WHACKY WIZARDS:
DESIGNING AND ASSESSING
AN ONLINE INTERACTIVE PROGRAM
FOR ELEMENTARY MUSIC EDUCATION

LEONARD BROOKS
Bachelor of Music, University of Lethbridge, 1996

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Department of Music
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Dr. Georg Boenn Dr. Marlo Steed Thesis Co-Supervisors	Associate Professor Associate Professor	Ph.D. Ed.D.
Dr. Rolf Boon Thesis Examination Committee Member	Associate Professor	Ph.D.
Ryan Harper-Brown Thesis Examination Committee Member	Instructor	M.F.A.
Dr. D. Andrew Stewart Thesis Committee Chair	Associate Professor	D.Mus.

Dedication

To all the teachers, students, and people everywhere that may have a chance to experience joy in musicking because of this work. Ultimately, it was done for you.

- LB

Abstract

Music, a subject once taught almost exclusively by specialists, is increasingly the responsibility of generalist teachers at the elementary level. This research documents the development, creation, and implementation of Whacky Wizards (a web-based program featuring interactive software and other resources) to help these teachers integrate music instruction in their classrooms using Boomwhackers® percussion tubes.

This thesis identifies 16 key barriers and needs faced by generalist teachers regarding music instruction and revisits these barriers and needs to outline the design rationales and objectives of the Whacky Wizards program.

In 2021 the program was implemented by 24 teachers in Southern Alberta for a 10-week field test. The researcher collected data from pre- and post-test interviews and online feedback forms completed by these teachers. Findings demonstrate that the program shows promise in addressing the aforementioned barriers and needs, particularly regarding increasing participants' confidence and competence (self-efficacy) towards infusing music instruction in their classrooms.

Preface

In the closing years of the last century, June Hinkley and other leaders of the National Association for Music Education (NAfME) were inspired to organize a special conference to address music education in the new millennium. The result was the Housewright Symposium on the Future of Music Education, held in Tallahassee, Florida, September 23-26, 1999, which gathered input from a large host of stakeholders across the United States, to define and respond to the most critical questions for music education in a rapidly evolving world. The document which stemmed from this symposium was called *Vision 2020*. It was presented at the Music Educators National Conference in Washington, DC. in March 2000 (National Association for Music Education, 2000)

At the heart of this document is *The Housewright Declaration**, a summation of the agreements made at the symposium. It outlines the goals and purposes of music education looking forward to the year in which this research project began. Because the declarations of that document align so closely with the aims of this thesis and research, and because it will be referred to with some frequency in this document, permission has been given to include it in its entirety here.

Of particular importance to me is the final statement of this declaration – that music educators have a duty to *identify the barriers that impede the full actualization* of these goals and to *work to overcome them*. It is my sincerest hope that my contribution to music education as outlined in this thesis, is considered a fulfillment, at least in part, of that duty.

Leo Brooks

January 2022

The Housewright Declaration

Whenever and wherever humans have existed music has existed also. Since music occurs only when people choose to create and share it, and since they always have done so and no doubt always will, music clearly must have important value for people.

Music makes a difference in people's lives. It exalts the human spirit; it enhances the quality of life. Indeed, meaningful music activity should be experienced throughout one's life toward the goal of continuing involvement.

Music is a basic way of knowing and doing because of its own nature and because of the relationship of that nature to the human condition, including mind, body, and feeling. It is worth studying because it represents a basic mode of thought and action, and because in itself, it is one of the primary ways human beings create and share meanings. It must be studied fully to access this richness.

Societal and technological changes will have an enormous impact for the future of music education. Changing demographics and increased technological advancements are inexorable and will have profound influences on the ways that music is experienced for both students and teachers.

Music educators must build on the strengths of current practice to take responsibility for charting the future of music education to ensure that the best of the Western art tradition and other musical traditions are transmitted to future generations.

We agree on the following:

1. All persons, regardless of age, cultural heritage, ability, venue, or financial circumstance deserve to participate fully in the best music experiences possible.

2. The integrity of music study must be preserved. Music educators must lead the development of meaningful music instruction and experience.
3. Time must be allotted for formal music study at all levels of instruction such that a comprehensive, sequential and standards based program of music instruction is made available.
4. All music has a place in the curriculum. Not only does the Western art tradition need to be preserved and disseminated, music educators also need to be aware of other music that people experience and be able to integrate it into classroom music instruction.
5. Music educators need to be proficient and knowledgeable concerning technological changes and advancements and be prepared to use all appropriate tools in advancing music study while recognizing the importance of people coming together to make and share music.
6. Music educators should involve the music industry, other agencies, individuals, and music institutions in improving the quality and quantity of music instruction. This should start within each local community by defining the appropriate role of these resources in teaching and learning.
7. The currently defined role of the music educator will expand as settings for music instruction proliferate. Professional music educators must provide a leadership role in coordinating music activities beyond the school setting to insure formal and informal curricular integration.

8. Recruiting prospective music teachers is a responsibility of many, including music educators. Potential teachers need to be drawn from diverse backgrounds, identified early, led to develop both teaching and musical abilities, and sustained through ongoing professional development. Also, alternative licensing should be explored in order to expand the number and variety of teachers available to those seeking music instruction.
9. Continuing research addressing all aspects of music activity needs to be supported including intellectual, emotional, and physical responses to music. Ancillary social results of music study also need exploration as well as specific studies to increase meaningful music listening.
10. Music making is an essential way in which learners come to know and understand music and music traditions. Music making should be broadly interpreted to be performing, composing, improvising, listening, and interpreting music notation.
11. Music educators must join with others in providing opportunities for meaningful music instruction for all people beginning at the earliest possible age and continuing throughout life.
12. Music educators must identify the barriers that impede the full actualization of any of the above and work to overcome them.

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* The Housewright Declaration (https://nafme.org/wp-content/files/2015/12/18-HousewrightDeclaration.pdf) is quoted from the book *Vision 2020: The Housewright Symposium on the Future of Music Education*, originally published in 2000, and is used here with permission of the National Association for Music Education (nafme.org). The 2020 reprint edition of *Vision 2020* is available from Rowman & Littlefield at rowman.com.

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To Adam Mason and all the members of Global Drums – I hope my contributions can be measured against how indebted I feel to have been accepted into this amazing musical family. You reawakened a dormant part of my musical identity.

To Pat Smith-Allen – Thanks for being the kind of mother a guy like me needed to make it this far.

To Michelle Brooks – You’re the best sister anyone could ever ask for. There is no one on this planet that I trust more than you to have my back, no matter what.

To my children – This journey has been a difficult one, and its burdens have been particularly heavy for all of you. I hope you know and understand how much it means that you took it with me.

Lastly, and most importantly, to Mary Johnson – you have simply been the whole of my heart.

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Chapter 1 – Introduction

The purpose of any academic research is to provide the world with new information, particularly as it pertains to filling in a gap in our collective knowledge or addressing some aspect of an identified but unresolved problem. The research presented in this document was initially conceived to chiefly increase my individual knowledge, and to address a predicament I personally witnessed over many years of my unique career in music education. As I began my research, I discovered that the problem I had observed was considerably more universal. It became clear that any solution I proposed would have to address more than just a regional issue.

This thesis is an account of how I identified and contextualized a problem in the realm of music education, the development and implementation of an intervention to address the problem in a limited scope, and the evaluation of how that intervention performed in those circumstances. The goal is to describe what such an intervention can accomplish at a local level and offer some ideas about how such a model could be implemented more broadly.

Before defining the aforementioned problem and the work that I have done to tackle it more specifically, I think it prudent to provide some background that brought me here.

1.1 – Background to the study

Before enrolling in my master's program, I made my living by presenting rhythm-based workshops in schools and communities near my home in Gatineau, Quebec. In these sessions I facilitated music making experiences with participants whom I supplied

with a variety of percussion instruments. The motivation behind everything I did then is the same as it is now: To get people to experience the joy and benefits of making music together.

While I conducted these workshops in a variety of settings, from nursing homes to corporate team-building sessions, the lion's share took place in elementary schools. I loved experiencing the surprize and delight of children and their teachers when they discovered that, with minimal instruction and a small amount of time, they were capable of making music. Yet while there was joy in these situations, there was also a sense of sadness in knowing that for a lot of the children I taught, my brief workshop would be the only opportunity they had to play music all year.

It was not that the teachers and administrators who hired me did not see the value of music education – in fact it was just the opposite. In conversations before and after my workshops, many of them would express their desire to teach more music, but would end with a statement that disqualified them from doing so:

I would love to build upon what the kids learned today, but I don't know how.

I wish I could do what you do, but I have no gift for music.

The students really enjoyed that! It is unfortunate that we don't have a music teacher in our school.

These exchanges always left me wanting some way to impart my years of knowledge and experience with them, to help them to share more music with their students. These were otherwise very accomplished teachers, juggling the instruction of half a dozen or more subjects to their classes. I wondered 'what was preventing them from teaching music?' I began to understand that there were needs for, and barriers

towards, music instruction that simply did not exist for other subjects. I also started to want to create a solution.

Over the months that my mind grappled with the issue of the lack of music in elementary schools, I had three notable ‘eureka moments’ which catalysed my resolve to work on a fix.

The first was in a classroom I visited where the teacher was doing her ‘DPA’ (Daily Physical Activity) with a group of grade 3 or 4 students. She was projecting a video at the front of the class from the popular video game “Just Dance”. All the students were standing in the aisles between the desks dancing along to the choreographed moves dictated by the game. She explained to me later that she did this with the kids for 10-15 minutes almost every day, and that some of them spent their recess working on their own routines with the moves they learned. I realized then there might be a way to present music in a similar way – short but meaningful ‘Brain Breaks’.

The second was observing my son learning to play some music from one of his favorite video games on the piano. There was no sheet music or traditional score available, but someone had created a YouTube video to teach the song using ‘Synthesia’ software. The video showed an interface with series of colored bars descending towards a keyboard to indicate which key needed to be pressed and for how long. I had seen similar interfaces for video games like ‘Guitar Hero’ and ‘Rock Band’, but never to show how to play an actual instrument. With his phone propped up on the piano showing the video, he was soon playing along. When I asked my son, who is dyslexic, how he could possibly learn the song that way, he told me that it was way more intuitive than reading from a

score, something for which he struggles greatly. This planted a seed in my mind about how such an interface might be used in a classroom setting.

The third revelation was more from an aggregation of events. I was doing a lot of workshops in schools using Boomwhacker percussion tubes. These simple, durable instruments create specific musical pitches when struck against a hard surface such as a desk or floor. Each different length of tube has a distinct colour, which helps identify its particular pitch. I employed mnemonic phrases and simple graphics matching the colours of the Boomwhackers to help children make music without knowing anything about conventional western notation. These ideas seemed so straightforward that I knew that if I could share them, it could facilitate music instruction in the classroom even if I was not personally there to do the teaching.

Ultimately, the desire to create a program that could be employed to introduce, augment, or improve music instruction germinated in my mind. Like the dance breaks I observed, I wanted it to be something that could be implemented easily, in short periods of time. I wanted it to be interactive and adaptable, with a game-like interface similar to the 'Synthesia' program. I wanted it to be able to share simple methods I had developed for teaching Boomwhackers to a wider audience. Most of all, I wanted it to be accessible to generalist teachers, those with little or no musical background, who needed some basic understanding and techniques to feel confident and empowered to include music in their classrooms.

My decision to return to university to pursue graduate studies is the result of the desire to create that program. The experiences outlined above gave me the initial vision of how it was to be designed and what it would need to do, yet I knew that the only way

for me to develop it was in an environment where I had access to expertise beyond my own. I knew that it had to be studied out and tested, and that data would need to be collected regarding its merits and weaknesses. More than just creating a product, I wanted to study and address the underlying issue of generalists and music education. This was going to require and understanding of the barriers they faced, and the needs they had, in order to offer music instruction in a way that would both meet curricular requirements and engage their students.

1.2 - Why is this study important?

The fundamental aim of this research is to promote and facilitate music education, particularly in learning environments where no music specialist may be present. To make the argument for why music education is beneficial, even essential, is beyond the scope of this thesis. Suffice it to say that I believe people are enriched socially, emotionally, and even physically through making music together in a way that is unlike ***any*** other activity. As noted in the Housewright declaration "Wherever human beings have existed, music has existed also…It is worth studying because it represents a basic mode of thought and action, and because in itself, it is one of the primary ways human beings create and share meanings." (National Association for Music Education, 2000, p. 219)

While I am a hearty proponent of studying music for its own intrinsic value, I am pragmatic enough to recognize that many compelling arguments to justify music education lie in extra-musical benefits, and much scholarly research has been undertaken to provide evidence of these benefits in a wide array of domains. A notable example is Susan Hallam's *The Power of Music*: *A research synthesis of the impact of actively*

making music on the intellectual, social and personal development of children and young people (2015), which documents the positive impact of actively making music in areas such as psychological well-being, empathy and emotional intelligence, social cohesion and inclusion, special reasoning and mathematical performance, and many others. Another noteworthy study examines the positive impact that music education had on shaping the successful careers of professionals in fields as diverse as business, law, and the military (Hartman et al., 2020). Canada's own Royal Conservatory of Music published a white paper entitled *The Benefits of Music Education* (2014), which outlines the many ways those involved with music making thrive in the world.

Even given the exhaustive reasons to advocate for music education, one of the hard truths the profession must come to grips with is that "those who doubt the benefits of musical learning – or more likely give them very little thought – are themselves the product of their own music education" (Pitts, 2017, p. 160). In other words, music education has as much capacity to create champions as to create detractors, so we must not look to its mere existence in schools as positive influence. I would argue that poor music pedagogy is more detrimental to the general public's attitudes towards music education than no music instruction at all. Even Hallam concedes "that the positive effects of engagement with music on personal and social development only occur if it is an enjoyable and rewarding experience" (2010, p. 269).

1.3 - The current state of music education in Alberta

Before delving into the remainder of this thesis, a point of clarification is in order: Music instruction in the context of this document always concerns music education at the

primary or *elementary* level, typically considered kindergarten through to grade 5 or 6. This is because at this level, music instruction is likely the responsibility of a generalist classroom teacher, which is the main impetus for this project. While some of the themes outlined herein certainly apply to music education in middle and high schools, specialists – teachers that have taken university level music and music education classes – are employed in the vast majority of these settings in Alberta.

By contrast, only an estimated 30% of Alberta elementary schools employ music specialists (Coalition for Music Education in Canada, 2010; Dust & Montgomery, 2007). This means that for the remaining 70% of elementary schools, the responsibility of music instruction falls to generalist classroom teachers.

It must be noted that although elementary schools employing specialist music teachers are relatively rare, a lot can depend on local circumstances and culture. Lethbridge School Division, for example, still has a dedicated music teacher in the majority of their elementary schools (Lethbridge School Division, 2021). It must be stressed, however, that the responsibility of music instruction falling to generalist elementary teachers, most of whom have received no training to do so, is a global trend that that has been rising for at least the last 25 years (Bresler, 1993; Byo, 1999; de Vries, 2014; Ferreira de Figueiredo, 2002; Holden & Button, 2006; Russell-Bowie, 2009; Welch & Henley, 2014).

Within the Alberta context, the governmentally mandated curriculum, known as the Elementary Program of Studies, lists Art and Music combined as one of six required subjects in grades 1 – 6 (the others being Language Arts, Math, Science, Social Studies, and Health & Physical Education) (Alberta Education, 2016). Ten percent of the 950

yearly instructional hours are to be dedicated to Art and Music, though it is frustratingly ambiguous as to what share each of these two distinct subjects should receive. Hypothetically, if music was given half of this allocation, it would amount to roughly one hour of music instruction a week.

While no data pertaining to Alberta specifically exists, evidence from other jurisdictions in Canada and internationally suggests that recommended allocations of music instructional time are not occurring in generalist classrooms (de Vries, 2014; Garrett, 2019; King, 2017; Vitale, 2020; Welch & Henley, 2014). If these reports are any indication, one could presume that most elementary students in Alberta are not receiving their recommended 95 hours of Music and Art education annually.

1.4 - What factors impede music education?

Knowing that music instruction is not taking place at an ideal level throughout Alberta and the world, it is essential to uncover the factors that contribute to this impediment. These obstacles can be considered barriers.

Barriers to music education can be defined as any kind of obstacle, impediment, hindrance, or deterrent that reduces, replaces, or removes music instruction from the classroom. These barriers can directly or indirectly effect both students and teachers. Barriers exist at many levels – from societal (the paradigm of the role and value of music and musicians broadly accepted in Western culture) to locally administrative (school principals who do not budget funds or instructional time for music). The term, especially as it will be employed in this document, is used with some frequency in the academic

literature which details challenges in music education (Abril, 2019; Crooke & McFerran, 2015; Culp & Clauhs, 2020).

A particular kind of barrier is created when something that is required is insufficient, lacking or altogether absent – this is considered a need. Teachers who are tasked with music instruction have many needs particular to the subject. These can be tangible, such as access to instruments, instructional materials, and teaching space, or intangible, such as time in the schedule, training and mentorship, and supportive administration. (Allen, 2011; Alter et al., 2009; Coalition for Music Education in Canada, 2010).

When it comes to music instruction offered by generalist teachers, the need/barrier which has received the most attention is confidence and competence towards the undertaking (or the lack thereof), the study of which has been undertaken for more than 3 decades (Biasutti et al., 2015; Joseph, 2019; Mills, 1989; Russell, 1996; Russell-Bowie, 2012; Seddon & Biasutti, 2008). There are several contributing causes documented for this deficiency. A small sampling of these include:

- previous experiences with music education (Juvonen et al., 2012; Ruddock & Leong, 2005; Sloboda et al., 1994; Vitale, 2020).
- attitudes towards their own musicality (Henley, 2017; Russell-Bowie, 2009; Stunell, 2010).
- insufficient training at the post-secondary level (Garvis, 2013; Jeanneret & Stevens-Ballenger, 2013; Webb, 2016; Welch & Henley, 2014),
- few opportunities for professional development (Garvis & Pendergast, 2012; Power & Klopper, 2011)

Regardless of the cause, it is clear that no solution to assist generalist teachers with music instruction is viable without identifying and addressing the underlying barriers and needs of teachers, particularly as they concern confidence and competence for the subject.

1.5 - How will this research address the problem identified?

Three perceptions have thus emerged: First, that music education is beneficial for children's development; Second, that the responsibility for this instruction increasingly lies with generalist teachers; Third, that significant barriers and needs must be addressed for this instruction to take place. Any attempt at addressing the problem had to keep these aspects front of mind.

On a personal level, I also wanted to ensure that any attempt to address the problem incorporated ideas that I had seen work so effectively in other areas of learning through experience; 1) the solution needed to be something that would incorporate technology in the classroom, 2) it would be easy to implement for short periods, 3) it would feature game-like elements, and 4) it would capitalize on the unique features of Boomwhackers as educational musical instruments.

Most of all, I knew that in addressing the problem would require a pragmatic approach – a tangible and utilizable intermediation for real world classrooms rather than a mere proposal of a theoretical framework to address the problem. This is because "For the pragmatist, truth and utility are indistinguishable – truth lies in utility" (Cole et al., 2005a, p. 3).

1.6 – What methods and methodology will be employed?

For the study to achieve its aims, a methodological approach had to be employed that could integrate the above-mentioned factors. When describing an early concept of my project to my professor Connie Blomgren, she told me about Design-Based Research (DBR). The highly pragmatic structure of DBR resonated instantly with my epistemological position. Its guiding principle is to design and create an innovative learning environment, learn about how such an environment works in the specific real-world settings for which it was designed, and hopefully, to generate some more fundamental knowledge about learning and teaching in general (Design-Based Research Collective, 2003).

The ways in which this project aligns itself with DBR will be further detailed in Chapter 3 of this document, but three key concepts associated with this methodology should be introduced here.

The first is that DBR often diverges from more conventional forms of research is in its use of *conjectures* rather than hypothesis, the difference being in the capacity for the former to be substantiated in a variety of ways rather than simply proven or invalidated. The focus in DBR is shifted from the trial of questions to the generation of adaptable and ongoing ways to overcome difficulties. DBR will often have some kind of high-level conjecture, which may address the more theoretical outcomes of the research, but also put forth sub-conjectures or research questions to predict and analyse specific outcomes for individual features of the design (Bakker, 2014b; McKenney & Reeves, 2012).

Once a problem has been identified and contextualized, and a conjecture is formulated, the next step is the design of an *intervention*, the second distinctive feature of DBR. An intervention is a plausible response or solution to a legitimate problem which has been identified by researchers and stakeholders and supported through published literature (Crippen & Brown, 2018). Decisions justifying the underlying philosophy and design of the intervention are crucial, as it needs to be as detailed and complementary to the complexity of the problem as possible given the scope of the research.

The third concept to note is that DBR is characterized as being *iterative*. "Design-based interventions are rarely if ever designed and implemented perfectly; thus there is always room for improvements in the design and subsequent evaluation" (Anderson & Shattuck, 2012, p. 17). Once one iteration of the intervention is implemented and data collected, the intervention is evaluated, improved, and re-implemented. Due to restraints of time and scope, this is one aspect of DBR that cannot be fully realized by my project. However, it remains a possibility that the intervention presented in this thesis may simply be the first iteration of a potentially larger process.

1.7 – Research questions

Following the conventions of DBR, and the aforementioned aims and features of this research project, its focus can be summed up by the following conjecture:

A program employing digital technologies can be designed, implemented, and evaluated to assist elementary teachers to introduce, increase, and/or improve music instruction for their students, particularly if they are not music specialists.

According to the pattern set out by Bakker (2014b), to follow more common research customs, the conjecture can be restated as a 'How' question.

How can a program employing digital technologies be designed, implemented, and evaluated to assist elementary teachers to introduce, increase, or improve music instruction for their students, particularly if they are not music specialists?

One of the difficulties with 'How' questions is that they can be extremely broad, presenting no clear path to an answer. However, in the case of design-based research, this can be used to our advantage, as we are able to define the path we will take through subsequent, clarifying 'what' questions:

1. What are the **barriers** that exist for these teachers towards music instruction?

   In what ways will this program address them?
2. What are the **needs** of these teachers with regards to musical instruction?

   In what ways will this program meet them?

To examine them to their fullest, eight sub-themes have been selected for each of these questions. These sub-themes are divided into barriers and needs and will be presented in reoccurring sub-sections within the thesis. These sub-sections provide a framework that will categorize our review of the literature, intervention design, findings, discussion, and conclusions.

1.8 – Thesis outline

The following outline provides brief overviews of each of the remaining chapters in this thesis:

Chapter 2 – Literature Review

The primary purpose of this chapter is to review the literature associated with each sub-theme, with the goal of substantiating our conjecture and validating our research questions. Each section of the literature review will conclude with a summative statement regarding how the intervention intends to address that particular barrier or need.

Chapter 3 – Methodology and Methods

This chapter will further detail design-based research, and outline the protocols adopted to obtain findings and results. It will describe the development of the component elements of the Whacky Wizards Program and the processes undertaken to find participants willing to implement the intervention in a field test. Lastly, it will define and summarize the data collection instruments employed in this project.

Chapter 4 – Intervention Philosophy and Design Rationale

This chapter will outline the intervention devised for this research project, known as The Whacky Wizards program. It will summarize the philosophical backbone of the program and defend the rationale behind design decisions using examples drawn from both the literature and comments drawn from pre- test interviews with participants. Each section will conclude by declaring the desired outcomes for the intervention as it addresses that barrier or need.

Chapter 5 – Findings and Commentary

This chapter will present the findings and data collected through interviews and online surveys completed by research participants. The desired outcomes generated in the previous chapter will be reiterated at the beginning of sub-section, and commentary will be included to place these findings within the context of the barriers and needs they are addressing.

Chapter 6 – Discussion and Evaluation

Through consideration of the findings presented in the previous chapter, chapter six will provide analysis and insights to assess how well the desired outcomes for each sub-themes were attained. It will also identify the limitations of the intervention and present the theoretical and practical implications of the study for the future.

Chapter 7 – Conclusion

This final chapter will detail the ways in which the project substantiated the principal conjecture and responded to the research questions. It will suggest the of contributions this research to three areas of study and outline further findings that were not included in the thesis. It will conclude by summarising the importance of the research, both academically and personally.

1.9 – An important note about the term “Musicking”

Unlike the verb form of doing dance (dancing), or doing an act (acting), there is no widely used verb to describe the process of doing music. The mere fact that there is a

lack of a verb form reflects how much our culture considers music a product – a thing one must play, make, or perform. A solution to this is the verb ***musicking*** – a contraction of 'music making' – which will be used with some frequency in this document.

It may be helpful to elaborate on the need for such a word by explaining the origin and intention of the term. It was first coined by David Elliott (who spelled it as 'musicing') to describe a social action that involves multiple aspects of music participation, such as listening, composing, performing, creating etc. (Elliott, 1995). Christopher Small (1998) expanded and popularized Elliott's term, emphasizing that music should be conceptualized as a process rather than just as a product. He also added 'k' to the spelling, which points back to music as it occurred in the Elizabethan era and before, when the word was commonly spelled 'musick' or 'musicke'. What is key is that during this time music was a considerably more communal, quotidian practice, as opposed to something like the emerging theatre of Shakespeare, which divided performers and audience by a stage (Lord & Brinkman, 2003). This usage is most notable in the opening line of the original transcript of the Bard's *Twelfth Night* – "If musicke be the food of Loue, play on" (Shakespeare & Wells, 1987).

Chapter 2 – Literature Review

The goal of the following chapter is to is to review existing literature that may elucidate, support, and substantiate our principal conjecture, that **A program employing digital technologies can be designed, implemented, and evaluated to assist elementary teachers to introduce, increase, and/or improve music instruction for their students, particularly if they are not music specialists.**

Implied within our conjecture is an understanding that music instruction, particularly at the elementary level when delivered by generalist teachers, is in trouble. Before we can do anything to address the problem, we must aim to understand it by reviewing and analyzing the scholarly work that has come before.

In doing so we can shed light on our research questions:

1. What are the **barriers** that exist for these teachers towards music instruction?

   In what ways will this program address them?
2. What are the **needs** of these teachers with regards to musical instruction?

   In what ways will this program meet them?

Each section of this chapter will respond to both portions of these questions in a distinct way. The main body of the section will answer the first, 'What are the barriers/needs' portion of the question by identifying and explicating a specific barrier or a need. The closing paragraph of the section, presented in **bold text**, answers the second, 'In what ways will' portion of the question by summarizing how our intervention (a.k.a. the Whacky Wizards Program) plans to address it.

This chapter begins with an examination of the barrier which is created by the lack of confidence and competence towards teaching music present in many generalist teachers. It could be said that this is the need/barrier to which all others are merely contributing factors. Nevertheless, other barriers and needs will be presented subsequently to expand our understanding of those things which can inform the design decisions of our intervention.

Because complex difficulties concerning music education are interwoven in an intricate web, In each section of this chapter, there will be quotes and references that illustrate the question at hand, but frequently hint at other topics that are addressed. Metaphorically speaking, the intent is for the reader to be aware of the 'forest' of issues while studying each individual problem 'tree'. Ultimately, the goal is for us to wholistically corroborate our conjecture, while finding the features which need to be present in the design of our intervention.

2.1 – Barriers to music education

As we investigate the sub-themes of first of our research question, (*What are the barriers that exist for [elementary teachers, particularly generalists], towards to music instruction)* it may be helpful to explain why barriers are so crucial to address. To so, let us return to the Housewright Declaration in the preface of this thesis, and re-examine the twelfth call to action presented there:

> Music educators must **identify the barriers** that impede the full actualization of any of the above and **work to overcome them**.
> (National Association for Music Education, 2000, p. 220 emphasis added)

To be clear, this research project cannot truly *overcome* the barriers included below some of which occur at societal, cultural, or systemic levels. The operative word is *work* – the aim of the project is to diminish those obstacles to some degree. Nonetheless, the discussion of these barriers places the current circumstances of music education in a wider context and will broaden the understanding of the underlying philosophy and design rationale of the Whacky Wizards program, as presented in chapter 4.

2.1.1 – Barrier #1 – Lack of confidence and competence (self-efficacy) for music instruction

It could be argued that to have the greatest impact in any given situation, one must discover and address the greatest deficiency. Given this standpoint, the single biggest impediment to music instruction in the generalist classroom are the interconnected deficits in *confidence* and *competence*. This extremely well documented problem first received attention over 30 years ago (Mills, 1989). Since then, the literature has been flooded with examinations of the subject (Biasutti et al., 2015; Collins, 2014; Jeanneret, 1997; Nethsinghe, 2017; Russell, 1996; Russell-Bowie, 2012, 2013; Seddon & Biasutti, 2008; Stunell, 2010; Vitale, 2020). While some studies have stressed the issue of confidence more strongly than competence (Alter et al., 2009) and others *vice-versa* (Wiggins & Wiggins, 2008), it is clear that these ideas come as a package – one cannot be affected without influencing the other.

While studies documenting the confidence/competence problem among generalists are plentiful, scholarship outlining possible new approaches to help teachers overcome this barrier, particularly once they have entered the workforce, are

considerably less common. This is reflected by Biasutti, Hennessy and Vugt-Jansen (2015) who state:

> We know from a range of studies which factors contribute to teachers' abilities and confidence, but there are fewer studies that document the possible training approaches and interventions that might improve the outcomes. (p.143)

If the purpose of the Whacky Wizards program could be distilled in to just one objective, it would be to improve teacher confidence by increasing teacher competence in music instruction. An excellent example to help us understand how this goal can be achieved is found in Albert Bandura's model of ***Self-Efficacy*** (1977, 1997), which can be interpreted as simply the combined confidence and competence required to gain proficiency within any distinct domain.

Self-Efficacy as a lens to view issues within music education has been adopted by several researchers in the field (Collins, 2016; de Vries, 2013, 2017; Garvis, 2013; Lowe et al., 2017). Garvis & Pendergast define self-efficacy in the educational domain as "a teacher's belief in his or her ability to affect change in students' learning outcomes" (2010, p. 7).

The four key aspects that contribute to positive self-efficacy, as defined by Bandura (1997), are:

1. enactive *mastery experiences* that serve as indicators of capability
2. *vicarious experiences* that alter efficacy beliefs through transmission of competencies and comparison with the attainments of others
3. *verbal persuasion* and allied types of social influences that one possesses certain capabilities

4. *physiological and affective states* from which people partly judge their capableness, strength, and vulnerability to dysfunction

(p. 79, numbering and emphasis added)

According to Bandura, *mastery experiences* are the most powerful influencers on self-efficacy, both positively and negatively. De Vries (2013) expounds on mastery experiences thusly:

> These are experiences that teachers have when they see that their teaching results in student outcomes being achieved, or even improved upon. This in turn leads to optimism about future teaching tasks of a similar nature, resulting in increased motivation to continue teaching at this level. Once at this point teachers are more likely to persist with teaching tasks that may initially be challenging. (p. 377)

Regrettably, many teachers have not had mastery experiences with musicking in their own educational journeys, which negatively affects their perceived self-efficacy for teaching (Hallam et al., 2009; Joseph, 2019; Ruddock & Leong, 2005; Siebenaler, 2006).

Vicarious experiences occur when a teacher can observe a peer or instructor effectively teach a lesson or perform a specific task, such that the witnessing teacher can feel like their confidence and competence for the task has been increased (Bandura, 1997; de Vries, 2017). This is often referred to in the educational sphere as *modelling.* It must be noted that the observed lesson must be relatable and within the realm of possibility for the witnessing teacher, such that they would feel they *could* accomplish a similar task.

Verbal persuasion is the feedback mechanism that affects self-efficacy in the form of comments, encouragement, constructive criticism and direction for future action. It is important to note that for this to be effectual, teachers must receive this feedback from a source they consider to be credible and authentic (Bandura, 1997; de Vries, 2017).

Physiological and affective states, also known as emotional arousal, can be described as the "level of excitement or anxiety associated with the teaching task" (Garvis, 2013, p. 86). This can be a very powerful indicator of willingness to attempt a particular undertaking – if the teacher associates dread or ineptitude with a subject they are much less likely to try a lesson than if they feel joy or assuredness about it (Bandura, 1997; de Vries, 2017; Joseph, 2019; Vitale, 2020).

The Whacky Wizards program must seek to ameliorate teachers' self-efficacy in the domain of music instruction. Its primary conduit for this goal will be providing teachers and students *mastery experiences*, with opportunities for *vicarious experiences* and *verbal persuasion* when possible. Lastly, it aims to foster positive *physiological and affective states* associated with music instruction and reduce anxiety towards the subject.

2.1.2 – Barrier #2 – Previous experience with music education

An overarching theme that may help us understand the current difficulties facing music education is that, for good or for ill, as a society we are all products of our music education (Pitts, 2017; Regelski, 2006; Vitale, 2020). While we can celebrate our successes with our many champions and advocates for whom the experience was positive (Abril & Gault, 2008), we have to acknowledge the many policy makers, administrators, educators, and students for whom the experience was at best inconsequential and at worst traumatic (Lepherd, 1995; Russell-Bowie, 2009; Stunell, 2006; Welch & Henley, 2014). As Stephanie Pitts, the author of *What Is Music Education For?,* so brilliantly points out:

> There are challenging questions to be asked, therefore, about what lasting values and attitudes the majority of the population acquire during their formative musical years – and what responsibilities school music education holds for shaping those values across the population. (2017, p. 160)

For the purpose of our study, the portion of the population for whom we are most concerned are educators that have been tasked with teaching music. Because many of these teachers often had either minimal or negative experiences with music in primary school, they lack confidence and even basic motivation to teach music (Nethsinghe, 2017; Vitale, 2020). One might even go so far as to say that music instruction delivered by generalist teachers in these circumstances is in cycle of self-harm. "In terms of the true aims of music education, little appears to be achieved in [classes taught by underprepared generalist teachers] - in fact the result is often inculcation of a dislike of music" (Lepherd, 1995, p.29, as cited in Russell-Bowie, 2009, p. 25).

An examination of individuals who considered themselves 'unmusical' by Ruddock and Leong (2005) drives the point home well:

> Each of the informants is seen to be adversely affected by a particular formal music learning situation in their past. This has important implications for the quality of the musical experiences of young students in today's schools. If the view of music as an unnecessary and ill-taught 'extra' is perpetuated, many individuals will be deprived of the joy of music. Music education needs to do more to effect a profound change in people's perception of music and themselves as musical beings. (p.21)

If the Whacky Wizards program is to impact this barrier in any way, and not perpetuate a cycle of negative or negligible experiences with music education, its duty is to endorse a paradigm that is not merely a reflection of what came before. It must provide alternate approaches to music instruction that prioritize meaningful, universal engagement and participation with music.

2.1.3 – Barrier #3 – Perceptions about musical ability

The current paradigm of music education, at least in post-colonial euro-centric cultures, has created a damaging dichotomy in our society in terms of those whom we consider 'musical' or 'unmusical', a judgement which is imposed upon people by both external and internal voices. (Ruddock & Leong, 2005; Shuter-Dyson, 1999; Sloboda et al., 1994; Vitale, 2020; Welch & Henley, 2014)

There are two indicators that our culture relies upon to identify 'musical' individuals. The first is a widely accepted notion that "musicians" are seen only as those who can play instruments, and to a lesser degree sing, at an expert or professional level (Hallam & Shaw, 2002; Stunell, 2010). It is in their capacity to *perform* music or create listening experiences for others to consume, either in live settings or through recordings, that one becomes accepted as a musician.

The second is a pervasive belief that being 'musical' is the result of some inborn gift or talent granted either through heredity, divine intervention, or fortunate fate, which is unfortunately accepted as truth by both 'musicians' and 'non-musicians' alike (Jeanneret, 1997; Kingsbury, 1988). This unfortunate opinion is emphasized by Sloboda who states that "self-fulfilling beliefs about the consequences of an innate gift being present are inevitably coupled with self-fulfilling beliefs about the outcome of a person lacking such a gift." (1994, p. 349). By this logic, those who lack this gift must be 'unmusical'.

This, of course, is abjectly false. Music, like any other ability, is one that can be nurtured and developed (Scripp et al., 2013; Shuter-Dyson, 1999). When a child fails a math test, we do not consider them 'unmathematical', and forever discount their aptitude

for learning math. However, elementary school children, often in settings when singing, either get labeled or self-label as ‘unmusical’ and carry this belief with them into adulthood (Cuddy et al., 2005; Ruddock & Leong, 2005; Sloboda et al., 2005).

Unfortunately, teachers are not exempt from these generally held perceptions of musicality. This becomes particularly problematic because the perception that they are not ‘trained musicians’ or do not possess a musical ‘gift’ or ‘talent’ makes them believe they cannot, or should not, teach music (Welch & Henley, 2014). Once the belief that one is ‘unmusical’ sets hold, it is extremely difficult to reverse; musical ability is an area where a fixed mindset it is much more common (O'Neill & Sloboda, 1997).

If the Whacky Wizards program is to address this barrier, it cannot simply hope to alter user’s perceptions about their musical ability. It must be made clear that everyone can and should be involved, regardless of real or perceived musical capacity.

2.1.4 - Barrier #4 – Belief that music instruction is somehow rarified and should remain the realm of specialists

A holdover from our cultural perceptions regarding music as singularly within the realm of ‘the gifted’, is that music education should purely be handled by specialists (Nethsinghe, 2017). Hennessy reinforces this claim of a “deeply rooted view held by large numbers of people, including teachers, that being able to `do' or teach music requires special gifts that are only attainable by, or given to, a chosen few” (2000, pp. 183-184).

A large part of this perception has to do with the measure which we judge those qualified to teach music, namely if they have undergone Western Classical training (Clements, 2008; Kim, 2016). Music education at Canadian universities almost exclusively adheres to a 'conservatory' system, which is devoted to the production of classically trained musicians (Hargreaves et al., 2003; Roberts, 2000), and it is from this pool of candidates that we draw our music education students. Accordingly, the wide opinion shared by educators of all stripes is that music should be taught by those who have expertise in the *performance* of music (Regelski, 2014; Welch & Henley, 2014; Wiggins & Wiggins, 2008). There is evidence that this assumption serves neither generalists nor specialists well: Specialist music teachers professional lives can be impaired when they believe that they have to uphold their identities as musicians first and as teachers second (Ballantyne et al., 2012).

This has implications for our research, because studies have demonstrated that the perceived lack of qualifications to teach music among generalist teachers makes it the subject for which most have the lowest perceived self-efficacy, and that they are most likely to avoid, to the point where for some it causes significant anxiety (Alter et al., 2009; Garrett, 2019; Holden & Button, 2006; Stunell, 2006; Vitale, 2020). This is doubly damaging because it can project a negative view of the value of music onto their students. As pointed out by Janet Mills "If music is not for all teachers why should children assume it is for all children?"(1989, p. 126)

The Whacky Wizards program must make clear that it is not a tool for music specialists only. It can and should be employed by generalist teachers in their classrooms.

2.1.5 – Barrier #5 – Never having received formal training in music or music pedagogy

The barrier that arises frequently in the literature concerning music instruction among generalists, especially as it pertains to the confidence and competence for the subject, is the lack of training these teachers received at the post-secondary level (Biasutti et al., 2015; Byo, 1999; Ferreira de Figueiredo, 2002; Jeanneret & Stevens-Ballenger, 2013; Koutsoupidou, 2010; Lowe et al., 2017; Rogers et al., 2008; Seddon & Biasutti, 2008). The problem is summed up brilliantly by Wiggins and Wiggins (2008):

> We would be appalled at the idea that someone could teach language arts if he or she had not read a book or written a word since the age of eleven. Yet we expect that generalist teachers can teach music when their last formal musical instruction, if any, may have occurred at that age or earlier (p.4)

The problem is exacerbated by a circumstance found in Alberta and elsewhere: Generalists, and the institutions who train them, assume that a music specialist will be present where these teachers are employed. But, as explained in the introductory chapter of this thesis, there is a disconnect between this assumption and the actual number of schools that have specialists (Coalition for Music Education in Canada, 2010; Dust & Montgomery, 2007). Findings from an extensive study of pre-service generalists in 5 countries by Russell-Bowie drives this point home: "[Generalist Teachers] were not expected to have the skills and expertise to implement music programmes, as this was

seen to be the domain of the music specialist teacher, and so they were not trained accordingly" (2009, p. 24).

In the same study 78% of respondents listed "a lack of personal musical experience" as a key contributor to their hesitation to teach music (Russell-Bowie, 2009, p. 31). What is particularly interesting is that a lack of confidence exists despite many pre-service teachers *having* experience with music earlier in their lives, some even receiving training at the university level (Lowe et al., 2017; Wiggins & Wiggins, 2008). It could be inferred that this is the result of one of two phenomenon: First is that even when training happens in post-secondary settings, it often favours theory and lacks any hands-on experience (Garvis & Pendergast, 2012); Second is that these students likely have very set ideas of what music teaching 'is' according to Western Classical norms, and have not had experiences making music with others in uncomplicated ways (Nethsinghe, 2017; Progler, 2004).

The Whacky Wizards program must provide teachers with opportunities for training *and* musical experiences to help reduce the impacts of this barrier.

2.1.6 – Barrier #6 – Music is not seen as a "core" subject, and the predominance of literacy and numeracy

Our attitudes about music, and about the arts more broadly, is exacerbated in the current political climate that favours 'literacy' and 'numeracy' (Smith, 2000; Webb, 2016). This stems from the neo-liberal ideology predominant in the West which presumes that the primary goal of education is to create a workforce that is competitive in a global economy (Aróstegui, 2016; Crooke, 2019; Horsley, 2009). This has essentially created a

set of ‘privileged’ subjects (Reading, Writing, Math, & Science) to which all other subjects are ‘subjugated’(de Vries, 2017).

This policy is also reflected by the emphasis in ‘the knowledge-based economy’ on standardized and so called ‘high stakes’ testing (Abril & Gault, 2006; Horsley, 2009; West, 2012). Because there is no systematic means of assessment for the arts, they are classified as non-core, or ‘soft’ subjects (Rabkin & Hedberg, 2011). As one respondent adeptly stated in a study exploring the global decline of music education “we test what we value and we value what we test” (Aróstegui, 2016, p. 96).

This trend has infiltrated education programs at the post-secondary level, where there is pressure to produce specialists in Literacy and Numeracy rather than true generalist teachers (Sirek & Sefton, 2018). Research by Linda Webb, which was conducted by interviewing a number of school principals who had recently hired new teachers, reinforces this new reality: “principals reported that beginning teachers arrived in schools as a literacy and numeracy specialist group rather than with developed generalist abilities” (2016, p. 6). Furthermore, this same report noted that “music expertise was clearly not a priority with ten of the eleven principals choosing those with strengths in literacy and numeracy, followed by information and communication technology (ICT).”

The harsh reality of how situation effects music education is detailed by Stunell (2006), who explains that in 1997 the School Standards Minister in the United kingdom “suggested primary schools should be allowed to adopt a less vigorous attitude towards the non-core subjects in order to allow success for literacy and numeracy strategies”

(p.12). She goes on to explain that for schools that had been struggling to deliver music instruction, this declaration effectively allowed them to drop music from their timetables.

There is no way that the Whacky Wizards program can sway the ubiquitous policy that privileges literacy and numeracy learning. Instead, it must employ tactics that work within this framework and exploit any opportunity to include music instruction and engender a valuation of music in the classroom.

2.1.7 – Barrier #7 – Music education is considered 'disposable'

There is an apparent disconnect between the value of music and its place in our educational institutions. For example, in an international survey of pre-service teachers who had completed a practicum, 78% agreed or strongly agreed that elementary schools should give music a high priority, however, only 43% indicated that they actually give music this high priority. (Russell-Bowie, 2009, p. 63) As noted by music education professor J. Terry Gates - "Music study is easy to defend, but hard to rationalize" (National Association for Music Education, 2000, p. 58).

As a cumulative effect of the pressures placed on music education from all the barriers identified thus far, it is frequently 'first on the chopping block'. There are two main areas in which music education is either neglected or seen as expendable, each with corresponding explanations.

The first is among principals and other decision makers where "music budget cuts and program reductions are often the result of administrators' tough decisions about which programs to fund" (West, 2012, p. 76). Even principals who value music often feel like they have no other choice of what to cut due to 'results-based' pressures, such as

standardized testing (Abril & Gault, 2006; Abril, 2019). On the positive side, where music education at the elementary level still exists, it is often because of active navigation around serious funding obstacles by school or board level administration (Crooke & McFerran, 2015).

The second is in the classroom, where curricular pressures can push music off overcrowded schedules. Given the reality of a finite number of hours to teach, the pressure to achieve curricular outcomes, and the anxiety many teachers feel towards music instruction, the unfortunate but inevitable outcome is that it will be neglected or even abandoned (Stunell, 2006).

A statement from a pre-service elementary teacher in a recent study by John Vitale (2020) is indicative of the problem:

> I fear that I will succumb to the pressures of the curriculum and report cards and pay little, if any, attention to music. It is very easy to cancel music class in order to get in some extra review for a math test. That's what will probably happen in my classroom. (p. 66)

The Whacky Wizards program must make targeted efforts to diminish barriers caused by funding and time restrictions.

2.1.8 – Barrier #8 – Music is viewed predominantly as a product more than as a process

To be clear, music is both a product and a process – both elements are necessary and worthy of appreciation. The trouble arises in music education when the emphasis on the product completely eclipses the value of the process (Reimer, 2000).

This problem exists not simply within the purview music education but is a reflection of our cultural musical paradigm. We tend to view music as a product for everyone, but a product for which most are required to be consumers and only a select few are destined to be producers. This is summarized by Crooke who states that "…playing or creating music has become an elitist activity; something to be undertaken by those sufficiently trained or skilled to do so, with subsequent products (recorded music or performances) to be commercialized and consumed by the remaining population" (2019, p. 26). This highlights the supposition that music is only for the privileged (Gill, 2017), and returns us to the issues surrounding the collective divisions about who is, (and more importantly, who is not) a musician (Regelski, 2015; Small, 1996, 1998).

The way in which this manifests itself with regards to music instruction is that often its sole intent is to work towards performances for special events, which is problematic on many levels. First, the mere idea of performing in front of others is stress inducing for a lot of people, and the anxiety is multiplied for teachers who may have to lead others in performance. "There is a strong performance imperative frightening many teachers, especially non-musicians, who feel compelled to "prepare the students to perform" " (Bartel et al., 2004, p. 88). Second, the focus on 'perfect performances' can alter teachers whose approach is otherwise inquiry-based and student-centred into more authoritarian directors during music time because they feel that they must abide certain protocols. These lessons tend to emphasize discipline more than meaningful music participation (Wiggins & Wiggins, 2008). Additionally, conceptualizing music instruction as merely the creation of something to be performed or produced for

consumption can remove the connections to music making as a means to strengthen identity and community (Goble, 2013; Regelski, 2015; Small, 1998).

The Whacky Wizards program must help swing the pendulum back towards esteeming process and participation with music more than polished musical performance.

2.2 – Needs of teachers who teach music

As explained in the introduction, a need is simply a requirement for any undertaking that becomes a barrier when it is not realized. One can conceive of needs and barriers as simply two sides of the same coin – almost every barrier can be articulated as a need unmet.

As we explore our second question, *(What are the needs of [elementary teachers, particularly generalists], with regards to musical instruction?)* we will explore the tangible and intangible needs of those with the responsibility for music instruction in their classrooms, as well as explore the special roles that technology can take in meeting these needs.

2.2.1 – Need #1 – Funding

It may be that funding for music education programs at all levels of instruction is at the root of all other needs teachers face. In a 2010 study commissioned by the Coalition for Music Education in Canada (CMEC), school administrators and teachers across the country were asked to rank the top three restrictions or challenges they faced in

implementing music education and opportunities at their schools from a list of 10 possible choices. Over a quarter of respondents (26%) listed funding as the number one challenge and nearly half (48%) included it in their top three.

Lack of funding appears to be a global challenge for music education (Abril & Gault, 2006; Abril, 2019; Crooke & McFerran, 2015; Russell-Bowie, 2009; Stunell, 2007). In reference to a study of teachers in Oklahoma by Ciorba and Seibert (2012), Abril (2019) states: "When asked to describe the ways in which they would be able to improve music in their schools, the most frequent response among participants was that funding should be increased" (p. 375).

The Whacky Wizards program (inasmuch as it is being used for the current intervention) must not be contingent upon funding for its implementation.

2.2.2 – Need #2 – Instruments

The cost of purchasing, storing, and maintaining instruments continues to be a prohibitive factor in music education. Lack of instruments was the third most common top choice in the aforementioned CMEC study, and nearly half (48%) listed it in their top three (2010). Having proper, accessible instruments and space to store them is a concern for generalist and specialist teachers alike (Byo, 1999). A 2011 study of music activities undertaken by first year generalist teachers highlights the problem – "When asked about the relative low number of people incorporating musical instrument activities in their music teaching, the overwhelming response was lack of access to musical instruments" (de Vries, p. 17).

The unpleasant reality of a music program with no instruments is summarized in a reflection by a pre-service generalist teacher:

> We had a music program in primary school but the teacher just made us sing along to a CD. That was music and we were taught to play recorder on a ruler! (Lowe et al., 2017)

Unfortunately, her situation was not unique. Similar 'music classes' have been reported by many (de Vries, 2017; Vitale, 2020).

It is essential that the Whacky Wizards program provide teachers with the instruments needed to implement the intervention in their classrooms.

2.2.3 – Need #3 – Instructional materials

A lack of appropriate resources, such as teaching materials and lessons plans, is a major concern to teachers and principals alike (de Vries, 2014; Garvis & Pendergast, 2012; Mills, 1989; Power & Klopper, 2011), and ranks among the biggest concerns of educators in many countries (Russell-Bowie, 2004). In a study by Holden and Button (2006), non-specialists tasked with teaching music 69% listed 'a published music scheme' as the support they would most like to receive.

The pre-service teacher respondents in a study by De Vries (2011) list 'a lack of resources and how to use them' as a major stumbling block to integrating music in their classrooms. The frustration is reflected by one respondent as follows:

> With such limited time spent on music in my course I think there needs to be a bigger focus on this, giving us the resources, knowing how to use them, so when we get out there we've got something with us that's practical and useful, not just another academic reading that we used in an essay. (p.13)

The desire for simple resources that do not require excessive skill and planning is so strong among generalists that many rely on commercially available teaching kits, which can cost hundreds or even thousands of dollars (Murillo, 2017; Musicplay, 2020). However, these kits often prescribe a set of lessons that may not address curriculum well, and do not often provide means for professional development or innovation (Wiggins & Wiggins, 2008).

The Whacky Wizards program must provide teachers with a comprehensive set or system of instructional materials that can facilitate musicking in their classrooms, in terms of both lesson preparation and delivery.

2.2.4 – Need #4 – Space

Having an appropriate space or classroom to teach music is often listed in studies that explore challenges facing music education (Allen, 2011; de Vries, 2013; Pike, 2016). This encompasses concerns about proper storage space for instruments, distance or isolation from other classes who might be affected by the noise, and an environment conducive to the classroom management that comes with music instruction (Pascoe et al., 2005).

The CMEC study reports that 7% of respondents listed lack of a suitable teaching space as the most important challenge they face, while 28% included it in their top three. Unfortunately, dedicating a classroom for music instruction is a luxury that many schools simply cannot afford (Crooke & McFerran, 2015; Schneider, 2003).

The Whacky Wizards program must be adaptable enough to be used in a number of spaces, including any 'regular' classroom.

2.2.5 – Need #5 – Time

The need to schedule or 'find time' for music instruction cannot be overstated. In the CMEC study, more than half (58%) of reporting elementary schools cited a lack of time or timetable pressures as one of the top three challenges for music instruction, with nearly a quarter (23%) claiming it to be the most challenging (2010). The need and difficulty for making time for music instruction is a nearly ubiquitous theme in the literature (Alter et al., 2009; King, 2015; Russell-Bowie, 2009; Vitale, 2020; Webb, 2016)

Even though 10% of instructional time for elementary students in Alberta should be dedicated to Art and Music (Alberta Education, 2016), there are external and internal forces that make teachers consider certain required subjects ""more mandatory" than a mandated music curricula" (Horsley, 2009, p. 6). With the incredible pressure of standards-based testing and crowded 'skills based' curriculums, coupled with the anxiety of teachers feel towards the subject, assuring that each child receives the recommended minimum music hours can challenging (Garrett, 2019; King, 2018; Russell-Bowie, 2009).

The Whacky Wizards program must be deliberately designed to work, and even thrive, within the confines of a crowded timetable.

2.2.6 – Need #6 – Mentorship

One path to developing Self-Efficacy can be found through a mentoring relationship. This occurs when a more experienced individual (the mentor) is purposefully paired with a less experienced one (the mentee) to provide support and training to for the professional and personal development of the mentee (Kram, 1988). The self-efficacy boost generalist teachers can receive from mentor support can drastically improve their desire and ability to provide music instruction (Barrett et al., 2019; Baumgartner, 2020).

As mentors, teachers with more experience or training can provide not only guidance for subject matter, but also strategies for classroom and time management, lesson planning and assessment, and moral support and encouragement (Conway, 2006; Schmidt, 2008). Mentoring can also be effective when an individual is connected virtually or physically with a network of peers for support and collaboration (Zeserson et al., 2014). Many have advocated for generalists to have access to a music specialist for guidance and direction to integrate music in their classrooms (Holden & Button, 2006; Jeanneret & Stevens-Ballenger, 2013; Russell-Bowie, 2009).

In as much as is possible given the digital platform on which it will exist, The Whacky Wizards program should bolster the self-efficacy of those who use it by providing mentorship in the form of training, vicarious experiences (modelling), and positive feedback.

2.2.7 – Need #7 – Training and Professional Development

Training and professional development (PD)for a subject is one of the best ways to foster self-efficacy. Michele Biasutti has conducted two studies that demonstrate how training programs increase generalist teacher confidence for music (Biasutti et al., 2019; Biasutti et al., 2015), while PD is one of the most often cited avenues to increased competence for the subject (Guskey, 2002; King, 2017; Koutsoupidou, 2010; Vitale, 2020). Unfortunately, access to suitable Arts-Based PD is often difficult (Garvis & Pendergast, 2012; Power & Klopper, 2011). One reality is that even when teachers do have access to PD, "schools now require them to attend professional development activities that have more to do with improving math and reading scores than with teaching music" (West, 2012, p. 76).

Hennessey (2000) and Nethsinghe (2017) both report on the increase of confidence among teachers involved in training programs that were centered in active musicking. Holden & Button contend that active musicking is in fact vital for PD – "We argue that the teaching of music in the primary school may not develop unless there is an opportunity for class teachers' professional development and that it may include the experience of making music" (2006, pp. 34-35).

One avenue to explore for the professional development of those tasked with teaching music is through the increased use of technology, both as a means of access to training and as a means of lesson delivery (Bauer, 2010; Bauer et al., 2003; Burn, 2017; Crawford, 2013; De Villiers & Sauls, 2017; Gall, 2017). This is especially true for music instruction during the COVID-19 pandemic, when many music teachers were obliged to contend with technology and distance learning (Frankel, 2020; Thornton, 2020). One

study which examined a professional development program that integrated technology with music education had numerous positive outcomes: “The use of technology improved teacher and student presentations, facilitated differentiated learning, and shifted learning experiences from teacher-centered to student-centered” (Zelenak, 2015).

The Whacky Wizards program is not intended to deliver music instruction to students directly. Rather it is to provide training and professional development to teach teachers how to teach music, with the goal of developing their self-efficacy for the subject.

2.2.8 – Need #8 – Integration of music instruction with classroom technology

We live in a world where all students are ‘digital natives’ but where many teachers are ‘digital immigrants’ (Prensky, 2001) – whereas many teachers would have been raised in a time without the internet, there is no child in elementary school today that was alive before touch screens became ubiquitous (Leong, 2017). As such, familiarity and comfort with interactive technologies in the field of education is now requisite. This is reinforced by a large body of academic work, including that which incorporates the TPACK framework (Baran et al., 2011; Bauer, 2010; Gall, 2017; Mishra & Koehler, 2006; Thompson & Mishra, 2007), arguing that to be effective educators, teachers must have Technological, Pedagogical, And Content Knowledge for a subject.

Many benefits have been attributed to the inclusion and integration of technology and digital platforms in education. It has been found to improve information retention

(Park & Choi, 2008), critical thinking skills (Bagdasarov et al., 2017; Bloom & Doss, 2021), and problem solving abilities (Ge et al., 2015; Neo & Neo, 2008). Students achievement can be bolstered by immediate feedback mechanisms afforded by technology (Denton et al., 2008; Muis et al., 2015), as well as make them feel more invested in their learning (Aslan et al., 2019; Thiele et al., 2014). Interactive whiteboards are a particularly good tool for fostering student engagement (Beeland Jr, 2002; Campbell et al., 2019).

It should be noted that technology in and of itself does not provide educational benefits; It must be designed and used to align with learning objectives (Burn, 2017; Pitler et al., 2012). Simply having access or knowing how to use a specific technology does not mean that a teacher will use it to teach (Bauer, 2013; Zelenak, 2015).

There is some consensus that the field of music education has lagged behind the trend of adoption of digital and interactive technology in the classroom (Bauer, 2013; Tobias & O'Leary, 2017). This is illustrated particularly well by Dorfman and Dammers:

> Despite several decades of research in the field of general education regarding the integration of technology into classroom practices, integration of technology into music education remains a challenging idea for researchers, teachers, and teacher educators… Successful technology integration, it is hypothesized, involves engaging students with technology that advances their music education in ways that traditional music teaching might not. (2015, p. 46).

There is a need to prioritize the use of technologies in music instruction, if for no other reason than to help it become more concurrent with educational realities (Clements, 2018; Murillo, 2017; Webster, 2017). The summary of a case study which evaluated a program which integrated music software into elementary classes in Korea is illustrative: "[a] digital technology mediated teaching and learning approach [has] the potential to

enhance students' self-motivated engagement in the music class and their perception of music in general" (Kim, 2013, p. 413).

One of the great education innovations of in the new millennium has been game-based learning. James Paul Gee, a pioneer in the field, identified 36 learning principles connected with the way video games engage and challenge users (2003). While most of his principles apply directly to the aims of this research, two deserve special mention: The precept of instant feedback, which Gee categorized under the Explicit Information on Demand and Just-In-Time Principle, and the "Regime of Competence" Principle – the space where one is working or learning on the cusp of capacity, where challenges are enticing but not impossible.

Criswell (2009) expounds the combined significance of these principles:

> Video games give a student instant, individualized feedback as well as providing direct control over the difficulty level of the game. Students set this difficulty level as high as possible in order to challenge themselves and feel good about their accomplishment. Although teachers would surely like to offer their classes a similar kind of challenge, it's difficult for them given the limits of their time and responsibilities, to attend to the needs of each individual student in the same way. (p.26)

The Whacky Wizards program should effectively integrate and employ technology which is readily available in local classrooms to meet the needs of teachers and students who are increasingly reliant on digital media. It should aim to help students learn on the cusp of their current capacity.

Chapter 3 – Methodology and Methods

This chapter will outline the precepts of the design-based research methodology employed and the development of the Whacky Wizards intervention. It will also summarize the process of recruiting participants and present some general and individual profiles of those participants. Following this, the development of the field test will be summarised, and the data collection instruments will be presented.

A brief outline of the methodology employed in this research is as follows:

- According to the design-based research principles followed in this study (to be outlined below) a conjecture and accompanying research questions were formulated regarding an intervention to address an observed and documented problem, namely the challenges faced by generalist elementary teachers with regards to music instruction.
- The intervention, known as the Whacky Wizards Program, was designed and developed in the form of a digital instructional system to be used with accompanying physical instruments (Boomwhackers).
- Collaborating participants were recruited to apply the intervention in a real-world setting over the course of a 10-week field test.
- Information was gathered on the usage of that intervention by participants with the aim of addressing the research questions, thus substantiating the conjecture.

Primarily qualitative data was collected in the form of pre- and post- field test interviews with, as well as online feedback forms submitted by, participants. Some quantitative data was also gathered, but because of the small sample size, it was analysed

principally as a means of comparing participants' perceived self-efficacy with regards to teaching music pre- and post- test rather than to draw broad conclusions.

3.1 – Design Based Research

Design-based research (DBR) is defined as a form of inquiry which identifies a practical problem in a particular real-world context and addresses it with a designed intervention. It is typically conducted through iterative cycles of development, testing, and refinement in close collaboration with stakeholders in the context for which it was created. It has as its goal the concomitant development of a pragmatic solution to a specific problem and the contribution of theoretical knowledge that can be applied in a broader setting (Anderson & Shattuck, 2012; Crippen & Brown, 2018; McKenney & Reeves, 2014). A fundamental aspect of DBR is that it is a method "in which the design of **educational materials** (e.g., computer tools, learning activities, or a professional development program) is a crucial part of the research" (Bakker, 2014a, p. 3 emphasis added).

Design-based research first emerged as a methodology in the field of education as a response to criticisms that educational research was too centered on theory and did not provide practical outcomes (Design-Based Research Collective, 2003). Most trace its origins to two seminal papers published on the subject in 1992 (Brown; Collins), whose authors were both drawn to the approach from design sciences such as aeronautics, architecture, and artificial intelligence.

While any product imaginable has undergone some process of design in its creation, the study of design – the informed, intentional process of working towards

efficiency and elegance – has only emerged in the last half century. Pioneers in the field like J.C. Jones declared that fundamental elements of design could be employed not only for material objects but for intangible ideas and principles (Jones, 1992).

Something that is designed has a purpose, plan, and intent that governs its function, development, and/or actualization. (Mitchell, 1995). Thus, in a similar way to which the design of an object such as an airplane wing can be scrutinized and manipulated in order to improve its utility, "a design science of education must determine how different designs of learning environments contribute to learning, cooperation, motivation, etc" (Collins, 1992, p. 16)

Though there is no universal approach to DBR, it may be helpful to list the common phases of the process as outlined by Crippen and Brown (2018):

1. Identification of a problem
2. Definition and contextualization of the problem
3. Establishing conjectures and aims of an intervention to address the problem
4. Design and construction of the intervention
5. Implementation of the intervention
6. Ongoing assessment, reflection, and evaluation of the intervention
7. Contributions of local theories and design principles

In the case of the current research, the identification of the problem came from years of personal experience working in the field of music education as outlined in the introduction to this thesis.

The definition and contextualization of the problem was addressed in the previous chapter. Crippen and Brown (2018) explain why this kind of thorough literature review is necessary:

> Through the processes of exploration and analysis, the sociocultural context of the problem is detailed; the needs of people who are potentially impacted by the problem are assessed; and relevant, published, and authoritative reference material related to the issue and context is explored. The outcome of this process is a clearer understanding of the dimensions of the problem and their likely causes. This level of understanding is essential for designing a responsive intervention. (p.490)

In the next phase, we endeavour to establish the conjectures and aims of our intervention. A conjecture can be defined as "an opinion or conclusion formed on the basis of incomplete information" (Lexico, 2021). Sandoval (2014) describes this phase of the process as the "highly provisional nature of the ideas we have about how to design a learning environment at the start of a design research project" (p.22). He continues by paraphrasing the Design-Based Research Collective (2003) by saying that a DBR intervention "aims to create novel conditions for learning that theory suggests might be productive but are not common or well understood" (p.22).

The intervention is the core of a DBR project, so its design and construction are of the utmost importance. It is a task that can involve collaboration between the researcher, practitioners in the field, technical advisors, learning scientists, and policy makers (Anderson & Shattuck, 2012; Crippen & Brown, 2018). Unlike a scientific experiment that can be calculated for the controlled setting of a laboratory, the intervention must be designed to be adaptable to the complex environment of the classroom (Bakker, 2014a; Brown, 1992; Cole et al., 2005b). The intervention is frequently manifested as an

innovative policy, didactic process, or set of instructional products to be employed by participant teachers (McKenney & Reeves, 2014).

The implementation of the intervention is the phase in which collaborating participants employ the intervention in their teaching environment. It is important to note that the implementation need not be ridged, but adaptable to circumstances, and modifiable if problems become apparent (Cobb et al., 2003). It may be the application of just one iteration of the intervention, or of several. What is crucial is that it is during this phase in which data concerning the usage of the intervention is generated and collected.

A key aspect during the implementation phase of a DBR project is the collaborative nature of the intervention. Those involved are not considered subjects merely to be observed, but rather participants in the process, whose feedback and input can help the researcher refine and adapt the intervention to their particular circumstances (Anderson & Shattuck, 2012). The collaborative nature of the intervention allows us to see not only which of the researchers goals have been met, but how participants are able to achieve instructional goals specific to their local contexts (Design-Based Research Collective, 2003).

During and after the implementation phase, there will be an ongoing assessment, reflection, and evaluation of the intervention. The primary goal is to gain an understanding of how, why, for whom, and under what circumstances the intervention was able to address the research questions and achieve success. Qualitative and quantitative methods may be employed to inform the researcher regarding participant use and interaction with the intervention and the outcomes generated. This data may be used

to prepare and improve the intervention for a subsequent iteration, or to present results (Crippen & Brown, 2018).

It must be emphasized again that the research which is the subject of this thesis incorporates many of the attributes of design-based research except for one: It lacks the iterative quality that is prevalent in many other DBR projects. The time and resources required for successive iterations is one of the main challenges faced by DBR (Anderson & Shattuck, 2012). It remains a possibility that the current research may prove to be the first of many iterations of the intervention.

The results of a DBR project should reflect two kinds of contributions: Local theories and design principles (also known as design frameworks). Local theories describe the way in which the intervention addressed the problem in the context in which it was applied and specify the learning that took place in that setting among participants. Design principles outline the more general characteristics and features of an intervention, and the conditions in which they must occur, in order to achieve desired outcomes. One way they can be presented is in heuristic statements such as 'Using approach/product *X* under *Y* conditions, students are likely to learn *Z*' (van den Akker, 1999). To be clear, design principles are not the same as replicable scientific findings from an experiment, but frameworks that can be applied and refined in other circumstances (Bell et al., 2004).

In conclusion, in order to honor the highly pragmatic underpinnings of DBR, it must be stressed that " the value of educational design research is measured in terms of its ability to improve educational practice" (Design-Based Research Collective, 2003, p. 8). Design research often aims to innovate not just processes of instruction, but the kinds of outcomes desired from instruction (Cobb et al., 2003). Ann Brown, one of the pioneers

of DBR, sums up our ultimate goal accordingly: “an effective intervention should be able to migrate from our experimental classroom to average classrooms operated by and for average students and teachers, supported by realistic technological and personal support” (1992, p. 143).

3.2 – The research intervention

As previously stated, the pivotal element in any DBR project is the intervention, a designed plan “undertaken to engender productive change in a particular education context” (McKenney & Reeves, 2021, p. 84). The intervention implements a modification into a learning environment with the intention of observing and analyzing the subsequent alteration of that environment.

It is important to remember that the intervention itself is just one ingredient in the research project. The researcher must partner with practitioners who are willing and invested in adopting the intervention in their classrooms and devise appropriate methods of data collection and analysis based on those factors. Most of all, DBR “goes beyond merely designing and testing particular interventions” (Design-Based Research Collective, 2003, p. 6), in that it aims to create theory to help others design similar interventions for their own situations. As such, this research seeks to follow the counsel of Anderson & Shattuck:

> The researcher is careful to document the time, commitment, and contingencies that are involved in the creation and implementation of the intervention. These are documented so that readers of the research can judge for themselves the possibility of achieving similar—or even better results—from the use of this intervention in their own contexts. (2012, pp. 16-17)

A more complete documentation of every step in the design process cannot be included within this document but can be acquired from the author upon request.

3.2.1– The Whacky Wizards program

The intervention created for this research project is a web-based interactive instructional program called Whacky Wizards. As stated in the main conjecture of this thesis, its primary aim is to help elementary level teachers, particularly those who are not specialists in music, to introduce, increase, and/or improve music instruction in their classrooms. While Whacky Wizards is a digital product, it is designed to facilitate music making with tangible manipulatives called Boomwhackers®. These simple instruments, also known as percussion tubes, are hollow plastic cylinders made in a variety of lengths, each of which produces a distinct pitch when struck against a hard surface such as a desk or floor. They are also colour coded so that each note in the scale has a unique hue.

The program has three separate but highly interrelated components that were designed and developed over 16 months (September 2019 – December 2020). These three components comprise of:

1. A set of three interactive applications that each focus on a particular realm of music creation: The Rhythm Tutor, The Whacky Looper, and The Song Wizard.
2. A website to house these apps and lesson pages about how to use the apps in a variety of ways. The main focus of the lesson pages are instructional videos (see below), but they also contain tables demonstrating curricular outcomes achievable by following the lesson, and downloadable resources to

supplement the lesson content. The website has non-lesson pages that provide additional information about the program and other linked resources for teachers.

3. Instructional and exemplary videos which enable musical and pedagogical learning for teachers, with the goal of using that learning to facilitate lessons for their students.

3.2.1.1 – Development of Whacky Wizard apps

The early stage of development of the apps was done in Processing (processing.org), a coding language and integrated software sketchbook designed primarily to help non-programmers learn to code in a visual context. The project was soon transferred to p5js, a web-based port of the Processing language as a JavaScript library (p5js.org). The first iterations of the apps were created as 'sketches' in the p5js editor starting in October 2019.

Various open-source libraries have been developed in the Processing community to broaden the functionality of the program. One of these is p5.sound, which extends p5.js with Web Audio capabilities. By employing p5.sound, in December of 2019 simple, proof-of-concept versions of the Whacky Looper and Song Wizard apps had been created. The Whacky Looper is similar in concept and execution to a basic drum sequencer, whereas the Song Wizard could be likened to a game like 'Guitar Hero' that uses a scrolling interface to indicate when notes should be struck.

The apps would not have been possible were it not for the insights gained from two YouTube channels. The first is The Coding Train (youtube.com/thecodingtrain) with Daniel Shiffman, a member of the Board of Directors of the Processing Foundation, and

an Associate Arts Professor at the Interactive Telecommunications Program (ITP) at New York University Tisch School of the Arts. The second is The Audio Programmer (youtube.com/theaudioprogrammer), specifically a series by digital audio artist and contributor Dan Tramte called Browser Noise, whose drum machine tutorial provided the foundations of the Whacky Looper.

Gradually, and with assistance from Professor Georg Boenn, the apps became more sophisticated, incorporating more features and innovations. One key improvement was the integration of sound font libraries to the program, which opened up a nearly limitless array of instrument sounds for the accompaniment tracks. For the unique percussion sounds needed for some apps, custom sound fonts were created, including one made from recording and sampling Boomwhackers in the University of Lethbridge recording studio.

By this stage, the development of the apps had outgrown the simple sketches intended for the p5.Js website, so the source code was moved to GitHub repositories, and the code itself was written in an editor known as Brackets. This transition greatly improved the workability and security of the project, adding version control and allowing for branches of the programs to be developed, tested, and then integrated into the whole.

A third app was added when it became clear that a tool to instruct students in basic rhythmic patterning would be helpful. This app, called the Rhythm Tutor, was a condensed version of the Whacky Looper that could be used with just two Boomwhackers representing high and low sounds. It also features mnemonic phrases that can be chanted with the rhythms to help students retain the patterns.

Once the functionality of the apps was fairly well established, the long process of streamlining and unifying the visual aspects of the interfaces could begin. For this process, considerably more JavaScript and Cascading Style Sheet (CSS) programming was utilized, to create custom menus, checkboxes, and volume sliders. This also aided with the integration of the apps with the website on which they were to be housed.

3.2.1.2 – The Rhythm Tutor

The Rhythm Tutor is a primer for playing repeating rhythmic patterns and can be used by individuals or groups. The function and features of the app are explained below. Figure 1 shows a screen shot of the app taken from https://www.whackywizards.com/rhythm-tutor/

Figure 1

The Rhythm Tutor

The horizontal central section of the app contains a grid with dots representing high and low notes in a rhythm, with an accompanying vocal mnemonic to be spoken when playing the pattern. Above the grid is a succession of numbers that indicates the beat division of the pattern.

To play along with the pattern, players would use two Boomwhackers of differing pitch. In this instance, the specific pitches do not matter, just as long as one instrument is longer than the other, and thereby a lower pitch. The larger, lower Boomwhacker is represented by the darker dots on the lower line of the grid, while the higher notes are shown above with lighter dots.

When the pattern is played, a cursor (or play-head) passes from left to right on the grid, highlighting every column as it passes. Players know when to strike their low or high note when the cursor highlights the corresponding dot. In the freeze-frame shown here, the player would strike their low Boomwhacker while saying the word “I”. The cursor continues to evenly pass over the grid from left to right, highlighting notes and words of the phrase as it passes. It goes back to the beginning after it reaches the rightmost frame.

The drop-down menu below the title to the right allows users to choose a rhythmic pattern. There are currently 5 rhythmic patterns with accompanying phrases, but players have the capacity to alter any of these patterns. They can add notes by clicking in empty boxes, or remove notes by clicking in boxes where dots are present. To encourage users to compose their own patterns, a blank grid can also be chosen from this menu.

To the left of the pattern menu is a drum loop menu, where users can choose to play the pattern along to accompanying groove. There is a selection of 6 drum loops, including three that are representative of drum ensembles from Guinea, Cuba, and Brazil.

Below the main grid on the left is a switch where players can alternate between drum sounds and Boomwhackers. There are 10 types of drums from all over the world to choose from, or if the switch is set to Boomwhackers, individual pitches can be selected for low or high notes. This is particularly useful when the app is being used by an individual, who can then match the notes in the app to their Boomwhackers.

Below the main grid in the centre are buttons to play (or pause) and stop the loop. Below these buttons is a tempo slider, allowing users to modify the speed of the pattern represented in Beats per Minute, or BPMs. Underneath this slider is a switch to toggle the beat division of the grid between eighth notes and sixteenth notes.

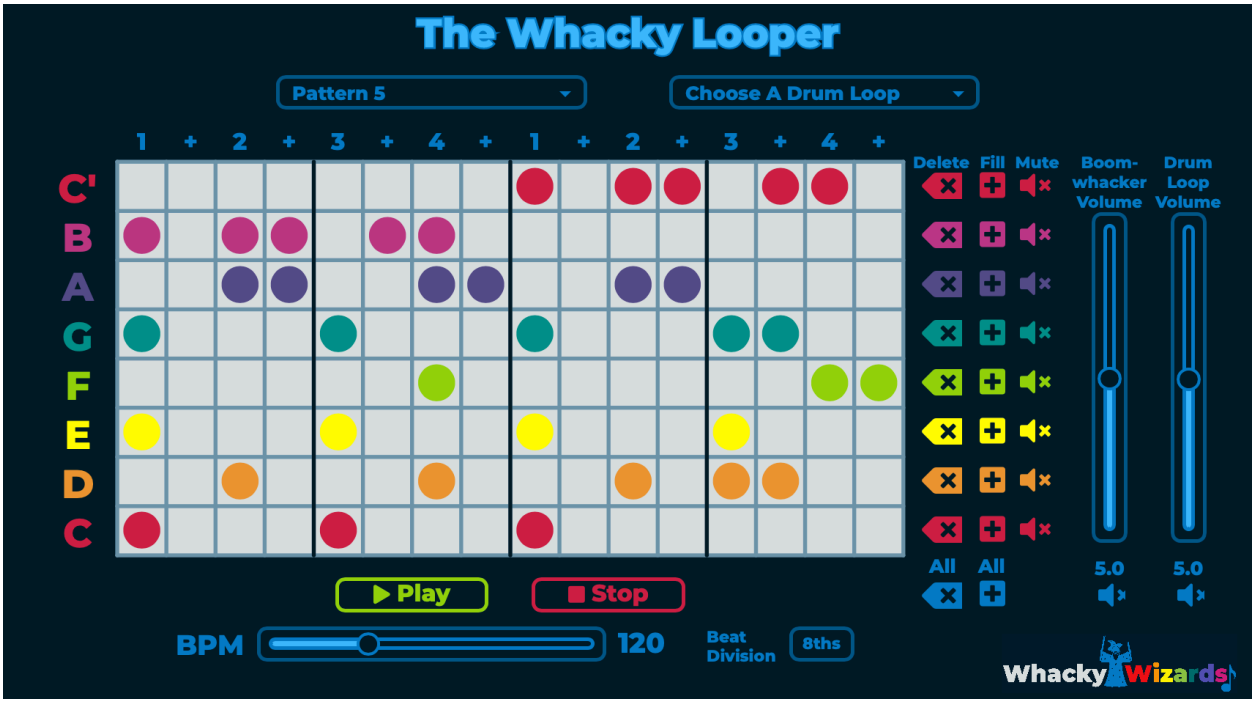
Under the main grid to the right are two sliders that can control the volume of the pattern (be it drums or Boomwhackers chosen) or of the Drum Loop. Either can be completely silenced with the mute buttons to the right of the sliders.

3.2.1.3 – The Whacky Looper

The Whacky Looper is a device to learn polyrhythmic rhythmic patterns that can be played by a number of players. The function and features of the app are explained below. Figure 2 shows a screen shot of the app taken from https://www.whackywizards.com/whacky-looper/

Figure 2

The Whacky Looper



The central portion of the interface is a grid, where vertical columns represent units of musical time, and rows represent all individual Boomwhacker pitches in a one-octave diatonic scale. Taken on the whole, the grid represents a complex rhythmic polyrhythm that can contain up to 8 individual patterns.

Like the Rhythm Tutor, the pattern is 'played' by a cursor or playhead which travels from left to right, highlighting one column at a time as it passes. Any circles in the highlighted column sound as notes, any empty boxes are silent. Also like the Rhythm Tutor, patterns can be manipulated by adding or subtracting notes to the pattern by clicking individual boxes of the grid.

The intention of The Whacky Looper was to be a tool to visualize and teach polyrhythms, inspired in part by musical traditions of rhythm cultures like those found in West Africa. Each player or sub-group using the Looper would be responsible playing for two pitches, an individual high-low pair.

The example shown in figure 2 is an adaptation of a rhythm from West Africa called Shiko, which may have originally been played on square frame drums of the same name. This pattern is actually four individual rhythms that would have been played on 4 shiko drums that gradually decrease in size, and thereby increase in pitch. The rhythm played on the lowest, largest drum is here represented by the pattern created by the low 'C' and 'D' notes, the rhythm of the next smallest drum in the ensemble by 'E' and 'F', and so on. The effect when all the patterns are played together is an intricate but captivating rhythmic tapestry.

The menu at the top left of the screen can be used to choose from 5 different polyrhythmic patterns and a basic ascending and descending scale. The top right menu allows players to choose from the same accompanying drum loops as are included in the Rhythm Tutor.

The Whacky Looper has play/pause and stop controls like the Rhythm Tutor, as well as an identical slider to adjust tempo. The beat division above the grid can be changed to display counting for either one measure of 4/4 music on a 16^{th} note base, or two measures on an 8^{th} note base.

To the far right of the interface are sliders and mute buttons to control pattern and accompaniment volume. Unlike the other two apps, these sliders are vertical to use the space more efficiently.

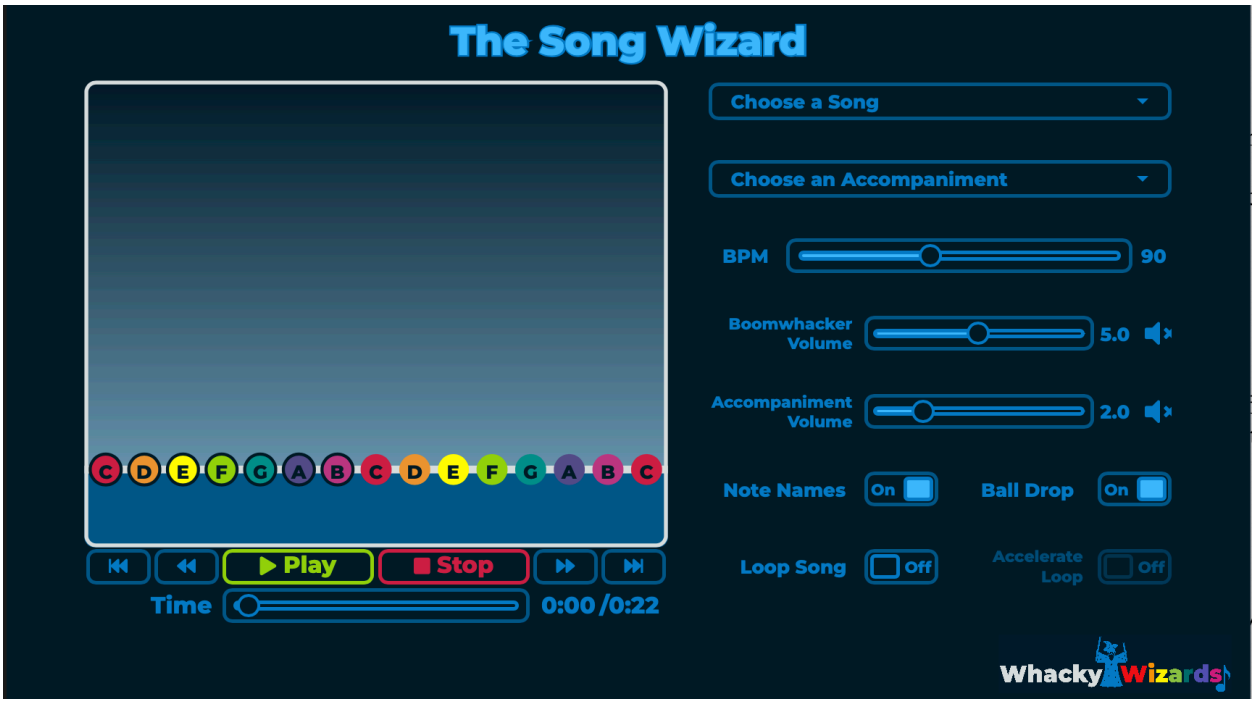
A unique feature of the Whacky Looper are buttons to assist users in creating and hearing their own patterns. Each row can be individually emptied or filled with notes, or the grid can be universally emptied or filled, to quickly create a template on which to compose and experiment. Additionally, each row can be independently muted to isolate certain patterns. These controls, like all the switches, buttons, and sliders, work in real-time, allowing users to manipulate the patterns as they are playing or listening to the loop.

3.2.1.3 – The Song Wizard

The Song Wizard is a tool chiefly focused on melody, to be used by a class or group. It is the 'flagship' feature of the Whacky Wizards website. The function and features of the app are explained below. Figure 3 shows a screen shot of the app taken from https://www.whackywizards.com/song-wizard/

Figure 3

The Song Wizard



The left half of the app window houses the main display. The series of colored 'balls' along the threshold line indicate the pitches that will be present in the current song which is chosen. The default is simply an exercise that employs all the pitches in a two-octave scale.

At least one Boomwhacker of each pitch shown must be used by the group playing the song. The group of players using the app divides the required Boomwhackers for the chosen song between them, each being responsible to play one or two pitches that are present in the melody.

When a song is played, a series of animated 'balls' drop towards their home on the threshold line in time with the music. When they arrive, the ball on the threshold line illuminates to indicate that the player should strike their corresponding Boomwhacker at

that moment. As each member of the group plays in time with their individual Boomwhackers, a melody is created.

Buttons underneath the main display allow users to start and stop the song, as well as skip to the beginning or end of the song, or merely jump a few seconds forwards or back. The slider can be used to cue to any position in the song, and the timer displays elapsed and total seconds.

At the top of the right half of the window is the song selection menu. The basic app has a basic scale (pictured) and 9 other songs to choose from. When a new choice is made, the number of balls on the threshold line will change to reflect the notes used in that particular song.

Below this is the accompaniment menu, allowing users to change the backing instruments in one of 8 configurations, including string quartet, brass ensemble, rock band and more.

Underneath the menus are a series of sliders. The first is used to control the speed of the song, indicated in BPM. The other two sliders control the volume of the Boomwhacker melody or the accompaniment. Either of these can be completely silenced with the mute buttons to the right of the sliders.

The last four controls are switches that modify the interface in interesting ways. Note Names will toggle the inclusion of note letter names on the threshold balls for those who want to just use colours. Ball Drop will stop the animation, creating a more challenging version with which to play along. Loop song will play the song over and over, while accelerate loop will increase each subsequent repetition by 10 BPM.

3.2.2 – Creation of website

The website began in a web-design class in the Spring semester of 2020 offered by Professor Christine Clark of the University of Lethbridge New Media department, who was also instrumental in assisting with several features of the site after the class was complete. The website went online in September 2020, and content was regularly added and updated until March 2021.

The initial concept design, layout, logo, and colour palette for the site was done in Adobe Photoshop. The site itself was built within the WordPress framework, using a custom theme and pages created with the Elementor design plug-In. Some interactive features of the website were accomplished by adding CSS and JavaScript code. The apps are housed in frames that link them from the p5.Js editor website. In rare circumstances, features of the website were given added functionality by the insertion of HTML code snippets.

The website has pages that are accessible to all visitors that offer examples of all the apps, Boomwhacker resources and links, background on the research project, general information about the site and its creator, and standard terms and privacy policy pages.

The ‘teacher portal’ portion of the website, which provides access to all the lessons created for the program, is only accessible via a login for registered users. Once logged in, teachers have access to lesson pages, which each contain an instructional video for the topic in question, expandible tabs that contain video transcripts and additional teaching resources, tables that outline the curriculum objectives that the lesson addresses, and downloadable PDFs that include diagrams, transcriptions, and additional teaching

resources. The lesson pages are created in a blog-post format, allowing users to search and sort through a listing of lessons to find specific content.

In terms of user feedback, teachers can add comments to individual lessons, and during the field test, were able to fill in the weekly survey, which was an embedded Google Form.

3.2.3 – Video Lessons and other resources

The primary reason that the videos were made was as a delivery system for lesson content. Each lesson on the website centrally features an embedded video that ranges from 10 to 20 minutes long. The videos were filmed in the graduate student office in the Faculty of Fine Arts at the University of Lethbridge between November 2020 and February 2021. They were edited and mastered using Final Cut Pro. Many diagrams, title pages, and other graphics were created using Adobe Photoshop. Animations were created using a combination of elements devised in Photoshop and anchor points in Final Cut Pro.

Video footage was also taken at a visit to a local elementary school in November 2020, where the author was able to try the Whacky Wizards program with a class of grade 1 and 2 students. All required permissions were acquired to film and use this material, as outlined in section 3.3.1 below.

In total, there were 14 videos created for lessons posted to the website before and during the field test period. The first of these was a series called ‘How Music Works’, that offered 5 lessons on the following topics; Beat, Rhythm, Pitch, Melody and Harmony. These lessons explained these foundational elements of music with examples

and exercises that related directly to using Boomwhackers and the Whacky Wizards apps. The second set of videos taught users how to use each of the apps on the website, as well as a lesson on general use of Boomwhackers in the classroom. The third set of videos were gradually added throughout the field test, and include lessons for 4 individual songs (*Shake It Off, YMCA, Korobeiniki:The theme from 'Tetris',* and *The Lion Sleeps Tonight).* Lastly, a lesson called 'Nothing at All' was added that explained in detail the concept and techniques of playing polyrhythms with the Whacky Looper.

3.3 – Recruiting participants

A major requirement of this research project was to recruit teachers who would be willing to collaborate by implementing the designed intervention in their classrooms. Some participants were first introduced to Whacky Wizards at a workshop offered at the South West Alberta Teacher's convention (SWATCA) in February 2020, but because of COVID-19, subsequent in-person recruitment at local schools was impossible. In the end, most participants were recruited through the channels outlined below.

3.3.1 – Ethical review for Research Involving Human Participants.

Any research involving human participants conducted through the University of Lethbridge is subject to approval from the Human Participant Research Committee. For this project, an application for ethical review of human participant research was submitted to the Office of Research Ethics on May 8, 2020, co-signed by the researcher and his two co-supervisors. The application confirms, among other things, that no conflict of interest exists between the researcher and any involved parties, that privacy

and confidentiality will be protected at all times, that there is no foreseeable risk of physical or emotional harm for participants, and that they may withdraw from the research at any time with no repercussions. A proposed outline of the research, in addition to example letters of introduction/recruitment and invitation/consent to participate were also included. The Committee approved the project on May 21, 2020.

After receiving approval from the university, the superintendents for five school districts in and around Lethbridge were contacted. These districts were: Lethbridge School District 51; Holy Spirit Catholic School District; Palliser School District; Westwind School District; and Livingston Range School District. The two Lethbridge districts had further formal applications to complete before individual schools and principals could be contacted, while the three rural districts required only informal approval by the superintendent. By the end of September 2020, the project had received approval from 4 out 5 districts, with the superintendent of Livingston Range citing complications from COVID-19 as the reason that his teachers could not formally participate. However, one teacher from the region was included as an informal participant.

Additionally, approval was granted by the office of research ethics to film the researcher using Whacky Wizards in a classroom setting at Agnes Davidson school in Lethbridge in November, 2020. This was done to create video content for lessons. Written consent was also attained from the school principal, classroom teacher, and the parents of the students involved.

3.3.2 – Letters of recruitment/ invitation to participate

The principals of all elementary schools in the 4 approved districts were contacted via email to inform them of the research project, asking them to forward a letter of introduction to any teachers in their school that may be interested. This letter outlined that the research project was seeking teachers who might be interested in collaborating in a project to introduce, increase or improve music instruction in their classrooms. It provided an overview of the timeline of the field test and the potential time commitments involved with training, interviews, and other feedback. It also included a proposed division of instruction time during the intervention. Teachers were asked to contact the researcher if they wanted to take part.

The researcher replied to all teachers who had expressed interest in the project with a formal letter of invitation, which mapped the project and teacher commitment in more detail. In addition, it defined the potential risks and benefits of participation, provided assurances of confidentiality, and outlined the dissemination of results. All participants signed and returned the letters to acknowledge that the objectives and procedures of the study had been explained to them, and they were voluntarily participating in the research. Signed letters were submitted to the Office of Research Ethics.

3.3.3 – Formal and Informal Participants

Initially, about 35 teachers from the 5 previously mentioned school districts expressed interest in being involved with the project via email. The original proposal was to include between just 6 and 10 teachers from the region, however, it seemed

counterproductive to turn away anyone who was willing to offer support. A plan was devised to divide the group into ‘formal’ and ‘informal’ participants. Formal participants were to be involved with pre- and post- test interviews and provide feedback during the field test via online surveys linked on the Whacky Wizards website. Informal participants were asked to simply complete the online surveys weekly and correspond via email if required. This arrangement worked well in schools where there were several teachers interested — One was designated as the formal participant while the others were listed as informal and could liaise with the formal participants when needed.

In the end, 24 teachers provided feedback about their experience with the program, either through interviews, the survey form set up on the website, or email correspondence. Ten teachers accepted the role of Formal participants, while the remaining 14 were informal participants. Detailed profiles of each of the formal participants can be found below.

3.3.3.1 – Profiles of Formal Participants

Below are brief profiles of each of the formal participants in the research, outlining musical background, teaching responsibilities and class demographics, and personal outcomes each teacher was hoping to achieve by participating in the research. Pseudonyms have been used to protect participant confidentiality.

Ash had been teaching for about 8 years. He taught a class of 20 grade 2 students in a rural school that has a full-time music teacher. His students receive 30 minutes of what he deems ‘formal’ music instruction twice a week. Previously, he had been tasked

with teaching music to his students when he lived in Grand Prairie and found it to be stressful. He acknowledged that he could not have done it without the help of a music specialist from the school district who mentored him.

Ash does not have much background in music but appreciates the value of a well-rounded education. His experience is more in physical education. His primary goal for getting involved with the program is to provide his students with movement/brain breaks that are meaningful and cross curricular, with the hope that it might open the door to music for students who will respond to a less formal approach.

Elowen taught a grade 1-2 class in a small rural school that has a predominant Low-German Mennonite population. It was her third year teaching, but her first with a permanent position. Her background is in visual arts and physical education and did supply work in high schools before this. Her school did not have a full-time music teacher, and most of her students had no previous music instruction.

Though Elowen had not taught music before, she is a highly confident teacher with a can-do attitude. She likes to sing and play guitar and was involved with her school band during her teens. A particular challenge was that her kids had limited exposure not only to music, but to English and interactive technology. Her primary objectives for getting involved were to build her own capacity to teach music and to provide a new opportunity for her students.

Holly was in her second year teaching in an urban French-immersion school. While she was not a music specialist, she was tasked with teaching music to 3 classes

when their regular teacher had preparation time. This was the first time she had taught music. The 48 students she taught ranged between grades 2, 3, and 4, and received two 30-minute music classes every week.

Holly was attracted to being a participant in the study because she wanted to gain more knowledge and support for teaching music, and to feel mentored in the process. She wanted her students to enjoy music making and really feel like they could be involved in the process.

Holly loves to dance and has taken or taught dance lessons most of her life.

Juniper was a first-year teacher with a class of 12 grade 5 and 6 students in a village school. She is full of youthful enthusiasm for teaching but is nonetheless overwhelmed by all the lesson preparation involved with being a new generalist teacher. There is no music teacher for the students in her school until grade 7 onwards.

Juniper has not been involved with music making in any formal way, but appreciates music nonetheless. She is self-deprecating regarding her musical abilities. Juniper's hope with getting involved was that it would give her the resources and capacity to offer music instruction without having to invest too much time with her already intense teaching responsibilities.

Laurel was teaching a class of 15 grade two students in an urban French-immersion school. Her school has a full-time music specialist teacher, but she likes to incorporate as much arts instruction in her class as possible. This was Laurel's third year

back teaching full time after being out of the profession for 12 years. She previously taught for 6 years in both high school and elementary school settings.

In her youth, Laurel took piano lessons, played the flute, and participated in the school marching band. She has also taken dance lessons most of her life and has trained to be a Zumba instructor. Her objectives for being a participant in the program were to encourage collaboration and cooperation among her students and to make connections between music and other aspects of learning, including language.

Linden had been teaching for 31 years. She taught a combined class of 16 grade 1-2 students in a rural school. The school does not have a music specialist teacher, but in years past other teachers have taken on the responsibility of teaching music. Many years prior, Linden had been responsible for delivering music instruction to her students for one year when she taught grade 7.

Linden likes to sing and plays the guitar. In previous years she brought her guitar to school and sang with her students, but because of COVID was not able to do so. Her primary goal for participating in the program was to gain confidence and competence for teaching music, and to provide her class with movement/brain breaks that were meaningful.

Magnolia had been teaching for 18 years in both primary and secondary settings. She has taught language arts, physical education, and acted as a support for children with language acquisition. This was her first year teaching music. Like Holly, she was providing music instruction when the students' regular classroom teachers had prep time.

She taught about 90 students in three grade 1-2 and two grade 4-5 split classes. Her school is in an economically disadvantaged part of the city with a large immigrant population.

Magnolia loves to learn from others and gain knowledge through differing approaches. Her primary goal as a participant was to explore new ideas, techniques, and activities for presenting music as a subject. She is a stickler for the curriculum and relies on it heavily for her lesson plans. While she has some hesitations about calling herself musical because she lacks some theoretical knowledge and background, she has participated in music making most of her life through membership in various choirs and vocal ensembles.

Olive taught a class of 17 grade 2-3 students in a larger rural town. Until that year, her school had a full-time music teacher, but the position was cut due to budgetary constraints. Olive wanted to ensure that her students continue having music instruction but has never taken on that responsibility herself. She has been a teacher for nearly 20 years.

Olive is really interested in the idea of using music in a cross-curricular capacity, to make connections between music and core subjects like language and math. She has had some experience with music, singing in choirs and taking piano and guitar lessons. She was attracted to be a participant in the study because, in her words “It felt like something I might actually be able to pull off myself with the music ability that I have”.

Rowan was teaching 15 grade 3 and 4 students in a small rural school with only 3 full time teachers. He taught grade 5 for 10 years previously in the same school. There

had never been a music specialist at the school, but he has done as much music as he can. He teaches his students ukulele and has also helped them compose music using Apple's Garage Band software.

Rowan is a very musical person who sings and plays guitar and ukulele but has never felt like he does justice to music instruction. He claims that when it comes to music he is "just goofing around, having fun". His primary motivation for becoming involved with the program was to be able to provide his students with more meaningful music instruction where he can recognize and achieve curricular objectives.

Willow was teaching a class of 15 grade 3-4 students in a very small rural school with only 2 other classes. She had been teaching for 15 years. Her students have had inconsistent music instruction up to this point, sometimes receiving a lesson every other week from a visiting music teacher from the district.

When speaking with Willow, while it is obvious that she has a great appreciation for the value of music education, it was evident that she has a lot of trepidation about doing it herself. Although she admitted to taking piano lessons when she was young (which may not have been a very positive experience), she emphatically stated that she has "zero musical abilities". Her main goal was to build the confidence to teach music to her students and to have a resource that she could rely on to provide her with lessons and programming.

Hazel was not chosen as one of the 10 original formal participants but was nonetheless interviewed after the conclusion of the field test at the suggestion of Ash,

who teaches in the same school as her. Hazel teaches grade 2 and has been teaching in her community for two decades.

While Hazel was not questioned about what she wanted to achieve with the program before the field test started, she offers some unique and excellent insights from her experience with it. Her school has a dedicated music teacher, but she used the program daily as a tool to help the students transition back to learning after the lunch hour.

3.4 – Developing the Field Test

The field test, or implementation of the intervention in a local context, took place over 10 weeks between January 11 and March 26, excluding the week of February 14 when students were not in class. For about three months before the field test began, there was extensive email correspondence with participants to inform them of the progress and structure of the program and explain what their roles and responsibilities would be during the field test. Training sessions for participants were scheduled during the week of January 3, and most participants were able to join via Zoom. The intent of these sessions was to give participants an overview of the Whacky Wizards website and apps, further explain was expected of them during the field test and answer any questions they may have had.

3.5 – Data collection

Data was collected from participants before, during, and after the field test from pre- and post- test interviews, online questionnaires/surveys, and some email

correspondence. These instruments, and the data they were designed to produce, will be detailed in the following sections.

It is worth noting that no data was collected directly from the students who used the program in their classrooms. The main reason for this is that collecting data from children requires a much greater level of ethical review, and individual permissions must be granted from every child's parent or guardian. The trade-off of possible insights gained in contrast to the vastly increased level of authorizations required was not judged to be essential for this research.

3.5.1 – Interviews

The principle instruments for data collection regarding the ways the intervention would address the needs and barriers of participant teachers were pre- and post- field test interviews. The complete outlines of these interviews can be found in appendix 1 of this document.

The path of inquiry developed for the interviews was devised to align with the topics of the primary research questions, namely the barriers and needs associated with music instruction. In the event that secondary questions could also be examined in the study, the interviews contained sections concerning technology use in the classroom, familiarity with curricular objectives, and student engagement. Taken on the whole, there was an overarching objective of ascertaining the participants overall perceptions of self-efficacy towards music and music pedagogy.

The methods used for transcription of these interviews, and the subsequent categorisation of quotes and statements into theme groupings, is also outlined below.

3.5.1.1 – Pre-test interviews

Pre-test interviews were conducted with Formal Participants between November 26 and December 7, 2020. The interview was divided into nine sections, each with several questions.

The first two sections were simply to gather information regarding the makeup of the class (grade level, number of students) and to find out how much, if any, music instruction the students were receiving and by whom it was delivered.

The third section probed into the use of technology in the participants' classroom, and if they had ever used technology for music lessons.

The fourth and fifth sections examined the participant's perceived needs for, and barriers impeding, music education.

The sixth section concerned the participant's personal experience with delivering music lessons, and if they felt their students were receiving adequate music instruction.

The seventh section investigated the participants' familiarity and comfort with the Alberta elementary music curriculum. This section was distinctive in that it followed more of a questionnaire or survey style format, where responses were given on a scale of one to ten, with one being weakest and ten being strongest. The first question in the section established overall comfort or knowledge of the curriculum. The next sub-section questioned the participants on where they would currently place their class in terms of the five General Learner Expectations outlined in the curriculum.

The line of inquiry in the last two segments of the seventh section of the interview was unique in that it asked the participant to answer three questions for each of the five concept and six skill areas outlined in the curriculum. First, they were asked to rate their

personal level of comfort and/or expertise with the concept or skill in question. Second, they were asked to rate their students' level of comfort and expertise in that area, age appropriate for the learner expectation level. Lastly, it measured the participant's level of comfort and/or expertise *teaching* that concept or skill.

The eighth section examined participant's perspectives on student engagement, particularly as it pertained to finding and creating meaning in music lessons.

The ninth and final section reviewed the participant's reasons for being part of the study, and what they hoped to achieve personally, professionally, and for the benefit of their students. It also asked what needs they hoped the intervention would address, and what barriers it might remove.

The interview concluded by asking participants if they had any questions for the researcher regarding the upcoming field test or the Whacky Wizards program.

3.5.1.2 – Post-test interviews

The post-test interviews followed a nearly identical format to that of the pre-test, with the intention of creating comparative data between the two. The questions were simply altered slightly to reflect this.

The first and second sections remained practically unaltered, adding only a question on whether their students received more instructional minutes in music than from before the intervention began.

The line of inquiry in the third section was to see if participants experienced any technical difficulties implementing the intervention, and if their perspectives on the use

of technology in the classroom, specifically as it pertained to music instruction, had changed.

The fourth and fifth sections re-examined the themes of needs and barriers, asking if and how the participants felt Whacky Wizards addressed them.

The sixth section revisited the participants experience with music education, and whether they felt their students were now receiving adequate music instruction. It also probed participants on how well they felt they were able to adapt the intervention to their circumstances.

The seventh section was identical to the pre-test, so responses could be compared numerically. Participants were encouraged to add commentary to their responses if they felt so inclined.

The eighth section reconsidered the theme of student engagement, particularly as it pertained to use of the Whacky Wizards program. It strove to identify those areas in which participants and their students found meaning while engaging with the program.

The ninth section returned to the reasons the participants had gotten involved with the study in the first place, asking if and how their expectations and aspirations had been met.

A tenth question was added to the interview regarding the participants' perceptions on the future viability of the program, and whether they felt that a similar approach or intervention might assist with the delivery of other specialized subjects.

The interview concluded by asking the participants if they had anything else they wanted to share concerning their experience with the Whacky Wizards Program.

3.5.1.3 – Interview transcription and theme categorization

A caveat must be mentioned regarding data from interviews: While each participant provided responses to every section of the interview, not all questions were asked to all participants. As the data to be collected was to be principally qualitative in nature, certain questions were omitted because a similar or sufficient response had been given already in another section of the interview, the question was not relevant in the moment, or time constraints were an issue.

The transcription process began with speech to text software that created a verbatim transcript of the interviews. After each section of the interview, the transcription was paused to divide segments of dialog between the researcher and the interviewee, add punctuation, and create some basic sentence and paragraph structure.

Once all interview transcriptions were complete in this form, they were re-examined to draw out statements that aligned with the themes associated with the primary and secondary research questions and each of their subsections (for instance, statements made not just about barriers, but about the barrier of perceived musical ability.) Before these statements and quotes were organized into categories, they were edited to improve readability; Verbal idiosyncrasies were omitted (i.e. so, like, um, you know, sort of, kind of…), and words or ideas were occasionally altered for clarification. When these clarifying edits were made, replaced words are shown in square brackets (i.e. when the interviewee is referring to her students and simply says ‘they had fun’, the transcription might read ‘[the students] had fun’.)

3.5.2 – Online weekly feedback forms

The intent of these online questionnaires was for each participant to complete and submit the form at the end of every week of the field test, with the purpose of reporting some details and impressions on the use the program in their classrooms. The form was created using Google Forms, and was designed to take less than 10 minutes to complete. There were 14 individual questions/fields for the teachers to fill.

For the first two questions, respondents were asked simply to input their first and last names. Then they were asked to indicate for what week they were responding. They could make one selection from a list provided. These were the only 'required' fields of the online form.

Next, the participants were asked to report on the grades that had received instruction with Whacky Wizards. There checkboxes each grade between kindergarten and grade 6, including a section for 'other' that could accept an alternate input.

The fourth section asked respondents to indicate the total time they had used the program for instruction, adding all classes/lessons together. They could choose one of four options in minutes: 15-30, 30-45, 45-60, or more than 60.

The next section consisted of checkboxes to indicate which of the three apps were used that week, indicating to check all that apply. There was also an open "other" choice offered.

The next question asked 'If the Rhythm Tutor was used, which rhythms were played?' Respondents had six choices and an open 'other' choice. The following question asked the same of the Whacky Looper, giving the respondents 5 choices for patterns they

played and an open choice. Lastly, a similar question was asked of the Song Wizard, inquiring which songs had been played.

Respondents were asked to answer the following 3 questions on a scale of 1 to 5, where 1 was poor and 5 was fantastic.

- How well did you feel lessons went?
- How engaged were your students with the lessons?
- How well were you able to make curricular connections to the lessons?

The last two questions were left as open fields for respondents to write their responses. They were ‘Overall, what went well?’ and ‘What could be improved?’

Chapter 4 – Intervention Philosophy and Design Rationale

The intervention is the core component to any education Design-Based Research project. It is much more than merely an imposed alteration on a learning environment, as its creation and development are explored, supported, and grounded in comprehensive theory and experience. The intervention is simply the central part of a larger mechanism that has to take into consideration the time, place and people who will be implementing and ultimately affected by it.

Our intervention, the Whacky Wizards program, consists principally of the website and the apps and lessons contained therein. However, the *implementation* of the intervention, which is also governed by an underlying philosophy and design, includes the provision of Boomwhackers to participants, the relationship building and training with all participants who will integrate the intervention in their classrooms, the planning and execution of interviews, and much more.

At every step in the process of planning, creating, and implementing an intervention, decisions are made. It could be posited that these decisions are guided by two principal forces – an underlying philosophical paradigm and case specific design rationales. This chapter will explain these two important concepts as they relate to the Whacky Wizards program.

4.1. The philosophical paradigm of the Whacky Wizards program

The evidence presented in chapter 2 of this thesis may give some the sense that music education at the elementary level is in a state of crisis. While there are most certainly individual programs and teachers that are doing an excellent service to the profession, overall, it could be presumed that serious problems exist. Furthermore, these problems seem to be self-propagating, passing from one generation of students and teacher to the next (Pitts, 2017; Regelski, 2016; Russell-Bowie, 2009).

It has often been said that the definition of insanity is doing the same thing over and over again and expecting different results. If this is the case, when it comes to elementary music education, we have to stop the insanity. It is time to start rebuilding "the philosophical backbone of music education"(Juvonen et al., 2012, p. 200) and create something better.

4.1.1 – The current prevailing philosophy of music education

While there is no possible consensus for the purpose of music education, one overarching theme might be to foster lifelong musical engagement among the populace (Pitts, 2017; Welch, 2001). Certainly, this is echoed in the first article of the Housewright declaration, as presented in the preface of this thesis:

> All persons, regardless of age, cultural heritage, ability, venue, or financial circumstance deserve to participate fully in the best music experiences possible. (National Association for Music Education, 2000, p. 219)

The quandary is that the current 'conservatory' influenced model of music education so prevalent in Western educational institutions is fundamentally antithetical to this goal – it gradually filters out practitioners until only a selected (and often privileged) few continue to participate in music throughout their lives (Crooke, 2019; Elliott & Silverman, 2015; Gill, 2017).

To get at the root of this problem we need to examine the current *aesthetic paradigm* of music education — the belief that the value of music in society, and the arts more generally, is to provide humans with aesthetic experiences. (Alperson, 1991; Regelski, 2016; Reimer, 2003) This is perhaps reinforced nowhere more clearly than in the seminal text *Foundations and Principles of Music Education*, where the stated primary goal of music education is to "develop the aesthetic potential, with which every human being is endowed, to the highest possible level" (Leonhard & House, 1972, p. 1). A simplistic but useful summary of the aesthetic archetype is that it is meant to teach people to appreciate and experience 'Art for Art's Sake' (Jenkins, 1968; Singer, 1954). Thereby, the value of music lies chiefly in the beauty, artistry, and goodness it brings to the world. Practitioners are those who have been trained and refined to meet these standards at the highest level (Kim, 2016). All others are relegated to 'appreciators' or 'consumers' of music (Taylor, 2007).

4.1.2 – An alternative philosophy

The critical opponent of the aesthetic paradigm of music education is one that instead values music as *social praxis* (Elliott, 1995; Regelski, 2015; Small, 1996). *Praxis* is a greek word which denotes action, an undertaking in a specific context. In this *praxial*

model, the worth of music is derived from the activity of making music, particularly as it pertains to the artistic, historical, social, cultural, educational, ethical, and political contexts in which it exists (Silverman et al., 2013). As David Elliott, one of the pioneers of this philosophy explains:

> "Praxial" emphasizes that music (as products-and-processes) ought to be understood in relation to the meanings and values evidenced in actual music making, music listening and musical outcomes in specific cultural contexts. (2021, p. 1)

Music, thereby, is cherished for the myriad ways and contexts where it allows people to participate. **In other words, rather than valuing 'music for music's sake', we value 'musicking for musicking's sake'.**

Another paradox of music education is its reliance on the structure, techniques, and conventions of Western Classical or Art music, because of a general acceptance that such music is somehow timeless, universal, and inherently valuable (Goehr, 1992). This is true even among educational institutions trying to integrate or include music that is contemporary, popular, or otherwise outside that tradition (Rodriguez, 2004). This greatly undermines the value of music which is important in the lives of students and restricts space for their musical ideas (Aróstegui, 2016; Lamont et al., 2003). Given this outlook, the aim of music education is scrutinized by Thomas Regelski, an outspoken proponent for a ground shift in the field:

> The question at stake, then, is whether (a) music education should be a matter of 'programming' the brain to be aesthetically receptive to music and 'converting' students from 'popular' musics to 'good' music. Or (b) is it instead a matter of encouraging and developing a latent and natural musical potential in all people for musicking? (2015, p. 6)

To quote Juvonnen et al. (2012) again, the "philosophical backbone" upon which the Whacky Wizards program is built is *praxial*, valuing musicking as a practice more than music as a product. This is because, as Richard McNichol states, "We only come to **know about** and **understand** music by **doing it**" (in Stunell, 2006, p. 9, emphasis added).

4.2 – Design rationales of the Whacky Wizards program

One component of other design sciences that has been adopted by DBR is the principle of *design rationale* – the precept that the inclusion of any and every element in the design of an artifact must be justified. Speaking on the subject with reference to computer interface design, pioneers of the concept MacLean, Young and Moran state:

> To understand why a system design is the way it is, we also need to understand how it could be different, and why the choices which were made are appropriate…The set of options which are selected for the final design describe the *artifact,* and the alternatives and reasons for the choices provide an *argument* (or rational) which supports and helps understanding of the choices made. We believe that such a description should be a product of the design process just as much as the final artifact. We use the term *Design Rationale* to refer to this representation. (1989, p. 247)

When it comes to implementing features of design science to educational research, van den Akker (1999) lists *theoretical embedding* as a key component. He defines this as "systematic efforts [which] are made to apply state-of-the-art knowledge in articulating the theoretical rationale for design choices." (p.8) Thus our design decisions must be justified and expressed by informed theories encompassing each component of the design.

As a means for demonstrating a sound justification for the design of the intervention, the remainder of this chapter will demonstrate design rationales for each research

question and their accompanying sub-sections. Each segment will begin by revisiting the summary made in the corresponding section of chapter two, presented in ***bold italicized text.*** As a refresher, the goal of these statements was to provide an initial response to the second portion of our research questions:

1. What are the **barriers** that exist for elementary teachers towards music instruction, particularly if they are generalists?

   In what ways will this program address them?

2. What are the **needs** of these teachers with regards to musical instruction?

   In what ways will this program meet them?

The next portion of each section will then clarify these responses, providing design rationales on both technical and theoretical levels. It may also include statements taken from interviews with formal participants to further emphasize that the issue exists and needs to be addressed at the local level. The names of these participants will always be shown in **bold text.**

The last portion of each section will follow the guidance of Sandoval, who states that "the success of any design endeavor requires making some commitment to articulating what *desired outcomes* will look like and how they might be observed or measured" (2014, pp. 23-24, emphasis added). To summarize each section and provide a blueprint for moving forward, a statement of desired outcomes will be shown in **bold text**.

4.2.1 – Design rationales for question #1 - What are the barriers that exist towards music instruction?

Each section below explores one aspect of our first research question regarding barriers, and importantly responds to the question – *In what ways will this program address them?*

4.2.1.1 – Barrier #1 – Lack of confidence and competence (self-efficacy) for music instruction

The Whacky Wizards program must seek to ameliorate teachers' self-efficacy in the domain of music instruction. It's primary conduit for this goal will be providing teachers and students **mastery experiences*****, with opportunities for*** **vicarious experiences** ***and*** **verbal persuasion** ***when possible. Lastly, it aims to foster positive*** **physiological and affective states** ***associated with music instruction and reduce anxiety towards the subject.***

Everything in the construction of the Whacky Wizards program has as its central goal the increase of teacher confidence for music instruction by increasing teacher competence. In other words, it is designed to improve teachers' *self-efficacy* towards the subject. Nethsinge (2017) claims that the best way to do this is "to boost the confidence of … teachers by making it *simple* and *interesting* for them to learn required skills for teaching music" (p.18, emphasis added).

Even though the theme of confidence is of central importance to this study, during the pre-test interviews only four formal participants mentioned confidence for teaching music directly, either when asked about what they hoped to gain from taking part in the study or the needs of teachers more generally. For example, **Willow** said:

> *I honestly think the biggest barrier is competence or confidence in teaching [music]... That's part of why I'm excited with this [opportunity]. If I learn how to use the Boomwhackers then I'm going to be more confident in teaching [music] beyond this.*

The theme of competence was more prevalent in the pre-test interviews, with eight interviewees using terms like knowledge, expertise and understanding when articulating their perceived needs and barriers, in addition to what they anticipated achieving through participation in the study. **Elowen** articulated that this was a barrier for her:

> *The major hurdle is having as much knowledge as I would like to have when teaching [music].*

Revisiting Bandura's (1997) model, one can examine how the program will employ the four key tools that contribute to positive self-efficacy:

Teachers can quickly have *mastery experiences* using the basic features of Whacky Wizards. Provided they first watched the corresponding training video, on their initial use of any of the program's apps, they can get their students making music in minutes. The format and content of the earliest lessons are engineered to lead to success. This can be especially powerful when students have corresponding mastery experiences playing music. Witnessing a class play a familiar tune with the Song Wizard on a first or second attempt encourages all involved to try new songs or increase the challenge level with tempo, instrument distribution, and other manipulatable features of the program. If used to its full potential, the capacity to manipulate the apps to match the skill level of the students, combined with the many avenues to musicking the program offers, the program can lead to mastery experiences with every use.

Teachers are provided with *vicarious experiences* to learn how to present material in the Whacky Wizards program via video footage on the website of the researcher himself using the program with a class of first and second grade children. To observe an instructor with more experience teaching with the program in a real-world setting provides learning opportunities by proxy.

While the opportunity of in-person feedback for participants was not possible due to COVID, the researcher attempted to offer *verbal persuasion* in both the dialog of the video portion of the lessons and in correspondence with participants.

Teachers can avoid anxiety and other negative *physiological and affective states* by virtue of the fact that they do not need to 'lead' music time, as the apps are intended to be extremely intuitive and easy to follow. In this sense, teachers can take on a more cooperative facilitation role with their students to learn and have fun alongside them, thereby inciting the arousal of more positive emotions.

More than anything else, using the Whacky Wizards Program should make teachers feel demonstrably more confident and competent with regards to music instruction. It will accomplish this primarily by providing mastery experiences, but will also do so via vicarious experiences, verbal persuasion, and positive physiological and affective states.

4.2.1.2 – Barrier #2 – Previous experience with music education

If the Whacky Wizards program is to impact this barrier in any way, and not perpetuate a cycle of negative or negligible experiences with music education, its duty is to endorse a paradigm that is not

merely a reflection of what came before. It must provide alternate approaches to music instruction that prioritize meaningful, universal engagement and participation with music.

Magnolia poignantly shared how this barrier has affected her. Although she has been involved with formal musicking all her life, and offers excellent lessons to her students, she articulated an insecurity regarding the music instruction she offers like so:

> *I desperately didn't want to be pigeonholing or stereotyping what I thought music should be. I wanted to make sure that I wasn't just duplicating what I might have gotten as a child.*

One of the hopes for the intervention was that the approach would be such a departure from conventional music education that it could be viewed as a fresh start. On a foundational level it was conceptualized to democratize music instruction, perhaps enabling teachers who might have not thought the inclusion of music instruction in their classroom possible, particularly for those whom music education has been an anxiety-inducing experience.

The way this can be done is simple – make music first. The three apps central to the program can help students to be literally *making* music in minutes, changing music from a task to a game. This permits teachers to step back and become co-learners with their students, because a thorough background in music, especially a sophisticated understanding of music theory or Western notation, is not required.

When musicking is the priority, theoretical comprehension becomes secondary. This lets teachers introduce musical and/or curricular concepts when they (and the students) have developed the self-efficacy to do so.

Users of the Whacky Wizards Program can feel capable of participating in active musicking, and have positive experiences doing so, regardless of previous experience with music education. Students and teachers can *make music first* and include theoretical learning as it naturally becomes relevant.

4.2.1.3 – Barrier #3 – Perceptions about musical ability

If the Whacky Wizards program is to address this barrier, it cannot simply hope to alter user's perceptions about their musical ability. It must be made clear that everyone can and should be involved, regardless of real or perceived musical capacity.

Many participants (7) expressed some reservations about their own musical ability in pre-test interviews, especially as it pertained to their ability to teach music. Some were uneasy simply because they had never been tasked with teaching it, but at least half the respondents made statements directly connected to perceived musical ability. For example:

> **Juniper** - *No. I can barely tap along to a beat. No musical ability here.*
>
> **Ash** - *To be told I need to teach music lessons when I know full well that that is a huge deficiency of mine…*
>
> **Willow** - *I have zero musical abilities. In order to be able to teach [music] I need to have some skill, right? So yeah. That's the biggest [barrier] for me for sure.*

Laurel, who had mostly positive experiences with music in school and extracurricular dance lessons growing up, made a particularly insightful statement:

> *I think music is one of those things that we kind of **teach out of people** or that people say like, 'Oh you're a singer - you're not. You're a musician - you're not.' Where I think we're all kind of musicians.* (emphasis added.)

Of paramount importance to the design of the intervention was that nobody who used it would ever conclude that they were 'unmusical'. Significant efforts have been taken to ensure at both the level of the instructor and the pupil that *anyone* can participate in musicking with Whacky Wizards, regardless of musical ability or any other limiting factor. The initial use of the apps relies more on hand-eye coordination than musical aptitude, as players refine their aural perception over time. Additionally, students start out by being responsible for one individual pitch in a melody or mimicking a basic rhythm pattern with a single Boomwhacker. Moreover, the lessons give council to teachers to help accommodate all learners, including simplifying rhythms, vocalizing patterns with mnemonics before playing them, or using the controls within the apps to adjust speed and complexity.

The apps, lessons, and videos have been created using the least amount of music-specific terminology possible, and use no symbology associated with Western notation. When musical terms and concepts are essential, they are explained in a thorough yet approachable manner, breaking down large concepts into smaller component ideas. In short, nobody's 'musical ability', perceived or otherwise, should hinder them from using the program.

Both teachers and students who try the Whacky Wizards Program should feel like they can 'do' music, regardless of perceptions of musical ability. Furthermore, the program should encourage everyone to get involved, providing opportunities for participation on several levels. Anyone who tries the program should feel 'musical'.

4.2.1.4 – Barrier #4 – Belief that music instruction is somehow rarified and should remain the realm of specialists

If the Whacky Wizards program is to succeed in its aims, it must be made clear that it is not a tool for specialists only. It can and should be employed by generalist teachers in their classrooms.

There is unquestionably a perception that those who teach music are somehow exceptional. This was implicated in exchanges with every interviewee about the presence or absence of a music specialist in their school. **Rowan's** reflections may provide some general insight into this peculiarity:

> *I did my teaching degree and learned how to teach all these different subjects, but I think music is different. I don't know why that's the problem. I don't know why music instruction seems to be different or if it's just that teachers like to structure it differently than a regular class, or if it's just because of the nature [of] music itself…*

This belief seems to be engrained enough that the Whacky Wizards program is not likely to change it. Instead, the program will aim to not only make generalists feel confident and capable, but *justified,* in teaching music. There are documented benefits for children's musical tutelage to which the program aims avail itself. For example, Mills (1989) points out that having the instructor the students are most familiar with teach music helps normalize the subject, removing some of the elitist air about it. Hennessy (2002) notes that a familiar classroom teacher can assess individual needs of students better than a specialist that may only see them for a limited time each week.

The focus for the intervention is creating a novel *learning* environment more than a novel *musical* environment. In this regard, the strength of the instructor lies in pedagogy, not background knowledge. As stated eloquently by John Vitale (2020):

> Moreover, I have experienced many music teacher specialists over the years that were terrible teachers and did nothing but turn kids off of music. Hence, special knowledge of a specific subject matter does not necessarily make for good pedagogy. The art of teaching, therefore, is very different from the art of music. (p.71)

The Whacky Wizards Program should remove some of the 'mystique' surrounding music education, by allowing users to feel like they are capable of offering meaningful and legitimate music instruction to their students.

4.2.1.5 – Barrier #5 – Never having received formal training in music or music pedagogy

The Whacky Wizards program must provide teachers with opportunities for training and musical experiences to help reduce the impacts of this barrier.

This problem is reflected at the local level. At least three of the participants reflected on the fact that their post-secondary training had not included any provisions for music instruction. **Ash's** comments highlight this barrier:

> *I think when most people become … generalists, [post-secondary institutions] don't include music as part of that consideration for them becoming teachers. So yeah - that's a that's a big deficiency… there was certainly no compulsory music education training as part of the program.*

Regardless of deficiencies in their education, the training within Whacky Wizards aims to meet teachers where they are at in a non-judgemental way. There is evidence to suggest that this is the most advantageous approach, as Crooke & McFerran (2015) report that teachers are considerably more receptive to training programs that do not require any pre-existing musical knowledge. They also endorse programs that do not "expose

teachers to any perceived discomfiture involved in directing … or performing music themselves" (p.36). As previously mentioned, there are no requirements for directing or performing music with the program – the teacher should take on the role of facilitator and co-learner.

Several studies have shown that training programs for pre-service and in-service generalists that focus on the fundamental elements of music have had significant impacts on these teachers' confidence to teach music (Jeanneret, 1997; Rogers et al., 2008; Walker, 2000). Following the success of these models, Whacky Wizards training videos and lessons explain fundamentals such as beat, rhythm, pitch, melody, and harmony, and provide examples of how these elements exist within, and can be introduced by, the accompanying apps.

Lastly, this program aims to help teachers gain the knowledge they need to teach music not through theoretical instruction, but through pragmatic, real-world, active musicking. As a supporting argument for this strategy, on can look to Susan Hallam's (2015) truly outstanding book which comprehensively documents the benefits of music education and participation in a myriad of domains. It is called *The Power of Music: A research synthesis of the impact of actively making music on the intellectual, social, and personal development of children and young people.* The subtitle holds the key – the benefits of music for children (or anyone) cannot be unlocked unless they are ***actively making music.***

The Whacky Wizards program should improve teachers' perceived self-efficacy for teaching music, regardless of pre-existing musical or pedagogical

training. It will accomplish this by focussing its lessons for teachers on 1) the most basic elements of music and 2) strategies to share those concepts with their students via the apps and resources provided on the website. Critically, it will augment teacher's self-efficacy through experiences of active musicking.

4.2.1.6 – Barrier #6 – Music is not seen as a "core" subject and the predominance of literacy & numeracy

There is no way that the Whacky Wizards program can sway the ubiquitous policy that privileges literacy and numeracy learning. Instead, it must employ tactics that work within this framework and exploit any opportunity to include music instruction, and engender a valuation of music, in the classroom.

This theme cropped up in interviews with about half of the formal participants. The following statements underscore the issue well:

> **Elowen -** *I would say obviously the one major barrier is time for teachers to focus on music education and focus on things that are deemed as "nonessential". A lot of the times we get stuck in having to teach the core subjects, but we miss teaching, and we miss knowing, learning, and doing PD (professional development) in the arts … I think we just kind of miss the boat when it comes to focus on the core subjects and toss the other stuff to the side – which I, as an art person, don't agree with.*

> **Juniper** - *We spend a lot of time focusing on how to be better in literacy and how to be better in numeracy and, right or wrong, I think music education is one of the last things we all plan in the year.*

The Whacky Wizards program (indeed music education more generally) cannot possibly overcome the power of a global trend that favours Literacy and Numeracy education. What it can do is help teachers view music as a viable, enjoyable, and valuable

addition to their instructional regimes, offering a more holistic environment for their students. The program can be part of the development of strategies that integrate music into current classroom priorities.

One such way this can be accomplished is through cross-curricular connections – using methods and mediums from one subject to assist with the instruction of another. Cross-curricular learning, especially as a means to fit subject-specific instructional minutes in a crowded schedule, is a priority for administrators and teachers alike (Abril & Gault, 2007; Crooke & McFerran, 2015).

There are ample sources that endorse, encourage, and explain how music can augment literacy and numeracy learning. The processes involved in learning music have long been thought to correlate with language acquisition. Engh (2013) powerfully supports this case with a review of the literature in fields as diverse as cognitive science, anthropology, sociolinguistics, psycholinguistics, as well as first and second language acquisition. Brant et al. (2012) argue that music and language learning can follow a parallel path in child development. Similarly, music has shown to enhance the learning of mathematical principles, particularly as they pertain to rhythm (An et al., 2013; Geist et al., 2012). Garland & Khan (1995) explore an astonishing array of the connections between music and mathematical conventions. Boomwhackers are a unique tool in the science classroom, as they can be used to illustrate concepts such as ratios and waveforms (LoPresto, 2005).

The whacky Wizards program opens windows of opportunity for integration with math (patterns & sequences, fractions, counting), science (sound waves and sound

production), language (syllables, mnemonic phrases to accompany rhythms), and social studies (developing an understanding of other cultures through their music).

Amalgamating music with other subjects can breathe a sense of joy into 'book learning'. With any luck, providing positive experiences with music in school, no matter what the end goal, will allow the next generation of teachers and policy makers to appreciate it's worth. As echoed in the immortal words of Baba Dioum;

> In the end we will conserve only what we love, we will love only what we understand, and we will understand only what we are taught.
> (Wikipedia, 2021)

The Whacky Wizards program should assist teachers in advancing the value and importance of music in the lives of and learning of their students and themselves. It ought to help open doors for the incorporation of music into other areas of instruction.

4.2.1.7 – Barrier #7 – Music education is considered 'disposable'

The Whacky Wizards program must make targeted efforts to diminish barriers caused by funding and time restrictions.

Music education is abandoned at the administrative level because of funding, and at the classroom level because of time. For the research participants, the existence of this barrier was abundantly clear. At the time of the pre-test interview, **Olive** was still reeling from the recent loss of her school's cherished full-time music teacher due to budgetary cutbacks. **Willow** reflected on this reality as well:

It seems like whenever they cut staff at schools, they cut those specialists.

Four participating teachers made statements that directly related to how music instruction seems to be the first thing to get pushed off the timetable when other pressures arise. **Linden's** comments are illustrative:

> *Unfortunately, too often if something comes up — there's an emergency or fire drill…and you lose half an hour of your day. The first thing it's going to hit is music. I mean, it's just… it is what it is. But it's hard. And you know some people are considerably more cavalier about it – like 'Oh, we can always cut music', right?*

The Whacky Wizards program cannot likely remove barriers around the 'disposable' stigma that has plagued music education for decades. It must instead address the more immediate needs of funding and time in the schedule, both of which will be discussed in more detail in their respective sections of this chapter.

Those who use the Whacky Wizards program should recognize its capacity to challenge the all-to-common dismissal of music education due to budgetary or time restraints.

4.2.1.8 – Barrier #8 – Music is viewed predominantly as a product more than as a process

The Whacky Wizards program must help swing the pendulum back towards esteeming process and participation with music more than polished musical performance.

In the majority of circumstances when music is included in the roster of subjects taught, it is motivated by some kind of performative event, such as a Christmas concert. There are many negative outcomes in this situation: musical understanding is rarely

emphasized, musical insights are not cultivated, and music is relegated as something done for special events rather than everyday enjoyment.

This stress that this very real situation can cause teachers was reflected in comments by some participants:

> **Laurel -** *I think when it becomes about perfection and not necessarily the process that sometimes [music instruction] gets really unfun for everyone. I think you have to remember that it's not really about you [as a teacher], that it's for [students], and they are like 6 and 7 years old.*

> **Linden -** *I guess there's always that unwritten pressure on the music teacher that you have to put on a concert… I would NOT want to teach music thinking that… I would be responsible for giant production, which tends to happen to the music teacher. So that could be a barrier.*

Whacky Wizards emphasizes the practice of musicking, not the product of performative music. While the Song Wizard is designed for students to re-create or play existing songs, the Whacky Looper encourages creation and the manipulation of the sonic environment, and the lessons provide many avenues for students to experience and feel challenged by the process. The goal is to have fun and develop musical understanding rather than polished performers or products. Many of the rhythmic examples are inspired by cultures where musicking is more commonplace, giving students a small taste of making music for praxial rather than aesthetic reasons.

Students and teachers should recognize and appreciate that the Whacky Wizards program is not meant to direct users to a performance event, but to participate in and experience musicking. It should clearly be understood to be a tool that emphasizes music as a process as much as, if not more than, music as a product.

4.2.2 – Question #2 – What are the needs that exist with regards to music instruction?

Each section below explores one aspect of our second research question regarding needs, and importantly responds to the question – *In what ways will this program meet them?*

4.2.2.1 – Need #1 – Funding

The Whacky Wizards program (inasmuch as it is being used for the current intervention), must not be contingent upon funding for its implementation.

While funding was not directly a subject of interview or survey questions, there was frequently an undercurrent present in these conversations that music, perhaps more than other subjects, requires dedicated resources. With **Magnolia**, who is solely responsible for music instruction in her school, the dialogue was more explicit:

> *It is difficult for me to ask for things that cost money. So that would be a barrier for me. I don't have a budget. I don't know my budget. When I need something, I have to ask for it usually more than twice.*

It was imperative that there would be no financial impediments for teachers who wanted to participate in this research. The very first correspondence with interested teachers stated that the instruments required to participate would be provided at no cost. In the fall of 2020, a GoFundMe campaign was specifically set up for this purpose, which raised nearly $2000. The instruments were purchased at Long and McQuade Music in Lethbridge, who kindly offered an educational discount. In the end more than 600 Boomwhackers were distributed to participants free of charge.

In addition, there was no cost or fee involved for the website. An account providing access to all the lessons and apps was given freely to all participants.

Teachers using the Whacky Wizards program (and possibly their administrators), can realize that offering musical instruction and experiences to their students can be managed with limited financial resources.

4.2.2.2 – Need #2 – Instruments

It is essential that the Whacky Wizards program provide teachers with the instruments needed to implement the intervention in their classrooms.

Without exception, access to instruments was listed as one of the top needs among interviewees in the pre-test interviews. At least half of the teachers reported having no access, or very limited access, to instruments:

> **Willow** - *We have a few maracas, a few Boomwhackers, a few sticks, and that's about as far as we go with the instruments. So, what do you do with just that limited stuff to teach the students? [It's a] pretty big barrier when you don't have enough equipment for music.*
>
> **Elowen** - *We definitely don't have any instruments at all throughout the whole building.*

From the very conception of this research project, Boomwhackers had been considered the ideal choice for the design of this intervention. They are accessible, durable, affordable, and inviting to play (Perlmutter, 2014). The instruments themselves remove obstacles with regards to notation because each 'note' (tube of a certain length and pitch) has a distinct colour. These colours can be used to represent pitches in a

variety of graphic representations rather than relying on a traditional staff with conventional note heads. They are unique in that they are very equalizing instruments in a classroom – it does not matter if some students have a stronger background in music, everyone can play them. The following are some endorsements of these instruments from the literature:

> Young students are intrigued by Boomwhackers, and even those who tend not to excel in traditional classroom instrument teaching are eager to try and find that they are able to participate in music making and creating. (Kunish, 2010, p. 293)

> Kids love Boomwhackers! Don't be fooled by these toy-like plastic tubes! They are dynamic and cost-effective instruments that kids can readily play, and the best part is that they are very easy to teach, even if you have a limited musical background. You don't even have to read music to be able to play them. (Vitale, 2020, p. 68)

The optimal ratio of Boomwhackers for the Whacky Wizards program is one one-octave set per 3 students in the class. Each participant was consulted regarding their class sizes and current access to Boomwhackers, after which point enough instruments were provided to meet that ratio.

During the field test, teachers should be able to implement the Whacky Wizards program without any concerns over having adequate instruments. They should also become aware of the many benefits that Boomwhackers provide for music instruction.

4.2.2.3 – Need #3 – Instructional materials

The Whacky Wizards program must provide teachers with a comprehensive set or system of instructional materials that can facilitate musicking in their classrooms, in terms of both lesson preparation and delivery.

In pre-test interviews, eight out of ten of the formal participants mentioned that suitable instructional materials were one of their chief needs. When asked "What is your biggest need?", **Juniper's** response was illuminating:

> *Simple, clear instructional [materials]. Like a simple clear program of 'Here's what you do', 'Here's how you do it', and 'Here's how it goes going forward'. Because I want to be great at teaching music… But I'm going to put more of my effort in to being great at teaching kids how to read or great at teaching kids how to do math. So, the clearer and [more] focused that we can get, the easier it is for us to just pick it up, read it over, and then be like 'This is meaningful, engaging, and fun'. Because I don't want my music class to be the class the kids hate. I want it to be something that they're enjoying doing because it should be fun, but it should also be focused and meaningful.*

Rowan was the formal participant chosen in a school where all the teachers were interested in trying Whacky Wizards. He expressed the challenge of meeting this need on behalf of himself and his peers:

> *With the other teachers I've talked to, that's one of their biggest obstacles - getting the materials for music classes. Especially the generalist teachers like us that kind of don't know about music class.*

The lessons and resources provided on the Whacky Wizards website have three goals in mind.

First, they are comprehensive – everything the participants needed to create meaningful sessions in their classrooms is provided in one place, so teachers do not have to gather resources from numerous sites. Second, they are manageable – lessons focus on one concept or skill, with sub-themes divided into digestible bites. Third, they are

straightforward – the concepts and skills presented are the distillation of years of experience teaching Boomwhacker classes and can be easily scaffolded to build a knowledge base.

Teachers should feel that the Whacky Wizards program provides them with all the instructional material and resources they need to teach music using Boomwhackers. It should also be easy to navigate and use.

4.2.2.4 – Need #4 – Space

The Whacky Wizards program must be adaptable enough to be used in a number of spaces, including any 'regular' classroom.

Boomwhackers do not require a dedicated room or specific classroom configuration, as they can be played on a student's regular working space, such as a desk or tabletop. They can also be easily played in open spaces such as gyms or libraries where desks may not be present by simply sitting and striking them against the floor. In addition, they do not require a lot of room to store – an entire class set can fit into two or three five-gallon buckets.

Whacky Wizards takes classroom logistics into account, with a lesson dedicated to the use of Boomwhackers that includes segments discussing distribution and collection of instruments before and after sessions, configuration of players, and storage ideas. Clear diagrams demonstrating how instruments can be assigned to students are included in both the videos and as downloadable PDFs.

Teachers should feel that the Whacky Wizards program can be fully realized within the confines of their own classroom. It should also be apparent that the program could be used in other spaces, such as dedicated music rooms.

4.2.2.5 – Need #5 – Time

The Whacky Wizards program must be deliberately designed to work, and even thrive, within the confines of a crowded timetable.

In pre-test interviews, only three participants directly mentioned time as a need they had considered. When asked about her needs, **Willow's** comments parallel much of what can be found in the literature:

> *Having time. Our timetables are so full, so making sure that [music] is something that I can fit into the day. Because 'oh. I need to have this many minutes of this, so this many minutes of this'. I know that having the things like music or art … are important as well, but sometimes you get in the middle of other things. Like 'Oh no. I need extra math, or I need extra language'. So that to me is a big deal.*

The lessons and exercises in Whacky Wizards are designed to be brief, modular, and flexible. Teachers can choose to reduce or expand sessions from as little as 15 to as much as 60 minutes. Similar interventions have demonstrated the value of short, frequent sessions. (King, 2015; Rogers et al., 2008). Following the directions provided on the website, a class can be ready to play in under 5 minutes, and clean-up is just as fast. A newly qualified teacher who participated in a similar intervention had this to say about the format:

> It does mean that we are all teaching music regularly and you know exactly what to do. So you teach it every week. It is straightforward to fit into the curriculum since you can drop in ten or fifteen minute sessions as appropriate.
> (Rogers et al., 2008, p. 488)

The Whacky Wizards program will be efficient and flexible enough to be used even in small segments of time. Teachers should feel that they can accommodate music instruction in their timetables, either planned or spontaneously, when using the program.

4.2.2.6 – Need #6 – Mentorship

In as much as is possible given the digital platform on which it will exist, The Whacky Wizards program should bolster the self-efficacy of those who use it by providing mentorship in the form of training, vicarious experiences (modelling), and positive feedback.

In conversations with participants, the need for not just instructional materials, but a person that could be relied on for support, was a reoccurring topic. In a pre-test interview, when asked what attracted her to become a participant in the study, Holly answered:

> *Probably because I'm not a music specialist, so having someone tell me what to do for music, give me suggestions on what I can do with them for music for that 30 minutes, was very appealing.*

Ash was very hesitant when he was asked to teach music in a previous job. He recounted what allowed him to overcome his trepidation:

> *The biggest thing that I needed was – and that they helped me out with is – that they provided some time for a music teacher to come and work with me in the class and kind of get me started on some things that I could go and do by myself… Well, that's perfect because then the person being mentored can ask questions and can observe, and then ask questions about what they're observing and about what they're doing and get feedback. It's ideal.*

Holden and Button (2006) report that the highest standards of music instruction often happen when a generalist teacher works in close collaboration with a music

specialist. This research project was intended to adhere to that principle from the very first interactions with participants. Though face-to-face interactions were complicated by COVID-19, efforts were made to establish connected relationships between the researcher and participants before and during the field test. This was accomplished via email communications, training sessions over zoom, and ongoing feedback via the weekly surveys.

The attitude of mentorship was extended to the design of the lessons on the website, particularly with the instructional videos. The aim was to use a tone of mentorship that would instill a sense of expertise and confidence on the part of the researcher without alienating those with less musical experience. While one-on-one mentorship could not be provided, an essential goal was that participants felt supported, guided and coached by an individual they trusted and respected.

The Whacky Wizards program should instill a sense of connection between the participants and the researcher such that they feel that he is someone they can rely on for guidance, coaching, and instruction.

4.2.2.7 – Need #7 – Training and professional development

The Whacky Wizards program is not intended to deliver music instruction to students directly. Rather it is to provide training and professional development to teach teachers how to teach music, with the goal of developing their self-efficacy for the subject.

Access to suitable professional development in the arts is an ongoing challenge for many teachers. **Magnolia** emphasises this problem:

> *I haven't done a lot of Fine Arts PD, because there is not a lot of Fine Arts PD out there.*

From the very inception of the Whacky Wizards program, the main goal was to provide teachers with the training and tools they needed to deliver music instruction in their own classrooms. The initial correspondence created to find participants for this project framed involvement with the research as an opportunity for teacher training and professional development, clearly articulating this to administrators and teachers alike. Teachers were assured of an opportunity to grow in their own capacity as music instructors, simultaneously providing an enrichment opportunity for their students.

What has been learned is that two things really matter for this to take place: First is the *kind* of training that is offered, and the information that is conveyed, the second is the *manner* in which that training is offered.

On this first point, it has been established that an understanding of music on a foundational level is key. The instruction need not be complicated but should allow teachers to understand 'how music works'. Welch and Henley (2014) indicate that training in the rudiments of music can lead to generalist teachers having more comfort with, and subsequently spending more time on, music instruction.

The series of five lessons entitled "How Music Works" on the Whacky Wizards website provides successive tutorials on the foundational elements of music (beat, rhythm, pitch, melody, and harmony). The lessons are presented such that teachers need only follow them up to the level of understanding required for their current circumstances. All lessons were conceived with the intent that teachers could adapt them

to their own situations. For example, teachers are encouraged to use the Rhythm Tutor app to introduce music to young children for the first time. To be able to plan lessons, the instructor needs only a basic understanding of beat and rhythm, and can leave pitch, melody, and harmony for when they and their students have significantly progressed in their music knowledge and experience.

Concerning the manner in which the training was to be offered, the circumstances surrounding the COVID-19 pandemic required that it was all done remotely and virtually. However, this may have turned out to be to the program's advantage. In pre-test interviews with participants, 8 out of 10 reported doing some manner of on-line professional development. While the teachers recognized that there were downsides, they listed a number of advantages to the format, particularly when the sessions were asynchronous and could be accessed at any time. These include:

- affordability – particularly as it pertains to travel and accommodation associated with in-person conferences
- opportunities to study and learn with a diverse group of people with whom you might not otherwise come into contact
- less time away from work and family
- potential for more immediate feedback
- most significantly, teachers can learn at their own pace according to their own schedule

The training offered by Whacky Wizards meets many of these criteria. In addition, it focuses on the basics of music and music pedagogy. Lessons can be visited at any time, and each takes less than half an hour to review in its entirely.

Participants who follow The Whacky Wizards program should be able to learn at their own pace, with short, adaptable lessons. They should feel that they have truly experienced a form of professional development, gaining knowledge not just about the subject of music, but skills to share this knowledge with their students.

4.2.2.8 – Need #8 – Integration of music instruction with classroom technology

The Whacky Wizards program should effectively integrate and employ technology which is readily available in local classrooms to meet the needs of teachers and students who are increasingly reliant on digital media. It should aim to help students learn on the cusp of their current capacity.

Using technological tools commonly available in today's classrooms is still uncommon for elementary music instruction. In pre-test interviews, it was determined that only one of the participants had ever used a dedicated technological program for music in their classrooms (In the past, **Rowan's** students created songs using Apple's Garage Band app). The extent of the majority of the participants use of technology was limited to having their students sing or dance along to YouTube videos.

Nonetheless, on the level of general education, all the participants mentioned the benefits of using technology in their classrooms. These included:

- Students gravitate to, and are engaged with, screens in a different way than static media
- Instant feedback and evaluation

- Multiple modes of learning – modelling in visual, aural, and kinesthetic ways
- Provides a learning environment that can be manipulated by the user

Ash articulated one of the most potent aspects of digital media:

> *Generally speaking, interactive technology is a good hook for the kids. They get engaged because they can manipulate something. I don't exactly know what it is about touching something and having it react to your touch, but it's something that kids latch onto right away… when something intrigues or interests a kid, then they are hooked [and] you can use that interest to bring them subject matter in a more interesting way.*

This was echoed by **Rowan's** observation:

> *I know that there are definitely a number of kids – maybe as many as 30% – that as soon as the screen goes on, they are paying attention.*

Juniper explains one of the reasons it is powerful for her teaching:

> *I love the instant feedback. When we get online, I love that I can set up things that make kids instantly know if they're right or wrong as opposed to doing a whole [paper] worksheet… [completing] 20 math questions incorrectly and now they've registered THAT in their brain.*

However, half of the interviewees also mentioned the downsides to technology, including the hazards of over-use of digital devices, and that the use of technology in and of itself does not equate to meaningful learning. **Willow** explained it like this:

> *They always expect to be having something exciting going on in the background. They want to be playing the games. They want to be doing more than just sitting and thinking. They want the machine to think for them sometimes. That's why I don't have [screens] on all the time...*

Whacky Wizards is obviously a technological tool. It was intentionally designed for classroom use on an interactive whiteboard, though simple projection to a screen is also effective. Because the program is web-based, an internet connection is also required. Before the field test was started, it was confirmed that all the participants' classrooms

were outfitted with high-speed internet and a SmartBoard or some other kind of projection device.

As outlined in chapter 3, a tremendous effort went into the design and realization of the apps, website, and lesson videos. Some features of the apps which received particular attention to exploit the features of the interactive whiteboard include:

- a 16:9 aspect ratio, which will perfectly fit the display dimensions in full screen mode
- proportional scalability for when the apps are opened in a smaller window
- buttons, menus, sliders and switches are consistent in form and function between apps
- interface uses bold lines and colours to make interactive elements prominent
- intuitive labelling, symbology and layout that encourages exploration, either with a touch screen or a mouse

The interface was also designed to develop critical thinking. As students manipulate the sonic environment, they become what Bandura (2001) calls 'change agents' through learning which is "generative, creative, proactive, and reflective, not just reactive" (p.4). He goes on to explain that these students have greater ability to problem solve and adapt when confronted with task demands.

A key point to consider is that the Whacky Wizards program has included many of Gee's (2003) principles, either as purposeful design decisions or as by-products of other elements of the program. While these design strategies are deemed game-based, it must be remembered that this program is much more than simply a game for students to play on the screen. It employs technology as a tool for training teachers to teach the

subject of music in a way that generates meaning for them and their students. The many aspects of the apps that can be altered help teachers keep lessons fresh and allows them to be modified to meet the learning capacity of the students. These include the ability to slow down or speed up any app, the power to mute or highlight either the sounds of the main music or accompaniment, and the multiple choices of accompaniment that can introduce students to important instrument families and ensembles.

The Whacky Wizards program should provide experiences for students and teachers which are intuitive, captivating, and enlightening. It should capitalize on the digital platform on which it has been created, providing students opportunities to stay challenged and engaged while also being fun and easy to use.

Chapter 5 – Findings and Commentary

This chapter will present data and findings regarding the *use* of the Whacky Wizards program as an intervention during the ten-week field test in participant classrooms. Additionally, and perhaps more importantly, it will set forth data regarding the attitudes and understanding of participants towards music instruction before, during, and after the field test.

The bulk of the data collected is qualitative in nature, consisting of reflections, descriptions and observations made by participants throughout their involvement in the research project. Some data, such as demographic and survey information, is more quantitative in nature, though no broad conclusions have been drawn due to the relatively small sample size. In most instances, the data is simply enumerated to provide information at a glance.

5.1 – General Overview of Data Collection

As explained in the previous chapter, the data was collected primarily through pre- and post- test interviews, online surveys, and to a much lesser degree, email correspondence. Some clarification regarding data presented from these sources can be found in the following sections.

5.1.1 – Interviews

The most informative data collected during the research is unquestionably the transcription of conversations with formal participants in both pre- and post- test interviews.

Broadly speaking, statements and quotes taken from these interviews can be grouped into two categories; 1) Affirmations that the sub-sections or themes associated with each of the research questions exist and are relevant to participants' situations, and 2) Assertions that the Whacky Wizards intervention addressed these issues in some way. In most instances, the statements validating existing problems were found in pre-test interviews and have already been presented in the design rationale portion of the previous chapter. Logically, statements confirming that the intervention had addressed barriers and needs were in post-test interviews. The bulk of the data presented in this chapter is in the form of quotations from these interviews.

5.1.2 – Online feedback forms

The online feedback forms provide two kinds of data, that for which participants had a fixed number of options from which to choose, or open-ended questions. Data from fixed questions will be presented in this chapter in tables for succinct presentation. The open-ended questions were very important to collect teachers' impressions of the program while the field test was taking place. When specific responses from the open-ended questions have been shared, they are italicized like quotes from interviews, but have no specific names attached, because non-formal participants were not given pseudonyms.

5.1.3 – Email Correspondence

Communication via email between the researcher and participants took place for roughly 10 weeks before the field test and continued throughout it. This communication was primarily logistic in nature and was not a means of data collection. However, during the field test, there were roughly half a dozen emails received from participants who wanted to ask questions or offer feedback that was pertinent. This feedback was included in a file with the open-ended responses from surveys. Any reference to these emails is noted when pertinent.

5.2 – General Findings

This section provides material that may shed light or provide further context for more specific findings presented in section 5.3 – Findings by Research Question. This includes geographic/demographic information about the participants and the students they teach, as well as other relevant data collected via the fixed option responses of weekly online feedback forms.

5.2.1 – Demographics

The 24 participants in the study came from 5 school divisions in and around Lethbridge, Alberta. The breakdown of participant by school districts is as follows:

Table 1

Number of participants by school division

School District	Number of Participants
Lethbridge School District No. 51	2
Holy Spirit Catholic School Division	10
Palliser School Division	6
Westwind School Division	5
Livingston Range School Division	1

Six participants (3 formal, 3 informal) taught in schools that are in Lethbridge, with the remainder in outlying communities.

Most participants (both formal and informal) are generalist teachers who taught principally in a single classroom. In addition, three participant teachers (two generalists, one specialist) were dedicated to teaching music to several classes between grades 1 and 5 when the regular classroom teacher had a prep period. Participant classrooms consisted of either a single grade group, or two grades combined (i.e. 1-2).

The breakdown of participant classrooms by grade level is given in table 2 below.

Table 2

Number of participating classes by grade

Grade Level	Number of participating classes
Kindergarten	1
Grade 1	1
Grade 1-2	3
Grade 2	4
Grade 2-3	3
Grade 3	4
Grade 3-4	1
Grade 4	2
Grade 5	1
Grade 5-6	1

5.2.2 – Online feedback form findings

During the field test, which took place between January 11 and March 27, 2021, participating teachers were encouraged to provide weekly feedback about their experiences with Whacky Wizards via an online form accessible through the website.

In total, 24 participants filled out the form at least once, and altogether there were 84 forms submitted. No questions were mandatory, and as such some surveys were incomplete. The breakdown is as follows:

- 3 participants submitted the form 7 times
- 1 submitted it 6 times

- 2 submitted it 5 times
- 3 submitted it 4 times
- 8 submitted it 3 times
- 3 submitted it 2 times
- 4 submitted it 1 time

Respondents indicated the week of their response from a list of the 10 weeks covered by the field test. (The week of February 14 was omitted because students were not in class that week). The breakdown of form submissions by week is as follows:

Table 3

Number of online feedback forms submitted by week

Week starting Monday	Number of submissions	Percentage of total submissions
January 11	13	15.5
January 18	14	16.7
January 25	9	10.7
February 1	12	14.3
February 8	16	19
February 22	1	1.2
March 1	8	9.5
March 8	4	4.8
March 15	5	6
March 22	2	2.4

5.2.2.1 - Amount of instructional minutes/time program was used

Teachers were asked to report on total instruction time using the program, adding all lessons for the week. Out of 80 responses:

- 22 (27.5%) said they used the program 15-30 minutes per week
- 32 (40%) said 30-45 minutes
- 16 (20%) said 45-60 minutes
- 10 (12.5%) said more than 60 minutes

It should be noted that 8 responses of 'more than 60 minutes' were by teachers who taught multiple classes using the program, so there were actually just 2 instances where a single class used the program for more than 60 minutes during a week.

The breakdown of responses from week to week is displayed in Table 4 below:

Table 4 - Amount of time program was used per week

Week starting Monday	15-30 Minutes	30-45 Minutes	45-60 Minutes	More than 60 Minutes
January 11	2	5	3	3
January 18	2	5	4	1
January 25	4	3	1	
February 1	3	3	2	2
February 8	5	7	1	2
February 22		1		
March 1	3	4	2	1
March 8	1	2		1
March 15	1	2	2	
March 22	1		1	

5.2.2.2 – General feelings regarding lessons offered with Whacky Wizards

Those who completed the weekly online feedback form were asked simply to create a rating for the following question *"How well do you feel your lesson went?"*. They were asked to reply on a scale of 1 to 5, where 1 was Poor and 5 was Fantastic. Of the 80 responses, there were:

- No responses of 1-Poor or 2-OK
- 9 (11.3%) responses of 3-Good
- 58 (72.5%) responses of 4-Very Good
- 12 (15%) responses of 5-Fantastic

The breakdown of responses by week are presented in Table 5 below:

Table 5 - "How did your lessons go this week"

Week Starting	1-Poor	2-OK	3-Good	4-Very Good	5-Fantastic
January 11			3	5	2
January 18				8	2
January 25			1	8	2
February 1			2	5	2
February 8			1	12	3
February 22			1		
March 1				10	
March 8				3	1
March 15				4	
March 22			1	1	

5.2.2.3 – Making connections to the curriculum with Whacky Wizards

Over the course of the field test, 77 responses were submitted for the following question: "*How well were you able to make curricular connections to the lessons?"* Of these responses there were:

- 1 response of 1-Poor (1.3%)
- 4 responses of 2-OK (5.2%)
- 14 responses of 3-Good (2.5%)
- 35 responses of 4-Very Good (45.5%)
- 23 responses of 5-Fantastic (29.9%)

Table 6 details the results:

Table 6 - Curricular connections made with program

Week Starting	1-Poor	2-OK	3-Good	4-Very Good	5-Fantastic
January 11		1	2	6	2
January 18		1		3	6
January 25		1		6	3
February 1			2	5	3
February 8			4	5	6
February 22			1		
March 1	1		1	6	1
March 8		1		2	1
March 15				2	1
March 22			2		

5.2.2.4 – Student engagement with music lessons using Whacky Wizards

Over the course of the field test, 79 responses were submitted for the following question: "*How engaged were your students with the lessons?"* Of these responses there were:

- No responses of 1-Poor or 2-OK (0%)
- 2 responses of 3-Good (2.5%)
- 35 responses of 4-Very Good (44.3%)
- 42 responses of 5-Fantastic (53.2%)

The breakdown of responses by week are displayed in Table 7:

Table 7 - Student engagement with lessons using program

Week Starting	1-Poor	2-OK	3-Good	4-Very Good	5-Fantastic
January 11				4	7
January 18				3	7
January 25				3	7
February 1				5	5
February 8			1	3	11
February 22			1		
March 1				8	2
March 8				3	1
March 15				2	2
March 22				2	

5.2.2.5 – Other information gathered via the online feedback forms

The other questions to which respondents had a set number of choices concerned the use of the Whacky Wizards program. Specifically, they asked about which of the three apps participants used, and within those apps, which songs or patterns they selected. This information was collected to see which of aspects of the program seemed most popular or relevant, and to see if there was any trends or progressions of use over the course of the field test. Due to inconsistent reporting among a small number of participants, no significant deductions could be made.

The original aim of this research had posed more questions related to the principal conjecture than those that were ultimately chosen. Some of those questions proved to be outside the scope of this thesis. As such, it was deemed that the some of the data collected from the online feedback forms did not apply to the remaining research questions. This information, including data regarding specific songs/rhythms/patterns teachers used week to week, may prove more useful in a future iteration of the intervention. An overview of the questions and themes which were not fully explored is included in the concluding chapter.

5.2.3 – Increase in music instruction time

Formal participants were asked in pre-and post- test interviews to estimate how many minutes of music instruction their students were receiving per week.

Table 8 - Weekly music instruction time (in minutes)

Name	Pre- test	Post-test	Increase
Ash	60	75 - 90	15 - 30
Elowen	0	60	60
Holly	60 (per class)	60 (per class)	0
Juniper	40	60 - 75	20 - 35
Laurel	60	80 - 90	20 - 30
Linden	0*	25 - 30	25 - 30
Magnolia	50 - 60 (per class)	50 - 60 (per class)	0
Olive	0	30 - 45	30 - 45
Rowan	30	60	30
Willow	0*	30 - 45	30 - 45

Holly and **Magnolia** taught music to multiple classes and provided their answers per class.

* **Willow** reported that her students were *supposed* to be receiving 40 minutes every two weeks from a visiting specialist, but that this instructional time had been very inconsistent. The students had only received 3 lessons in the previous 3 months. **Linden**

also reported that the students were supposed to have been receiving 30 minutes, but that target had seldom been reached.

5.3 – Findings by research question

The following section offers substantiation of the principal conjecture of this research, namely that **a program employing digital technologies can be designed, implemented, and evaluated to assist elementary teachers to introduce, increase, and/or improve music instruction for their students, particularly if they are not music specialists.** Like previous chapters of this thesis, it will organize this evidence under headings corresponding to the research questions, with sub-sections examining the themes associated with barriers and needs.

Each sub-section will begin by reiterating the desired outcomes of the intervention towards that particular theme as presented in the previous chapter. These will be displayed in ***bold italicized text.*** The section will continue with illustrative quotes from participants and observations made by the researcher to demonstrate if and how the desired outcomes were met, or if there were results that were outside what was expected.

While examining this section, please keep in mind that conversations do not always fit in tidy boxes, and statements made by participants could often be categorized under many different headings. For example, one verbal exchange in an interview might simultaneously touch on issues relating to use of technology in the classroom, meeting a tangible need of the instructor, and addressing a barrier. The intention, therefore, is to provide the reader a study of many trees while still gaining a holistic understanding of the forest.

5.3.1 – Barriers to music education

As previously mentioned, this research has no delusions of being able to fully overcome long standing and systemic barriers concerning music education. However, statements and reflections made by participants in interviews and survey feedback in the previous chapter do provide testimony that these barriers exist and are sometimes prevalent in their individual situations. The goal of this section is to provide some evidence that the intervention designed for the research project did, in fact, address these barriers, and in some instances made significant strides to reduce them.

5.3.1.1 – Barrier #1 – Lack of confidence and competence (self-efficacy) for music instruction

More than anything else, using the Whacky Wizards Program should make teachers feel demonstrably more confident and competent with regards to music instruction. It will accomplish this primarily by providing mastery experiences, but will also do so via vicarious experiences, verbal persuasion, and positive physiological and affective states.

The combined themes of confidence and competence came to the fore for participants during the post-test interviews, and compared with the pre-test interviews, discussions referencing these topics were far more prevalent. Without exception, interviewees mentioned that the intervention gave them a boost to confidence, either using the term directly, or with words like comfort, ease/easy, and supported. Below are a few excellent examples:

> **Holly -** *After watching the videos and trying all the programs, I felt pretty confident knowing what the steps were and knowing how to progress [with the*

program]. I don't think it was really hard to figure out how to progress in [the right] way.

Magnolia *(speaking of the website) - The fact that all this was done for me boosted my confidence in feeling like I could take this on.*

Linden - *I felt like I had a little more confidence. There is no way I would have taken on Boomwhackers without the Whacky Wizards program because I wouldn't have known even where to start.*

Rowan - *It made teaching [music] a lot easier. It made it easier for me. I think that music teachers, especially in the smaller schools (his whole school has less than 60 kids), don't feel like they have any support. And so, it felt like I had all the support right there [on the website].*

Olive - *Music simply would not have happened in my classroom without the [Whacky Wizards] program.*

This direct increase in confidence was reiterated in survey feedback as well. A sampling of responses from the "What went well this week?" question are illustrative:

All of the tools and videos available helped me feel really well supported and gave me the confidence I needed to jump right in and get started.

I'm getting more confident. The kids love it.

Equally, an increase in competence was a universal theme in post-test interviews, expressed with words like know-how, knowledge, experience, and background.

Juniper – *It provided a solid foundation of music instruction … I don't have to stress about having that in my own capabilities because I had this program that was going to lead [my class] in the right way.*

Hazel - *I think that it helped me realize that I knew more music than I thought I did, and I was able to transfer that to the kids… it was enough that I could say to my mom 'You know what Mom? All those piano lessons you gave me were a benefit to me 40 years later.' It was exciting, and the kids caught onto it.*

In almost all instances, these boosts to self-efficacy for music instruction were tied to *mastery experiences,* both for the teacher and the students involved. These mastery experiences were often closely related to positive *physiological and affective states,* such

as having fun with the program, feeling a sense of pride and accomplishment, and, importantly, *not* feeling anxious about music lessons.

Linden shared the following anecdote, which provides a textbook example of a mastery experience:

> *The very first day, the kids tried Twinkle, Twinkle Little Star, I recorded it and sent it home as a video link and the parents were just astounded that their children could play Boomwhackers so well after just 20 minutes of instruction. So, you helped make me look good as a music teacher… Thank you, I am glad that I got to be a participant in the cohort that was testing it, because it will give me the courage I need to try Boomwhackers again with [future classes].*

Laurel shared excellent instances of a mastery experiences on the part of her grade 2 students using the program:

> *They really looked forward to it – they felt [a sense of] accomplishment really quickly, which is huge for the young ones. And they really loved it. Anytime I would say 'OK. It's time to get the Boomwhackers' the class was all like 'Yeah!' And then I'd have to remind them to try not to get too excited.*

It cannot be stressed enough how much emotional arousal can influence self-efficacy, both positively and negatively. During the interview with **Magnolia,** she often returned to the enjoyment that her and her students had with the program. She reflected on using the Rhythm Tutor as opposed to notation-based materials that she was accustomed to. With reference to one of the app's mnemonic phrases (*Walk the Fat Dog*) she remarked:

> *A lot of these teaching manuals lack joy, whereas the good thing about Boomwhackers is that we have silly rhythms, we have silly phrases. I have kids running out to recess talking about how the dog [walks]. They are not going to run out of the school reciting "G,G,A,A,A,B" (as she motions playing a ukulele). No, they don't.*

To reiterate the joy her students experienced, she gave an example of when she first let her students try two Boomwhackers each:

It was too much — but you could tell that they were having FUN with too much.

While none of the respondents used the actual term self-efficacy, the concept was implied in their responses many, many times. To demonstrate this, look at the following sampling of comments made on weekly feedback forms that use terms like engage, achieve, master, and enjoy.

The children were very engaged and interested in the Boomwhackers.

They really enjoyed trying 'twinkle, twinkle' and making an actual song during their second lesson. They think the whole thing is very cool!

Students were super engaged!

The students really look forward to music lessons.

The students love this program! It's super cool to see them learning to play as an ensemble

They were really excited about the success and overall achievement they had in creating music.

Students are very engaged and really starting to understand what beat is.

Kids are getting really engaged in mastering some of the songs. We started them off slow the week prior but are really making some progress and feeling success!

It allowed the students to have engagement, enjoyment, and collaboration in a very positive fun environment. I was so happy to be a part of this program.

5.3.1.2 – Barrier #2 – Previous experience with music education

Users of the Whacky Wizards Program can feel capable of participating in active musicking, and have positive experiences doing so, regardless of previous experience with music education. Students and teachers can make music first and include theoretical learning as it naturally becomes relevant.

During interviews, all of the formal participants reflected upon their experiences with music education either as teachers, students, or both. For some the experience has been positive, for others, less so, but all of them were shaped by it. **Magnolia** was able to articulate how her early and current experiences with music education inform her teaching practice today in a remarkably relevant way. In September 2020, for the first time in her teaching career, she was tasked with providing music instruction for 5 classes in her school. Because of COVID restrictions, she was given a box of 16 Boomwhackers and told 'Use these – they are easy to clean'. She explains why this presented a challenge:

> *Before I had learned about the [Whacky Wizards] study… I took a look at [the Boomwhackers] and said – I don't know how to play this instrument, I'm going to clean the Ukuleles, because I know [them]. You kind of gravitate to what you know and … I feel Boomwhackers are relatively new. Most of us didn't grow up playing them in elementary school, which is, let's face it, where most of us get the bulk of our [musical] learning.*

She continues to explain how the Whacky Wizards program gave her what she needed to break out of that mindset:

> *[It provided] confidence, you know? I felt comfortable flying through the website, I saw a couple of activities I knew I could build to, I knew how to kind of use it, so – OK let's do it, let's just jump in. But had there only been Boomwhackers and no website, I probably wouldn't have done it at all.*

An unexpected finding regarding experience with music education came from a conversation with **Holly**. Her students come from disparate socio-economic backgrounds – some of them have the good fortune to study music outside of school, others do not. Holly had encountered a problem with this in music lessons she had been offering, which relied heavily on Western notation. For those that have exposure to music outside of school (such as private piano lessons), their attitude was '*OK. This is too easy. I don't*

want to do this', while those who do not have that opportunity said '*That's way too hard. I could never learn that'.*

In the post-test interview, **Holly** described how the Whacky Wizards program was able to address the situation:

> *It gave everyone an equal opportunity. Everyone was starting from the same place, so there was an even playing field to start. Some are naturally better at rhythm than others, but no one felt disadvantaged from not having skills/experience with Boomwhackers … you could see how they progressed together.*

As mentioned in the desired outcomes of this section, the hope was that the program could help participants consider musicking their primary objective - to *make music first*. **Ash** reflected on what this meant to his students:

> *They got to MAKE music, and I think that there is definitely power in that, and that there is certainly something engaging about just being able to make music at any level.*

An informal participant left this report on an online weekly feedback form:

> *They really enjoyed trying 'twinkle, twinkle' and making an actual song during their second lesson. They think the whole thing is very cool!*

One of the most satisfying manifestations of the objective to make music first and learn theory later was found with first-year teacher **Juniper.** She unwittingly adopted the music first, theory second approach from her commitment to create inquiry-based learning opportunities for her students, because, in her words, the "program was creating spots for that to happen":

> *If I teach music next year, I'll just have a sticky note on my desk outlining the concepts I want to teach – Melody, Harmony, Rhythm, [etc], then have my music lessons go parallel to that. In all of our other subjects we have to be so objective based – like finding out what surface tension is, or defining democracy – but with music I'd almost go the other way, to look at what objectives you covered after the fact. Like, 'Today we are going to try this crazy activity', and then wherever the students learning is going we can pull out the parts from that.*

When asked if this was due to the learning she had made about basic elements of music and their relation to the curriculum, she continued:

> *Absolutely. Because then I just knew what the point was, or the objective was, and I could touch on these things, I could pull them out because I could see them. Whereas if I am trying to teach [a particular concept] as a non-music person, it just feels so forced. Because it's not natural, it's not inquiry based. Whereas when I can see the things underneath, I can guide the students towards that, they would get there and ask 'I wonder why this is happening?' and I could say 'Aha! – Here is why this is happening'. So that was cool.*

5.3.1.3 – Barrier #3 – Perceptions about musical ability

Both teachers and students who try the Whacky Wizards Program should feel like they can 'do' music, regardless of perceptions of musical ability. Furthermore, the program should encourage everyone to get involved, providing opportunities for participation on several levels. Anyone who tries the program should feel 'musical'.

One of the most encouraging aspects of the initial (and enthusiastic) response of teachers interested in becoming participants in the project was that they sensed that it could help them, regardless of their musical ability. When asked why she wanted to collaborate with the researcher, **Olive's** reply exemplified this:

> *It felt like something I might actually be able to pull off myself with the music ability that I have.*

It may be significant that many teachers were willing to give it a try after only reading a description of the program. **Laurel** recalled:

> *When I saw [your email] I was like 'oh this is … the music [teaching] someone else is doing [where] I can jump on board.' That part really attracted me – That you had organized it all, set something up … I was like 'oh, cool.'*

In pre-test interviews, there were strong opinions expressed by some participants regarding their perceived lack of musical ability. At the time of the post-test interviews, although none of the teachers recounted feeling like their innate musical ability had changed, some at least demonstrated a blossoming of their self-efficacy for the subject. **Elowen** provides an inspiring example of how the program awakened a sense self-assurance in her own latent musical understanding. When asked what she had gained from the being a part of the project, she answered:

> *Personally, learning how much I already knew about music, and that I actually have comfort level with teaching it, I just needed to teach it*

She later went on to elaborate how the program helped her in this regard:

> *I think it just reiterated how easy [music] is — we know about music, non-music teachers know about music, we might just not have the proper phrasing or proper terms, that sort of thing. So, the link to [the videos oulining basic elements of music] is really nice, and it's not rocket science… maybe other people thought it was hard but [I think] it's easy instructional stuff, that is easy to fit into the day, that kids are attached to, and want to do.*

She continued, providing a glimpse of hope for the perceived musical ability of her students in the future:

> *Even just the fact of letting them know that they CAN do music, that it's simple and it easy, that you can just pick up this Boomwhacker and make some music,* ***that was the best thing they learned*** (emphasis added).

Rowan shared a story about another teacher in his school who was one of the informal participants in the study. She was able to overcome a perceived lack of musical ability and use Whacky Wizards to teach her students.

> *[She] had never had to teach music before this year, because they used to split the class responsibilities and there was another teacher that would do music time… She has always said that she can't teach or do music. But the principal said – 'Well, you're going to have to'... So when the program [went online], she was*

really excited to have it … she was able to pick up the Boomwhackers and teach it no problem. I think that was a big deal for her.

Wrapped up in the idea of musical ability are opinions about who can and cannot participate in music. One of the desired outcomes for the intervention was that it would remove barriers to participation, encouraging everyone to get involved. **Willow** recalled how this barrier to participation was removed in her student's very first lesson using Whacky Wizards:

I think at first, they were like 'Ok, I've got these two things in my hands, what am I going to do?' but it was very easy for them to follow along, [especially] when you can slow it down. And I think very quickly they realized – 'Hey, I can DO this'. And all of them, even behavior kids, [English Language Learners], anything – it was something ALL of them could do.

Juniper described universal participation among her students extended to music creation using the program:

They loved making their own [patterns]in the Rhythm Tutor. That was a preferred activity for an entire month … and they all wanted to. There are things in the class that some students are willing to do and others reluctant or unwilling, but EVERYONE wanted to try this. It wasn't intimidating like 'talking in front of the class or sharing' because they just had to click on the smartboard and press play.

When asked about the differences he observed in his students participation, comparing music lessons before and after the introduction of the Whacky Wizards program, **Rowan** responded:

It was phenomenal, for one thing. Part of it was that they felt a lot more confident, just being able to grab a tube, and I think because it seemed simple to them and they felt like they had a lot of security, it was something they could watch on the [interactive whiteboard], people weren't looking at them, it was engaging, it was something novel to them, it was – I don't know – I definitely noticed a difference, where the kids just felt more comfortable. Nobody was worried about what the other kids were thinking, right?

5.3.1.4 – Barrier #4 – Belief that music instruction is somehow rarified and should remain the realm of specialists

The Whacky Wizards Program should remove some of the 'mystique' surrounding music education, by allowing users to feel like they are capable of offering meaningful and legitimate music instruction to their students.

This theme manifested itself somewhat indirectly at first: During pre-test interviews four participants said that because there was no music specialist at their school, the students were not receiving any music instruction. Implied in that statement is that music specialists are the only ones who can offer music lessons.

Olive was one of these teachers. Her school had just lost their specialist music teacher a few months before her pre-test interview, and she was discouraged about the musical prospects of her students.

> *I think when you watch the music specialists who just could sit down … it's just innate to them to be able to sit and play the piano, or if things aren't going well, to engage kids in some way. I'm not sure that in a classroom without that background you can do the same, do [music] justice.*

However, simply learning that she might would be able to participate in the intervention helped change her perspective:

> *Just the opportunity to have music again knowing that we don't have a music specialist. This was a way that [music] could go into the classroom, and it was it was doable.*

By the post-test interview she observed:

> *Some kids in my class, they would relate [to music], because they play the piano or they play the guitar, but then there's a lot of other kids in the class who have never played an instrument at all. It gave an opportunity to some of these kids that I don't think they would have gotten any other way. Depending on when and if we get a [music specialist] back, some of these kids may never get to learn … an instrument. It gives them some kind of a feel for playing their own music.*

Rowan was another interesting case of a teacher that significantly grew their self-efficacy for music. There is no music specialist at his small rural school, but he had been teaching music to his students for several years. By all indications, he is capable and invested in the musical education of his students, but he was plagued by a feeling of inadequacy because he was not a music specialist:

> *Even when I feel like I've got a good music lesson like 'oh that was great', I don't know where to go to next and I feel like that's my issue because I don't specialize in teaching music, right?*

According to **Rowan**, his chief deficiency was a lack of understanding of the curriculum, particularly musical rudiments, and terminology. In the pre-test interview when asked what outcomes he was hoping to achieve for his own professional development, he replied:

> *I want more engaging music classes but also, I want to get know the curriculum better. I want to be more effective, right? I think I'm good at getting them to enjoy music enough, but I'd rather be able to teach them properly, to do both.*

In the post test-interview, he reflected on how using the Whacky Wizards lessons had helped him overcome this barrier:

> *Before, when I looked at the curriculum, I didn't really know what it's saying, I didn't understand a lot of it, not having a background. But this is the first year that I can feel confident in saying 'Yeah, I taught the music curriculum this year'. I used to say 'Yeah, I taught [the students] music'. But I would never add the word curriculum afterwards.*

In a follow-up question, when asked if the program had helped him achieve his goals for professional development, he simply replied:

> *It exceeded all my expectations*

5.3.1.5 – Barrier #5 – Never having received formal training in music or music pedagogy

The Whacky Wizards program should improve teachers perceived self-efficacy for teaching music, regardless of pre-existing musical or pedagogical training. It will accomplish this by focussing its lessons for teachers on 1) the most basic elements of music and 2) strategies to share those concepts with their students via the apps and resources provided on the website. Critically, it will augment teacher's self-efficacy through experiences of active musicking.

Elowen provides an outstanding example of how the intervention succeeded in this regard.She was asked in her pre-test interview if she had received any training to teach music at university. This was her reply:

> *No. Nope, nothing.*

Later in the interview, when asked 'what outcomes are you hoping to achieve for your own professional development?' She immediately said:

> *Some knowledge to teach music – instruction that I've never had before because I never got it in school.*

In the post-test interview, the topic was revisited. When asked if the program if it met her expectations, she replied:

> *Oh yeah – 100%. Just having the website is so helpful. So easy to [use]. It takes 10 minutes to learn something I want to teach the next day. It took pretty much all the restraints away for not teaching music*.

Linden had a similar exemplary experience, but more specifically targeting an increase in knowledge of the fundamental elements of music. In her pre-test interview, she also expressed what her goals were for participating in the program:

> *To learn more about the elements [of music], like the melody and rhythm and things like that, so that I boost my confidence in teaching it*

Ash commented on the merit of the videos. When questioned regarding the needs/barriers he felt the intervention addressed specifically, he replied:

> *A little bit of barriers as far as musical background… you provided some training videos ... I think that overcomes that barrier, I'm glad that you did that. I watched the ones on beat and rhythm… if I didn't know anything about music, that would be essential. It was very smart of you to make those along with the rest of the program.*

A last point to include here is that to go beyond merely learning about music, to the point where one is truly internalizing musical understanding, a catalyst is required. This bonding agent is **active musicking**. Many participants related how some of their most significant lessons involved playing alongside their students, becoming co-learners in a musicking environment.

> **Hazel -** *some of the kids caught onto what the buttons were used for before I did, so they would say things like 'If you hit the Loop On button, it will just keep going and going'. So we could learn together which was really fun*

> **Magnolia -** *I love learning with them. They EAT it up when I say I need their help to learn a new concept. Because [if] I am honest with the kids when I am learning something then that gives [me] street cred – like 'you don't know this either? let's learn together.' That's fun – that layer of honest was fun.*

> **Laurel** also admitted that she would often join in the musicking with her students:
>
> *I would just enjoy it myself… I just really liked doing it too.*

5.3.1.6 – Barrier #6 – Music is not seen as a "core" subject and the predominance of literacy & numeracy

The Whacky Wizards program should assist teachers in advancing the value and importance of music in the lives of and learning of their students and themselves. It ought to help open doors for the incorporation of music into other areas of instruction.

It is probably a safe assumption that all the participants value music education for their students, as they were all willing to implement the intervention in their classrooms. During interactions with formal participants, most expressed their feelings towards not just the importance of music, but on providing a rich and balanced learning environment that served all their pupils. However, as is evidenced by statements made in Chapter 4 (4.2.1.6) and other areas of this document, it was also clear that they knew how literacy and numeracy were systematically prioritized.

Finding strategies to integrate music into other areas of learning was of chief importance to **Olive**, who explained:

> *I have a good friend who's a music [specialist] and the things that she talks about … all of the connections: the literacy, the numeracy, and the ways that it interacts with the rest of the curriculum. I just don't think people know enough about that or value it enough.*

In the pre-test interview, when asked what she would like to achieve by participating in the program, she answered:

> *Just another way to be creative within the classroom. To come up with ways to show learning … maybe it's math, maybe it's patterns, maybe it's something that [Whacky Wizards] might be a way to tie it in. They can show learning from that subject area with music… And even things like working together, having to listen and be quiet, wait their turn, and be patient. All those things come in with it, I think.*

In the post test-interview, when asked if she had achieved any of the outcomes she had hoped for, her answer was clear:

> *Yeah definitely, without ever having to teach music before, I've never looked at the music curriculum until now. As soon as you look at that curriculum, you can start to see the connections between it and literacy and numeracy … So you find lots of other connections to do cross-curricular teaching.*

When asked for her general impression, **Juniper** responded:

Awesome. Like SO awesome. I have nothing but great things to say about the way this program went. Honestly, I am so glad that we did this. The kids have loved it, I have loved it. It has made [music] time so much more meaningful and engaging.

After explaining that the music specialist in her school had just been cut due to budget cuts, **Olive's** statement says it all:

Music simply would not have happened in my classroom without the [Whacky Wizards] program.

During post-test interviews, other teachers commented on ways they could use the program for cross-curricular instruction:

Holly - *Like grade three science is hearing and sounds. [I can see] incorporating music into that and it really doing well*

Laurel - *Last year we did tons of music because I just love teaching French and everything through music … they remember it so much easier.*

Linden - *Well there are a lot of parallels to math. And they did see that. The kids could see when a pattern would repeat itself and they would say "hey, that's like what we did in Math class." It's kind of neat that they were making cross curricular connections a little bit.*

Elowen - *Cross curricular, I can see this being helpful in many different ways. For example, in grade one we have a unit on building, how things are built, why they are built certain ways. The engineering behind things. So just asking how are Boomwhackers made? Why are they made this way?*

One of the informal participants was a kindergarten teacher. While she found the apps a bit beyond the capacity of her young pupils, she found other ways to make cross-curricular connections:

I am using the Boomwhackers at calendar time and for pounding out words or sounds in words or syllables as we say a nursery rhyme and they love it.

Another informant participant related how she had used the Boomwhackers to introduce her grade 3 students to their science unit called "hearing and sound"

A big part of that curriculum talks about high vs. low pitch and how to understand that high sounds come from smaller instruments (quick vibrations) and low

sounds come from larger instruments (slow vibrations). … I used 2 tubes as a visual to [represent] a diving board. This helped me to explain how one length would have a slow bounce vs. a quick bounce. Anyways, there is some good chances for grade 3 teachers to incorporate some cross-curricular science in this program!

Nonetheless, it is still crucial that music be valued for being something more than just a medium to serve the more privileged subjects. It should be understood as an important piece of a well-rounded education. **Hazel** was able to clearly verbalize this. When explaining how the program provided an enriching and valuable experience to her students that went beyond the 'core' subjects she said:

It was the icing on the cake as far as of keeping them focused and being able to offer them something that's different than the academic learning, as far as numeracy and literacy go, but still it's opening their minds up to great things – like kinaesthetic movement – They have to think, they have to work with their partner – and those things are really important.

When asked if the program helped her achieve the outcomes for her class she was hoping for, **Hazel** continued:

I think it went beyond my expectations. Because… I have this deep love for music, and I wanted the kids to feel that, which I think they did … I didn't want them to get bored of it, and they didn't … It met things that I needed it to meet as a classroom teacher, but it also kept them very captivated. I did get everything I wanted out of it and more, because I can see that the kids respect [music].

5.3.1.7 – Barrier #7 – Music education is considered 'disposable'

Those who use the Whacky Wizards program should recognize its capacity to challenge the all-to-common dismissal of music education due to budgetary or time restraints.

When it comes to barriers that affect teachers at a level of their individual classrooms, where 'the rubber hits the road', it would have to be the 'disposability' of music education.

Olive ruminated about the general zeitgeist in the educational community towards prioritizing music instruction:

> *I don't know. Just the value. That seems to be one thing that people — it seems to get bumped down there — people don't see the value beyond just 'music', or a way to give teachers a prep, which it shouldn't be.*

Drawing a direct line from the previous statement, **Holly's** job is to teach music to classes when their regular teacher had a preparation period. While this gave her the advantage of never having to concern herself with 'fitting' music into the schedule, as she was certainly aware of the problem:

> *I know other teachers teach their own music, so they find it hard to find time during the day. They're like 'Well it gets pushed back', right? Sometimes it just gets pushed.*

It is clear that this barrier remains a difficult one to fully address. While budgetary pressures came up in conversations with participants, for most teachers, financial decisions are beyond their control. What they do have the power to manage is instruction time, which, given the pressures of a crowded timetable, remains a challenge for many. In the section of the weekly feedback questionnaire titled 'What could be improved?", these were a few of the answers:

> *I need to take small blocks out of the week to get going more.*
>
> *I need to give them more time to practice.*
>
> *Try to schedule more time.*

Nonetheless, there were indications that the intervention may work to challenge the 'disposable' attitude in an innovative way – through the students. They are the ones motivated by more time with the program (and thereby music), encouraging their teachers to make it a priority

Willow conveys how this played out in her classroom:

> *Honestly, there were so many times that the kids would say to me 'You said we could do Boomwhackers today!' and I'd be like 'Oh yeah'. They wanted to; they were excited for it.*

Rowan recognized what using the program meant to his students, and made sure to include it as much as he could:

> *During COVID especially, I try to schedule something every day that the kids really look forward to, so that was Boomwhackers. On the daily schedule I would just write 'BOOM' in big letters on music days and the kids would come into class and exclaim "Yeah! We get BOOM today!"*

Some informal participants made similar comments on the weekly feedback forms:

> *Music has become a means to motivate students with their daily responsibilities so we can work towards going [to the music room] more than once a week.*

> *The students are really starting to understand the differences between the notes and are asking for more time with the Boomwhackers.*

5.3.1.8 – Barrier #8 – Music is viewed predominantly as a product more than as a process

Students and teachers should recognize and appreciate that the Whacky Wizards program is not meant to direct users to a performance event, but to participate in and experience musicking. It should clearly be understood to be a tool that emphasizes music as a process as much as, if not more than, music as a product.

At some point during the interviews, at least half of the interviewees mentioned the strain that focussing on performance can place on a music instructor, and on the students. **Ash** explained the resistance he feels for more customary music programs that focus on performing:

If someone [i.e. an administrator] said do something with Boomwhackers I'd say 'great we can try to work something out'. If they said something with recorders, 'I would say you're probably not going to get what you want'.

With regards to students in these situations, this is what he had to say:

In a more formal or more traditional musical instruction setting, [some kids] just tune out or kind of give up.

Many participants expressed appreciation that the goal to perform was simply not a part of this intervention. **Juniper's** remarks reflect this:

I think for so much of music education, we're focussed on the end product, like we're getting ready for the Christmas concert, or we are getting ready for the spring concert, and we spend so much time working towards perfection. But then that kind of limits the growth. [While using Whacky Wizards] we were not even worried about an end product, we were just moving through stuff and having fun, and just talking about the different parts of music without actually preparing for this final showcase… It was WAY more engaging.

Later in the conversation, she shared this inspiring thought:

I feel like my whole philosophy towards music education has changed a little bit, which is good. Like yeah … working more on the process and less on the product.

Elowen reflected on how much it meant to her that the program was primarily process driven:

I am a huge process person as well, I don't like end goals for a lot of things, especially for stuff like this … For [the students] not to have any end goal was not a problem for them either. We deal with high anxiety in our Low-German schools, so that even takes away a lot of stress for kids too. It was just pure fun. We worked it in after writing period, which is often strenuous, and it was an easy thing. It was unreal to see them when I would say "Ok – we're doing music now" and they would all be like "YES" and couldn't wait to get their hands on the Boomwhackers.

Another component of working to reduce this barrier is to encourage participation in musicking among all involved. In the post test interview, **Willow** reported that her class' participation in music lessons was much greater than it had been before the intervention. When asked why, she pondered:

> *Maybe because we can't [perform] this year, that makes a difference too, it's all within our space. So, I was never like 'we are never going to show this to another class' but there was an understanding that it is just us doing this.*

At this point in the conversation, Willow had not fully realized that the program was intentionally process driven. When this was pointed out to her, she was asked if she felt that it made a difference to how she perceived it. She replied:

> *Yeah definitely. And when you say that, even myself — I can see that. Because when I have to teach a song for a Christmas concert, there is way more stress involved in that, for me and for [the students], instead of 'Hey, let's just play some songs today'*

Even though she is not a music specialist, **Holly** was tasked with teaching music to 5 different classes. It was only her second year teaching after receiving her degree, and her first time teaching music at all. She had experienced some struggles with her music lessons before her pre-test interview. When she was asked what she hoped her students would gain from her participation in the study, her response spoke volumes about what music instruction had meant to them up to that point:

> *Just so that they are familiar with different kinds of music and different experiences doing it. Different things that maybe they didn't know – [that] they LIKE music. Maybe they learn that 'Oh. They do kind of like it'. It's always not just a boring thing that's just there that they listen to. It's like 'Oh no. I can actually participate in this'.*

In the post test interview, **Holly** made several remarks about how nice it was to have something to enable the students to participate and *play* music.

Wrapped up in the goals of the Whacky Wizards program to shift the focus of music instruction away from performance and more towards process is the parallel objective of striving less for perfection and more for participation. This concept is sometimes referred to as 'permission to fail' (Abramson, 2021), which was an aspect of

this research that was not fully explored. Nonetheless, the testimonies of numerous participants showed how the students thrived in this regard:

> **Rowan** –. *Kids are worried about doing [music] wrong … that people are going to hear them and judge them and stuff. [With Whacky Wizards] I felt like they felt like there was no chance that they could fail.*
>
> **Laurel** - *One of the outcomes I wanted from this program was … just teaching them ways to engage in work together and gain confidence in creating and participating in things that are learning opportunities. So even if you are not fantastic at first, just building that resilience. Teaching them that it's OK to fail and to make mistakes at first, but you can learn and grow, and achieve something of beauty, of worth. I think that goal was accomplished.*
>
> **Willow** - *If they miss their beat, it's not the end of the world … Sometimes we would laugh, we'd be like we don't even know where we are at at all, and I think that they just enjoyed that they could make those mistakes.*
>
> **Hazel** - *And for the kids to say 'Oh dang, I made a mistake, but that's OK. I'll get it next time' and for them to be able to voice that. It made it really easy for the timid kids in the class to keep trying, because they knew that there were mistakes happening always.*
>
> **Magnolia** - *they need to touch [the instruments], they need to hit themselves on the head, they need to yell, they need to shout out the answers, they need to dance in a circle around their desk and totally miss their [colored] ball as it drops on the screen, they need to do that. For my students, their need was fulfilled in that they had a manipulative in their hand that immediately allowed them to participate, whether it was successfully or not didn't matter to me. They were still participating.*

5.3.2 – Needs of Music Instructors

From information collected in both surveys and interviews, ample data was collected to help us address the second of our research questions: *In what ways does [the Whacky Wizards Program] meet the needs of teachers?* Formal participants were probed concerning their individual needs when it came to music instruction and asked to postulate on the needs of music teachers more generally. In addition to examining multiple facets of their tangible and intangible needs, special consideration is given to the

needs associated with technology in the classroom/music instruction technology, and the need of new approaches to music education.

5.3.2.1 – Need #1 – Funding

Teachers using the Whacky Wizards program (and possibly their administrators), can realize that offering musical instruction and experiences to their students can be managed with limited financial resources.

Oftentimes, the barrier of a lack of funding has to do with what teachers perceive a music program has to be, which traditionally, has been resource intensive – a dedicated teacher with a dedicated room full of expensive instruments. This was especially true for **Olive**. The sting of losing the music specialist in her school due to budget cuts was still raw, and she had not really conceived of any other way to do music. The program introduced her to Boomwhackers and the unconventional ways to teach music with them, which was a shock to her paradigm. When asked about potential needs the program could address, she said:

> *When I went to school, [music] was always just a band thing. So just the fact that there's an instrument of some kind that is affordable, and that [students] can … play without having to go out for private lessons, or spend a lot of money on instruments, to get some information about rhythm, about notes, and about … just music.*

When asked if they could see the Whacky Wizards program as something schools would potentially pay for, participants unanimously responded yes. Many were aware that their schools did have a budget for music, it was just limited, so expenditures needed administrator backing. Here are some of their responses to that effect:

Rowan - *The staff already talked about it, they said if it costs something they will convince the principal next year. Principals have a budget they have to work with, but the staff all agreed that we would want to invest in it right away.*

Ash - *I was at a teacher's conference or something, and I found out that I had to teach my own music next year, and you could hand me the Boomwhackers and the website and say 'You can meet your curricular outcomes with this, with minimal professional development time', I would be sold on it. I would be calling and emailing my principal saying, 'I want to get this out of the budget please!'*

Elowen - *I would [ask] my principal for a subscription service for the school. Just how easy it is, how tangible it is to have in the school.*

5.3.2.2 – Need #2 – Instruments

During the field test, Teachers should be able to implement the Whacky Wizards program without any concerns over having adequate instruments. They should also become aware of the many benefits that Boomwhackers provide for music instruction.

A lot of effort was made to ensure that participants would be supplied with sufficient Boomwhackers to implement the intervention. Without exception, teachers expressed their gratitude for these instruments, often on the part of students as well. Many considered them something of a boon to their classrooms. When asked if the program addressed any of his barriers or needs, **Ash** proclaimed:

Yeah, right off the bat – The Boomwhackers. [They] are very economical instruments. They are a great solution. Easy to buy and replace. Easy to store too – I just have them in buckets in the back of my classroom. They meet the need.

That the instruments did not need to be shared, and could stay right in the teacher's classroom, was also very significant:

Holly - *Actually having the Boomwhackers given to us and having enough sets for everybody was great… when everyone has instruments, nobody has to miss out, wait turns, share. Everybody got to play and had the opportunity to use them and stay engaged the whole time.*

> **Willow** - *Having the Boomwhackers right in the classroom was awesome. We didn't have to go find them, we didn't have to share them*
>
> **Laurel** - *Just having a classroom set of Boomwhackers was great, because they are just really easy. There's no sign out sheet, there is no coordinating with other teachers, that part made it very accessible and very flexible. I could just say 'Oh, we need a little activity, a little movement, or just something to re-focus, or a change of pace, and we could would go'.*

Even in situations where the Boomwhackers were shared between classes, they were an excellent resource, particularly with COVID-19 restrictions. Once **Linden** started using the program, other teachers in her school wanted to try it too. She tells of her strategy to accommodate everyone interested:

> *Everybody had their days [of the week] to use them, and then would clean them at the end of the day, so we were able to include 5 classrooms in the program. That was definitely a huge advantage.*

This was the first experience the teachers in **Linden's** school had with Boomwhackers. But the following anecdote illustrates another reoccurring theme, which was that teachers were not only thankful for the Boomwhackers, but thankful for *enough* of them to run the program properly.

> *One of the other teachers tried doing something before Christmas with Boomwhackers and said it was a huge challenge trying to find something they could do with the few instruments we had. It was really restrictive what she could do with the kids with a fairly large class and relatively few Boomwhackers*

Many participants' students had never used Boomwhackers before, but this did not seem to cause an issue. The following positive feedback was received from the online survey during the first week of the field test:

> *The students were very excited to get started and use the Boomwhackers*
>
> *The students loved the new instruments!*
>
> *The students were thrilled with the Boomwhackers*

The children were very engaged and interested in the Boomwhackers

5.3.2.3 – Need #3 – Instructional materials

Teachers should feel that the Whacky Wizards program provides them with all the instructional material and resources they need to teach music using Boomwhackers. It should also be easy to navigate and use.

All the participants understood that the heart of the intervention was providing them with instructional materials, and after instruments, was the topmost area for which they conveyed gratitude and admiration. In one form or another, each of them expressed how program had met their needs in this regard.

Holly provides a great example of how the program met this need for her. As previously mentioned, she had no music teaching experience when her principal informed her that she would be covering prep periods for other teachers with music. In her pre-test interview she explained:

> *When I was told I had to teach music I was like 'OK', like (pretending to hyperventilate) … yeah. I didn't even really know where to start. I needed kind of a program.*

During her post-test interview, she explained how Whacky Wizards addressed this need directly:

> *I would have been ambling trying to find material to teach them, this gave me a lot of direction. For the most part [the students] very much enjoyed it and I very much enjoyed teaching it because I was never like 'oh no, what am I going to do next for music' kind of thing, it was like 'I know I have this [program], I know what I am going to do'.*

She made a few suggestions about small changes to the app interfaces for the future but added:

Other than that, the programs were SO easy to use, I loved them.

Holly was a formal participant in a school with several informal participants. Speaking on their behalf, she relayed that:

> *The other teachers really enjoy using it, it's really easy to pick up, easy to be able to use either in their dedicated music class, or as a quick thing between other subjects.*

Ash's main objective for using the program was to have a meaningful musical option for movement breaks with his students. When asked if the program met his need in this regard he said:

> *Absolutely. I couldn't have come up with a program – [let alone] a music program – on my own that would have been meaningful or helpful to the students, especially one that is multi-functional, where they can be learning music while having some movement breaks, some daily physical activity.*

Rowan is a great example of how this program truly met a need, something for which there was an observed lack. He had wanted to introduce Boomwhackers to his music lessons long before this research project began but could not find instructional materials that he found suitable. Nearly a year ahead of the field test, he was introduced to a prototype of the Whacky Wizards program at a workshop given at the South-West Alberta Teacher's Convention (SWATCA). He explains:

> *I hadn't found anything really that looked exciting to me until I went to that SWATCA thing in your class, and I was just like 'Ah! This is perfect! This is, when I go online looking for something, what I'm hoping to find. I can't seem to find it anywhere.'*

This search extended to other teachers in his school as well. He recalled:

> *The staff tried looking online for some kind of Boomwhacker program they could work with before the field test started, and they really couldn't find anything they*

considered worthwhile. There was nothing. So, to have something that was this inclusive and easy to work with — there was nothing even close.

A few participants compared the program with other instructional music resources they had used. These teachers commented on the relatively high cost of these materials, mainly because they were in the form of books and worksheets. In addition to being expensive, **Magnolia** pointed out another major issue with that medium:

A physical copy can never get better, whereas a website can be continually updated, it can be accessible in any room without having to cart around the books… And even then, you don't use all of it, and paper doesn't improve. Whereas the good thing about a website is that it can improve, there are new things on it.

Willow illustrates how the program, and the medium on which it is presented, can influence both teachers' and students' self-efficacy.

I really liked how I could just go on the Whacky Wizards [website] and just play around a little bit, and it gave me the confidence to say "Yep, I can do this." Because it is all set up there. [The students] are watching it on the screen, they are seeing what it looks like, and they can say 'Hey, let's try these kinds of beats' or 'let's try this song'.

She went on to explain that part of the reason she felt this confidence was because the instructional materials can be modified to suit student learning and provide everyone with mastery experiences.

It was just so easy to adjust for how [the students] were that day … I very much tailored it to 'Ok, this isn't working well today let's move onto something else' — and it was so easy to do that.

Laurel also felt that the straightforward design and implementation of the program bolstered her. She shared her impressions of how to use Whacky Wizards in a classroom:

You facilitate, [and] it kind of runs itself. You set up the parameters enough for the proper use of the Boomwhackers, how to respect the instrument and treat it properly… and once that is set, the program is really easy to run. You can

basically just press the buttons and make sure [the students] hit their [Boomwhackers] in time.

5.3.2.4 – Need #4 – Space

Teachers should feel that the Whacky Wizards program can be fully realized within the confines of their own classroom. It should also be apparent that the program could be used in other spaces, such as dedicated music rooms.

During pre-test interviews, most participants (7) mentioned the space required for music instruction as one of their recognized needs. More than one participant lamented the fact that dedicated music rooms were no longer the norm in schools. Here is what **Willow** had to say:

We don't have space at all for that kind of music room stuff that I had as a child – just storage for the instruments themselves and anything that goes with [it].

There are two things to bear in mind when considering the needs of teachers concerning space – room to play music and a place to store instruments. Teachers who mentioned anything regarding the first point agreed that the program worked well with the space that they had.

Holly -S*ometimes we had to move around according to how desks were positioned, but [the program] mostly worked well. The classes that have desks in rows were super easy.*

Linden *- Space was good. [Boomwhackers] are a good thing to use in a [standard] classroom. The kids knew that when it was Boomwhacker time they had to sanitize their hands and to clear their desktops.*

Olive gained access to a dedicated 'music room' about half-way through the field test, which was carpeted, with no desks or chairs. She expressed that running the program

in the music room "improved the quality of what they were doing" but admitted that a regular classroom is fine to run the program.

While not every participant commented on space being a specific need, using the program in a regular classroom was not reported as being prohibitive in the post-test interviews, nor was there any comments to this effect by any of the respondents of the online weekly feedback.

The other space concern had to do with instrument storage. This was true for **Magnolia**, who described her day as "monkey running from class to class" to teach music when other teachers had prep time, pushing all her teaching resources and instruments on a cart. She acknowledged that Boomwhackers were a good option for her because they are lightweight and easy to move.

Storage was a particular concern for **Laurel**. Before the pre-test interview, she brought up the issue in correspondence with the researcher, who mentioned that he recommended 5-gallon buckets to hold the Boomwhackers. Nevertheless, she still fretted about space:

> *And then just the physical space for some of the bigger instruments… And then the safety around having lots of loose objects in your class too right? The storage - that would bother me. To have even the Boomwhackers, I'm like 'how do I store these in my class?' Then you said the buckets, and I was like 'OK that will work' But that does feel stressful, like 'more crap in there'*

Because of this, inquiries were made concerning the matter in the post-test interview. When asked if the Boomwhackers ever made her space feel cluttered, she replied:

> *No. They had a home in the room and that was great … I did like the two-bucket system, [but] I personally used baskets, and the kids learned really quickly how to take them out, put them away, and wipe them off when they were done.*

5.3.2.5 – Need #5 – Time

The Whacky Wizards program will be efficient and flexible enough to be used in even in small segments of time. Teachers should feel that they can accommodate music instruction in their timetables, either planned or spontaneously, when using the program.

As discussed in the sections of this thesis about music being 'disposable', time can be a major barrier to music education. Thankfully, more than two-thirds of the formal participants made some reference how Whacky Wizards met their needs when it came to time and scheduling considerations in post-test interviews. Two themes emerged in these responses – time required for teacher learning and lesson preparation, and the time required to use the program in the classroom.

The Whacky Wizards training lessons were intended to be digestible in small time portions. This was a significant concern for **Juniper**, who, as a first-year teacher, was overwhelmed with lesson preparation. During the pre-test interview, when asked what she hoped to achieve from being a participant in the program, she replied

> *If I can give my kids a better music experience without weeks and weeks and weeks of studying and work on my part that is an unbelievable win. So, I am very, very grateful because this is going to be super helpful, I think.*

In her post-test interview, when asked what needs the program addressed, **Juniper's** response was particularly poignant:

> *The biggest one is time. I feel like everything you sent out was very time efficient. I felt like I could actually do it, rather than ignore it, saying 'we just don't have time for this'. I feel like I was able to do a better job of it, because it was taking less of my planning and marking time. It was just so clear and easy to work within, so that was amazing.*

Hazel was particularly enthusiastic about how little time was required to prepare lessons.When asked if she could see Whacky Wizards being offered to a wider audience, she replied:

> *Oh, absolutely! It is SO easy to learn … That's what we need. As teachers we need things that have little prep, and huge payoff, and this is one of them*.

From its earliest inception the intention for the Whacky Wizards program was that it could, and even should, be used for relatively short periods of time. On this front, **Ash's** feedback was effusive:

> *That's one of the ways [the program] really shines! I don't view time as a barrier, because its best practice to give your kids those movement breaks. So you are doing two things at once, teaching them something and giving them the opportunity to get up and move their bodies.*

Several teachers remarked that after following the instruction given in videos about the most efficient ways to organize and distribute Boomwhackers, that their class could start a music lesson within minutes. This was **Laurel's** assessment of this aspect of the program:

> *I found it very useful. It was organized, and very easy to just pick and choose for your class, and if we only had a few minutes, what we could accomplish and do. Yeah – I thought that it was really successful.*

Nonetheless, more than one participant reported that despite all the efforts made to make it easy to fit into the schedule, they still had difficulty. In particular, **Olive** had a hard time shifting her mindset from when her school had a music teacher, and therefore dedicated time for music.

> *That's made it harder to provide [music] to everyone, because teachers are responsible to pull [it] out of what time they already had and for some, that became more difficult – like 'I could keep going with my math lesson, or I could take them down to the music room.'*

Thankfully other teachers were able to get over this hump. **Laurel** describes how this happened for her, starting with a recollection of how she felt initially about scheduling music lessons in her day:

> *In a way, I just wasn't sure how it was going to work … But I did think going forward that I [would have to] put it into the schedule. However, in the end it did work really well for us to just do it 'as needed' … It's nice to be able to just pull it out - once you've explained the rules and expectations. So, if we did have 15 minutes before lunch, or we got through an activity quickly, it was like 'Oh! We can do our Boomwhackers now!' That got [the students] really excited.*

5.3.2.6 – Need #6 – Mentorship

The Whacky Wizards program should instill a sense of connection between the participants and the researcher such that they feel that he is someone they can rely on for guidance, coaching, and instruction.

A theme that surfaced during many interviews was the power of not just having instruments and instructional materials, but a person on whom one could rely for support and advice. Having a human connection to rely on was a key concern for many.

Although the researcher did not meet the participants face to face due to COVID concerns, there was definitely a sense that a mentoring relationship had been built up between them, even through digital mediums. This is evidenced in a short episode related by **Willow**:

> *After I watched the first three "How Music Works" videos, I was like 'OK – I got this Leo!'*

Linden had a colleague in her school who had a lot more experience with music education than her, on whom she previously relied on for direction. In the following

reflection, one can see how that relationship may have shifted or expanded to include the researcher. When asked about her general impressions of the program, she said:

> *It was definitely a valuable tool because without it I wouldn't have even attempted to teach Boomwhackers. So having guidance and having guidance when I needed it – it's not like I had to run down the hall and ask [the other] teacher who used to teach Boomwhackers – you could just click on a Leo video and figure out what the flow and the outcomes of the next lesson could be. I could go into the Rhythm Tutor or into the Whacky Looper and look at [the menus] and see what I wanted to do next.*

Rowan's response to a similar question echoes the sentiment:

> *I mean it's nice to have some resource or someone you can reach out to that knows what they're doing, right?*

Magnolia repeatedly expressed how much working with people, and not just websites or books, was crucial to her. In the post-test interview, when asked what she gained from being a participant in the program, she replied:

> *I would not have tried Boomwhackers if somebody had just given me the name of a website and said … "go here, it will help". I don't think that – if I didn't have a human contact – I don't think that I would have jumped the barrier on [using Boomwhackers] one on my own. So the idea that here is a gateway or a door into a better understanding of Boomwhackers, and here is this person — they know Boomwhackers — go and pair up with this person and you'll understand it better yourself. That of course [made] me feel more comfortable.*

Another way the mentor/mentee came through in the interviews was on the issue of trust, particularly as it related to expertise. This was particularly apparent when asked about how the program was able to meet curricular expectations. **Elowen** places confidence in the mentor like so:

> *I know that I am trusting you, as a person with a music background and knowledge, that you know what you're talking about when it comes to curricular outcomes, so there was never a question in my mind of how I'm going to link it.*

Ash expressed his trust somewhat differently than **Elowen**, but being able to rely on the researcher's expertise is still in his message:

I don't have to do the work – I don't have to dig through that curriculum and find those outcomes that match what I am doing. I can just pick it up and use it. I don't have to worry about whether it connects to the curriculum or not, because you're already letting me know that it does.

5.3.2.7 – Need #7 – Training and professional development

Participants who follow The Whacky Wizards program should be able to learn at their own pace, with short, adaptable lessons. They should feel that they have truly experienced a form of professional development, gaining knowledge not just about the subject of music, but skills to share this knowledge with their students.

In the post-test interviews, seven teachers specifically remarked that participating in the intervention succeeded in providing them professional development, citing the website lessons as a major contributing factor. A statement by **Hazel** is illustrative:

Because nowadays, having [training], you know where it has to be an extra part of your time, is too hard. So to be able to learn – like if you want to [go to the website] – at 8:00 at night to learn a Boomwhacker song to teach the next day, you can.

As has been touched on previously, training in the *basic elements* of music and Boomwhacker pedagogy via the videos and lessons improved the teacher's self-efficacy towards music instruction, providing them with the confidence and competence they required. Speaking about the videos in particular, **Rowan** stated:

That was exactly what I needed to feel more comfortable going into teaching music… I would watch [the videos], and then I would watch them again the day that I was going to be teaching about rhythm, or melody, or whatever it was we were talking about, and so I just felt like I could answer questions for the kids, and actually teach it.

Some participants recognized the value in simply gaining an understanding of the foundational elements of music. When asked what she had gotten from her participation, **Linden** explained

The background was especially good for me – everything you taught us about rhythm, pitch, melody and that sort of stuff. [The lessons] were nice and concise, with concrete examples… it will be a good resource for some of that basic, foundational knowledge that I need to continue. I felt like I knew a lot more about pitch, and melody, and rhythm, when I had just watched your [videos] and then could teach it to the kids.

These remarks were markedly pertinent, because she expressly stated that the main goal participating in the project was to gain competence with fundamental concepts in music.

5.3.2.8 – Need #8 – Integration of music instruction with classroom technology

The Whacky Wizards program should provide experiences for students and teachers which are intuitive, captivating, and enlightening. It should capitalize on the digital platform on which it has been created, providing students opportunities to stay challenged and engaged while also being fun and easy to use.

All formal participants reported using technology extensively in their classrooms, particularly their interactive whiteboards, so much so that time when students were working outside the presence of a screen was the exception, not the norm. Over two-thirds (7) related that their students also had time during the week with iPads, Chromebooks, or other computers.

While everyone was comfortable with employing their classroom's technology, in post-test interviews, it was apparent that using these devices for music instruction was a new experience for some teachers:

Hazel - *I use the smartboard daily – every chance I can, but I'd never tried anything like [Whacky Wizards] before*

Linden - *Yeah, it's not something I would have thought to teach using a smartboard before this. Our previous music teacher used to use these big charts,*

and lead along to the chart, tapping rhythms or showing notes, demonstrating on these flip charts, but it was nice to not have to do that.

Regardless of whether they had ever used technology to teach music before, in both post-test interviews and the via online weekly feedback forms, the vast majority of participants reported that the Whacky Wizards program worked well with the digital tools available to them, claiming only minor issues (such as occasional lagging with slow internet or troubles logging into the website).

Ash - *I'd say it was a really good implementation of an application for an interactive display. The size of the controls and the touch controls were really good for a Smartboard.*

Laurel - *I use the smartboard regularly. It was very user friendly, very easy to navigate and very easy to manipulate. I'm not super tech savvy, but I didn't have any problems navigating through the site, or through the lessons.*

Rowan - *All of the software was really easy to work with. The two other teachers at the school that were using the program are not as tech savvy, (He talks about having to help one log into their email) and neither of them had any issues using the program, no problem running it. Really user friendly, intuitive*.

Others commented on how much they appreciated the technological features of the program:

Elowen - *Just being able to interact in so many ways with the material. For example, if I wanted the kids to see where the tempo button was, I could use the digital pen and circle it for them.*

Willow - *Just having all of the options in front of me, of being able to change the beats per minute, or the accompaniment patterns. Instead of it being a barrier where I would have been like "I don't know how those things work" I found myself saying, 'Oh, I tried it this way, let's see what we can [manipulate] to try something else'*

Holly - *The programs were so easy to use, I loved them*

Juniper - *It was very naturally rewarding – very instantly gratifying, right? Because [the students] could see it and then do it*

Perhaps a key component to the way the program was received was not just that it was digital, but that it was game-like. The Song Wizard in particular has an interface specifically meant to emulate hugely popular video games like Guitar Hero and Rock Band. An informal participant who had previously used non-interactive digital tool to teach Boomwhackers (Musication) reinforces this with her observations:

> *The students found YMCA easy to follow along with. I was surprised by this as I am used to using the Musication Youtube channel's method of Boomwhacker play-alongs and think those are quite simple to follow. When I asked the students which method of play-along they found easier to follow, the majority choose your method with the dropping and highlighted color balls.*

The previous comment is important, as one of the main aims of the Whacky Wizards program is to incorporate principles of game-based learning, those key components of video games that keep children engrossed when playing them. **Rowan** inadvertently describes Gee's (2003) "regime of Competence" Principle here:

> *That whole idea of when you're playing a video game you want to find the right amount of challenging that they want to keep trying but easy enough that they don't get frustrated and quit, so they can't get to the next level.*

The reason there are so many manipulatable elements of the Whacky Wizards apps is to facilitate finding the 'regime of competence' – the 'sweet spot' of engagement. Many participants had success in this regard:

> **Laurel** - *I found that I could easily correct the problems that appeared just by manipulating the program or choosing songs that were appropriate … [The students] were engaged, they really enjoyed the challenge, and that pride of creating and accomplishing.*

> **Elowen** - *If they were kind of getting bored there were easy ways to just manipulate [the program] slightly, and that would let us change what we were doing with it. I would make the simple stuff engaging. I would try going super slow, and then super fast, and see how fast we could keep up and stuff.*

Ash also provided some evidence on the flip-side, showing that when trying to use the program outside of the 'sweet spot', its effectiveness is negated.

> *Like a lot of things, when it gets too hard they lose interest. When we got to some of the more technical, or challenging rhythms and songs, stuff that maybe had more off-beats or things like that, as soon as they found it too difficult, they disengaged.*

5.4 – Areas for improvement

Thus far, the feedback from participants which has been presented is overwhelmingly affirmative, and in truth the lion's share of responses to the intervention have been positive. Nevertheless, it befits us to share some of the negative reports that were given, particularly from the "What could be improved?" section of the weekly online feedback forms.

5.4.1 – Technical issues with the program

There were very few reports of the Whacky Wizards program not running properly. The most common complaint was that the animation and sound would sometimes be out of synch. It seemed that the longer the program was used, the more likely it was to get out of synch. Luckily, only two participants reported incidents where they could not get the program to run at all.

> *Couldn't get any of the songs to work so we didn't end up doing any.* ☹

One of them admitted that it was due to using 'ancient' school computers:

> *When I had been planning, I had always tested it out on my laptop and everything worked fine, so I was flustered when it didn't work in front of the class and so I didn't have time to fidget with it when the kids were getting antsy. When we are back next week I will see if I can hook the SmartBoard up to my laptop instead or cast my iPad screen to the board instead.*

5.4.2 – Distribution of Boomwhackers

The most common complaint, and it was brought up less than half-a-dozen times, was that the methods for distributing Boomwhackers among the students when using the Song Wizard and the Whacky Looper were not obvious. Some comments include:

> *I'm trying to figure out which combinations of Boomwhackers to give the kids for the whacky looper to make the most sense. If there was a "guide" quick reference for which are meant to be played together (like which make the particular rhythms from the rhythm tutor) that would make it easier for me to plan to use.*

> *It took a while for me to find what worked best when distributing Boomwhackers for the different songs and regrouping students according to the number of notes played in each song.*

In relation to this, one teacher responded that certain children felt that their notes were 'less important'. A difficulty for her was:

> *The expectations on which boom whacker each child gets. Depending on the song how often they play and how important they think their notes are.*

5.4.3 – Volume control

There were 4 – 5 reports of wanting to be able to make the program louder, so that it was easier for students to hear the underlying melody or accompaniment. Even at maximum volume the program was not able to be heard.

> *We had random Boomwhackers given out, a high and a low, and perhaps the cacophony of the mixed sounds along with the Rhythm Tutor and different sounds being played all at once was too loud. The students said, "we are terrible at it" - I think they were expecting better sound as a group.*

5.4.4 – Navigating the website

A few participants mentioned that they had a hard time finding what they were looking for on the website, whether it was downloadable resources or topics from specific

lessons. This was especially true for those who were looking for a particular segment of a video.

5.4.5 – Conventional Western music notation

Only a couple of participants critiqued the program for not having stronger ties to music notation. Both felt that opportunities to make connections with written music could be stronger. Said one:

> *Currently, the Song Wizard drops the notes down vertically. I think it would be more beneficial if the notes moved horizontally from right to left, and the balls with the note names on them were stacked vertically on the left-hand side of the screen. That would mimic reading sheet music more accurately and set them up for that musical skill and curricular outcome.*

5.4.6 – Different kinds of videos

Some participants asked for different kinds of videos to be included on the website. Several asked for 'How Music Works' videos directed specifically for younger students. Others asked for videos showing the program being used in a classroom, or for another kind of 'example performance' of the songs. A video was also requested to detail or demonstrate "how to *invent* rhythms using the Whacky Looper".

5.4.7 – Student engagement

There was only one comment mentioning anything negative about student engagement. It was so out of the ordinary compared to the other feedback concerning student engagement that it may be worth pursuing to see why this is the case.

> *Still have some students who are disengaged and will just put down their boom whackers in the middle of the lesson and don't participate.*

5.4.8 – Achievement tracking, levelling up

One aspect of the program which was not fully developed was an achievement tracker that could help students ‘Level up’ on a song or rhythm. Only one prototype page was available for teachers to try:

> *We ended up using the "Achievements" feature, and played the first two achievements. They liked the idea of this "unlock" the next level feature. Today I'm having troubles finding the "Achievements" feature when I'm logged in...*

Chapter 6 – Discussion & Evaluation

Before delving too deeply into the discussion and evaluation of the findings of this research, it behoves us to revisit the path taken to address the problem it identified, namely the difficulties elementary teachers face when delivering instruction in music.

Following the design-based research structure of the study, a conjecture was formulated that **A program employing digital technologies can be designed, implemented, and evaluated to assist elementary teachers to introduce, increase, and/or improve music instruction for their students, particularly if they are not music specialists.** To substantiate this claim, such a program was developed and implemented in the form of an intervention in the classrooms of over two dozen elementary school teachers in Sothern Alberta.

To assess how the program assisted teachers in the delivery of music instruction, two related research questions were presented:

1. What are the **barriers** that exist for these teachers towards music instruction? In what ways will this program address them?
2. What are the **needs** of these teachers with regards to musical instruction? In what ways will this program meet them?

In the previous chapters, these questions were thoroughly examined by breaking them each into eight sub-themes. In chapter 2 (Literature Review), responses were formed for the first, '*What are… '* portion of both research questions by looking at the published literature addressing each of the sub-themes. It then offered a summary in each

section to present, in general terms, how the program would need to address the second, *'In what ways…* ' portion of the question.

Chapter 3 (Methodology and Methods) outlined the model that would be used to formulate the project, presenting not only the development and features of the intervention (apps, website, lessons, etc.) but the means by which data could be collected to assess and evaluate it.

Chapter 4 (Intervention Philosophy and Design Rationales) explained why the intervention was created the way it was, both on a broader philosophical level, and on the level of specific design choices. It outlined in some detail how intervention would address the issues encompassed by barriers and needs and presented desired outcomes for the intervention in each of these topics' subsections.

Chapter 5 (Findings and Commentary) provided illustrative and descriptive data collected from participants who implemented the intervention during a 10-week field test. The main portion of the chapter reiterated desired outcomes for each of the previously established sub-themes and provided participant quotes and observations collected from interviews and on-line forms to support them.

This journey has now arrived at the current chapter, where the central goal is to evaluate the data collected as it pertains to our goals. For this purpose, it may be helpful to reiterate the research questions in a modified form:

1. What are the **barriers** that exist for these teachers towards music instruction?

   Did this program address them?
2. What are the **needs** of these teachers with regards to musical instruction?

   Did this program meet them?

In order to answer these, the amassed data will be reviewed, and discuss whether the desired outcomes had been achieved in each thematic sub-section, in some cases comparing results with studies mentioned in the literature review. Whether the outcomes were positive or negative, postulation will be made concerning why this was the case, positing what the contributing factors may have been.

6.1 – Discussion of general findings

This section will briefly examine the significance of findings that were predominantly generated from the weekly online feedback forms.

6.1.1 – Demographics

There may be some significance to the fact that the majority of participants were in rural schools, where small school populations traditionally cannot justify a full or even part-time music specialist. Participants from these schools tended to be keener on the program because their students had more limited exposure to music than those in larger centres. It would be interesting to see what the response was like in an even larger urban population like Calgary or Edmonton, to ascertain if receptiveness to the program has more to do with population size or the prevalence of music specialists.

The original planned target age range of the program was from grade 2 to 4. While it is encouraging to see that students in this demographic were well represented and received the program well, it is equally interesting to know how teachers for other age groups above and below this range were able to use and learn from the program.

6.1.2 – Online feedback form findings

If all 24 teachers whohad submitted a form at least once had submittedfor all 10 weeks, there would have been a total of 240 submissions. Compared to that ideal total, the actual number of submitted forms (84) represents a 35% response rate. When one considers the response rate of surveys in general, and of how busy teachers are in particular, it could be argued that this percentage is quite good.

There was a drop in responses overall after the break week. This may have been due to teachers refocusing on other learning priorities, or it may have been due to the fact that the researcher was not sending as many messages reminding teachers to complete the form. Regardless, it is unfortunate that submission rates were not consistent throughout the entire field test.

6.1.2.1 - Amount of instructional minutes/time program was used

As mentioned in the introduction of this document, in a situation where recommended guidelines were followed to the letter, elementary students in Alberta would receive about 60 minutes of music instruction a week. While only 2 respondents reported achieving or exceeding that target in a single week, one should still be encouraged that 60% of respondents were reporting *at least* half of that amount (30 to 60 minutes). Clearly there is still room for improvement, but for many formal and informal participants this was a huge step forward, as their students had not been receiving any music instruction before the field test began.

The small sample size and inconsistent response rate makes it impossible to extrapolate any trends or conclusions about what factors may have influenced the amount of instruction time participants were able to dedicate for music.

6.1.2.2 – General feelings regarding lessons offered with Whacky Wizards

This question *"How well do you feel your lesson went?"* was perhaps too vaguely worded to generate truly meaningful results, but there is nonetheless some substance to the fact that almost nine out of ten responses (87.5%) were 'Very Good' or better, and there was not a single response in the lowest two categories (Poor or OK). Again, while one must be careful drawing conclusions from such a small sample, it is promising to know that participants felt like their lessons using the program were at a minimum satisfactory and very frequently better.

6.1.2.3 – Making connections to the curriculum with Whacky Wizards

Because of scope and time, the sections of the research directly relating to the potential of the program to assist with achieving curricular objectives have been omitted. There was nonetheless a significant amount of data collected on the subject, of which the findings taken from this section of the online feedback form are but a small overview. This data has been included to provide a glimpse of the potential of the program for assisting teachers with curricular objectives. When asked "*How well were you able to make curricular connections to the lessons?",* the rating of 'Very Good' or 'Fantastic'

account for more than three quarters of all responses (75.4%). It is fair to say that this is an auspicious result.

6.1.2.4 – Student engagement with music lessons using Whacky Wizards

Once more, the limitations of this thesis do not allow for inclusion of all the portions of the research dealing with student engagement with music instruction. However, the results from this section of the online feedback form were simply too compelling not to share.

For the question "*How engaged were your students with the lessons?",* there were no responses in the lowest two levels. In fact, more than half of the responses (53.2%) were at the highest level (5/5). When factoring in the responses for the next level down (4/5), that number jumps to an astonishing 97.5%. To reiterate this in another way, teachers using the program felt that the level of student engagement with the program was **almost always very good or better**.

Indisputably, this aspect of the research bears the most possibility for further investigation.

6.1.3 – Increase in music instruction time

The results from these findings will be left for the following chapter, where they will be highlighted in reference to the substantiation of the principal conjecture of the research.

6.2 – Discussion by research question

As this research in scrutinised through the lens of a design-based research framework, it is helpful to re-examine the purpose of our conjecture. Ultimately evidence is presented not to prove or disprove, but to corroborate an unsupported claim. Debating whether the conjecture is sound is not truly the objective – that it can be seen as valid in both influential in the local context and as a theoretical design principle is the goal.

Thus, to substantiate our conjecture, the task at hand is reflected by the transformation of our research question. The previous chapter offered many specific, exemplary, and descriptive responses to the questions of ***what ways will*** the program address barriers or meet needs. This chapter seeks to answer the deeper questions of

1. ***Did*** this program address the **barriers** that exist for teachers towards music instruction?
2. ***Did*** this program meet the **needs** of these teachers with regards to musical instruction?

Implied within each of these questions are the probing inquiries of ***If so, how?*** And ***If not, why?***

The remainder of this chapter seeks to respond to these important queries by analyzing and evaluating the data previously presented for each research question and the established sub-themes contained therein.

6.2.1 – Barriers to music education

With regards to the first question *(In what ways does [Whacky Wizards] reduce or remove barriers that exist for the instruction of the subject?)* the data confirms that none

of the barriers identified were completely removed but suggests that they were all addressed and reduced to varying degrees by the intervention. Each of the following subsections seeks to provide answers to the following:

Did the program address this barrier? If so, how? If not, why?

6.2.1.1 – Barrier #1 – Lack of confidence & competence (self-efficacy) for music instruction

As explained chapter two, there is probably no topic associated with music instruction, particularly as it applies to generalist teachers, that has been studied more than confidence and competence. This extends to the substantial selection of articles that deal specifically with self-efficacy. It is doubtful that this thesis would contribute greatly to any new knowledge on the subject, but it certainly corroborates other findings.

There are, for instance, a number of fascinating parallels with de Vries' (2017) excellent narrative study of the self-efficacy of five teachers tasked with teaching music, particularly as it concerns the effect of mastery vicarious experiences. Statements made by participants regarding their own confidence and competence resound with quotes in an equally outstanding narrative study by Vitale (2020). A study by Russell-Bowie (2013) is remarkably analogous to the present research. There, teachers were involved in a similar intervention to the Whacky Wizards program which provided them with experiential musical learning and showed nearly universal improvements in confidence and competence.

Did this program address the barrier of a lack of confidence & competence (self-efficacy) among teachers tasked with music instruction?

On the issue of reducing the lack of self-efficacy towards music instruction among participants, it could be argued that the intervention was a resounding success. The findings presented in the previous chapter was only a fraction of the data actually collected on the subject through interviews and on-line feedback supporting this claim.

However, to substantiate this claim, and ultimately the conjecture of the research on the whole, it is essential to provide arguments that are more evidentiary than opinion. This can be provided through the Bandura's (1997) well established framework of self-efficacy, particularly pertaining mastery experiences and positive emotional states that the participants and their students enjoyed. The teachers in this study were often hesitant to teach music because of the long list of barriers they had encountered up to that point – all of which have been extensively detailed in this document – yet when they implemented the intervention, they achieved success. How else can you explain a comment like the following feedback from an informal participant: '*The students LOVED it"*? If teacher self-efficacy can be defined as one's "belief in his or her ability to affect change in students' learning outcomes" (Garvis & Pendergast, 2010, p. 7), can there be no better evidence than the report of another informal participant that '[*The] kids are getting really engaged in mastering some of the songs. We started them off slow the week prior but are really making some progress and feeling success!'* And these quotes were simply two among dozens.

The amazing thing about mastery experiences is that they are self-replicating – A successful undertaking increases our comfort and knowledge to try it again. In many

instances in this study, this phenomenon played out among teachers and students alike. While not explicitly described, it is hoped that the reader can recognize the presence of this positive feedback loop among some participants.

Looking to the future, teacher self-efficacy may be improved even more if they were able to have vicarious experiences and verbal persuasion through the program. This may be accomplished by in-person or virtual visits to classrooms by an expert (possibly known as a Whacky Wizard?), both to offer lessons to students for which teachers can observe and learn, and as one who could watch the teacher facilitate with the program and offer feedback.

6.2.1.2 – Barrier #2 – Previous experience with music education

On the subject of previous experience with music education, statements made in interviews by participants in this research align so closely with quotes from participants in studies by Vitale (2020), and Stunell (2010) that it is almost eerie. As Pitts (2017) points out – for good or bad, everyone's musical self-perceptions are shaped by their earlier experience with music, most notably at school. This particular obstacle is very difficult to reduce or remove, as one cannot rewrite the past.

Over the course of the study the formal participants reflected upon their experiences with music education either as teachers, students, or both. For some, the experience has been positive, for others, less so. **Laurel** and **Elowen** reminisced about school band programs in junior high and high school with fondness. **Holly**, **Olive**, and **Linden** recounted the benefits of experiences with music outside of school, such as dance lessons or private instrument instruction. Conversely, **Willow** remembered music lessons

as a child as being unhelpful, possibly even traumatic. **Ash** gave the impression like he felt he was never able to engage with music. **Juniper** wanted to offer a great musical experience to her students, was overwhelmed by feeling undertrained. **Rowan** had included music in his classroom for years, but still felt underqualified. **Magnolia** also offered exemplary programs for her students, but constantly undermined herself through comparisons with music specialists, because this was the music education model she knew best.

All these things likely affected the ways in which these teachers employed Whacky Wizards, and ultimately the outcomes they had.

Did this program address the barrier(s) created by previous experience with music education?

It is very difficult to evaluate whether use of the intervention directly overcame the influence of previous experiences with music education, particularly if they were negative. However, the following two narratives may hold some truth.

On the positive side, **Elowen** and **Hazel** both exhibited some surprise by how much music they actually knew. After reviewing lessons and videos on the website and using the program to help their young students make music, they both realized that their latent knowledge was more than sufficient for teaching children the basics, and this empowered them.

By contrast, **Willow** had taken piano lessons as a child, but she recalled the experience with a bitter tase in her mouth. This kept her from being involved with music from that point on, thus her musical capabilities were not nurtured. Consequently, she felt

that her only musical "talent" was to press the 'play' button on YouTube – Her perceived self-efficacy for music instruction was very low. This was unfortunate, because it was evident to the researcher that she had a definite capacity for music, music instruction was clearly a priority for her, and she employed the intervention in her classroom with great success. Nonetheless, her comments in the post-test interview reflected that her perceived musical self-efficacy had only slightly improved.

One of the desired outcomes expressed for this barrier involves a considerably more long-term solution: While little can be done to affect the music education experiences of teachers, much can be done to affect the music education experience of students. The hope here is that those in the present who have had positive experiences with musicking, who felt encouraged and capable of participating in collective music, will not have their musical identities stymied by mediocre or traumatic engagement with music. One strategy for this is to follow a make music first model.

Without realizing it, all the participants were following the precept of Make Music First. None of them reported doing any 'music theory' before giving the students Boomwhackers and letting them try the apps, and many expressed the satisfaction they (and their students) felt by just making something that actually sounded like music.

Once cannot help but wonder if the program may have been even more effective in this regard if Make Music First had been more explicitly stated on the website, and as a mantra throughout the lessons. With the very notable exception of **Juniper**, none of the other teachers really voiced the concept as something they had contemplated.

In the future, one way that this may be addressed is to offer a lesson, video, and/or dedicated web page on the Whacky Wizards website which clearly articulates the

underlying philosophy of the program. A resource such as this would no doubt enhance potential learning in several areas that have been constructed with a praxial approach in mind.

6.2.1.3 – Barrier #3 – Perceptions about musical ability

As reinforced by Ruddock & Leong (2005), Stunell (2010) and others, the self-imposed label of being either 'musical' or 'unmusical' is not an easy one to change. This was certainly apparent with participants in this study. While no participant (thankfully) ever referred to themselves as 'unmusical', many expressed that they had limited 'talent', 'gifts' or 'ability' for music, reinforcing the nearly universal belief outlined by Sloboda et al. (1994), that musical ability is innate or fixed.

Did this program address the barrier(s) created by perceptions of musical ability?

None of the teachers who said they lacked musical abilities in the pre-test interviews had a true change of heart. However, none of the lessons or training offered to participants in the Whacky Wizards program addressed this issue head on – perhaps if future lessons reinforced everyone's innate musical capacity in a more explicit manner some movement might be attained in this area.

What had potentially changed was participants' perceptions regarding music *instruction* ability. From the start, an encouraging take-away was the fact that, in many cases, participants were willing to get involved with the research *despite* feelings that they lacked any musical 'talent' or 'gift'. Like **Rowan's** colleague who firmly believed

she could not teach music - something about the program seemed achievable to them and they were able to get over that hump. Once the field test was underway, this perception was bolstered as a result of *mastery experiences* on the part of the students learning and the teachers facilitating, (think of **Linden's** account of sending a video home to parents that showed she was a 'good music teacher'). It was also strengthened by the corresponding positive *emotional states* that resulted from lessons. This is evidenced by descriptions of lessons from participants that include the words 'fun', 'exciting', 'love', 'joy', 'enthusiastic' and others.

Equally promising were hopeful sentiments on the part of participants for their students' perceptions of *their* musical ability. This was illustrated by **Elowen's** statement that her students knowing that they CAN do music was the best thing they learned. If these students can maintain a positive outlook towards their musical ability, it could help break the cycle of self-harm inflicted upon music education as noted by Ruddock and Leong (2005), Russel-Bowie (2009b) and others.

One way to reduce the effects of this barrier in the future is to promote wide ranging inclusion in musical activities rather than isolating a 'musical elite'. As stated elsewhere, the program aimed to promote participation for everyone. On this front, the accounts by **Elowen**, **Willow**, **Juniper** and **Rowan** in the last chapter were only the brightest stars in the constellation of reported success. One regret is that there is not room enough in this document to include the narratives shared by participants about individual children, many of whom had special needs, and how this program affected them on a meaningful level because it allowed them to participate. Suffice it to say that they testimonials are very heartwarming.

6.2.1.4 – Barrier #4 – Belief that music instruction is somehow rarified and should remain the realm of specialists

This was another barrier that kept emerging in conversations with participants, but in very subtle ways. Certainly the concept outlined by Hennessey (2000) that most people think of music specialists as possessing 'a gift for music' was present. This was overtly stated by **Olive** who claimed that music pedagogy was *'just innate to them'*. Another belief that was expressed was that to teach music 'properly' that one needed specialized training, echoing ideas explained by Clements (2008) and Kim (2016). **Ash**, **Willow**, **Magnolia** and others fell into this camp.

Did this program address the barrier(s) created by a belief that music instruction is somehow rarified and should remain the realm of specialists?

This barrier, as so many discussed in this thesis, is likewise a belief that exists on a systemic level and would be impossible to completely overturn. However, if we focus on just the two desired outcomes listed for this this barrier, namely, to remove some of the 'mystique' surrounding music education and to make participants feel like they are legitimate teachers of music, the intervention certainly did achieve some success.

On the first of these desired outcomes, one must admit that it would be hard to measure how much the 'mystique' of music education was reduced. The question was never asked directly, which is one of the researcher's regrets. Nonetheless, many participants (notably **Elowen** and **Hazel**) expressed a sense of satisfaction when they realized they were capable of 'doing music'.

To observe a shining example of accomplishment in this regard, one need only to look at **Rowan**. The 'dark doors' of music education were opened to him simply because,

once he watched the videos and applied the training with lessons in his classroom, he had the vocabulary, knowledge, and experience to understand how to meet the expectations outlined in the curriculum. It cannot be understated how important this was to him – it truly magnified his self-efficacy for music instruction.

As far as the second of the outcomes is concerned, to make participants feel legitimate and justified in offering music instruction, an interesting observation was made: Participants seemed to have very different approaches and aspirations for the program depending on whether there was a music specialist present in their school. Both **Ash** and **Laurel** are in this category and expressed that their primary aims for using the program were mostly extra-musical (movement breaks and community building respectively). Both teachers used the program at least twice a week but did not really explain the musical concepts present with their students. They expressed that they wanted to rely on the music specialists to "take care of teaching music". Consequently, they did not report much of a change in their overall self-efficacy for the subject. On the other hand, teachers like **Elowen**, **Juniper**, **Linden**, and **Willow**, who have no music specialist on staff at their schools, made huge strides with their confidence to teach the subject. It may be that for educators to experience growth in this way, they cannot have the option to just 'leave it to the music teacher'.

6.2.1.5 – Barrier #5 – Never having received formal training in music or music pedagogy

Although the researcher did not inquire if every interviewee had received training for music in their university education courses, those to whom the question was posed

answered ‘no’ so emphatically that it made the idea seem laughable. This aligned with findings in studies by Rogers et al. (2008), Jeanneret & Stevens-Ballenger (2013), Biasutti et al. (2015), and many others.

While it remains a matter of speculation, based on the reactions of those mentioned previously, it would not be a surprising if the mere idea of receiving training to teach music at university (if one was not a specialist) was either preposterous or beyond what any of the participants had ever considered. Nonetheless, most would have likely agreed that it was a gap in their education that needed to be filled, as evidenced by what **Elowen** said she wanted most from the intervention: *instruction that I've never had before because I never got it in school.*

Did this program address the barrier(s)created by never having received formal training in music or music pedagogy?

The desired outcomes for this sub theme were threefold:

1. Provide teachers with knowledge about the essential and fundamental elements of music
2. Help them to learn how to convey these concepts to their students
3. Internalize their understanding of these concepts through active musicking in their classrooms.

The first of these objectives was to be addressed by the “How Music Works” lessons and videos. For the most part these videos were extremely well received by the participants, so much so that many of them showed the videos to their own students. At

least 5 asked if I would consider doing another series of videos to explain the elements of music specifically for children, which may be a consideration for the future.

The second of these outcomes was to be addressed by the series of videos created to familiarize participants with each of the apps and the more general use of Boomwhackers in their classrooms. These videos were also watched, appreciated, and shared extensively by participants. For example, even though it is unlisted on YouTube and only the participants were given the link, the Boomwhacker training video has been viewed 187 times.

In fact, the YouTube view logs provided certain insights into how teachers were using the lessons. The researcher was somewhat concerned and disappointed that all the "How Music Works" videos were not receiving equal amounts of views, with numbers declining sharply between the first and last lessons in the series. But this trend turned out to be positive. At least 5 teachers explained that watching the first few videos gave them all the confidence and knowledge they needed to jump into using the program, and to explain the musical concepts presented therein to their students in age-appropriate ways. They also realized that many of the curricular expectations for the grade(s) that they were teaching were easily met with the basic training they had received. This is humorously reenforced by **Willow's** statement shared in the last chapter: After watching just three videos she boldly said, "I got this, Leo".

The third outcome concerned providing participants experiences with active musicking. Some participants reported being able to shift their role in the classroom from 'director' to 'facilitator' and many spoke about using the program alongside their students (like **Laurel** who confessed, "I just really liked doing it too"). Nonetheless, the

concept of stepping into the role of facilitator, for the students to understand that musicking is just as valuable for the teachers as for them, was not as explicit as it might have been in the lessons. While the students using the programs certainly developed through active musicking, it is unclear if this made as much of an impact on their teachers. It is hoped that the program can continue to develop strategies to overcome the deficiencies caused by a lack of teacher training in music at the post-secondary level.

6.2.1.6 – Barrier #6 – Music is not seen as a "core" subject and the predominance of literacy & numeracy

After examining the interview transcripts and online form feedback from participants there is little doubt that "core" subjects are prioritized in their classrooms. As de Vries (2017) notes, reading, writing and math are 'priviledged' when compared with music and other arts. This was especially evident with younger teachers, many of whom received their entire education in an era and place where policies that extol literacy and numeracy education have been in place (Horsley, 2009; Smith, 2000). What Webb (2016) found in the study of post-secondary programs in New Zealand probably resounds with the participants in our project — that we are not producing true generalists, but specialists in literacy and numeracy.

Did this program address the barrier(s)created by the fact that music is not seen as a "core" subject, and the predominance of Literacy & Numeracy?

Like many other challenges identified in this thesis, there is no way that a small program can overturn such an engrained educational policy. Findings would suggest that

the Whacky Wizards program did not make major inroads with regards to this barrier, though the possibility is clearly there.

This barrier's corresponding section in chapter 4 lists two desired outcomes as ways the program could reduce the obstacles created by music's subservient status to the "core" subjects. Put simply, these are: 1) advancing the value of music learning and, 2) incorporating music in other areas of instruction. In both instances, the solution is just to increase the presence of music in the timetable, though the tactics vary. Regardless of the route taken, there is a strong point to be made by those in the camp of Janet Mills (1989), who argues that when music is integrated in the generalist classroom, it is seen as on par with other classroom subjects, and the stigma that it is a superfluous, luxury activity may be removed.

The first tactic is to meet the problem head on, and just make it easier, or in some cases even possible, to include music lessons in the timetable. The program allowed this tactic to work wonderfully in at least 5 classrooms where there was no music taking place before the field test, and those participants admit that there would not have been *any* music instruction offered if it were not for their involvement in the intervention. As music flourishes in these environments, it can lift its status by its mere presence, allowing students to see it on the same footing as reading, writing or math. As seen in our findings, music can be used as a motivator, encouraging students and teachers to get other work completed efficiently to ensure that there is time to include it.

The second tactic to increasing the presence of music takes a "if you can't beat 'em, join 'em" kind of approach in the form of cross curricular connections. Here music is synergized with the instruction of another subject to make sure that both are receiving

much sought-after time in the schedule. On this front, it could be argued that the program has tremendous untapped potential. Several teachers remarked that they recognized in theory where these connections exist, though a small number reported actually making them.

In fact, a plan to include a cross-curricular lesson on the website was in place from early stages of the program's design. It explained that the Rhythm Tutor is an excellent tool to teach basic addition and subtraction. Numerals can be represented in the app by rhythmic patterns that have the same number of notes. This provides both visual and auditory reinforcement of the numbers' value for the students. Students would learn and practice these patterns, counting the notes as they played. Then, when asked simple math questions, they can respond by playing the rhythm that contains the correct number of notes. Unfortunately, simply due to a lack of time, the video was never filmed, and the method never shared. Certainly, this will be included in the next iteration of the program.

6.2.1.7 – Barrier #7 – Music education is considered 'disposable'

At some point in the interview process, *every* formal participant in the program related a case where they had experienced 'disposable' music. On the level of funding, most of the veteran teachers lived out experiences corresponding to those described by Abril and Gault (2006) or West (2012) where they had seen a music program or teacher get cut due to budget reductions. In **Olive's** case it had only been a few months before. On the level of the daily or weekly schedule, participants recalled times when music had been bumped for fire drills, assemblies, PD days, government tests, etc. This reverberates with the results study of the challenges facing primary school music in 5 countries by

Deirdre Russell-Bowie (2009) in which 77% of respondents indicated the lack of priority for music as a major problem. It would seem that this issue is as prevalent in Southern Alberta as it is in the rest of the world.

Did this program address the barrier(s)created by the fact that music education is considered disposable?

As the roots of this problem are so intertwined with issues associated with funding and time, the ways in which the Whacky Wizards program addressed this barrier will be discussed in those sections, found below (6.2.2.1 & 6.2.2.5).

6.2.1.8 – Barrier #8 – Music is viewed predominantly as a product more than as a process

In relation to the idea that music is a 'thing' that is intended to be prepared and presented, many participants echoed the findings of Bartel et al. (2004) who reported on the stress that this can cause teachers. The comments made by some reinforce the findings of Crooke & McFerran (2015) – a 'traditional' performance driven music program can lead to negative pushback from teachers and students alike.

For many teachers, the principle of musicking applied to a path for music education – as described by Small (1998), Regelski (2016), Stanton (2018) and others – was truly 'outside-of-the box'. It took some of them a while to understand the focus on process. Once they realized that music in the classroom can exist just for 'fun' and learning, it was a breath of fresh air.

Did this program address the barrier(s)that exist because music is viewed predominantly as a product more than as a process?

The evidence provided by participants does not directly suggest that this barrier was overcome. The idea that music is a product, and even more so something with clear lines between those who produce it and those who consume it, is simply too engrained in our culture. This would be another area that would be very beneficial to have introduced to participants via a lesson or video about the underlying philosophy of the program. The positive impact described below may have been even greater.

Regardless of the fact that the 'product vs. process' concept was not explicitly taught to participants, the principle created a shift in many teachers' classrooms. The change was almost certainly precipitated by the ways participants explained that they could 'let their guard down' and just enjoy music time with the children under their tutelage.

Even more than this, there was a manifested transformation in the ways that students became engaged in participation with music lessons. Many teachers indicated that *every* pupil found ways to participate - an unusual occurrence in an elementary classroom, to put it mildly. It could be surmised that removing the pressure of performance, of being seen or judged by those outside a familiar and trusted peer group, allowed them to take risks that they would not have otherwise attempted. They understood they not only had occasion to try, but permission to fail.

It is regrettable that every story which was shared by participants about this phenomenon cannot be included here. For those passionate about the power of music in

the lives of children, these accounts are inspiring and heartwarming. This would be an area of study that should be more fully explored in any future iteration of the program.

6.2.2 – Needs of Music Instructors

For the second research question *(In what ways does [Whacky Wizards] meet the needs that exist for music instruction?)* the data suggests that the program has made some real breakthroughs. Not every need was met to its fullest, but significant gains were made in many areas. Once again, each sib-section below will explore the following

Did the program meet this need? If so, how? If not, why?

6.2.2.1 – Need #1 – Funding

As described before in this thesis, the need for funding is at the root of all other needs for music education. As expressed by several participants in the project, while this need affects them in very direct ways, they understand that it is often outside of their control, as it falls under the purview of administration. As suggested in articles by Abril & Gault (2006), and de Vries and Albon (2012), a supportive administrator can 'make or break' music instruction in an elementary school. Thankfully, the majority of participants reported having sympathetic principals. This is a reflection of findings by both Gerrity (2009) and Young & Young (2010), who claim that most principals view music as an significant part of a child's education.

Did this program meet the needs of teachers tasked with music instruction with regards to funding?

During interviews, participants rarely overtly listed funding when identifying their needs. It nonetheless underwrote the conversations around nearly all other needs - instruments, instructional resources, music rooms, professional development and staffing. This should become clearer in the ensuing discussions of these needs in the sections to come.

Even though teachers understand that their administrators hold onto the school's purse strings, they also know that budget can be available for things that have proven value. It is extremely telling that while every formal participant expressed gratitude for free login access to the website, they also unequivocally said that if there was a cost involved in the future, they would seek the required funds from their principal. This is an impressive indicator of the worth and success of the program.

It is also fair to say that this attitude extends to Boomwhackers as well. Most teachers involved with the program had limited exposure or experience with these instruments before the field test began. Even fewer would have had any idea how relatively affordable they are. In one instance, once the participant teachers began using Whacky Wizards, there was an instant demand among other teachers in the school to try Boomwhackers, but because of COVID protocols, it was very difficult to share. As soon as the principal found out how inexpensive these instruments are, she purchased two more classroom sets.

6.2.2.2 – Need #2 – Instruments

As noted by de Vries (2017), providing valuable music instruction without access to enough suitable instruments is an arduous task. This problem was severely

compounded during the worldwide coronavirus pandemic when the most common conduits for elementary music instruction – playing the recorder and singing – were not even permitted. The use of most other instruments, such as ukuleles and xylophones, if schools had them at all, was also severely restricted.

However, this very difficult circumstance was actually a blessing for the intervention, because of the ease of sanitizing Boomwhackers. These smooth, plastic, tubes are a very safe option in this situation, requiring just a quick wipe with a disinfectant cleaner before or after use.

On top of this extremely useful characteristic, teachers were able to recognize the benefits of using Boomwhackers that have been previously reported by Vitale (Vitale, 2020), Kunish (Kunish, 2010) and others (Perlmutter, 2014; Rajagopalan, 2005). They found the instruments durable, affordable, accessible, easy to store, and attractive to students.

Did this program meet the needs of teachers tasked with music instruction with regards to instruments?

Many teachers admitted that what first got them hooked on the idea of joining in the project was the promise of instruments for their school or classroom, and in this it is very satisfying to report that this one area in which it may be said that the project met a need completely. Through efforts made by the researcher and funds raised in a crowdfunding campaign, every participant in the program received, free of charge, enough Boomwhackers to effectively implement the intervention with their class.

The obvious limitation is that the circumstances just described are extraordinary, and apply only to this research project. In the future, teachers who may want to use the program will have to find ways to procure instruments on their own for this need to be met.

However, this may not be as large an obstacle to overcome as it seems. As supported by more than half of the schools involved with this research and years of observation by the researcher, many schools *already have* Boomwhackers. The problem is that they do not have *enough*. At least 5 schools that were given instruments for this project had between 8 – 24 Boomwhackers (1-3 one-octave sets of eight tubes). The shortfall is that for a typical class of 24 students to effectively use the Whacky Wizards program, they need *at least* 64 (8 one-octave sets).

This may, in fact, be one of the successes of the program. A lot of teachers expressed that they had seen a neglected box of Boomwhackers in their school and just not known what to do with them. Once they had actually had a sufficient amount, many teachers commented on the unexpected capacity these unassuming plastic tubes hold for music instruction, being tools that can be used to explain beat, rhythm, pitch, melody, and harmony.

Teachers expressed that these instruments met needs for them and their students that went beyond just 'music'. Some conveyed how good they were for kinaesthetic learning – kids benefit from frequent opportunities to move and physical, sensory feedback. This extended to how well the instruments worked as a 'manipulatives'; something kids could touch and use without fear of 'breaking' them.

6.2.2.3 – Need #3 – Instructional Materials

One of the principal needs of teachers who are tasked with music instruction is what Holden and Button (2006) refer to as 'a published music scheme' – meaning a program or set of lessons to follow. Wiggins and Wiggins (2008) continue by declaring that while teachers look for such programs to be as all-inclusive as possible, wanting a 'one-stop-shop' for music, they also need them to be within their abilities to employ. De Vries (2013) adds the important clause that it is not just having a prescribed program that is important, it is the training to use it effectively that matters.

A lot of what the Whacky Wizards program was designed to be and do hangs on these three points. With this as a framework, we may examine how well this sections' need was met.

Did this program meet the needs of teachers tasked with music instruction with regards to instructional materials?

Overall, the evidence would suggest that on this front, the Whacky Wizards met the needs of the teachers involved extremely well.

A significant amount of the praise which was given to the program had to do with its comprehensive nature. Teachers loved that they did not have to spend valuable preparation time amassing lesson ideas from multiple websites or sources. Many expressed their appreciation that they could use the website for their own professional development, to offer drop-of-a-hat music lessons to their pupils when the opportunity struck, to download PDFs to use or print in their classrooms, or to see what curricular expectations they were meeting.

Importantly, *every* formal participant, and many informal participants, commented on how easy the program was to use, using words like ease, simple, clear, and straightforward in their feedback. Some even used some form of the term 'removing barriers' to describe what it was like to have everything in one place.

Something that became apparent was that a resource as exhaustive as the Whacky Wizards program could not exist outside of an online, digital realm. The fingertip accessibility of the instructional material, being able to find and use what you need, not needing too much time to learn it, or any room to store it were all listed as bonuses by participants many times. The fact that the resource can potentially grow and improve in the future was also a significant feature.

6.2.2.4 – Need #4 – Space

Crooke and McFerran (2015), Allen (2011), and Pike (2016) are three researchers who document a lack of appropriate space to teach music as a barrier which is difficult to overcome. This has to do with having appropriate storage for instruments, room to play those instruments, and concerns about the sound disturbing other classes. These were all concerns that were shared by participants at some point.

Unfortuanetly, as Schneider (2003) reports, having rooms dedicated for the instruction of a single subject, such as music, art or science is an expense most schools are not able to bear. This was also the lived reality of most participants who had to offer music classes in their 'homerooms'.

Did this program meet the needs of teachers tasked with music instruction with regards to space?

Knowing that space would be a challenge most participants faced, there was significant effort placed into demonstrating ways to implement the program within the space that they had. This involved very specific instructions in the lesson videos about how to distribute and collect the Boomwhackers before and after lessons, how to arrange students when they were playing, and how to store the instruments when they were done. This became especially crucial during the period when COVID-19 precautions were strongest, and students were not even supposed to leave the 'bubble' of their work area. For the most part, teachers reported being able to use the program in their classrooms even in this highly restrictive environment.

In this regard, the program met the need sufficiently, but not perfectly. There were many overhead diagrams prepared for the videos that showed teachers how to play the Boomwhackers in an 'average' classroom with desks in rows. These diagrams could also be downloaded as PDFs from the corresponding lesson pages on the website. While many teachers commented about how useful these diagrams were, they were a one-size-fits-all solution to a condition that is anything but uniform. Other teachers asked for videos or images of students using the program in a variety of real-world settings to see what the options were. Given the situation with COVID, the researcher was fortunate that any footage could be created of children using the program, and while this footage was useful as a teaching tool, it was also limited to a single camera perspective in one room.

One area associated with space in which the program performed quite well was storage. Most participants kept the Boomwhackers in five-gallon buckets, as is suggested often by the program. Most concurred that this was an effective, unobtrusive solution, even for crowded classrooms, and that the buckets facilitated getting the instruments into

the hands of students quickly when it was time for music. Many also remarked about how nice it was to have their own instruments in their own classrooms, and that sharing or signing out instruments was never an issue.

With regards to the advantage of having a ‘music room, there is one last observation which is important to share: About halfway through the field test, one participant gained access to her school music room, which had no desks or tables. (They only had this room because the music teacher had been laid off earlier that year). She reported, quite accurately, that using the program in this room improved the experience overall – students were able to change their mindset for music learning, they could sit on a carpeted floor and spread out, it was easier to hand out and collect instruments, and they were not worried about making too much noise and disturbing other classes. However, using Whacky Wizards only in a dedicated room such as this can be a double-edged sword. This same teacher reported that actually dedicating time to teach music, booking the room, and organizing and moving her students into a new space became barriers. In terms of time, she reported that her students were receiving less music instruction after the music room became available.

6.2.2.5 – Need #5 – Time

Setting aside time for music instruction, both to prepare lessons and to deliver them, is one of the most difficult needs to meet. Input from participants in this study reinforce the findings of a report by the Coalition for Music Education in Canada, claiming that nearly 6 out of 10 respondents list it among the top 3 challenges for music instruction in elementary schools (Coalition for Music Education in Canada, 2010).

Participants in this research reported the pressure of prioritizing 'core' subjects, which makes music harder to fit into the teaching schedule. This reinforces findings by Knapp (2000) and de Vries and Albon (2012). Equally, some teachers in this study recognized that their own anxiety or lack of confidence for the subject may have made it easier to neglect in the past, echoing the reports of participants in studies by Garrett (2019), King (2018), and others.

Did this program meet the needs of teachers tasked with music instruction with regards to time?

It could be argued that the Whacky Wizards program has been fairly successful in meeting the needs of teachers listed up to this point, but when it comes to time, it is likely that gains remain to be made.

While many teachers were grateful for the fact that the program was fast to get up and running, there were also many, including some in the former group, who said that they wished they had scheduled more time for music. Some teachers caught the vision of simply fitting music lessons into their days as opportunities arose, or even motivated their students to work on other subjects efficiently to make sure there was time for music. Other teachers did not make that jump –they stuck to the more conventional model of blocking out time in a weekly schedule.

An encouraging but unexpected development was how much making time for music was driven by students. There was more than one report of a class that, once the teacher said it was time for music, had their workstations cleaned and Boomwhackers passed out in a matter of minutes. Students requested, and in some cases insisted, to have

time with the program. There were also several reports of an opposite problem – it was hard to end the music lesson. This was due to the fact that everyone, including the teacher, was enjoying themselves too much.

Looking forward, more detailed or emphatic instruction for teachers on how to carve out time for music will be necessary. This direction will be given in future lessons or other resources available through the website. It may even require additions to previously published lessons to be most effective.

One last thought to be shared about time: Before the project started, the researcher had not given much consideration to the limited time teachers have for training and lesson preparation. This issue became clear only after several participants praised how little time it took to be able to learn from the website and video lessons. Having access to 'on-demand' training, lists of curricular objectives, and teaching ideas on the website allowed teachers to prepare short lessons very efficiently. Multiple participants expressed how they loved being able to create a meaningful learning experience for their students with minimal time investment. It will be very beneficial for future iterations of the program to focus on ways to make teacher training even more streamlined.

6.2.2.6 – Need #6 – Mentorship

There may not be a more effective way to boost a teacher's self-confidence to teach music than by providing them with a trusted mentor. This claim is supported in recent studies by both Barrett et al. (2019) and Baumgartner (2020), and could easily be maintained by examining results from the current research.

Did this program meet the needs of teachers tasked with music instruction with regards to mentorship?

Creating a pathway for a mentor/mentee relationship was not one of the original aims of the program. In fact, it only became clear to the researcher that these relationships had been developed after the field test was completed and interview transcriptions were being made. Themes regarding human connection in training and learning emerged repeatedly. The program may have met the need for a music mentor among some participants without even intending to do so.

One surprising observation was that relationships seemed to have developed between participants and the researcher without ever meeting in person, face to face. All noteworthy interactions took place over Zoom, with a lesser amount via email. Even more remarkably, the total amount time of these interactions, combining email correspondence, an interview, and an online training session, was much less than 4 hours.

One could hypothesize that even this limited exposure was enough to allow participants to build a relationship of trust and friendship with the researcher, which was then extended to the feelings they had when watching the videos and learning from the online lessons. There was a level of personal interaction. This was reflected by statements made like:

> *... just click on a Leo video and figure out ... the flow and the outcomes of the next lesson*
>
> *... after I watched the videos I was like "OK, I got this Leo!"*
>
> *... everything you taught us about rhythm, pitch, melody and that sort of stuff*
>
> *... but I was confident enough to use anything that you had taught*

... that one live session that you did where you introduced everything, I had two pages of notes from [that], and that was enough to get me going.

... Thanks for providing me with all the [resources] on the website

In any teaching endeavor, a 'human connection' should not be underestimated. At least two participants overtly stated that they do not think they would/could have used the Whacky Wizards program without it. Importantly, this was also reflected in statements by one informal participant who was mentioned, that never felt as comfortable with the program. Whether this was due to not having established a relationship with the researcher is up for debate, but it certainly seems probable.

6.2.2.7 – Need #7 – Training and professional development

The claims made by Power and Klopper (2011) regarding the difficulty in finding suitable arts based professional development (PD) resonated with a number of participants. At least one illustrated the point made by West (2012), when they said that if PD is made available to teachers, it is only to improve the instruction of 'core' subjects.

Jeanneret (1997), Walker (2000), and Rogers et al. (2008), defend that training in the basic elements of music is a highly effective means to a increase teacher self-efficacy for the subject. This strategy was adopted for significant portion of the program, with lessons focussed on providing participants with a strong foundation in the rudiments of music.

Did this program meet the needs of teachers tasked with music instruction with regards to training and professional development?

This need takes us back to one of the two components of teacher self-efficacy – competence for the subject. Due to insufficiencies throughout their educational lives, many generalists lack not only competence for the subject matter, but on the pedagogical techniques required to teach it.

The Whacky Wizards program was able to meet this need, at least as far as it pertains to teaching music with Boomwhackers, for many participants. Importantly, at least three of these teachers expressed that this training also gave them the competence and confidence to provide other forms of music instruction to their students, most notably with ukuleles.

Nearly all the formal participants remarked that the asynchronous component of the training was a major plus for them, allowing them to access of the instructional materials nearly anytime or anywhere. These teachers reported watching the training videos at work during lunch breaks and prep periods, at home after dinner, and at other times and places such as when their kids were at riding lessons.

It might be argued that a hunger exists for music and arts-based PD in the region. The very first communications sent to schools about this research project billed it as an opportunity for professional development. During pre-test interviews, about half the formal participants declared that this was the hook that drew them in. In post-test interviews, this group of teachers and others confirmed that participation in the project had meet that need.

6.2.2.8 – Need #8 – Integration of music instruction with classroom technology

The need outlined in this section can be underscored by a framework known as TPACK. First described by Mishra and Koehler (2006), the principle behind the framework is that for teachers to be effective educators in today's world, they need not only content knowledge for the subject they are instructing, but knowledge about how to teach the subject, in particular teaching using technology. This is summarized as Technological Pedagogical And Content Knolwledge. Ideas presented by Gall (2017), who is a proponent of applying the framework to music education, influenced the design of this research.

While the teachers involved in this study may not know anything about TPACK specifically, they nonetheless understand and express the importance of integrating technology in their classrooms to create a meaningful education environment. This is particularly true for music education which, as noted by Tobias and O'Leary (2017) and Dorfman and Dammers (2015), is behind the curve of general trends.

A statement made by Kim (2013) that was included in chapter 2 of this thesis is worth reiterating here. Regarding an intervention similar to Whacky Wizards implemented in Korea, he said:

> [A] digital technology mediated teaching and learning approach [has] the potential to enhance students' self-motivated engagement in the music class and their perception of music in general. (p. 413).

The remainder of this section demonstrates how this is also the case in our circumstance.

Did this program meet the needs of teachers tasked with music instruction with regards to the integration of music instruction with technology in the classroom?

Participants in the study had overwhelmingly positive feedback regarding the technological aspects of the program. Some commented on how well it worked on their classrooms' interactive whiteboards, citing particular admiration for the design features of the apps which suited the hardware. These included large, clearly defined controls which were intuitive to alter or manipulate and easy to read from a distance.

Other teachers commented on how the program appealed to their students because they were able to learn through different modes, allowing children to create meaning from the experience based on areas in which they were most 'literate' – the realm of apps, digital films, and video games. This included how students were able to process information that was being generated simultaneously on audio, video, and sensory levels. Some participants reported the wonder of witnessing the focus and engagement in the task-at-hand that the program was able to elicit in certain students, especially those who may be categorized as 'reluctant learners'.

The program intentionally integrated several game-based learning principles, as outlined by Gee (2003). Chief among these are those principles which describe instant feedback and learning on the cusp of capacity. It is significant that although these principles were not overly emphasized in the training materials contained in the program, most teachers discovered and capitalized on them, nonetheless. This includes the various accounts of manipulating the apps in real time to suit the needs of the students in the moment, creating learning challenges that were nonetheless attainable for the students. It

is likewise important to note how participants report on the ease of creating these circumstances.

Going back to the statement by Kim mentioned previously, it should be evident that the program enhances students self-motivated engagement in music from the testimony provided regarding their enjoyment of the program throughout this document. Participants have reported that not only has their perception of music improved by using this digital technology mediated teaching and learning approach, but their students' perceptions have improved too.

Much of what has driven the development of the Whacky Wizards program revolves around creating new, innovative approaches to music education, particularly as they pertain to technology. There are many indicators to suggest that the program has made great strides to meet this need.

6.3 – Areas for improvement

This section was included simply to address some of the valid critiques of the program that were brought up by participants. This should also provide some ideas of further development of the program looking forward, whether as a second formal iteration of the research project, or just as improvements that can be made with the aim of a commercial version of Whacky Wizards.

6.3.1 – Technical issues with the program

Considering that this program was created by someone who had almost no experience with website development or computer coding, it worked extremely well.

Nonetheless, if the program was a car, it would be considered at best ‘vintage’ and at worst a jalopy. The apps are somewhat cobbled together with interwoven elements of several web languages and libraries. The web audio tools used are comparatively basic and outdated, and many more sophisticated frameworks exist that synchronize better with modern browsers. However, integration of these newer frameworks was far beyond the developer’s coding capacity at the time that the program was made.

If future opportunities for growth and improvement of the program present themselves, the developer will seriously consider collaborating with a professional programmer or team.

6.3.2 – Distribution of Boomwhackers

One possible solution for the issue of distributing Boomwhackers is to create more videos showing the program being used in a variety of locations, so teachers can see multiple examples of the program working in real-life classrooms. Issues regarding privacy, and the permission to release footage created in a school setting would have to be overcome before this could take place.

6.3.3 – Volume control

Because teachers may or may not have quality speakers connected to their interactive whiteboards, this issue is potentially beyond our control. However, the relatively low volume of the program is a known issue at the software level. Efforts were made unsuccessfully to correct the issue within the structure of the program as it exists. A better solution would likely require a complete reconstruction of the apps.

6.3.4 – Navigating the website

If users of the website watch the lesson videos on YouTube instead of within the imbedded frames of the lesson page, they able to click on time-stamped markers to navigate to specific, labelled points in the video. This feature is missing from the Whacky Wizards website. Additionally, there are ways to imbed links directly in the videos (such as to download a PDF corresponding to the focus of that scene), which have not been explored.

There is currently no effective way to search for topics or key words on the website. The need for this will only become greater as lessons and resources continue to be added.

6.3.5 – Conventional Western music notation

Perhaps not surprisingly, the only participants to request more explicit connections to Western Notation were teachers with a more advanced musical background. Nonetheless, as a far-reaching vision for the program, the incorporating an animated Western notation score that corresponded directly to the existing movement of the apps might be a highly effective way to introduce 'reading music' to users of the program.

6.3.6 – Different kinds of videos

The request that was most unexpected was to create instructional videos, in the same format as the existing ones for teachers, specifically directed to kids. The expectation of the program was that teachers would simply convey this information to

their students, but those teachers who requested this feature contend that students love to learn from ‘an expert’. They also mentioned that if they found the videos a good way to learn, there is no reason their students wouldn’t too.

In truth, only half of the video lessons originally planned for the program were made, as they are incredibly time intensive. On average, it required more than 1 hour of work to produce one minute of finished video.

6.3.7 – Student engagement

Student engagement is an incredibly important part developing this program in the future. Any teacher observations of either positive or negative student engagement should be carefully considered for the insights that might be gained to improve the program in this regard.

6.3.8 – Achievement tracking, levelling up

The original intention of the lessons was to create a series of challenges and ‘Level-Ups’ that would direct the teachers and students towards continual improvement, building on the game-like features of the program. While many teachers found their own paths to create new, fun challenges for their students, a more structured ‘Level-Up’ path would likely be extremely well received.

6.4 – Theoretical Implications

Crippen and Brown (2018) describe the two outcomes for any design-based research project that are widely accepted among proponents of the approach –

contributions to local theories and design principles. It bears repeating the definitions given for each of these concepts in chapter 3:

Local theories describe the way(s) in which the intervention addressed the problem in the context in which it was applied and specify the learning that took place in that setting among participants.

Design principles (also known as design frameworks) outline the more general characteristics and features of an intervention, and the conditions in which they must occur, in order to achieve desired outcomes.

6.4.1 – Local theories

There are many local theories which can be generated from the current research. Disassembling the definition given above can demonstrate how this might be done.

The first step is to *describe the way that an intervention addresses a problem*. Implied within that statement is that the problem is already clear. In the case of this research, the problem may be stated something like this:

> *There are significant impediments to music instruction at the elementary level, particularly when this task falls on generalist teachers*

Because this is an extremely complex problem, it has been broken down into its many component parts in this thesis, each of which has been addressed individually. In other words, each identified barrier and need has been identified and defined as a separate sub-problem, which is nonetheless directly linked to the central issue. The end goal was to describe the way the intervention addressed the problem by dividing it into more digestible portions.

The next step is to outline *the context in which the intervention was applied*. In this case, it was in numerous elementary classrooms across southern Alberta with participant teachers willing to implement music lessons using the Whacky Wizards program.

The last step is to *specify the learning that took place in that setting among participants*, which, because of the collaborative nature of design-based research, should include the researcher and their collaborators.

The pieces are now in place to create a *local theory* using a component problem of the research. Need #4 (Space) can be used as an example — The sub-problem here can be described as the difficulty most teachers face who do not have a dedicated space for music; they must use their regular classroom for music lessons.

The first way the Whacky Wizards program addressed this sub-problem was to use instruments that do not take up a lot of space and can be played at a typical student workspace, like a desk or table. The next way it was addressed was through training videos which suggested ways to store, pass out, and collect these instruments in buckets. In addition, diagrams were created to demonstrate how the instruments should be distributed among players in the class. The learning that took place among the participants was that Boomwhackers *can* work in the space that they have, if they used the bucket methods and distribution diagrams offered by the program.

The local theory could be stated like this:

Teachers in southern Alberta may learn how to teach music in their own classroom (i.e. without the need of a designated music room) if they use

Boomwhackers with the methods and resources provided in the Whacky Wizards program.

To be absolutely clear, these theories should never be taken as definitive statements, which is why words like 'may', 'might', or 'could' ought to be used in their formulation. The key is that they provide a framework on which to attempt to address a problem. Once the attempt has been made, the theory may be either validated or dismissed by one who implements it in their own local context.

6.4.2 – Design Principle

Design principles are theoretical notions which are much broader in scope than local theories.

To isolate design principles, one must first know the *desired outcomes* of their intervention. In the case of this study, it is the introduction, increase, or improvement of music instruction among elementary teachers, particularly if they are not music specialists.

Once the desired outcomes are established, the theory behind the design principle may be formulated. This will begin with a description of the learning approach/product that has been designed for attaining the desired outcomes previously defined. Here, the product in question is the Whacky Wizards program. At its core, this program is comprised of two basic ingredients:

1) A set of interactive, video-game-like apps that represent and demonstrate modes of music making using Boomwhackers percussion tubes.

2) A package of online resources, including instructional videos, accessible to teachers at any time, to train them in

a) the use of these apps

b) the foundational elements of music that can be explained through the use of the apps.

If teachers employ the Whacky Wizards apps in a classroom as directed, applying the pedagogical principles and subject learning presented in the accompanying online resources, they are likely to have teaching mastery experiences, which occur when an instructor can witness that the lesson they have offered has resulted in student achievement of learning outcomes. The resultant sense of accomplishment may be heightened by positive emotional states related to the experience. Mastery experiences with associated positive emotional states may also occur among their students, who recognize their own achievement of learning outcomes.

The probable result of this phenomenon is a combined increase of the confidence and competence these teachers feel towards offering music lessons. In other words, their self-efficacy for the subject is bolstered. This may be especially true if they have not previously been trained or equipped to teach music. This bolstering of self-efficacy will in turn likely lead to an introduction, increase or improvement of music instruction for their students.

The description above has outlined the detailed pathway required to realize the intervention's desired outcomes, which in turn has provided the components necessary to reformulate the theory for brevity. An excellent model for this process can be found in a heuristic formula outlined by van den Akker (1999), which essentially states:

Using approach/product (*X)* under (*Y)* conditions, students are likely to learn (*Z)*

Thus, the main design principle which could be derived from this research is:

Using the Whacky Wizards program (X) in the context and manner in which it is designed and intended (Y) can lead to a bolstering of the self-efficacy of teachers for the instruction of music, particularly if they are not music specialists (Z). This will in turn likely cause the introduction, increase, and/or improvement of music instruction for their students

6.4.2 – Implications of local theories and design principles

These local theories and design principles have implications for both the Whacky Wizards program itself, and any other learning approaches and/or products that may emulate the program.

To further validate local theories and design principles using Whacky Wizards, it would have to be implemented in another context. One possibility would be to implement an intervention on a much larger scale – as a mandated instructional tool in every school in Southern Alberta for example. Penuel et al. (2011) note the difficulties of reimplementing local educational research projects on a systemic scale, cautioning that what works in one context is not often universal. For instance, the researcher would not be able to create or maintain mentoring relationships with all users of the program in the example above. Careful consideration would have to be taken to re-design elements of the program that may simply become unfeasible in a broader context. Returning to our example one last time, an adaptation may be that other people would be trained as experts in the Whacky Wizards program to establish mentoring relationships.

Another potential outcome is that these local theories and design principles could be used to design a different learning approach/product with similar objectives. As a hypothetical example, let us imagine a program to train teachers in the instruction of visual arts. It might have the following component parts:

- interactive apps that focus on different aspects of visual art, such as perspective, positive and negative space, and colour theory
- training videos to guide teachers in the use of these apps, and explain the underlying artistic principles contained therein
- sample lessons that allow teachers to have mastery experiences in art lessons, and students to have mastery experiences in art creation using the apps

The key is recognizing and adopting those elements which have worked in one context and are backed up by viable theories generated therein. The practical application of these theories may be further tested and validated under the auspices of that new intervention.

It may be important to note that several of the participants envisioned ways in which the model employed by Whacky Wizards could be used for other musical instruments, such as xylophones or ukuleles, or other specialized subjects such as physical education or art. The example above was in fact given by **Elowen**, who had received training as an art education specialist.

6.5 – Recommendations and looking forward

The next steps for the Whacky Wizards program remain undefined. It is undeniable that the program shows real promise as a tool to stimulate more music making in elementary schools. One possibility is to work towards a second iteration and field test of the program, ideally in another context (i.e., another Canadian province). It is possible that this may take place under the umbrella of another academic institution, but it is equally possible that it will be done independently or through a corporate interest or investment. Most of the thoughts regarding changes that would be made to a future iteration have been sprinkled throughout this document. The most crucial thing to note is that the program should not need any major overhauls and could evolve within the structure it has already effectively established.

It is likely that future users of the program will need to provide monetary remuneration to continue its development. This may be organized via a subscription fee for access to the site. It would be wonderful if the program was able to partner in some way with the company that produces Boomwhackers, to disseminate the program not just as software but as a complete package. This may be financially beneficial for both parties. It would be equally fascinating to see the framework of the program employed for other music-based instrumental instruction, such as ukuleles, recorders, or drum circles. The structure has promise for other specialized areas of arts instruction as well, such as dance, drama, visual or digital art.

Regardless of the future of this program, there is some assurance in knowing that it is constructed on a solid theoretical and philosophical foundation, that nonetheless has

real credibility in the complex, real-world environment of an elementary school classroom.

Chapter 7 – Conclusion

For this chapter, I will share my closing thoughts in a first-person narrative. I feel that, given the personal account provided in the introduction of the thesis, that this is a fitting way to conclude the document.

We will begin by examining both the conjecture and research questions behind this project, exploring whether the former was substantiated, and the latter were answered. Following this, I will deliberate the possible implications for the research study in three differing areas where I noticed potential gaps in the literature.

Next, I have included a section whichscrutinizes deficiencies in the research and considers improvements for the future. After this comes a section which outlines those portions of the research that were excluded, the reasons for this, and possible ways to revisit these topics in the future.

The last two sections present a position for why my research is important, and my final thoughts and reflections on the project.

7.1 – Substantiation of conjecture

As explained in Chapter 3, design-based research projects are unique in that they focus on substantiating a conjecture rather than proving or disproving a hypothesis. Again, the conjecture for this project was that:

A program employing digital technologies can be designed, implemented, and evaluated to assist elementary teachers to introduce, increase, and/or improve music instruction for their students, particularly if they are not music specialists.

In short, I feel that this conjecture was absolutely strengthened and supported by the findings generated through the implementation and assessment of the intervention. To explain why, it may be helpful to deconstruct the conjecture statement and validate the evidence generated for each of its component parts.

7.1.1 - Designed, implemented, evaluated

For the first portion of the conjecture, let us examine whether we can verify if a program employing digital technologies was designed, implemented, and evaluated.

Design – To return to a definition of design given in chapter 3, something which is designed has a purpose, plan, and intent that governs its function, development, and/or actualization. In the case of the Whacky Wizards program, I feel that this thesis has attested that nearly every component of the website, apps, lessons, and videos, on both practical and theoretical levels, was created with the purpose, plan, and intent of facilitating the instruction of music among elementary teachers, generalists especially.

Implementation – The intervention was implemented successfully in more than two dozen classrooms, which was corroborated jointly by the positive feedback of nearly 80 online forms submitted by teachers attesting to this fact and statements provided in more than 10 hours of interviews with research participants.

Evaluation - The program has been evaluated by both me and teacher practitioners who used it, as documented in chapters 5 and 6 of this thesis. Commentary has been provided therein on areas where the intervention achieved success, and on areas that could use improvement.

7.1.2 - Introduce, increase, and/or improve music instruction

A verification of the whether the program introduced, increased and/or improved music instruction for students will substantiate the second portion of the conjecture.

Introduction – Three of the ten formal participants (**Elowen, Linden, Olive**) attested that no music instruction had taken place in their classrooms in the months leading to the field test, but that they were able to introduce music lessons to their class through the Whacky Wizards program. Two of these teachers (**Olive** and **Linden**) also admitted that music instruction most likely would not have taken place *at all* without it.

Increase – For teachers like **Laurel** and **Ash**, whose students also had the chance to have music lessons taught by a specialist in their schools, all time spent using the program increased the music exposure their students received. **Juniper** commented that she was much more consistent in setting aside time for music in her classroom. In **Willow's** case, she explained that a music specialist was supposed to visit her class every 2 weeks, but it was often cancelled. Using Whacky Wizards allowed her students to receive music instruction between 1-3 times a week, and most importantly, *she* was able to deliver it.

Improvement – **Holly** and **Magnolia**, who were teaching music lessons to 5 classes in each of their respective schools, confirmed that that these lessons had improved through use of the program, citing heightened student engagement, enjoyment and understanding in the subject. Similarly, **Rowan** was able to offer music lessons to his students that built stronger ties to learning objectives outlined in the curriculum.

Of course, in the examples given above, most of the participants could be classified in more than one category (I am confident that some introduced, increased, *and*

improved music instruction over the ten-week field test), but have been presented in these categories for the sake of clarity. Similar outcomes were reported in less detail by informal participants in the study.

7.1.3 – Elementary teachers … particularly … not music specialists

The last segment of our conjecture reminds us to which group of teachers the conjecture is addressed. All the participants in the research taught elementary students from kindergarten to grade 6. Apart from one informal participant who had a background in music education, the remainder were not specialists. I would argue, given the data collected and presented, that the Whacky Wizards program assisted with the delivery of music instruction in their classrooms.

7.2 – Response to research questions

The entire structure of this thesis is designed to demonstrate how the project responded to the research questions. Nearly every chapter has sections devoted to both questions, which are further split into sub-sections, to formulate, in as detailed way as possible, answers for these inquiries.

As such, it is fitting to revisit these questions one final time, to offer a summation of the measure to which these questions have been resolved.

7.2.1 – Barriers

The first question relates to those elementary educators who have been tasked with teaching music to their students, particularly if they are not music specialists. It asks:

1. What are the barriers that exist for these teachers towards music instruction? In what ways will this program address them?

To respond to the first portion of the question, barriers were identified via a thorough review of the literature on the subject, corroborated by the experience, observations, and feedback of participant teachers. These barriers exist on many levels, from broad systematic difficulties present within our cultural and education institutions, to challenges that exist in the personal and professional lives of the teachers in question. A brief sampling includes:

- ingrained perceptions in our society about who is or is not 'musical'
- a lack of training for music pedagogy in post-secondary education programs
- administrative budgetary restrictions for music resources
- difficulty finding time for music in a schedule that prioritizes literacy and numeracy learning.

It may be obvious that this project cannot completely overcome these barriers. Nonetheless, for each of these barriers, strategies were created to reduce their effects within the context of the classroom. These include:

- facilitating the use of the Whacky Wizards program, regardless of previous education or perceived ability for music.
- capacity to carry out short music lessons in a standard classroom (i.e. not a dedicated music room)

- straightforward and accessible instruction for instructors to develop their competence with music and music pedagogy
- creating avenues for mastery experiences that bolster instructors' confidence for music instruction

While I would concede that the project did not achieve a full actualization of all its goals, there is plenty of evidence to suggest that it achieved a measure of success and was able to respond to the first of these questions in a comprehensive and convincing way.

7.2.2 – Needs

Our second question addresses those teachers previously identified: It asks:

2. What are the needs of these teachers with regards to musical instruction?

   In what ways will this program meet them?

As with barriers, needs were identified by previously published academic work on the subject and insights offered in interviews with the teachers themselves. These needs are both tangible and intangible and can be seriously problematic towards music instruction when they are not met. These needs include:

- instruments of sufficient quality and quantity
- clear and comprehensive instructional materials and resources
- time to plan and deliver lessons
- training and mentorship opportunities
- access to appropriate technology in the classroom

The intervention was able to address these needs in a number of ways. Some, such as the provision of instruments, were met completely. Others, while not being fully attained, were tackled in such a way that advancements were made. These include providing teachers with:

- the Whacky Wizards website that provided a one-stop-shop for training and resources
- instructional apps that could be run in any classroom with an internet connection and interactive whiteboard
- lessons and videos about the fundamentals of music, and strategies to teach these concepts
- tactics and techniques to create opportunities for music within the confines of their schedules

I would contend, based on the information which has been collected and presented in this thesis, that the second of our research questions has been answered in important ways. I would also assert that the project has accomplished this by utilizing wide-ranging and compelling methods.

7.3 – Implications for academic study

There are three high-level frameworks for which I had no previous knowledge before beginning my graduate studies, which nevertheless became incredibly important structural elements of my thesis.

1. design based research
2. generalist teacher musical self-efficacy

3. praxial music education

These theories and methodologies are not inherently linked in any way except one — the tie that binds them is that I could find little or no *pragmatic* examples of these approaches in the literature. I am a pragmatist to the core. I'm always looking for nuts-and-bolts, rubber-hits-the-road solutions. Yet for each of these frameworks, there were frustratingly few academic articles outlining real-world, tangible, and/or practical examples of how these theories were being put into practice.

The following sub-sections provide some offerings as to how this research could begin to fill the gaps of pragmatic scholarship in these areas.

7.3.1 – Implications for Design Based Research

As outlined previously, I was drawn to design-based research from the first moment I heard of it because it aligned so well with the purpose, philosophy, and paradigm of my goals. Furthermore, its open, flexible, and *pragmatic* outlook towards research and methods made it a strong candidate for field testing an unproven educational resource in the local context.

As I began digging into the literature, I found many articles and book chapters that explained and outlined the DBR approach on a theoretical level. They provided varied and interesting models that could be followed, with maps and diagrams outlining the process. The problem was that I could not find many studies that actually employed it, at least as far as music education is concerned. In the studies that I did unearth, the interventions were implemented on a comparatively large scale, some with multiple

iterations. Because of this, there was very little included in the articles about the basic nitty-gritty components of the design.

I have endeavored to present this project in such a way as to make it valuable to those who might want to investigate the possibilities of employing DBR in a similar manner as this study – on a small scale, with practical goals, and simple conjectures. I wanted to make sure that I outlined the structure and paradigm of the research in such a way to highlight the connection to DBR While I realize this project (currently) does not include the iterative component so commonly associated with the approach, I have tried to align the intervention as closely as possible within the tenets of the framework so as to make the structure and application of DBR in this setting obvious.

7.3.2 – Implications for Generalist teacher musical self-efficacy

The second major theme where I hope to contributeis the self-efficacy of elementary educatorswith regards to music instruction. Again, in this area I found dozens of studies that examined the lack of confidence and competence towards music among teachers, but few that made any proposals to address it. There were thankfully several studies that described programs and strategies employed to address the problem for *pre*-service teachers, but those that presented tangible solutions for teachers already in the work force were limited. Of the few documented interventions, some reported on professional development programs that took in-service teachers out of the classroom. Only one presented the findings of an intervention that bore similarity to Whacky Wizards, and it was for a program based on vocal music in England ('Voices Foundation' in Rogers et al., 2008). This echoes the findings of Wiggins and Wiggins who said “We

found very little literature reporting what actually goes on in the classroom when generalists teach music" (2008, p. 4).

It is safe to say that academia has firmly established the existence of a serious problem concerning teacher self-efficacy for music, especially if they are generalists. One of the ambitions of this research is to present and demonstrate a concrete, real-world example of not only how to address the issue, but when, where, and why it was done.

7.3.3 – Implications for Praxial Music Education

The amount of literature that explains and advocates for the adoption of a praxial model of music education is almost astonishing. There is, in fact, an entire academic journal devoted to it – Action, Criticism & Theory for Music Education. The field is full of pioneers like David Elliott, Christopher Small, and Philip Alperson, not to mention titans like Thomas Regelski. Despite all that, I was unable to find even *one article* documenting how the philosophy was implemented in a practical, real-life setting. I am not claiming that nothing is out there, but I was unsuccessful in finding anything.

At this point, I would beg the reader to suffer a tangent to explain why the praxial approach to music education is so important to me, on a personal level. When I 'discovered' music at the age of twelve, it revolutionized my life. By the time I reached high school, it was all I wanted to do. I practiced hard, played in school and community ensembles, and ultimately got accepted into a university music program. I dedicated the next 4 years of my life to music study, but after I graduated something happened – I stopped playing. With no recitals or performances, no ensembles or chamber groups, I

just did not see the point. I was a decent percussionist, but I knew I would never make the cut for a major orchestra or earn a living as a chamber musician.

I stumbled along for a few years, gigging where and when I could, teaching private lessons to eke out the rent. I did not know what else to do, because I spent so much of my life on music that I had no other skills. By the grace of God, I encountered African drumming. I was soon teaching large group classes, facilitating workshops, and performing again. To me, it was like I had been a child raised by the Western Conservatory system of music, only to realize that I had been adopted, and Drum Circles were my birth parents. I finally found my people.

When I ultimately learned about the praxial philosophy, it triggered a huge eureka moment for me: I never loved music – I loved MUSICKING. I loved everything that was involved with making music with a community; the meaning and connections generated by playing with other people.

There is no possibility that the entire institutionalized establishment of music education can be overhauled – It will need to evolve slowly. But it will never move without a push. Ultimately, I want to get to a point where kids will be able to see other options for music in their lives, so that they can find their musical 'family' long before I did. My sincerest wish is that this research can be an example of how the praxial paradigm can inform a *pragmatic* way forward, a change wrought by small means that might contribute to greater musical participation for everyone.

7.4 – Deficiencies in the project and improvements that could be made

While I am extremely pleased with the outcomes of this research project, like any undertaking of this magnitude, there is a long list of things I could have done better. Some of these became apparent thanks to the gift of hindsight, others were stumbling blocks I might have addressed at the time.

Presented here, in no particular order, are some of the areas of the project which I feel may have the most significant deficiencies, and what I may do, should the opportunity arise, to correct them. Perhaps these may serve as cautionary tales for others who may attempt similar projects.

If I had the chance to go back, I would make the underlying philosophy which underpinned the entire project more explicit throughout. I would have done a lesson with a video, like all the other lessons on the website, outlining praxial music education and I would have asked all participants to watch it before anything else. Then, in other lessons and videos, I could have made more obvious reference to the important principles of the philosophy, such as musicking versus music, process before product, participation for all, and to provide an alternative perspective to the predominant 'Art for Art's Sake' paradigm. While this added theoretical level may have overwhelmed teachers with little musical experience, it may have engendered them even more to the goals of the program. If the opportunity arises, I will almost certainly add a lesson of this nature to the program, whether I would attempt to retcon anything to existing lessons remains to be seen.

I wish I had deliberately followed up with participants in post-test interviews to specific questions for which they responded in pre-test interviews. Some of the most

powerful data was generated when this happened, but more often than not, it was incidental, not intended. I think because I took a very casual, conversational approach to the interviews, I did not concern myself with making sure the participants answered every question. Had I done so, I would have had more opportunities to compare pre- and post-test responses to specific inquests. Another way to have approached this would be to have given participants the opportunity to review their responses from the pre-test interview before the post-test interview was conducted and ask them to comment more directly on what was previously said.

Along these same lines, I may have prepared the participants better for their interviews if I had provided them with a summary of the research goals of the project beforehand. An almost humorous result of neglecting this reoccurred in multiple interviews. I had spent months reading, reviewing, and ruminating on the preponderance of academic literature focussing on barriers and needs for music education, and thus assumed it must be a pressing concern for teachers everywhere. In fact, the opposite was true, and in most instances, when asked what the barriers they faced were, or what needs they had for music instruction in their classrooms, the teachers struggled to generate any response. It was only with considerable prompting and explication on my part that I was able to get a few phrases from them. Clearly what I had assumed was a major concern based on academic scrutiny of the subject was not obvious in the lived realities of these teachers. It is not that the needs and barriers did not exist for them, they just had never taken the time to contemplate it and were broadsided by the line of inquiry.

I wanted the whole structure of the website, apps and lessons to be non-linear, allowing teachers to explore and find the things that were most pertinent to them and the

circumstances of their classrooms. By the end of the study, when I asked the teachers what they thought of this approach, they all said that while they appreciated the flexibility, clear direction on a few possible paths to take would have been extremely helpful when they started to use the program. This was echoed frequently in comments found in the "What could be improved" section of the online weekly feedback form, particularly among informal participants with whom I had had less face-to-face interaction. I will need to include more instruction, possibly in the form of short lessons with 3- to 4-minute-long videos, to help direct teachers on the path in the future.

By far my biggest regret is not responding promptly and directly to teacher concerns shared via the online feedback forms during the field test. I was overwhelmed by responsibilities involved with instructing an advanced university course and felt some frustration for not having enough time to devote to responding to participant comments and questions. I sense that had I been more diligent about ongoing communication with these teachers, I would have been able to generate a more consistent response rate on those forms and been able to foster a stronger relationship with them. The project was promoted as being collaborative project, and I do not think I tapped into that potential. If I had it all to do over again, I would not have undertaken the demanding task of developing and teaching a class during the same time frame as the field test. The research should have been my highest, if not my only, priority.

7.5 – Topics and data for further analysis

To narrow the focus and limit the length of this thesis, it does not include a review and analysis of all the data that the project generated. In fact, the original conjecture had

four associated research questions, which was later expanded to five, before (mercifully) being reduced to two. Nonetheless, there were some amazing findings generated in these areas, and I regret not being able to share them all here

The additional findings can be grouped into the following three categories:

1. curricular objectives
2. new approaches to music education
3. student engagement with music

The research questions for each of these topics are presented in the sections below. For each question it's associated sub-themes are outlined, along with brief summaries of some of the most important discoveries that were made in these areas.

One option for the future is to create and hopefully publish articles about the project that focus on each of these areas. I certainly feel that there is great value in exploring this possibility.

7.5.1 – Curricular Objectives

The proposed research question for this topic was:

What are the curricular objectives for elementary music?

In what ways will this program help teachers attain them?

These questions were explored within the following 4 sub-themes:

7.5.1.1 – Music Curriculum and policy

This section concerned itself with the fact that while music is a mandated part of curriculums around the world, it remains unique as a subject that still requires advocacy. As a result, music curriculums are often poorly thought out, uninspiring or outdated.

Many are designed with a top-down, teacher-directed, positivistic approach. This segment of the study suggested that the intervention could advocate for taking those elements of the curriculum which were relevant, and teaching them using more student-centered, inquiry-based approaches.

7.5.1.2 – Teacher self-efficacy specifically as it pertains to the Alberta curriculum

A major portion of the pre- and post- test interviews was devised to gain an understanding of the formal participants' self-efficacy for the Alberta elementary curriculum. Teachers were asked to rate their comfort (confidence) and knowledge (competence) for each of the 5 general learner expectations and 11 specific learner expectations outlined in the curriculum document. The results reported an average increase in each category but one, but the most fascinating findings demonstrated which teachers had the largest individual growth levels in certain categories.

7.5.1.3. – Cross curricular connections

Some of the discussion regarding approaching the curriculum through cross-curricular activities was moved to chapter 5, section 5.3.1.6. However, there was a lot more to explore, especially as it pertains to the literature that advocates and provides examples of this approach.

7.5.1.4 – Including music instruction for reasons beyond the curriculum

There were other reasons participants wanted to include music in their classrooms beyond merely achieving curricular objectives, such as to promote wellness, teamwork, and creativity. Examples from the literature included studies outlining how musicking can enhance the social, emotional, and physical well-being of children.

7.5.2 – New approaches to music education

The proposed research question for this topic was:

What innovative approaches might be employed for music instruction?

In what ways will this program implement them?

These questions were explored within the following 5 sub-themes:

7.5.2.1 – Move away from Western based, colonial music

While there is value and beauty in the 'Classical' tradition that is at the root of most Western music, the institutions that promote this music, and the colonial powers which created and upheld them, have dominated the dialog for well more than a century. We need to promote alternative means and approaches to *decolonize* music education (Bradley, 2012; Hess, 2015; Stanton, 2018). One path to this goal is by adopting a more praxial philosophy which engenders the value of music as a social practice, particularly as it applies to musicking traditions outside of the Western canon.

7.5.2.2 – Include more music relevant to students' lived experience

For music education to remain relevant, it must be reflective of the lived experiences of students. This is not to say that music education should solely endorse learning 'popular' music, but that its focus should be on the meaning and connections which are generated through participation in musical instruction. The Whacky Wizards program strives equally to include music with which students already identify and to teach how to find meaning in music which is unfamiliar to them.

7.5.2.3 – Reduce emphasis on 'reading' music in the form of traditional notation

We do not expect babies to read before they speak, and yet the expectation that one needs to *read* music before one can *make* music is commonplace, evidenced by both the literature and comments made by participant teachers in this study. While traditional Western notation can convey a lot of information in an efficient manner, it is difficult and alienating to those who do not have an extensive background reading it (i.e., most children). Reading and Writing music are perhaps the areas of music education which cause teachers the most anxiety and for which they feel the least self-efficacy (de Vries, 2011; Hallam et al., 2009; Hennessy, 2000; Vitale, 2020). As demonstrated by Whacky Wizards apps, there are many ways to convey musical ideas that require less background knowledge and mental processing, but which facilitate musicking.

7.5.2.4 – Discontinue current predominance of singing

Many people believe that there is no instrument better for music education than the human voice – no cost, no storage, and everyone has one. There is strong evidence to

suggest that we are not all biologically wired to sing from birth (Loui et al., 2009), and this 'instrument' works much better for some people than others. This can be a tremendous barrier to participation in music, causing tremendous anxiety in children and teachers alike.

7.5.2.5 – Open up music education to game-based learning

While the thesis does touch on some of the points of game-based learning, there is so much yet to be explored. In particular, there are many design elements of the program that were inspired by Csikszentmihalyi's 'Flow' theory (1990), which has direct connections to several more of Gee's (2003) game-based learning principles.

7.5.3 – Student engagement

The last topic, and conceivably the one with the most potential for further investigation, is student engagement, and the ways in which a program like Whacky Wizards can affect it. The research question which was proposed for the topic is:

> *What are the factors that influence student participation with music instruction?*
>
> *In what ways will this program engage students?*

These questions were explored within the following 5 sub-themes:

7.5.3.1 – Student-centered, inquiry-based learning

These two distinct but interrelated pedagogical methods both aim to put the opportunity for leaning more into the hands and minds of the student. However, music

instruction is one area where teacher-directed methods are still prevalent – classes are managed the same way a conductor would lead an orchestra. The discipline needs to find ways for students to be 'part of the equation', which results in much deeper and more meaningful learning. The intervention shed light on what might be needed to allow this learning environment to develop.

7.5.3.2 – Multimodal Learning and New Literacies

The traditional concept of literacy is considered the ability to communicate ideas via the mode of textual reading and writing. Yet meaning can be communicated through a variety of modes, be they textual, images, sounds, spaces, or gestures (Kress, 2009). The Whacky Wizards program strives to value and promote 'literacy' in these other modes, particularly as it pertains to 'new literacies' those modes of meaning which are transmitted via digital electronics (Knobel & Lankshear, 2014). This was done via the graphical, interactive nature of the apps and the multi-modal understanding which is developed in the corresponding music making activities.

7.5.3.3 – Brain/movement breaks

'Brain Breaks" are respites from periods of academic or intellectual learning, which usually involve some component of movement or other physical activity. Employing movement breaks that have a component of active music making may meet aims for both physical and musical education, while providing students an opportunity to re-focus and engage with the learning environment. One of the original targets of the

Whacky Wizards program was for it to excel as a Brain Break activity specifically geared towards music.

7.5.3.4 – Permission to fail

Music is often taught as something with a lot of potential to 'make mistakes', which can engrain feelings of anxiety associated with music instruction. These feelings can last a lifetime. Having 'permission to fail' allows students to self-advocate, find comfort in uncomfortable circumstances, and focus on the positive (Abramson, 2021). Music should be presented as a subject in which there are no winners or losers, and everyone can participate. The Whacky Wizards program aims to create safe spaces for students to explore music without being preoccupied by errors or faults.

7.5.3.5 – Building Community

There is a worldwide trend among adults who are reconnecting to music through communities of practice. These groups emphasize collaborative creation, focus on the well-being of their members, and promote the democratization of musicking (Koopman, 2007). There is an ever-increasing call for music education to adopt some of the tenets of the community music movement to make the discipline more inclusive, relevant, and reflective of the wide array of ways music can provide meaning in the lives of its practitioners. Whacky Wizards endeavours to create communities of practice within the classrooms where it is employed by encouraging and developing collaboration, mutual growth and the joy of musicking.

7.6 – Why is this study important?

Looking back on the introduction to this thesis provides a unique lens for the reasons why this study (and music education more generally) is important. There, I briefly mentioned the benefits of music on the extra-musical development of children — gains which could be made on academic, social, emotional, and even physical levels. While I will never deny these justifications for music education, I would prefer to offer the chief reason for why this study is important by returning to the Housewright Declaration from the preface of this thesis:

> *Music makes a difference in people's lives. It exalts the human spirit; it enhances the quality of life. Indeed, meaningful music activity should be experienced throughout one's life toward the goal of continuing involvement.*
> (National Association for Music Education, 2000, p. 219)

As that document was intended to provide direction for music education in the current century, we can perhaps gauge the importance of this study in relation to its 12 calls to action (listed in the preface of this thesis). I am confident that this research has, in its own way, advanced *every one* of them. In the interest of brevity, I encourage the reader to revisit the preface and judge for themselves.

I will nonetheless draw the reader's attention once more to the Housewright Declaration' s twelfth article:

> *Music educators must identify the barriers that impede the full actualization of any of the above, and work to overcome them.*

In this, I sincerely hope I have succeeded.

7.7 – Final Reflections

To finish off this document, I would invite the reader to go back to the story in the introduction of how I came to start this project – by wanting to create a tool to help elementary teachers include music lessons in their classrooms. If I put myself back into that time, which was not much more than a few years ago, the thought of what I wanted to create seemed almost impossible. I wanted to keep my expectations low by only having four requirements for the tool I had envisioned:

1. It would employ technology most teachers have access to, namely interactive whiteboards
2. It would be possible to be used in short increments of time, for 'brain break' type activities.
3. It would contain game-like elements, particularly the piano scroll interface used in video games like 'Guitar Hero'
4. It would focus on making music cooperatively with Boomwhackers.

Based on these criteria, one might conclude that all I had envisioned was the Song Wizard app — and they would correct.

I realize now, as I look upon the whole of the Whacky Wizards program, that what has been created is beyond anything I could have imagined before starting my master's degree. I was able to create not one, but three apps, and what is more, those apps are available to anyone with an internet connection. On top of that, the apps are housed on an attractive and functional website, which is a hub for a collection of comprehensive lessons and videos which explain not only how to use these apps, but the very essential components of music. Perhaps most remarkably of all (and trust me this is truly

extraordinary in my eyes), is that dozens of teachers were able to use these lessons to enrich the musical lives of hundreds of children.

To say simply that I am astonished at what this research has produced would bean understatement. And while I am immensely proud of what I've been able to accomplish, that pride pales in comparison to the gratitude I have for everyone who has supported me along the way.

What excited me the most is the opportunity I may have, hopefully in the not too distant future, to do a rhythm workshop in a school where a teacher might remark "I really wish I could do that with my students", and I can say "Oh, really? There's a website you might be interested to see…"

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Appendix 1 – Pre- and Post- Test Interview Questions

Whacky Wizards Research Project – Pre-test Interview Questions

Date & Time _____

*Participant Name*_____

Pseudonym _____

For general classroom teachers, proceed to Section 1.

For music specialists, skip Section 1 and go to Section 2.

Section 1 – Basic questions for General Classroom Teachers

1.0 – What grade(s) is your primary classroom?

1.1 – How many children are in the class that you will teach music to?

1.2 – Are your students currently receiving any music instruction?

1.2.1 – Who delivers this instruction?

1.2.2 – Is the music instructor a full/part time music specialist?

1.2.3 – Approximately how many hours/minutes of music instruction do your students receive a week?

Proceed to Section 3

Section 2 – Basic questions for Music Specialists

2.0 – To which grades do you teach music?

2.1 – How many students do you teach music to in a week?

2.2 – How many hours/minutes of instruction does each class receive?

Section 3 – Technology in the classroom

3.0 – Do you use a Smartboard/Projector/largeTV in your classroom?

3.0.1 – Can you describe the ways in which you use it? How often?

3.0.2 – What ways, if any, have you used it for music instruction?

3.1 – In what ways do you employ New Media in your lessons?

3.2 – What experience do you have with on-line learning for your own professional development? What works well, what doesn't?

3.3 – Do you think New Media/Interactive technologies are effective as teaching tools in general? Why?

Section 4 – Needs of Music Instructors

4.0 – The next section has to do with the perceived need of teachers delivering music instruction. These can be both specific to your situation and your ideas of needs in general

4.0.1 – What are the tangible needs? (These could include instruments, adequate teaching space, instructional materials, maintenance budget, storage space, etc)

4.0.2 – What are the intangible needs? (These could include time in the schedule to teach, willing students, supportive administrators, confidence with the subject, training, experience, etc)

4.1 – Of the needs identified, which would be particular to your situation?

4.2 – Of the needs identified, which do you feel apply more generally to all music instructors?

4.3 – Of the needs identified, which do you feel apply more specifically to non-specialist instructors?

Section 5 – Challenges/Barriers towards Music Instruction

5.0 – A barrier is anything that impedes the needs of instructors from being met completely, usually, but not always in the form of something lacking. The next questions concern the perceived barriers and challenges for the delivery of music instruction. These can be both specific to your situation and your ideas of barriers in general (These could include a lack of anything listed as a need)

5.0.1 – What are the tangible barriers?

5.0.2 – What are the intangible barriers?

5.1 – Of the barriers identified, which would be particular to your situation?

5.2 – Of the barriers identified, which do you feel apply more generally to all music instructors?

5.3 – Of the barriers identified, which do you feel apply more generally to all music instructors?

Section 6 – Music Teaching Experience

6.0 – The next section concerns your experience as a music instructor.

6.0.1 – How many years have you been teaching music?

6.0.2 – What grades/levels have you taught music to?

6.0.3 – What are your specific areas of expertise/comfort in teaching? (recorders, choir, percussion, Orff, etc)

6.1 – Do you feel like your students are receiving adequate music instruction, both in terms of time and quality? Why or why not?

Section 7 – The Music Curriculum

All questions in Section 7 will be answered on a scale of 1 to 10, (10 being highest).

7.0 – Where would you place your overall comfort or knowledge with Alberta's curriculum for elementary music education?

1 2 3 4 5 6 7 8 9 10

7.1 – The Alberta Music Curriculum is divided into General and Specific Learner Expectations. For each of the following General Learner Expectations, where would you place your students? (music specialists can indicate a specific class of grade level if preferred)

7.1.1 – Students have developed an enjoyment of music

1 2 3 4 5 6 7 8 9 10

(All remaining questions in this section follow the same format)

7.1.2 – Students have developed an awareness and appreciation of a variety of music, including music of the many cultures represented in Canada

7.1.3 – Students have developed insights into music through meaningful musical activities

7.1.4 – Students have developed self-expression and creativity

7.1.5 – Students have developed musical skills and knowledge

7.2 – The Specific Learner Expectations in the Alberta Music Curriculum are divided into sections for concepts and skills. For *each* of the following concepts and skills, please evaluate on a scale from one to ten:

• Your level of comfort or expertise with the concept or skill,

• What you feel your students' level of comfort or expertise is with the concept or skill (accommodating for age appropriate knowledge)

• Your level of comfort or expertise in *teaching* the concept or skill

Concepts

7.2.1 – rhythm

Your Level

1 2 3 4 5 6 7 8 9 10

Student Level

1 2 3 4 5 6 7 8 9 10

Teaching Level

1 2 3 4 5 6 7 8 9 10

(All remaining questions in this section follow the same format)

7.2.2 – melody

7.2.3 – harmony

7.2.4 – form

7.2.5 – expression

Skills

7.2.6 – singing

7.2.7 – playing instruments

7.2.8 – listening

7.2.9 – moving

7.2.10 – reading (and writing) music

7.2.11 – creating

Section 8 – Student Engagement

One measure of student engagement is to gain a sense of how much *meaning* an instructional activity has for the students. Meaning is created when students feel connected to the activity, and those connections can arise through the content of the lesson, the medium through which the content is delivered, or the emotions the lesson elicits. Given this outlook:

8.0 – What activities (or activity) engage(s) your students the most during their music instruction?

8.0.1 – What aspects of this activity have meaning for the students?

8.0.2 – How is this meaningfulness fostered?

8.1 – What activities (or activity) engage(s) your students the least during their music instruction?

8.1.1 – Why do you feel this activity lacks meaning for the students?

8.1.2 – Could you see a way in which this activity could become more meaningful?

Section 9 – Participation in the research study

9.0 – What attracted you to be a participant in this study?

9.1 – What outcomes are you hoping to achieve for your own professional development?

9.2 – Which needs for music instruction in your classroom are you wanting this research to address?

9.3 – Which barriers are you hoping it will reduce or remove?

Thanks so much for you time. The post-test interview will revisit many of these questions to see in what ways you have noticed changes in these areas. As always, if you have any further questions or comments please let me know.

Whacky Wizards Research Project – Post-test Interview Questions

Date & Time _____

*Participant Name*_____

Pseudonym _____

For general classroom teachers, proceed to Section 1.

For music specialists, skip Section 1 and go to Section 2.

Section 1 – Basic questions for General Classroom Teachers

1.0 – What grade(s) is your primary classroom?

1.1 – How many children are in the class that you will teach music to?

1.2 – Are you their primary music teacher?

1.3 – How many weekly minutes of music instruction the class receive?

1.4 - Is this an increase from before using the Whacky Wizards program?

Section 2 – Basic questions for Music Specialists

2.0 – To which grades do you teach music?

2.1 – How many students do you teach music to in a week?

2.2 – How many hours/minutes of instruction does each class receive?

Section 3 – Technology in the classroom

3.0 – Did you have any major technical issues using the Whacky Wizards program?

3.1 – Did you find that using the program made you more comfortable with the use of smartboard/ projector?

3.2 – Do you feel like it changed your perspective on how these technologies can be used (i.e. for music)

3.3 – Do you think New Media/Interactive technologies are effective as teaching tools in general? Why?

Section 4 – Needs of Music Instructors

4.0 – We talked in the pre-test interview about the needs of teachers with regards to music instruction. These needs were broken down into categories of tangible and intangible needs.

Tangible	Intangible
• Adequate Space • Proper instruments • Time in schedule • Good instructional materials	• Confidence teaching • Supportive administration • Engaged students • Experience

4.1 – In what way do you feel like Whacky Wizards helped you address any of these needs?

4.2 – Do you feel like any of these needs are particularly pertinent to non-specialist instructors?

4.3 – Do you feel like these needs were met in a way that may not have been possible otherwise?

Section 5 – Challenges/Barriers towards Music Instruction

5.0 – The flip side of a need is a barrier – when the need for music instruction is unable to be met, it becomes an obstacle. Again, obstacles can be categorized in both tangible and intangible ways.

5.1 – Do you feel like certain barriers apply more to non-specialist music instructors?

5.1 – Do you feel like using the Whacky Wizards program removed any barriers you had previously experienced with music education? If so, what were they?

Section 6 – Music Teaching Experience

6.0 – How did using the Whacky Wizards program expand your knowledge or experience for teaching music/

6.1 – Do you feel like your students are receiving adequate music instruction, both in terms of time and quality? Why or why not?

6.2 – Originally, my thought for the program was to have a set of pre-defined lessons to follow, but because of the great variety of experience of teachers involved in the project, I changed it to be more a resource that

teachers were able to use to create their own lessons. How successful was this for you? What would you want to change or improve?

6.3 – How did the inclusion of a graph of curricular touchstones in the lessons benefit you?

Section 7 – The Music Curriculum

All questions in Section 7 will be answered on a scale of 1 to 10, (10 being highest).

7.0 – Where would you place your overall comfort or knowledge with Alberta's curriculum for elementary music education?

1 2 3 4 5 6 7 8 9 10

7.1 – The Alberta Music Curriculum is divided into General and Specific Learner Expectations. For each of the following General Learner Expectations, where would you place your students? (music specialists can indicate a specific class of grade level if preferred)

7.1.1 – Students have developed an enjoyment of music

1 2 3 4 5 6 7 8 9 10

(All remaining questions in this section follow the same format)

7.1.2 – Students have developed an awareness and appreciation of a variety of music, including music of the many cultures represented in Canada

7.1.3 – Students have developed insights into music through meaningful musical activities

7.1.4 – Students have developed self-expression and creativity

7.1.5 – Students have developed musical skills and knowledge

7.2 – The Specific Learner Expectations in the Alberta Music Curriculum are divided into sections for concepts and skills. For *each* of the following concepts and skills, please evaluate on a scale from one to ten:

• Your level of comfort or expertise with the concept or skill,

• What you feel your students' level of comfort or expertise is with the concept or skill (accommodating for age appropriate knowledge)

• Your level of comfort or expertise in *teaching* the concept or skill

Concepts

7.2.1 – rhythm

Your Level

1 2 3 4 5 6 7 8 9 10

Student Level

1 2 3 4 5 6 7 8 9 10

Teaching Level

1 2 3 4 5 6 7 8 9 10

(All remaining questions in this section follow the same format)

7.2.2 – melody

7.2.3 – harmony

7.2.4 – form

7.2.5 – expression

Skills

7.2.6 – singing

7.2.7 – playing instruments

7.2.8 – listening

7.2.9 – moving

7.2.10 – reading (and writing) music

7.2.11 – creating

Section 8 – Student Engagement

One measure of student engagement is to gain a sense of how much *meaning* an instructional activity has for the students. Meaning is created when students feel connected to the activity, and those connections can arise through the content of the lesson, the medium through which the content is delivered, or the emotions the lesson elicits. Given this outlook:

8.0 – How did the program help you engage with your students in meaningful ways?

(Or in what way did the program have meaning?)

8.1 – In what ways was the program similar to those activities identified as successful at engaging students previously?

8.2 – In what ways was it different?

8.3 – What role do you think the interactive nature of the program played in engaging with students?

8.4 – Can you think of ways that this program could be more meaningful or engaging?

8.5 – What activities were the least engaging for Students?

8.6 – In what ways could such an approach be employed in other contexts with the goal of engaging students (i.e., Drama, Art, other subjects)?

Section 9 – Participation in the research study

9.0 – What have been the benefits of being a participant in this study?

9.1 – Did you achieve the outcomes that you anticipated for your professional development?

9.2 – Did the program address the needs you were hoping it would?

9.3 – Did it reduce or remove the barriers you were hoping it would?

9.4 – How do you feel that the program assisted you in the delivery of music instruction in your classroom?

Section 10 – Commercial Viability

10.0 – Can you imagine this resource as being a commercially viable teaching tool?

10.1 – Would you be willing to subscribe and pay a monthly or yearly fee?

10.2 – What would you need to be included for you to feel like you were getting value for the investment (i.e. new lessons weekly/monthly, one-on-one tutoring)?

Thanks so much for being part of the study. I hope the Boomwhackers last a long time, and that you can continue to get use out of them.

Anything else you want to share? Experiences in the class with the program? Improvements?

Appendix 2 – App Change Logs

These change logs briefly document the changes and improvements made to each of the Whacky Wizards apps over the course of their development. Entries were made after most coding sessions when something significant was added or modified. Many comments are simply notes which the developer was making for himself. A more thorough catalog of changes, which can be accessed via the apps' GitHub pages, can be made available upon request.

Rhythm Tutor Change Log

I began the Rhythm Tutor program as a supplemental addition to the Whacky Wizards project as a way for either individuals to work on rhythmic patterns using Boomwhackers or drums (or anything they can tap), so that teachers could both work on simple rhythmic patterns in class and students could learn rhythmic patterns at home. This is potentially an important development as home-based study remains a possibility with COVID-19. The program was started on June 17, 2020.

The third (and final) addition to the Whacky Wizards program is called the Rhythm Tutor. The main idea is to be able to work on individual rhythmic patterns using Boomwhackers or drums (or anything they can tap).

Teachers could work on simple rhythmic patterns in class and/or students could learn them at home using Boomwhackers or just tapping along. The 'lyrics' help to learn and remember the patterns; the idea would be to say them as you are playing. One idea would be for students to learn individual rhythms at home, then when they get back to class, they can try putting them together using the larger rhythm looper. Of course this is potentially an important development as home based study remains a possibility with COVID-19.

The project basically is a reorganization of the looper to include just two rows of notes, one low and one high, with a section to see words to speak ('lyrics') to the rhythmic patterns. While this is in some ways a simplification of the looper program it presents it's own challenges to make the choice of notes and instruments possible through menus.

June 19

Essential framework and layout of program complete.

Features:

- Users can choose from 6 rhythmic patterns (more to come).

- Users can add a drum loop to play along with (direct import from Looper)
- Standard play/pause, stop buttons, volume and mute controls imported from looper
- Users can choose between hearing the rhythm being played on Boomwhackers or various types of drums.
- If users choose to play with Boomwhackers, they can choose which notes they are using to play along with via menus

Features yet to implement

- I want note possibilities as low notes get higher to decrease so that you can never have a high note lower than your low note.
- Nicer menu layout with custom colors (I think I can figure this out with some fiddling)
- Get the lyrics to show up where they are supposed to (lined up with notes) and have the playhead highlight them.

There is a lot of fiddling around with menus and menu values in the code and a lot of things switching other things on or off. I am a bit worried that I will lose track of the flow. I should really look into that program of Georg's to create flowcharts of the programs.

I'd like the program to be done by the end of June, along with my other two programs, get them nice and tidy and documented well. We'll see how that goes.

June 21

Managed to get the note menus to increase or decrease based on the number of available notes. Also added lyrics, they are lined up and are highlighted with the rhythm. Still working on menu display to get it to be vertical rather than horizontal.

June 24

Spent time tidying code, adding capacity to use different soundfonts from the Gleitz Repo. Will probably lift everything on the interface today as well.

Oct 14-15

Back to the program after several months away. Preparing to upload to Website. Fixed minor bugs in pattern and drum loop menus (id names didn't match up). Set initial value for grid_beat_count function to set counts and lyrics. Made appearance and color more consistent with other apps, including title, borders around elements Logo and link in corner, 'fill' effect on sliders, spacing of elements, menus at top of screen

Whacky Looper Change Log

I haven't documented this particularly well up to this point. The program was started in late October 2019. The latest version was made around March 18, 2020.

May 21

Updated the program so that the stop button works. Did this by renaming the drawMatrix function so that it is contained in a global variable. This is the way that we can get functions to be accessible in all instances or namespaces, VERY IMPORTANT. Created a branch off the master, then merged and deleted it.

June 6

After successfully updating the song-wizard to NOT use a name space division, and to use the existing DOM elements and styling with CSS, I've decided to update this program to use a lot of the same conventions, particularly for being able to have dynamic sizing. It will be sized to a 16/9 ratio.

I also plan to change the delete row buttons to real buttons, and to add some other functionality. I would like to add a menu that would pre-load a number of patterns. As a long term goal, I hope to add a percussion/drum loop function as well.

Added a lot of cosmetic improvements, mostly through CSS

June 9

An almost complete rewrite of the program has streamlined functions and stored many variables in arrays which makes for easier access by functions. Particularly important is the use of an array for the main parts. This overcomes the difficulty of naming them and replacing the sequences for the names (i.e. CPat, DPat, etc.). This streamlines many functions. Hopefully this will also pave the way for user generated patterns. I probably shaved 100 - 150 lines of code out of the program today.

Added:

- A menu for choosing song patterns
- Buttons on each row for deleting, filling and muting that row's patterns
- A print button which is really just a novel way of saving patterns that are then displayed in the web console. Again, a first step to user generated menus.
- Clear all button
- Fill all button
- Button to change counts on the top of the program from 8ths to 16ths

June 12

I've been working for a few days to get a drum looper working in p5.js, with drum beats using various sound fonts. My trials have been good, so I think it's time to try to add a menu to the looper where people could add a funky beat to their creation.

June 17

I've been working on a branch called drum-loop-addition. The following features have gotten the looper up to the point where I don't plan to add any functionality to it before the field test, just maybe some

layout/cosmetic changes and new loops/patterns. This branch will be merged into the main branch when the code is tidy.

Big addition is the Drum loops, all played with sound fonts, most of which I made or modified myself. Still working on how to pre-load them so there is no lag or delay. The program does not make use of samples at all anymore, just sound fonts. I have figured out how to create quasi-dynamic note playback.

All notes in a part need to be set to the same value, but that value will increase or decrease with bpm. This is done using the variable beat_time

Still some work to do with getting the interface pretty. I will probably shrink the whole grid down. I moved the add notes buttons to the left side of the grid. Not 100% sure on that.

I've also tried to store instruments as they are created in an array, then clear the array when the menu is changed. I'm not positive, but I think otherwise all the created instruments bog down memory.

The BPM setting in p5.Sound is somehow a little fast - I don't know how to fix it, but I slowed down the initial BPM settings and slider range and massaged the numbers in the display to reflect a more accurate bpm (at least at moderate tempos).

Big change was to try and make my functions more efficient, putting almost all objects and variables into arrays that the functions can use for loops to cycle through. I'll have to implement this in the Song wizard program as well.

Lastly, changed the playback function to only accept note values as arrays, and changed callback function so that it will play notes in the arrays only when they are there. With this system up to 64 notes could be played simultaneously (8 arrays with 8 notes each). This change will need to be made in the Song Wizard as well.

Added:

- A menu for choosing drum loops with 6 beats.
- Volume sliders and mute buttons for the main part and accompaniment.

(Volume is changed by adjusting the gain multiplier in the instrument playback, see changeLoop() and newAccomp() functions)

June 24

Tidying up code, adding improvements discovered when creating Rhythm Tutor. Eliminated redundant functions like clearAccomp() and replaceSequence (Absorbed them into their respective menu functions). Changed the highlight color for counts. Raised the Boomwhackers to the correct octave (they were too low). Added a few arguments for the newAccomp function that allow for more soundfonts to be chosen from the Gleitz repo

June 30

Added a few styling features to make it more consistent with other apps

- borderless mute buttons and progressive fill sliders,

- border colors to more muted blue

Started a new branch to shuffle things around on the canvas. Try to make appearance less cluttered.

- Moving all row buttons back together
- Moving div over
- Potentially moving menus
-At some point I found some nifty code to add a gradient to the sliders to show if they were full or not. I really wish I had recorded where I found that...

Oct 14-15

After several months away I am back to get the programs set up for the website.

- Tweaking interface
- Moved beat division next to BPM and added Label
- Centered title on Screen, made bigger
- Moved top menus
- Moved Logo/link to bottom right corner - less busy there, less obtrusive
- Moved Volume values below sliders
- Took away labels from drop down menus - Just used 'Choose a Pattern' as first choice
- Used this as a template to make other apps appear more consistent with this.
- Very happy with the look of things, going to merge onto main branch

FEATURES I WOULD LIKE TO SOMEDAY IMPLEMENT

- ability for users to save a certain number of their own loops as pre-sets. I just think that would be awesome.
- Maybe an undo button if someone deletes a row by accident? You would just have to save the current pattern of the row in a variable when the delete button was pressed. To undo, it would retrieve the pattern from that variable.

Song Wizard Change Log

The development of this app began in starting October 2019

Oct 4

Began program and created basic layout, first simple tracks playing

Oct 5

Added 'light-up' balls when notes played, added BPM functionality

Oct 7

Simplified song arrays to one line (previously each note had separate array)

Oct 10

First animation of balls dropping with music

Oct 14

Animation based on reading ahead in the song sequence

Oct 15

Created Main Program file to which future improvements would be added

Oct 18

Discovered partStep in p5.Sound which changed approach to animation

Oct 25

Spent a great deal of time spinning my wheels to improve animation - passed it off to Georg

Oct 30

Georg's smooth ball animation added - MAJOR update to main program

Oct 31

Dynamic array creation fixed (song length adjusts to pattern length)

Nov 1

Stop button fixed, menu changes now trigger stop button, BPM slider labelled

Nov 4

Created dynamic progress slider, timer, new Step Back and Step Forward buttons, dynamic BPM update, fixed animation pause

Nov 6

Added 5 new Songs, program has a total of 10 working tunes

Jan 15

Created a number of smaller sketches to understand how to implement key concepts namely, accompaniment tracks. Began working with soundfont loader. Figured out how to play chords, multiple tracks, multiple instruments.

Jan 23

Moved main song arrays into seperate file => song_arrays.js. New file for accompaniment arrays => accomp_arrays.js. Added volume slider & mute button for accompaniment

Jan 25

Function to remove/add accompaniment phrases with change menu (IT WORKS!). Began moving larger functions from the program to sepearte files to keep main sketch tidier.

Jan 30

Completed accompaniment patterns for 9 out of 10 menu selections, with different voicings, instruments.

Feb 5

Created loop to populate song menu from list, changed volume slider. Added a loading animation that prevents playback while sounds are loading

Feb 19

Was able to add Boomwhacker sound fonts. The quality of sound could still be improved, but sound is synched much better between accompaniment and main song

March 2 – 18

Set up GitHub repositories to house this project and the Looper program. Created website for project at www.whackywizards.com.

Apr 18

Began work on a separate branch to begin to address a number of key features I want to implement to improve the look, feel and functionality of the program. These include,

1) displaying only the number of balls needed for a particular song, in order of pitch lowest to highest

2) having the balls dynamically size to the screen, based on the number of notes in the song

3) having balls display their color according to their pitch.

4) including letter names for the notes,

5) adding black rings to notes below the main octave, to signify the use of octave caps

Apr 22

Successfully accomplished all changes outlined above. Up to two diatonic octaves can be supported. Working in 'converting_to_midi' branch. Still need to do some massaging to get animation looking good, particularly at slower tempos.

Apr 24

Merged 'converting_to_midi' to main branch. Changed name of main file to song-wizard from sketch. Standardized Boomwhacker sound font names, tidied up code and added loads of comments to explain.

May 19

Began Version 2.0 of the program - involves completely redesigning the interface. I plan on using a canvas inside of a canvas or using an instance or namespace of one canvas inside of the other. This is tricky business, becuase there has to be global variables and functions that can affect both canvases. I expect this to take about a month of work.

The canvases will be built with units, essentially grid blocks. Resizing the entire program should be as simple as resizing the unit size. The first thing to do is to create a new instance that allows the whole program to run as it does now, but in its own instance canvas. The files need to be loaded in the index in order - The main canvas first and the smaller, inner canvas second.

If this deosn't work as planned, I may have to keep the inner canvas as the global canvas, and make the outer one (behind), the seperate instance. Let's hope that this works...

May 21

Figured out that functions need to be stored in global variables to be accessed in all instances (namespaces). Trying to convert program to make use of this. What ultimately needs to be a global variable and what doesn't is something I'm still learning

June 2

After much fiddling with namespaces and a GUI library for custom buttons, I decided to go back to just using the DOM elements and figuring out how to style them with CSS. WAY BETTER!

I got a lot of help from Christine Clark, who taught me about how to use P5 to create DIVs and containers in the HTML to store these elements, which makes them much easier to style using addClass() and CSS stylesheets.

I worked on a sample sketch in the p5 online editor to get all the styling, then imported all the CSS and samples into this program. By the end of the day, things were looking more like I wanted them.

June 4

Finished interface improvements, got menus to work. Individual menu functions are embedded in the w3schools menu function (tricky to find). Added note names and ball drop checkboxes. Still think there's work to be done for arranging elements but they are all there. Everything seems to be sizing dynamically as well. Cleaned up global variables, need to clean up and annotate CSS more. Program is looking pretty much how I want it for now.

June 24

Started a new branch called accomp-choices to try and get accompaniment menu working. I will also implement all the improvements and small code efficiencies discovered while working on the Whacky Looper and Rhythm Tutor. In particular, the capacity for the sound font instruments to play arrays from 1 to 8 notes, which is a marked improvement to the way they are working here. This will allow me to add the capacity to change accompaniments.

Put the changeMenu function back into the main program and renamed it changeSong. Put the newAccomp function back into the main program as well

June 26

Finished getting the accompaniments to work. Added a selection of instruments in families. Regardless of family this is roughly how they are working:

inst_1 - Melodic Lead

inst_2 - Instrument 2

inst_3 - Instrument 3

inst_4 - Chordal instrument

inst_5 - Alternate lead

inst_6 - Main Bass

inst_7 - Alternate Bass

inst_8 - Percussion (Drums)

Inst_8 is only turned on if it's value does not equal 0, so it doesn't play for every track. I had to add a drum pattern for every song, and I tidied up the accompaniment patterns so that they were organized one or two measures per line. While I feel that there is work to be done, I'm fairly pleased with how this turned out.

I moved things around on the interface and cleaned the mute buttons as well. I'm feeling a bit discouraged that my code sucks but it works like I want it to, so that's saying something.

June 29

Added styling to sliders that fills them up using a gradient. Changed the styling and underlying code of the toggle switches to make them more attractive with Off/On labels

Oct 21

Updated program to have more consistent look with other apps. Fixed bug in Song menu for Three Little Kittens. Increased font size for volume labels. Moved volume slider & mute buttons. Changed Mute buttons. Changed Song and Accompaniment selection menus, eliminated labels.

Oct 23

I spent the afternoon adding a loop and accelerate loop feature to the program. They borrow a lot of ideas from the other apps. Basically just boolean switches that turn on or off looping functions. Functionally additions found in 'sequence' callback. Accelerated loops add 10 BPM per passthrough until max tempo is reached.

FEATURES I WOULD LIKE TO IMPLEMENT:

- A loop button to play the songs over and over - DONE!
- An Accelerating loop feature so the song gets faster every repeat. -DONE
- Many more songs - some with various difficulty levels.
- Multi-Voice songs = more than one ball dropping at a time. This would involve duplicating the main part and simultaneously running two parts. Maybe all it would take is the creation of another phrase calling the same functions. But I think they could both run at the same time and call the same functions.

INTERFACE IDEAS

to make more consistent with other apps. Perhaps consider making ball drop window wider and less high, placing song and accompaniment menus above ball drop window, making volume sliders vertical - just throwing it out there...