ME AND MATHEMATICS:

“DOING WHAT YOU’RE TALKING ABOUT”: IN DIALOGUE WITH MY FAMILY

by

EDEN MORRIS

A master’s capstone submitted to the Graduate Faculty in Liberal Studies in partial fulfillment of the requirements for the degree of Master of Arts,
The City University of New York

2024

APPROVAL

Me and Mathematics:
"Doing What You're Talking About": In Dialogue with My Family

by

Eden Morris

This manuscript has been read and accepted for the Graduate Faculty in
Liberal Studies in satisfaction of the capstone requirement
for the degree of Master of Arts.

Approved: April 2024

Beth Ferholt, Advisor

David T. Humphries, Acting Executive Officer

THE CITY UNIVERSITY OF NEW YORK

ABSTRACT

Me and Mathematics:

"Doing What You're Talking About": In Dialogue with My Family

by

Eden Morris

Advisor: Beth Ferholt

This paper is a philosophically oriented accompaniment to my audio project (accessible through the following link: https://cuny.manifoldapp.org/projects/me-and-mathematics). Working together, the paper and audio collages form a call to action and a resource. My primary finding is the importance of *doing what you're talking about* or exploring and implementing your ideas experientially. *Doing what you're talking about* is important for effective teaching/learning and feeling in line with oneself. This working concept came to my attention during my research conversation with my oldest living relative, and then, again, with my youngest (non-baby) relative. This *doing what you're talking about* is a way of being that is particularly useful for math teachers and teacher educators but is useful for many others as well. I believe that everyone is unique, with their own unique abilities and unique learning styles. Despite learning differences, there may be ways that math education could be better for everyone. I hope this project can act as a catalyst towards finding ways that math educational experiences could be improved for both teachers and learners. I have a positive and unique relationship with, and positionality towards mathematics. My aim is to share some of my personal educational and mathematical perspectives, as someone diagnosed with a "learning disability," "dyslexia."

I don’t really think of myself as “disabled,” so understanding myself as someone with a learning disability can be confusing. Lambert and Harriss explain that “it is the social effects of difference that disable rather than the differences themselves,” which really resonates with me. I love the way they “avoid a deficit approach to disability” (Lambert & Harriss, 2022, p.90–91). Throughout this project, I aimed to use my abilities and do things I like, allowing me to feel like I am being me. I took this master’s capstone project as an opportunity to engage in dialogue with my family and to use my artistic ear to create audio collages. The audio collages are about me, mathematics, philosophies of teaching/learning, and my methods of reflectively incorporating myself into what I do. My hope is that teachers and teacher educators might be able use my project and findings to help them in their imagination and creation of better educational experiences for everyone, especially within the field of mathematics. Furthermore, I hope that the audio collages stimulate the ears and minds of all who listen.

I find myself personally engaging with these questions in this paper, and I invite you to join me:

- When do you feel “your-self?”
- How do you learn?

ACKNOWLEDGMENTS

I'd like to acknowledge the people in my life: My friends, my family, and my supervisor Beth Ferholt, who have all allowed me to feel seen and heard as myself: by believing in me, my process, and my abilities.

My supervisor Beth Ferholt's words continuously allow me to feel like I can be me within the context of Graduate School, along with my strengths and challenges.

I'd like to additionally thank each of my family members who had a call with me for the creation of this project. It is a joy to listen to your voices. And a special thanks to Malakai for his unique perspective and contributions to my project.

Thank you also to my editor Nicole, who helped me translate multiple ideas into accessible, communicative written form.

CONTENTS

DIGITAL MANIFEST

I. White Paper (PDF)

II. WAV Audio File(s)

• Online location:

https://cuny.manifoldapp.org/projects/me-and-mathematics

A NOTE ON TECHNICAL SPECIFICATIONS

- Zoom: I used Zoom to create recorded conversations.
- M4A to WAV Converter: I used an online converter to put the zoom recording into a better editing file format.
- Audacity (3.2.1): I used Audacity, a free audio editing software, first to snip and label my conversations. I then used it to arrange multiple tracks and record onto another track within the same file.
- iPhone voice memos: I used some previous recordings of mine.
- Google drive: I used Google drive to share voice clips that I was interested in using with my respective family member for approval.
- YouTube: I relied on short YouTube tutorials while learning to use the audio editing software Audacity.
- Email/ Messenger App/ Text: I used these modes of messaging to plan and communicate with my participants.

Chapter 1: Introduction

This paper and this project are, together, a philosophical, mathematical, musical, family-oriented and relational, autoethnographic exploration and expression of myself, but also a call to action and a resource for teachers and learners. I believe we are all teachers and learners and thus can all benefit from my findings. My primary finding is that *doing what you're talking about* or acting on your ideas, is essential for effective teaching/learning, and one's sense of self. This working concept came to my attention during my research conversation with my oldest relative, and then, again, with my youngest (non-baby) relative. This *doing what you're talking about* is a notion, a way of being that is especially useful in teaching and learning. As a math tutor myself, I intend to always be a mathematics learner. I like to be aware of my own learning, my strengths, and challenges. I believe everyone is unique with their own unique abilities and unique learning styles, but there may be ways that education and math education could be better for everyone. I hope this project can contribute towards finding ways math education could be improved. My aim is to share my understandings and perspective, as someone diagnosed with a learning disability or "dyslexia" who has her own unique position and relationship with mathematics.

I don't really think of myself as "disabled" so understanding myself as having a learning disability can be confusing. Lambert and Harriss explain that "it is the social effects of difference that disable rather than the differences themselves" which really resonates with me. I love the way they "avoid a deficit approach to disability" (Lambert & Harriss, 2022, p.90–91) by relying on neurodiversity theory, "developed in the autistic community" (Robertson & Ne'eman, 2008, as seen in Lambert & Harriss, 2022, p.90). Throughout this project, I aimed to use my abilities and do things I like, allowing me to feel like I am being me. I took this masters capstone project as an opportunity to engage in dialogue with my family about my interests and analyze our

conversations into the creation of audio collages. The collages are about me, mathematics, philosophies of teaching/learning and my methods. The audio collages exist in "an almost utopian space" (B. Ferholt, personal communication, April 6, 2024), in that they don't engage with deficits of math education as it is. My hope is that teachers and teacher educators might be able to use my project and findings to help in their imagination and creation of better educational experiences for everyone, especially within mathematics.

Audio Collages

This capstone project consists of three audio collages and this paper. The audio collages gave me an alternative form in which to explore my ideas and express myself artistically. In communicating through art, I wish to afford you the listener with interpretive agency, just as I felt agency in the art making process.

Reading and Listening

If you have not already listened to my audio collages, I would recommend doing so now [pause here to listen via this link: https://cuny.manifoldapp.org/projects/me-and-mathematics/resource-collection/audio-collages]. This paper is meant to contextualize (my making of) the audio collages within my own life and thought. In the following section I describe my process making the collages which I believe would be more meaningful and interesting after having listened to them, as you might even have questions. If at any time you find that you could use a break from reading, but would like to stay engaged with my project, you can listen to an audio collage. My process writing involved a lot of breaks from writing, while staying engaged in my project through listening to my recorded conversations and audio collages. The Appendix of this paper can be read if you would like more access to the conversational context for the things said in the collages, and how I see these clips forming a cohesive topic together.

What I Did

I have created a collection of audio collages to bring together my multifaceted interests and express myself. The audio collages are primarily built out of the voices of my family members, recorded while in conversation with me about mathematics, education, and their own related ideas and memories. During each conversation, I aimed to be flexible with the structure and content of the discussion, while we co-imagined ways that mathematics education could be. I wanted to avoid a prescriptive interview format to allow my relatives' ideas to be unrestrained and to process and incorporate their contributions as collaborators in my work.

Each conversation I had with a family member was approximately 40 minutes to an hour in length and took place on a consensually recorded Zoom call. I then imported the recording into the free audio editing software Audacity, where I listened closely to the conversation and labeled my favourite parts.[1] I then sent my favourite parts to the family member to listen to and I asked if they would: approve or disapprove of these clips use in my project and if there are any parts they particularly liked. I then continued listening to these favourite clips and transcribed them, as to see them on the page together, and further my analysis of the conversations. From there I further refined the many clips by highlighting the transcribed parts that seemed especially relevant to my project, or particularly stood out to me.

As I was highlighting, I discovered emerging themes that I wanted to include in my work, and I switch to colour-coded highlighting to identify them. I then dropped the clips with a common theme/ highlighted colour into a new Audacity file. From there my process continued to rely heavily on listening. Each final audio collage is arranged with three components;

[1] The labeling of favourite parts is an established method of audio and video analysis, used in Beth Ferholt's work on play-worlds (Ferholt, 2009, p111).

vocalizations from these conversations; ambient sounds and noises I recorded separately (walking with birds, the patter of rain from within a car, among others); and a track of harp music that I played and recorded whilst listening to my arrangement of the voices. To me the environmental track represents being-in-the-world, and just now I realize that the voices of my family can be representative of being-with-others, while my playing harp is in some ways being-with-myself.

Why I Did This

I am interested in all of these being-withs, and wish to explore them, and their dialogic possibility. Bakhtin uses the term *dialogic* to mean engaging in a dialogue with another that is reciprocal in which further understanding can be achieved. To me dialogism as engaged, interactive, and open to further understanding, is applicable to more than just spoken or written dialogue: this can be taken as a mindset or a way of being-with. Dialogism understood this way puts Bakhtin into dialogue with other philosophers and scholars such as Heidegger and Stetsenko. I have found the term *hermeneutic,* in reference to Heidegger's *hermeneutic circle* especially helpful and connected to Bakhtin's dialogism, as both concepts can be understood as ways of passing back and forth between two perspectives as to reach a deeper understanding (Heidegger, 1927). The structure of the audio collages and this project more generally is based in my interpretation of and interest in this approach to understanding. I created my project in this way (format/process) to further explore my interests in a way that feels very true to myself.

The process of making the audio collages initially involved conversation, and then required listening, creativity, and artistic open-mindedness to complete. These acts and practices are authentic to me: I like to do them, and they feel natural to me. To clarify, the project was not constructed in this way to make it "easy" for me, but to make it feel "natural" to me, to feel I am

being me, bringing together my interests, aptitudes, and ways of *knowing*. There were plenty of parts that were not "easy" (writing, learning to use Audacity, editing). I wanted to make this clarification because I don't believe one should only use their strengths and avoid their challenges, but rather, it might be important to find ways to incorporate one's strengths in working with challenges, to make the process more fun and "natural" feeling (as opposed to a battle…).

Being Me in What I Do

Throughout this project I have aimed to feel I can be me in what I do and bring myself to this project. My finding for this project, the importance of *doing what you're talking about*, helped me frame my project and better understand how dialogicity[2] is related to the goal of being me, in action. Ultimately my methods heavily rely on these interactive and reflective notions.

Finding: "Doing What You're Talking About"

On the very first call with my mother, during which we discussed my vision for this project, she said, "You're doing what you're talking about" (personal communication, March 21, 2024). It is important to me to see how *doing what I'm talking about* can be incorporated at all the levels of the project, in an attempt to actually *do* what I'm *talking about*. In this way, my method and subject are the same thing, based on me, my own intellectual and creative frameworks and reflectivity on how I want to be living my life. This concept of reflexive praxis—engaging in the very activity or idea that you are describing, in real time—has been a

[2] 'Dialogicity' as a term (to me) sounds more fitting than 'dialogism,' as an actionable concept: "to do something dialogically," but I am not the first to use it. 'Dialogicity' is used in the following article within the field of math teacher education: "Reflections on Dialogicity: Challenges and Suggestions by Mathematics Student Teachers" (Lehesvuori et al., 2021). 'Dialogicity' is also defined on Wiktionary as "The state in which the self is fundamentally connected to others, oneself, and the world, via dialogue" ("Dialogicity," 2021). This is interesting, and I used the word without knowing this definition, although I would like to further explore 'dialogicity' now, with this definition.

great source of inspiration to me. Ringing through on the reverse of my mother's statement is "talking about what you do" or "talking about what you're doing." And it all makes perfect sense, that I can hermeneutically study what I do, and do what I study… In the end, this finding—the importance of *doing what you're talking about*, has helped me frame and engage with this project.

In a broader sense, reflecting on *doing what you're talking about* sheds light on the existential concern of "how can I be me?", or "what is a way of being in which I feel like I'm being me?", or, in this context, "how can I be me and bring together my different interests in this project?". This finding of *doing what you're talking about* also supports my hypothesis about the importance of dialogic being-with, to (the process of) being me. My finding emerged out of two of my conversations. In these two conversations my family member and I did what we were talking about in the midst of our conversation. I will expand upon this in [Chapter 5] of this paper. These moments initially stood out as interesting to me, and then I realized that they were connected in this way.

There is of course a colloquial interpretation to *doing what you're talking about* that is important in all areas of life: living by your values, practicing honesty, and avoiding hypocrisy are all commonly accepted moral norms. I would further suggest that it may be an especially relevant and overlooked notion for teaching/learning. The best educational experiences regularly involve more engagement from both teachers and learners as opposed to a model in which the learner is thought of as a passive recipient of knowledge from the teacher. This divide between teacher and learner is challenged by Stetsenko, and Miyazaki, who each present a model in which the teacher actually also learns about the topic through the students (learning) (Miyazaki,

2019; Wortham, 2021). When a teacher is *doing what they're talking about*, they become a learner, and the learning experience is enhanced for all.

Dialogic Being-With

Largely what I am interested in is a way of being (understood colloquially as being in everyday life, in any contexts, in what you do) that allows a person to represent and express themself in a way that feels aligned with their internal world. This concept of *being yourself* is one most have engaged with in one way or another and may be dismissed out of hand as being trite, but I believe it is important. I find the ubiquity of this theme *being yourself* as a *way of being* allows me to be in conversation with multiple philosophical theorists whose ideas interest me. I want to be me (in what I do), or as Anna Stetsenko describes it, to be "engaged in the project of becoming," to explore with others, who we are in the world (Wortham, 2021, 16:30). I think of engaging in the project of becoming, as being-me, in that I am a constantly developing, embedded, dynamic entity. By understanding Being and being me as primary to what I do: being me becomes a way of researching (a method), and a way of teaching/learning, because I can think of these activities as contained in the most basic activity—Being.

I put together the terms *dialogic* and *being-with*, as a concept, and a hypothesis with which to further investigate being me and bringing together my interests: I suspected that *being me* is related to *dialogic being-with*, as a way of being-with, -oneself, -others and -the-world. By using my new phrase *dialogic being-with*, I aimed to synthesize my understanding of Bakhtin, Heidegger, Miyazaki, and Stetsenko whose works all incorporate ideas that I feel relate to this concept. I wish to further investigate this way of being as a research method, and how it relates to being myself.

Method

The nature of this research leads me to investigate by doing, or attempting to do the very thing I am attempting to analyze or describe. Being myself: using/finding my own voice, making art, and engaging in activities that I feel are a true expression of myself and my curiosity, is all integral to this enjoyable exploration. I also employ the use of autoethnography, which as a method is well aligned with my goal of being myself and expressing myself, while I further "interrogate the intersections between self and society, the particular and the general" (Adams et al., 2015, p.1). Autoethnographic research regularly includes reflexivity about personal experiences, valuing relationships with others, incorporating emotion and creativity, and exposing the process of "figuring out what to do"—all of which I aim to do in this work (Adams et al., 2015, p.2).

Chapter 2: Inspirations

I am influenced by what I read, even more influenced by what I listen to, and likely even more than that, influenced by the actual people in my life. My academic influences include mathematicians, philosophers, and education researchers. My primary musical influences for this project are my friends.

Academic Influences

In my application to the Graduate Center, I mentioned the Mathematician William Thurston as an inspiration of mine. Thurston expressed his views on mathematical practice, and he cared about mathematics education; he philosophized about mathematics and what it was that he was doing. I have primarily accessed his working philosophy by listening to and watching his lectures on YouTube, which tend to start with a more philosophical introduction, before diving into the mathematics. In the last year of my undergraduate studies, I transcribed a few of his lecture introductions, which was a great way for me to engage with his ideas. Aside from the content, the transcribing was also an interesting experience in making written choices to try to capture or imitate how he was speaking and how he sounded. Thurston primarily believed that "mathematics consists of ways that people think," and that closely related to that is the challenge of how "to communicate mathematics to each other" (*Landau Lectures| Prof. Thurston | Part 1 | 1995/6*, 2014). Thurston emphasized sharing his personal understanding when communicating, and he valued the role of close collaborators in mathematics with whom he could communicate his personal understandings more successfully. In many ways I wish to work in his legacy, to help create better mathematics education informed by "the nature of mathematics [and] of mathematics education" (Thurston, 2005). To do this, my goal is to better understand both "the nature of" mathematics, and "the nature of" teaching/learning.

Last spring, the analysis of my class project was supported by Kiyotaka Miyazaki's writing on what makes a lesson dialogic according to "Saitou pedagogy" (Miyazaki, 2019). Miyazaki's pedagogical theorizing and analysis is underpinned by Bakhtin's definition of and writing on the dialogic author. I am interested in the possibilities described in Miyazaki's "Dialogic Lessons and Triadic Relationship Among Pupils, Learning Topic, and Teacher" for the betterment of mathematics teaching and learning. To best imagine this dialogic way of being described by Miyazaki, I sought to integrate it as a method in my current research, where "all participants have equal rights to what is true" (Miyazaki, 2019, p.62). Miyazaki describes how a teacher can be a dialogic participant and "authentic learner," which applies to researchers as well, where "to be the dialogic participant is to discover something significant in pupils' responses" (Miyazaki, 2019, p.84). In my project, I attempted to be a "dialogic participant" while hearing the participants' responses. My desire for dialogic participation in my research led me to engage in dialogue as my primary method of data creation and collection.

I was encouraged to read Bakhtin because I expressed enthusiasm about what Miyazaki was talking about. The term "dialogic" is a term employed by Bakhtin and used in contrast to the term "monologic." "The kind of discourse which is dialogic allows people to go beyond the authoritative dogma and investigate the message using their own understanding and then help create a proper communication" (Shirkhani et al., 2015, p.514). I have been interested in theorizing about *communication* and *understanding*, based on my own experience with these topics throughout my math education, and so Bakhtin's philosophizing on these notions excites me. Bakhtin says, "Any true understanding is dialogic in nature" (Bakhtin p.102, as seen in Bakhtin et al., 1994, p35). True understanding is not a finite enterprise, and so dialogicity to me means engaging in deep listening, with an attempt at deep understanding, that then opens the

door to further understanding. In creating the phrase dialogic being-with, I wanted to make explicit the way that Bakhtin's "dialogism" can come into our being-with (the world, each other, and our own selves).

Anna Stetsenko is a researcher at CUNY who emphasizes the way in which we all need to be humbler, and open to learning, especially within the context of mathematics education. She understands teaching and learning as really the same act and expresses a wish that the English language had a word for this teaching and learning concurrently as one. Stetsenko strongly recommends the stop (or pause) to current teaching practices and presents a possibility for pedagogy that I find to be both beautiful and meaningful:

> So we need to think of pedagogy as a joint project of becoming. […] From the first days of life, all of us are engaged in the project of becoming, which means finding out who we are, who we are in this world which we share with others—very important. But it's the project. It's the project and pursuit of finding out who we are [that is a] fundamental quest for all of us [and is mentioned by] many philosophers. [I'm urging all of us to imagine how within the classroom we can actively address the following question:] how do we join our students on a quest to together find out who we are in the world as it is today[?]
>
> (Wortham, 2021, 16:30)

I agree with Stetsenko that the primary goal of education could be this collaborative engagement in becoming ourselves in the world together. I recognize that schooling and education serve many functions in our society, but society and the functions schools play within it can and should be questioned, whereas the "project of becoming" can be seen as primary to being human. I believe that developing our understanding of what this "project of becoming" means can lead us closer to embodying our humanity as humans. This framing has been useful in my project, as it

allows me to see my desire to be me as analogous to the desire to be engaged in the project of becoming.

I do not conceptualize my life and research as separate, but as integrated, and this guides my methodological choices to explicitly intertwine my life and research in a way that is meaningful to me. In "THE CONSTANT: or Person-as-Place, and Research-Life," Beth Ferholt describes ways that she has worked with long-term friends as collaborators in her research (Ferholt & Schuck, 2023). Ferholt affirms that the "research-life process is as much or more a use of science in life, for life, as it is an attempt to bring life to science" (Ferholt & Schuck, 2023, p.25). My research process has been influenced by Ferholt's concept of research-life, the concept and usefulness of blending method and subject, and the benefits of collaborating through long-term meaningful relationships. I am additionally influenced by Ferholt's use of finding your "favourite parts" as a method in the analysis of film-play, or in my case, in the analysis of my recorded conversations with family (Ferholt, 2009).

Family

I know that my friends and family have a huge influence on me, and I initially thought of including both groups as participants in my project. I then decided to reduce my data collection through recorded conversations to just my family to reduce my recruiting population to an especially meaningful and diverse (in both age and interest) population. Using my family members as participants also felt in line with my previous work last spring and aligned with my family value of valuing family.

While there is plenty of mathematics education research, my research was uniquely brought into my own life through my meaningful relationships and interpersonal dialogues. Through the blending of method and subject, I aimed to learn more about dialogic being-with

through my dialogue with others. I was directed to further my research based on the conversations I had, and the perspectives of the people in my life, as I treat the research and my life hermeneutically, i.e., compoundingly influencing and enhancing the other in a cyclic way.

Music

My friends Harrison and Andrew (and our collaborative music, released on Bandcamp under the conceptual label collective HEATRR) were my biggest artistic influences for the making of my audio collages. They are both very skilled musically, and technologically, in the use of audio editing software to create sharable music files. Their independent musical output and my experimentation as part of our album "Zone Seeds" introduced me to the concept and construction of audio collages.

Both Harrison and Andrew value the use of found sounds from your environment (field recording), including voices speaking, in their music. About a month before my first family recorded conversation, I spoke with Andrew to get his view on the use of spoken voices in music (which I recorded to listen back on). He told me that he had just recently had a similar conversation with another friend who makes music about having the personal in your music and bringing in something from your own life. Andrew said:

> Sometimes we make music that can feel kind of out there or abstract to people,… but at the same time it is very personal, and it is something about our internal world,… having something that is very directly like 'here's like my friends talking',… and this literal thing that actually happens in everyday life, I think is a really cool way to bridge the gap.
>
> (A. Ames, personal communication, March 3, 2024)

Incidentally, Andrew's perspective on this unconsciously emulates Thurston's discussion of mathematics, which also makes specific reference to a gap that must be bridged in the

communication of mathematics from one's internal world. Andrew's view on bringing the personal into one's art and one's communication with others fit well with my plan to bring together my life and my work. I replied that "For me, I feel like things are so much more meaningful if they are personal like that." Andrew agreed and brought up that it can feel better to just let yourself be emotional. I was glad he brought up emotion, and I commented that I find it interesting the way that emotion can get expressed like this. Andrew agreed and noted that even if it's just of us "goofing around, making jokes or whatever," that emotion is portrayed in the quality of people's voices (A. Ames, personal communication, March 3, 2024).

Our mutual interest in this "quality of people's voices" to me transcends auditory experience and ties into my desire to use my own voice even when writing, and my interest in transcription. Harrison and Andrew have influenced me musically but also influenced my thought, because some of my most positive feelings of collaborating in music and in mathematics have been with them, and I believe these positive collaborative experiences are worth analyzing and theorizing from.

Chapter 3: Philosophically Oriented Educational Autoethnography

Placed within the context of my life, some experiences seem especially important for this project's impetus. I believe that, as much as possible, we should seek to understand all things this way: that to *fully* understand something it must be understood within the context of *everything* else. Generally, at best, we can only hope to pick out some of the most important factors to put the *something* in the context of.

Educational Autoethnography

We all have our own stories and experiences as students, on which to base our theorizing about teaching, learning, and knowledge, and from which to reflect on educational practices and education systems. Many of my friends and other people I have spoken with have deeply reflected upon their time in schooling, as it plays a large role in our lives for many formative years.

Reading and Writing

As a young child, I engaged in many activities that allowed me to explore my aptitudes such as music and art. I felt I was good at these things, and good at many things, although I learned early on to feel like there was something wrong with me for not reading.

Reading

As early as first grade, because I wasn't reading the way that others could, and I found it challenging, I became defensive and began to say I didn't like it. At some point, I started saying Dr. Seuss books were my favourite when asked, because it received a much better reaction from people than "I don't like reading"—everyone likes Dr. Seuss, and they could also take it as a joke. At my elementary school, whenever we went to the library, we had to take out the number of books equivalent to the grade that we were in. In my final year, sixth grade, I found this

especially intimidating, and I would primarily take out fairy tales with beautiful pictures. I had to be confident in the checkout line around other students and the librarian about repeatedly taking out the Twelve Dancing Princesses and the different versions of Cinderella from around the world. Larger books, and books without pictures felt too intimidating, there would be too many words I didn't know, and I would never be able to read them fast enough.

I had a reading tutor twice; with the first one I just remember having to go through the alphabet to say the sound of each letter, and she was very picky about how consonant sounds must be said in this way that excluded any vowel sounds. The second tutor was very nice, and I remember learning some song-like memory tools like "I before E except after C, and in neighbour and weigh." She taught me rules, and their exceptions, and then when I would try and find more exceptions, she praised my thinking. I think I struggle with learning the rules of language, and spelling, which don't seem explicit, and are only sometimes followed. I actually felt that I didn't want to improve in reading because I believed that if I did, it might retract from my other abilities like art and math, as though there was some total amount of ability that everyone has, that got divided into me in a certain way.

Throughout school, when assigned books to read, either my parents or friends would need to read them to me, or I simply would not read them. I would do my best to gather what was going on during class discussion.

Writing

(Meta-comment: My friend and editor Nicole expressed regret for suggesting edits to this section, and wondered if she should just leave it how it was. I thought that was sweet of her, but ultimately it is important to make my writing accessible to a larger audience, instead of just writing for those who already know me well. This makes me think also about transcription. For

me, all the little sentence restarts and filler words, of spoken language can provide a feeling of closer access to the speaker's thinking processes in real time. Most people might prefer a transcription that is cleaned up, as it might be easier to read, with better flow and efficiency. I wonder what can get lost in the cleaning up of thoughts, or spoken words to written text, such as the speaker's humility, which might feel more apparent in their sentence restarts and filler words. I hope my humility and access to my thinking are present in my work for the reader and listener.)

Writing takes a lot of work. In high, school either my best friend Lucie or my mom would transcribe my dictations, which involved the cumbersome step of translating what I wanted to say from spoken into written form. This translation from oral to written is difficult for me: speaking is less linear and far less formal, the "rules" seem more flexible, and it doesn't have spelling either, all of which hinder my ability to write fluently. At the advent of high school and undergraduate coursework entered the added difficulty of citations and style guides. Writing has always felt so burdensome, with so much for me to do at once while trying to record my thoughts and ideas. My writing and editing style is extensive, usually starting with words with a vague sentence and paragraph structure, eventually growing to actual sentences and so on, with many review stages. Throughout college, my best friends always helped me immensely with editing. By the end of my bachelor's degree, my friend Nicole mentioned how much I had improved: that there wasn't even much to do to help edit the final essay she looked over for me. That was encouraging, and a helpful voice to hold in my head, about my improvement of this skill, and has contributed towards my efforts in combatting the belief that I am a bad writer. I am excited by using my own voice in writing, as it feels far more natural, and I am so thankful to get to write this with that feeling of being me, although it still requires a lot of work.

Mathematics

I believe I always understood mathematics. It made sense to me. My father and I would talk about math. We would chat about fun tricks or ways of thinking about things, and from a very early age I remember understanding what was going on with numbers when you multiply. I certainly did not have my multiplication tables memorized, and I still sometimes need to think to be sure, but I always know that I can figure it out and that that's what matters. So, in elementary school, I understood, but was not particularly fast, while many other people memorized. When reading "Insider Accounts of Dyslexia from Research Mathematicians," I found the strengths and challenges described by these mathematicians extremely relatable (Lambert & Harriss, 2022). It was particularly interesting to me when these findings were compared with previous "research on mathematicians describing their own thinking, research that does not specifically mention neurodiversity" (Lambert & Harriss, 2022). Many of the strengths and values were the same across all mathematicians surveyed, but while in "Burton's study (2004), mathematicians described a primary mathematics focused on facts and memorization as being unfulfilling, memorization is not described as a barrier" (Lambert & Harriss, 2022). This is interesting to me, and I wonder if in some ways I needed to understand math, because I couldn't memorize it.

In middle school, I started to like math more, and I had a great math teacher. If you were able to get above a certain grade on the quiz early in the unit, you could choose to work on more challenging material for the remainder of that unit. I got to learn about "*i*" (the square root of -1) and enjoyed playing around with it, doing operations. I asked my teacher when I would encounter "*i"* in school, and he responded that we would learn about it in eleventh grade. In the end, I had to wait until college. During my conversations with family for my project, many of

them thought back on times when they were given the opportunity to work on more challenging material (in math, or another subject), as a positive experience.

In high school, I got to help many of my friends in mathematics class, but I rarely did my homework. I remember the teacher coming around to check, and I just told her the names of some friends whom I had helped instead of doing the homework myself. She let me get away with this response because I was doing well in the class. I would also frequently leave during class to hang out with my friend, as I didn't feel I would be missing anything (that I didn't already know). My classmate who sat beside me thought it was unfair, that I did so well and didn't need to put in any work. Another friend of mine expressed to me that it was unfair that I was so good at math—all I could respond was that at least he was good at reading and that we all have different strengths. The most I ever really studied for tests would be on the way to school by just thinking through the things I would do on the test that I knew. Otherwise, I thought of tests as a fun challenge to try my best with what I knew and to work things out on the spot.

Undergraduate mathematics was much harder, and I had to put work into math, which I honestly didn't really know how to do. My previous approach to testing was especially unsuccessful. I did well in the intro year, which was quite like high school, but I remember having to redo a very long problem on a calculus exam because I found there was a mistake near the end. I had to take all my extra time to correct it and complete the exam, so I took that test for 4.5 hours (as I got time and a half for testing through the Office for Students with Disabilities).

"Real math" started in the second year and there were a lot of new ideas to understand. There was another time that I took all my extra time on an exam, and really applied myself—I had even studied at length to understand the material to the best of my abilities—but I had taken the wrong approach, and I was supposed to have memorized the longest proof of the class. Oh

well. The professor had to hold my exam up “to the light” (personal communication, December 22, 2017) and barely passed me. This was the first of a few math classes I took in the “Honors” stream, which were far more rigorous and always taught by research mathematicians. I was much more interested in learning about the topics being offered in “Honors” math, and I liked that what we learnt was always contextualized into a larger picture—connections were frequently being drawn. This contrasted with some classes I took in the “Majors” stream in which the material was presented like a set of distinct problems with prescribed procedures to follow, which seemed easy to me, but uninteresting, and I ultimately got low grades in those classes.

I eventually took a graduate-level geometry and topology class with multiple friends that I had made, and I was very keen on learning the material. This class was unique, as the lecturer really taught things in a way that gave insight into how he understood the material. My friends and I worked very hard and collaboratively on the weekly homework assignments, making large leaps in our understandings together. The professor once let my friend and I work on a midterm exam for that class together. At some point I remember speaking with the professor and feeling understood by him when he recognized that my expression on tests was quite rough, but that within class I was highly engaged and clearly understanding quite a lot.

My Higher Education

My undergraduate studies shaped my interests. By majoring in mathematics and taking a wide variety of mathematics classes, my conception of mathematics grew. I also gained more personal experiences in learning mathematics and reflected upon how I learn mathematics: largely through my relationships with friends in my classes to talk to and try to understand with—essentially making use of a dialogic learning strategy. By minoring in philosophy, I was exposed to many thinkers and questions, but I was particularly influenced by phenomenology

which brought to light the topic of Being and the significance of my own being-in-the-world and being-with-others (Heidegger, 1927). Through phenomenology I was also exposed to the concept of a hermeneutic circle. This idea was described with a metaphor about understanding a book: to understand a book, you need to have read all its parts to give you an idea of the book as a whole, but then in going back to the beginning you have a better understanding of that part based on your knowledge of the entire text, and then each part you reread gives a further understanding of the text as a whole, which then gives further context and understanding of the parts, and so on. Through a hermeneutic circle you're understanding continues to cyclically deepen through this back-and-forth contextualizing process indefinitely.

My interests in math and philosophy came together when I took a course on the philosophy of mathematics, and I believe it was the first time I heard the question "What is mathematics?" (D. Schlimm, personal communication, Fall 2017). I came to regard Mathematics as a human activity and felt it was important to further investigate the many ways in which mathematics is human.

When applying to the MALS program I articulated my interest in humanizing mathematics: in exploring mathematics from a humanistic point of view, including the "aesthetic, cultural, historical, literary, pedagogical, philosophical, psychological, and sociological aspects of mathematics as a human endeavour" (Huber & Karaali, 2015). I wrote about the mathematics professor with whom I took two (graduate) classes with. He values sharing his personal understanding (or how he thinks about things), more than formalizations. He hopes to give students a feel for things first, which makes lectures feel more conversational because he uses his own *voice*.

By reflecting on my many years of being a pupil in a math classroom, I became interested in the communication of mathematics, and in its teaching and learning. I also value using my own *voice* and bringing myself into how I communicate: sharing feeling for things, and communicating in a way that is less formal, more natural, more accessible, more interpersonal, more conversational, and which ultimately leads to feeling more creative, more myself, more aligned and "authentic." I believe that autoethnography as a field validates this form of communication, by allowing me to tell stories from my own life and use my own voice, as a way of presenting a context for my theorizing and understandings.

Philosophically Oriented Reflections

Within the school setting, students are frequently reduced to their grades and compared to others, although it is generally more constructive to be recognized by yourself and others for your skills and improvements with challenges. We all have our own particular way of understanding things, and to be recognized for your method of engagement can be more than just validating, but can propel you further.

Aptitudes in Relation to Others

How does better understanding myself relate to better understanding my aptitudes (including my strengths and challenges)? We are always in relation to others, and this relation may help us to understand ourselves better, although it is important to avoid enforcing hierarchies in doing so.

Usefulness

I find my psychoeducational assessments extremely useful in better understanding where I seem to have strengths and challenges. I received my first assessment in ninth grade, and my second one after my undergraduate degree, and before applying to graduate school (to receive

GRE accommodations, which I ultimately never took). It is interesting but also strange to be given multiple percentiles in which to compare yourself to the general population. Having an Individualized Education Plan (IEP) has been great, as it has given me testing accommodations which allowed me to continue this far academically, but it also sometimes felt like I was cheating or lucky to get extra time on exams, etc. In graduate school I haven't really used my IEP because I never had to take a test. I suppose I could have let my professors know that I have an IEP, so that we could discuss how I can best succeed in their classes, but it never came up.

Maybe it is natural to compare ourselves to others. I believe that the way in which I compare myself to others has influenced my decisions. I went to an arts high school in Toronto, where we all had an arts major which we got to do every day. I majored in visual arts, which was primarily a conceptual program and certainly contributed to my undergraduate interest in philosophy. I had friends across arts majors, (but especially in drama), and I got to help a good number of them with mathematics. I excelled in math and science compared to most of my multitalented—creative and artistic peers. I believe this influenced my decision to pursue math and science at McGill, because I thought of myself as good at it. I've said as a joke that if I had gone to a math-science specialty high school, that I might have pursued an undergraduate in art, but whether that really is just a joke is ambiguous.

Mathematics

These days, I spend a lot of time around math Ph.D. students and postdocs, because my partner is about to graduate from his PhD in math. In comparison to them, I don't do math: I tutor K–12 math, and I think about math in my master's degree. I have chosen not to pursue math at a graduate level. I consider it a choice in that I have the confidence that I would be capable of doing it (in the right department with the right supervisor…), but also believe it is not the right fit

for me, in terms of getting to further explore my interests in ways which feel best to me. It would be very challenging for me, and I would rather work hard elsewhere... Even though I never enrolled in graduate school for math, I have had the opportunity to take four graduate level mathematics classes: two at McGill, and two at the Graduate Center. Obviously, this puts me at a much higher percentile of mathematical learnedness than the general population, but I still find myself comparing myself to those in my immediate surroundings more so than the general population. Socially, when in a group that includes math graduate students and professors, I find myself unsure how to respond to questions like "do you do math?". Most people seem to be able to answer that kind of question clearly, with less nuance.

Possibilities

In my opinion, it is better to compare oneself to oneself as opposed to comparing oneself to others. Throughout my undergraduate degree, I improved significantly in writing. It is empowering to notice your own development and learning. It is important to understand oneself as developing, and never static. Under this view we can understand ourselves as both evolving through time, and as still the same person that we were as children.

Understanding

I've always aimed to understand the material I was learning, as opposed to just memorizing it. Some of my "learning disabilities" actually relate to memory, so it is very important for me that things I learn fit within a context and be placed within my other understandings for me to retain them. During undergrad, as I learned more mathematics, I felt my understanding of even the most basic concepts grow. I came to question what it means to understand mathematics. In working on homework problems with friends, it was fun, challenging, and personal to express how we were understanding things, to reach some shared

understanding. I felt that sharing that understanding can be vulnerable, and require trust, and self-confidence, and openness to further understanding. I will never forget when my friend Harrison expressed that for him to understand (in math), he needs to hold *it* in his hand. It made me think more about bodily understanding, such as feeling oriented in a place, or how the "mind" can extend into the fingers, like when I play the harp, and it is the fingers knowing what to do, which is also highly apparent when I'm braiding.

Personal Understanding

I am interested in engaging with learning material in a way that feels true to my own self and allows me to integrate it with myself. Sometimes in school, it feels like there isn't room to engage in a way that allows me to be myself. For example, I'm unlikely to connect to a course if it solely involves reading and writing, with little class discussion or room for alternative forms of creative exploration in assignments. I know this experience is not unique to me, that others also find much of schooling gives little room for their self-expression or authentic exploration of ideas. We may all need to engage and understand in our own way, in a way that makes sense to us, to understand *it* for ourselves. But we also must be able to enter into communicative conversation with others. This is a process that can be done hermeneutically, to engage first on some more personal level, and then to engage and communicate our findings in a more structurally formal or functional level. For example, I need to write clearly, and to read the writing of others, if I want to engage in constructive dialogue, and be part of a growing, hermeneutic cycle of thought. I feel much of my own processes of understanding happens outside of reading and writing, so it is important for me to also engage in these other ways of knowing such as art making and conversations or being at the park.

In revisiting the idea of understanding *something* in its context to *everything* else (i.e., the impossibility of a total or final understanding recognized by Bakhtin and by the concept of hermeneutics), we can also think of that external *everything* as our own *everything else*. Our *everything else's* are unique: we have all had our own experiences, have learnt different things, which are additionally processed by our own unique psychologies. So, in this way, the process of learning something new: of integrating, into our personal *everything else*, will be unique and dictated by each individual's psyche.

This conception of integrating into a larger (and personal) *everything else* is modeled by the philosopher Quine's "web of beliefs" (Quine, 1951). Quine's model has us imagine how everything we believe forms a large network, which is open to input and revision based on experience, but in which highly connected central beliefs would be difficult and unlikely to change. His model is based in his conception of science, and he states: "The unit of empirical significance is the whole of science" (Quine, 1951, p.39). Both Quine and I think of things as always being within an unknowably larger context, whether within science or our personal understandings.

Feeling Seen/Heard

I have experienced feeling seen and heard in my close musical collaboration. I also hold onto the times that I have felt understood for my strengths, in relation to my challenges. Teachers might have the opportunity to make a child feel seen and heard, contributing positively to the child's self-development and self-conception.

Music

An important example from my own life, that has acted as a metaphor and an influence throughout this project is my collaborative experience playing improvisational music with my

friends Harrison and Andrew. Our collaborations often incorporate the use of harp, guitar, vocalizing, synth and other computer and machine capabilities. We also frequently engage with our surroundings or the space/place that we are in, by listening and interacting to capture and create sounds that we like. When I create music with these friends, I feel very heard, encouraged, and able to experiment and try things. This experience creating music with them has created a paradigm from which to think about dialogic being-with, where I am feeling very me. It has also been a very rewarding experience when we record our sessions and listen back on them from a new outside/inside perspective. I feel excited to keep exploring this example from my own life as I continue to think about my finding— *doing what you're talking about*, and the possibility of the doing and the talking about happening hermeneutically or even simultaneously. (See Appendix B, for a reflection on a song and music video in which another friend of mine engages in the topic of being herself.)

English Self-expression

English was always my lowest grade in school, because of my challenges with reading and writing. I tended not to say much in class, and that would usually result in a low grade for participation. I felt seen though by my eleventh-twelfth-grade English teacher Kim. I will always hold onto her clarificatory recognition that I am actively participating in class, because Kim recognized that I was actively listening (even if it sounds like a joke to others, it made me feel seen). When I took Intro to Philosophy at McGill, I remember feeling surprised and excited that I was being recognized for my understanding, in my writing. Prior to that, it seemed that feedback given to me on written assignments would focus on how I was writing it, rather than my ideas, or what I was trying to say. The psycho-educational assessment that I took just prior to applying to graduate school involved writing a short essay. The assessment reports:

> Eden was required to write an essay based on her favourite activity, including at least three reasons why she likes it. She decided to write about bike riding. […] She included 3 paragraphs; however, she did not adhere to the instructions in that, rather than supporting her choice of activity with three elaborated reasons, instead, she described her history of riding, including two reasons for her choice. […] Her essay reflected her 'voice' and was interesting to read. There were some spelling errors on words that are fairly common ('road' instead of 'rode', 'allone' for 'alone', and 'exersize' for exercise').
>
> (P. Foreht, Psychoeducational Assessment Report, September 16, 2020)

It is certainly interesting to me to read that now, while writing this. I am very excited about being allowed and encouraged to write in my own voice for this project, and I feel encouraged to continue writing now and in the future in this way, which allows writing to feel self-expressive.

Educational Possibility

Teachers might have the opportunity to really see students and their skills and put powerful voices and dialogue into children's heads. For example, a great teacher might be able to discuss a student's difficulty with concentration in class, while emphasizing their skills. In conversation with Beth Ferholt, she described to me how the teacher might say, "How can you concentrate better in class, given that we know that your doodling in your notebook is not actually 'doodling', it's great artwork, and we're really supporting that, and there's no question in my mind that you have to keep doing your art in order to do your humanities work?". In this way "you're giving voice to these things, that the children, you hope, then keep in their mind simultaneous with the piece of the voice that says, 'I do need to pay more attention in class'" (B. Ferholt, personal communication, April 6, 2024).

My audio collages can be used as a tool to teach teachers about these kinds of dialogues that a teacher can instill in students, and Dr. Ferholt plans to play them for her foundations class. I was particularly intrigued by Ferholt's comment about the audios: "It just was very powerful because there is all this work on math anxiety, but you're like working in this almost utopian space" (B. Ferholt, personal communication, April 6, 2024). In a more metaphorical way, my work can be understood meta-contextually as providing this same kind of dialogue, but instead of addressing individuals, it is a dialogue for (a personified) mathematics/ math education, telling it that I see it, and these great things about it, while recognizing that it needs to change.

It was also meaningful when Ferholt brought up the reference to sailing from the audio collages, wherein my Bube exclaims, "Ooh, what about your sailing?". To her, it conveyed that "you have to know the student, you have to love them and love what they do, and be really interested, and be vulnerable to make a connection that you don't fully see." (B. Ferholt, personal communication, April 6, 2024). Sailing is something I am actively working to incorporate more into my life, along with my other interests. Even if I sometimes don't see how all my interests can come together, I can aspire to know me, to love me, and love what I do, and be really interested and be vulnerable to make a connection that I don't fully see.

Throughout my time knowing Beth Ferholt, she has continually provided me with these kinds of positive dialogues. I have found her comments so helpful in propelling my motivation to continue investigating and doing what I'm doing. I frequently refer back to a comment she wrote or listen back to an observation she made (that I have recorded). It has helped me to literally refer back to her comments, to remember that voice in my head.

Chapter 4: Collaborating With, And Learning from Myself and Malakai

In many ways, my thinking that led to the genesis of this project started last spring when I took "Research Methods in Education" taught by my now supervisor Beth Ferholt. In this class, we explored the idea of collaboration with "traditionally excluded knowledge, knowers, and means of knowing" to create our own research methods (Ferholt, Course Syllabus, 2023). The idea of collaborating with those outside "the academy" in conducting research, made a lot of sense to me. It seemed especially obvious that both teachers and students are practical collaborators for researchers and scholars in the field of education.

Collaborating With Myself

I started off the semester of Dr. Ferholt's course thinking about who I would want to collaborate with, and who I have collaborated with in the past. I reflected on my experience collaborating with friends and family members on a variety of projects. I was especially thinking about my positive experiences collaborating in improvised music with my friends Harrison and Andrew when I wrote "Collaborating feels great when you get to just be you." Dr. Ferholt responded to my post and wrote: ""Just be you" --at the start of a project --is a beautiful first step of a scientific method that I'd support. Thank you, Eden! That it makes collaborating "feel great" is key ... I think…" (Ferholt, February 1, 2023). I greatly appreciated Dr. Ferholt taking my view on this seriously: to have my "just be you" validated and understood as a legitimate avenue to explore for my methodology. In this same post, I also said, "I want different parts of myself to collaborate, (…) [but I don't want to be] compartmentalizing myself into different parts." I don't want to assume that I am made up of separate parts, which must come together—instead I want to be understood first as a whole being. Dr. Ferholt also responded to this and agreed that compartmentalization or the shutting off of parts of oneself can be harmful in science, and she

gave further encouragement to me about the direction of my project: stating that the study of art and math, involving art and math could be revolutionary, and is much needed in education.

The notion of being oneself can be understood via reflection on personal (contrasting) experiences. In many ways I think it can be understood similarly to a good and dialogic collaboration with others, only also happening within your own self. Being "me" (or "you," the reader) involves listening, openness, trust, and belief in oneself. These traits and skills are important components of any collaborative relationship. Not only am I interested in collaborating with "others", but I am also interested in collaborating with "myself" using these same principles.

There is undoubtedly room for philosophical exploration about the boundary between our internal world, and the world around us, aka. the separation or lack thereof between us and others/the world, but for ease of the discussion I will assume these things are all distinct. Tying in this view of self-collaboration, I want to feel like I am being me and exploring ideas in multifaceted ways that reflect what I like to do and how I want to be living my life. In collaborating with myself I shouldn't have to choose only some of myself, I should get to be all of myself, exploring my likes and interests, and seeing connections between multiple ways of knowing, that might all exist in me. Through the process of collaborating with myself, I am also recognizing myself and my ways of knowing as emergent through experiences and my relationships with others and the world.

Summary of Previous Project

My project for this class centred on an annual visit to my West Coast family, during which time my nephew[3] Malakai would be turning six. I saw this as a unique opportunity to meld

[3] Technically Malakai is my first cousin once removed. He is the son of my cousin, who is like a brother to me.

my work with my family and many of my curiosities, all of which are essential to who I am. I considered multiple relatives as potential collaborators for the project, but my primary collaborator would be Malakai. I would be investigating math education, and the relationship between math and my artistic interests in music and drawing, which Malakai eventually told me are "things that you like." In class, we presented our anticipated projects. I described my proposed methodology to our class as: "fitting into and playing what I hear," because I knew from previous visits that I would be entering into my family's busy life and world. I conceptualized this method for how my project would fit into my visit by basing it on my philosophy of how I collaborate musically with my good friends (which is an important instance of getting to just be me). I also shared with the class my aim of "being self and sharing my perspective, favourite things, skills..." as part of my proposed methods.

Per Dr. Ferholt's advice, I asked my co-researcher Malakai about the connections between math, art, and music. His response to my line of inquiry was: "Those are just things that you really like, so you're just asking that." This astute answer led the direction of my project for the remainder of the class. I spoke with Dr. Ferholt about this question and answer, and she pointed me to the work of Kiyotaka Miyazaki, an education scholar in Japan. Miyazaki's paper "Dialogic Lessons and Triadic Relationship Among Pupils, Learning Topic, and Teacher" (2019) helped me to frame and analyze my project with Malakai, with special attention to his answer to my question.

Analysis and Direction: "Things That You Like"

Malakai pointed me to the relational aspect of teaching and learning. It made sense to think about me, Malakai, and mathematics, as taking part in a triadic relationship as described by Miyazaki. Miyazaki explains how within this triad, the teacher can be learning from the students'

learning of the material (Miyazaki, 2019). This occurs especially within the context of a child's seemingly wrong, odd, or irrelevant answers to a teacher's question; applicable here as I, admittedly, overlooked Malakai's insightful comment at first. Miyazaki quotes the observation of the teacher and pedagogy developer Tsukamoto:

> The child interprets the teacher's asked question, chooses one among many possible implied questions as her/his own, and answers it. Sometimes, the child choses a question that differs from the teacher's intended one. In that case, the child's answer is not likely to match the teacher's expected answer; the teacher thinks the answer is incorrect. However, if the child's answer can be traced back to the child' question which brought the answer, the teacher can become aware of a new view of the learning topic hidden in the child's incorrect answer (Tsukamoto, 2014, p. 25, as cited in Miyazaki, 2019, A74).

This framing of Malakai's answer to my question was very powerful and inspired me to deepen my understanding of math and art connections as applicable to teaching and learning—by using his answer and perspective as an anchor and opportunity to discover a new view of the topic.

One possible question to the answer "**Those are just things that you really like, so you're just asking that**" is: "Why am I asking about (/interested in) the connections between math, and art and music?". This interpretation is perhaps the most literal given the structure of Malakai's response, including the proffered "so you're just asking that". We might be able to further deconstruct Malakai's answer as follows:

The first part of his answer can be understood as a direct response to the question I gave: he is saying "These things are connected because you like them." The clearest and most important connection between these things to Malakai is that I like them, rather than some other external relationship between math and art. He then responded to why I asked the question,

telling me “You want to see connections between things that you like.” My classmates pointed out that to Malakai, it might be as though math, art, etc. exist between us (him and me). So really, Malaki and I are just trying to get to know each other, and these things (math, art) were brought into the relationship. In this way, the question I asked was, to him, about “you and me.”

I wonder if it is true that people tend to want to see connections between things that they like; it seems likely. These possible questions and answers make me think about how all these distinct things that I like can be understood analogously to distinct parts of myself. Despite this, I want to be whole, not some collection of parts, and so I am wondering about how all these things go together, because I am wondering about being (all of) me. And that points me back to my original desire to be myself, as a whole entity, that is more than the sum of its parts.

Methodological Reflections

This project was for a methods class, and so Dr. Ferholt attempted to elucidate for the class some of the methods I had been using in my project during the class discussion after my final presentation. She used the phrase from improvisational comedy “yes, and” to describe the way I continued to say yes to myself. I think of this research process as trusting in my process and seeing how what I’m doing contributes along the way. Most importantly, I need to be reflective about what is working for me, which I think of as a method from my life, for what I do.

This approach harkens back to a worldview that comes from my childhood: I’ve never known “what I want to be” when I grow up, but I feel some driving forces have remained stable, as exemplified in an early assigned reflection: at age 9 “When I grow up, I would like to have a job that I enjoy and am talented at. I don’t quite know what I want to be, but I think I would enjoy it more if it involves art and maybe math” (Morris, assignment response, November 15,

2007). I know that I can't find out ("what to be," "who I am," or "my place in the world") by just thinking; I need to try things and see along the way how those contribute or not. My dad especially taught me to try things, and my mom especially taught me to check in with myself.

This is a methodological philosophy: one can't see into the future, but can try to be open, and reflective so as to better understand. This semester, during my conversation with my Bube I said: "I feel like everything I do helps me to figure out what to do next. So, I kind of think, I don't have to know exactly what I'm doing but I can keep trying things and directing it like that." I feel like this kind of hermeneutic methodology can be clearly present during one's experience of art-making, and this is something I would like to further explore.

Chapter 5: Current Project

This project follows from the work I did last spring in Dr. Ferholt's course on research methods in education. I started with the intention of being myself and bringing my interests together. This objective is directly related to the work I did with Malakai, and this project as a whole is an expansion of that work. The use of art in my work is multipurposed: it allows me to feel more myself—through my creative exploration of ideas, and it also serves as an effective form of communication and self-expression.

Creation/Process

For this project, I wanted to use my strengths (listening, engaging in conversation), and incorporate dialogic being-with throughout the process. Most of the calls with my family members that serve as the foundation for this work were just under an hour in length. The final product is a synthesis of the analyzed conversations into a collection of audio collages of my relatives speaking about: mathematics, teaching and learning, and their related experiences and ideas. In this process, I considered them collaborators and asked for their input on the direction of my project. While I aimed to keep these conversations as open as possible, I had some common questions posed to all to guide us: I asked about their memories and experiences, asked everyone "What is math?" and asked if they had suggestions for my project.

I reached out to 17 of my closest family members, and recorded conversations with nine of them. Of all these recorded conversations, I deeply listened to and analyzed the first six, putting those voices into three audio collages. During the analysis of these conversations, four themes emerged to me as core topics for the collages:

1. Dialogism.
2. Bringing my interests together, or the role of the self in my methodology.

3. Math and the physical body.
4. Defining mathematics in our world.

These discussions with my family members were extremely fruitful and yielded an abundance of ideas and perspectives. With this work, I limited myself to three collages (see Appendix A), however, I hope to expand this project to include other family members' input including a call with my previous co-researcher Malakai. My conversation with him has been partly analyzed and is full of conceptual material and special moments that could be made into a collage unto itself; I hope to make use of this and other material in the future.

One quote from my Zaide really stood out to me, as a recommendation for both my project, and for how I can be me: "Just keep an open creative mind, and you can put it all together." In a visual collage, one gets to physically put multiple things together using feeling, and an artistic eye, to assemble a product that may be meaningful or beautiful. There is an open-endedness inherent to collaging: the artist may have ideas they wish to convey, but they are also led by an artistic sense, and in the end, the art piece is open to the viewers' interpretation. I have used photo collages in class presentations and projects multiple times during my graduate studies. To me, there is great value in allowing the viewer to see multiple things together, and I appreciate the freedom this format affords that allows me to use my visual artistic eye. In my pivot towards audio collaging for this project, I am consciously employing a format that enables me to explore my interest in music and speech, my strengths as a listener and my drive to follow my artistic impulses and feelings to synthesize this work.

I listened back on the conversations. I picked out my favourite parts (a method used in Ferholt's film-play analysis (Ferholt, 2009)), clipping, labeling, and exporting them (which I was learning to do from YouTube videos concurrently). I sent my favourite clips to my respective

family member to listen through and let me know if there were any parts they would like me to not use, or any parts they especially liked. I re-listened to these clips while transcribing. As I transcribed, I highlighted some further favourite parts. Then I started feeling I saw connections about ideas that I wanted to reveal and support. I then highlighted parts in special concept colours. This process of passing back and forth between auditory and written, audio-clipping and written-highlighting, and between myself and my research subjects: all to whittle down our conversations to just a few words, gave me the feeling and essence of what I would like to communicate.

I placed the clips with a common theme into Audacity, and I further edited them based on how they sound. In making my first audio collage "Dialogic," I tried putting the clips right back-to-back. In doing so, I overlapped some (accidentally) but liked the sound of it. I could still hear the individual tracks, but it created a fuller feeling, and a nice transition. So, I made further overlaps of voices, while noticing the sound of the transition from one voice to the next and the kind of rhythm in it. I felt this also aligned well with my understanding and learning of dialogic relationships. I chose to make repetitions to turn it into the length of a standard song. I then added a track of harp and added a space between the repetition of the voices and included some small alterations to the repetitions to add a bit of variety.

While listening, I heard this tone, and so I decided to make a vocal track as well, to hit the tone I was hearing, and then I let myself make some others that followed naturally. The track of bird sounds and walking was recorded on my phone and was added to capture the being-in-the-world aspect. Next, I started writing about the audio piece, (See Appendix A), which required me to find the clip back in the original context of the conversation. I felt this writing was part of the dialogic artistic process, and it was interesting to hear the clips that I now knew

so well back in the original conversation. Making the audio collages and listening back to the clip's original position felt like a process of de-contextualizing, and then re-contextualizing; it made the words feel even more significant. The next two audio collages were influenced by my process of making the first, but also involved listening in a way that made the making of each collage unique. I felt the art-making process was dialogic.

Analysis

The creation of the audio collages was my way of engaging with the "interviews" and of doing research. I analyzed to find my favourite parts and themes: cutting, and then pasting the audio clips together was not just the outcome but a method of this analysis. Although I find it nonobvious exactly how or when the (making of the) audio pieces as a form of analysis might have contributed to the realizing of my primary finding, I do believe in making them I was *doing what I'm talking about*, by bringing my interests together and imagining dialogically. My conversations with my Zaide (grandfather, age 87/88), and then with Malakai (age 7) particularly stood out to me. These discussions made me reflect the most and brought to light the importance of "doing what you're talking about" (as phrased by my mom), which has now tied back into my original question.

A particular quote that stood out to me but was not included in the audio collages comes from my Zaide, who said, "I saw a squirrel drawing a bagel." This sentence may appear meaningless or nonsensical, however it in fact ties in and reinforces my line of inquiry with this project, which I will attempt to describe in the next section. I took this quote as an example of how I can be me, bringing together my multiple interests, and seeing them in the same picture. When he said this, it was also an example, foreshadowing his beautiful recommendation to "Just keep an open and creative mind, and you can put it all together." In conversation with Malakai,

at some point, I realized that our entire conversation was *doing what we were talking about.* When I asked him about math, he brought up numbers, and started counting. Later I brought up shapes, and he went around finding things to show me, which turned into a guessing game, to guess what the other person was holding, while they described its shape, and other attributes. Malakai immediately knows to do the thing we are talking about and how (he wants) to do that (involving fun and games).

Zaide

During my call with my Zaide, in which my Bube was also present, he said "I saw a squirrel drawing a bagel." Bube and I had already spoken, and then she brought in Zaide to participate too. I got to hear about some of his stories with early education, and things that he remembers. The call felt like it was wrapping up in some ways, as I was being asked about my coming life plans, but I remembered that I needed to ask Zaide the question that I had found especially fruitful thus far, "Do you have suggestions for my project?" He asked, "What's the title of your project?" to which I replied, "I'm still coming up with the title, but I'm interested in ways to reflect about math in my own life and making it more human." He responded, "If you can humanize it, it's another step towards teaching it."

I remarked that it's nice talking with family members, people who know me, and might even have memories from my childhood. Then Zaide brought up the Squirrel, a central character in an anecdote from when I was a child. He recounted the story as follows: In Bester Plaza, "as I wheeled you around in your stroller (…) the squirrel found a banana (…)," to which I replied, "I remember you and I, we always talked about a squirrel eating a bagel. We always brought up the squirrel eating the bagel (…) I remember talking about it, and you and I laughing about it." It was like a special joke between us. Zaide remarked, "Well, it had to be something ridiculous (…)

I could write a story, a whole novel about a squirrel eating a bagel." I think this sounds like a great idea.

It seemed again like the call might end, so Zaide said, "That was an interesting conversation about nothing, which makes it more interesting." I replied, "I'm interested in conversations, in general too." I explained that I would be listening back on the conversations, picking out some of my favourite clips, which I would then send for approval to use in my audio project. I added, "I'm now thinking about the significance of the squirrel eating the bagel."

Bube and Zaide tried to remember where the squirrel encounter had happened. Zaide suggested that I ask my partner what he thinks about a squirrel eating a bagel.

Bube laughed, "What does it mean, let's think of a meaning of a squirrel eating a bagel." To which Zaide seemed to gently correct her, "The significance, yes." I then realized a connection to one of my favourite parts of math, topology and remarked that "a big part of [topology] is about the shape of the surface of a bagel." Which led Zaide to recall that I was also interested in the mathematics of braids. Bube recalled my drawing, the many pictures I would draw, and how I could draw for a long time anywhere. She asked if I would still do that, and I said yes, that I would like to be drawing more. I asked if Zaide had any last things that he wanted to say. **"Yes, we were at Bester Plaza, and I saw a squirrel drawing a bagel."**

Bube was laughing and took it as his sense of humor, but I wanted to dig into it more. "That's a good point, you saw a squirrel drawing a bagel." I prompted. He replied, "In my mind, as we were talking, that flashed in my head." Bube seemed unconvinced. "Where does a squirrel have paper …" But I suppose I wasn't thinking about those details.

"It's because all these things can relate: the squirrel eating a bagel, the drawing, the being at Bester Plaza, by a squirrel drawing a bagel." I started getting emotional, as this funny sentence

seemed to summarize much of what I have been wanting to unravel. I shared with them, “Zaide sees how everything can be in one picture. There’s no need that things can’t be together. I think it’s beautiful too, because it relates to my idea of that I can have all these different interests and all these different aspects of myself and bring them all together. That I don’t need to only do one thing that I like—that I can do all these things that I like.”

From then on, we were clearly talking about both my life and this project, the question of how I can bring it all together, and my different likes and aptitudes. I felt I “just have to imagine as openly as Zaide, and let pictures come to [my] mind of squirrels drawing bagels.”

“Or squirrels manning a sailboat.” Zaide concurred. We were approaching the end of the call for real this time when I checked to see if Zaide had anything else he wanted to say: “Just keep an open and creative mind, and you can put it all together.” I loved the suggestion, and Bube made a nice short list for me of many of my interests. Zaide jokingly remarked that I take after him in terms of my beautiful looks, but really, I am inspired to take after him in his open and creative mind, and ability to see things together, even if, or especially if, it is “ridiculous.”

Malakai

Being with Malakai is pure gold, and I believe the call I had with him for this project contains some of that gold. Working with Malakai makes me reflect the most and teaches me the most. I’ve come to realize that with him, the doing and the talking-about are inseparable.

Malakai asked about what it was that I wanted to say to him. I told him how I was hoping he might be able to help me with my project, and that I had been talking with family about things like math and learning. I asked him about how he learns and about his experience learning by asking, “Like how do you even learn things?”

“How do I learn things?” He replied. “Good one.”

I laughed, “What do you mean?”

“What do you mean how do I learn things? Easy.”

“It just happens?”

“Happens with magic!”

We moved on to talking about math.

“Maybe you can think a little bit about, or tell me about what you think math is.”

“Numbers!”

“Numbers are interesting, what do you think about numbers, or know about numbers?”

Malakai began to list numbers from one to 17, then continued, “I know 17? And I know, ...18, 19…20! … 20! Right, right, right, 21, 23, 24, 25, 26, 27, 28, 29, 23… Wait...”

What stood out to me is that he immediately began counting when asked about math; the transition from talking-about to doing was nonexistent. He just started doing, as part of the talking about. We continued to chat a bit about numbers and even bigger numbers. He played around, joking and trying to better understand how he corresponded with his image on the screen, which was flipped.

He then said, “I have to show you something” He left to get it and said upon return, “Guess the blue thing that I’m holding right here.”

He told me a little bit about it, but it was hidden off screen… He gave me a clue: “Something round.”

“Round and flat or round and round in all directions?”

“Round in all directions.”

“So, is it a ball?”

“No, it’s not like a *ball…”*

I was stumped, and he decided to show me that it was the punch balloon (a fun balloon to play with that has a rubber band attachment). I then mentioned how one thing in math I really like is shapes, and how it's cool that we were just able to describe that.

Malakai's response was, "Shapes, I can show you a shape… This is a cool shape; I don't know what shape it is."

So now we talked about this new object that he had, and I agreed that it had lots of different shapes. He brought more things to show me their shape, and we could try to describe the shape, and he also told me what the object was.

Then he remembered the guessing game and he brought our discussion of objects and their shapes back to the game. "Wait, how about I show you things, and I'll tell you what the shape is and the colour, and then you guess them." My first challenge was Rectangle-White. From then on, most of our call incorporated this game, which had rules that Malakai was generating and enforcing: one of us was holding something, and the other had to guess what it was. At first it seemed the rule was that you couldn't show it, but then when I was struggling to guess his object, he said, "Here I'll show it really fast." That was a funny addition, because when shown really fast, I could barely make out the object, but got some sense of its size and proportions.

Looking back on my conversation with Malakai, it's like it didn't make any sense to just talk about math, but once we were doing math and playing this game there were plenty of interesting things to say and talk about that related to what we were doing.

I recently watched the beginning of a lecture by Anderson Norton, who studies psychological models of mathematics. In this video, he presents a study where an individual watches another performing actions. When someone watches someone else wave their hand, the

premotor area in the brain related to the viewer's hand is activated to make sense of seeing another person doing that action. The viewer imagines and almost even plans to move their own hand. Norton then remarked that children might do the action as they observe it, whereas adults stop themselves or have enough self-control, and just imagine it only enough to make sense of it without doing it (*Brown Bag Series - Anderson Norton*, 2018). My conversation with Malakai as well as my general interest in math education leads me to wonder how much we can really make sense of things without doing them ourselves. To what degree is our not-doing it socialized, and possibly even hindering our development, and might we consider the benefits of mirroring and doing for learning, as an impulse to regain.

Hermeneutic Analysis

I consider the audio collages I created to be my analysis of the recorded conversations, and my example of *doing what you're talking about*, in terms of Being Me as a method that is continually dialogic. During my initial recorded conversation with my mom, she said "You're doing what you're talking about," as she saw our "interview" itself as me engaging relationally and dialogically while we spoke about how math education could strive to incorporate those things more. Throughout my entire process I aimed to incorporate being dialogic, and being myself, as that was what I was thinking about. And now here I am, talking about it, the hermeneutic, dialogic way of creating, as my method.

My major finding from this current project is the importance of *doing what you're talking about*. Since last spring, stemming from my earlier project with Malakai, I have been directed to dialogic being-with as an important piece towards this way of Being, where some important *withs* to consider are with-others, with-world, and with-self. I now realize that if I talk about what I'm doing, and do what I'm talking about, hermeneutically, and conduct my research in this

way; I am able to feel like I am being me. I believe that this hermeneutic approach of *doing what you're talking about* is inherently dialogic. This process inherently involves my conception of dialogic Being-with. One possible framing is that the *doing* puts you into dialogic being-with-the world, the *talking-about*, puts you in dialogue with others, and the circle of going back and forth between both the *doing* and the *talking-about* puts you into dialogue with yourself.

There are many ways to understand the importance of *doing what you're talking about*; returning to our colloquial understanding of this notion, we can refer to the idea of *acting in line with your beliefs*. Understood hermeneutically, your beliefs and values are also being developed by what you do. This hermeneutic *doing what you're talking about* is integral to being who you are, as the process of Becoming: Feeling in line with yourself, and ultimately being yourself.

I am excited about articulating *doing what you're talking about* as a hermeneutic-paradigm. I will see how it allows me to continue to put my interests together. I hope to see how by keeping it in mind, I can incorporate it where possible, and feel good as aligned with myself in the act of Becoming. I am wary of how my theorizing here can be perceived as self-help-adjacent rhetoric. While I do think there is more to consider in terms of how my work relates to manifesting a better math experience for all and could be applied on a more general landscape of manifesting an improved reality in different areas, I am hopeful that my finding can be considered from a research and education-focused perspective.

Education needs to be better, and I open it up to those reading this to consider the application of *doing what you're talking about* to their own lives and to educational settings and practices. I recognize that feeling seen/heard/understood by myself and by those around me propels me further. I think that being yourself requires vulnerability but opens up the possibility of feeling seen as oneself, which can help propel one further in any area. A teacher's position

might be an especially powerful one with which to see a student and provide propulsion towards the student's becoming.

> Miyazaki explains how a teacher can (and should) also be a learner in the classroom:
>
> A teacher as an adult already learns the learning topic and already has some "cognizance" about the topics. However, she/he "remakes" her/his cognizance anew when engaging with pupils. This implies that the teacher's remade cognizance is possibly influenced by pupils' cognizance of the learning topics, that is, the teacher learns about the learning topic from pupils. (Miyazaki, 2019, A67)

If a teacher can follow the thinking and learning process of the child, that teacher also stands to gain more perspective on the learning topic itself. This phenomenon might be especially powerful when students provide answers that are seemingly absurd. When further analyzing why it is that I learned the most from Malakai and my Zaide, it may be that the words they said, or the things we did during the call could seem the most irrelevant (at first) to the questions that I was asking. So, in line with Miyazaki's analysis of powerful moments for teachers learning from students, the moments that were the most productive for me came from answers that seemed the most wrong, irrelevant, or ridiculous.

Evaluation

I believe that my project captures its objectives, which themselves are exploratory in nature. I want to explore my interests, bring them together, work with others, feel like I am getting to be myself, have conversations, and feel creative. I enjoyed making my audio collages, and I think they are interesting. The audio collages stem from my listening, which I like to do, and they reflect my own hearing and interest in putting things together. I got to learn more about

how to do audio editing as well, and I want to create more art in the form of audio in the future, so in making this I have set myself up for more creative endeavours.

I titled my concentration within the MALS program Humanizing Mathematics, and I think this project contributes to that goal. On top of the audio pieces, this paper contributes towards humanizing mathematics as I have aimed to convey my related ideas and experiences, as a human.

Future

Specific to this project, I would like to finish the fourth audio collage I started, finish listening to and analyzing my last two conversations, and consider making a fifth audio collage full of some of the special moments from my call with Malakai. I would also enjoy having a call with the remainder of my family members, and seeing where that takes me.

Art

I am especially interested in how *doing what you're talking about* relates to art making, and my experience playing collaborative improvisational music. I have talked about how *doing what you're talking about* can be happening hermeneutically with talking about what you did/are doing. I have a feeling that in making art, this hermeneutic process might be able to be understood as happening concurrently. I would like to explore this idea further, and I would especially like to be making more art.

Life

I primarily plan to continue engaging in the project of becoming, and to keep up with my "yes and" approach, by trying things, and checking in with myself along the way. I will see how I can further investigate *doing what you're talking about* by hermeneutically doing what I'm talking about and talking about what I'm doing.

I am not sure exactly what field of study this project and my interests fit into, and so while I am open to the idea of continuing into a PhD program someday, it may be a challenge to find the right program. I would like to continue exploring my interests artistically, and through my relationships with others and the world. I want to be outside more, moving, exploring, in nature, etc. and I want to be sitting at a computer far less. I also want to continue to consider how to incorporate sailing and being out on the water into my life. It is unclear how these desires might fit into further enrolment in school.

Hopes

In terms of education and math education, I think we can learn from neurodiversity theory, by phrasing things in terms of strengths and challenges, rather than relying on a deficit model. This has implications for teachers, because they are in a position to put voices into children's heads that can affect a child's self-beliefs and development. It is important to avoid giving children the belief that they have a deficit, so instead we must see their strengths, and believe that those strengths might be able to somehow synthesize inside of the student along with their challenges. I also believe that this framing can be applied *within* the domain of education: that to better the educational experiences of students, particularly within mathematics education, we should consider the state of education today in terms of strengths and challenges.[4] How might the prevalence of math anxiety and other important or relevant phenomena in math education be affected by further research that incorporates this line of thought?

As a call to all teachers and researchers, I urge you to consider how *doing what you're talking about* might be incorporated within your work at all levels. I know I trust someone more

[4] It is possible that the way we talk about math education, effects math education, so what kinds of voices do we want to put into (personified) math educations head?

if they appear to be doing what they're talking about, and so it is important for us all to actively avoid hypocrisy. My hope is that through *doing what you're talking about*, we can all strive towards dialogical being-with, while being ourselves, as becoming.

Conclusion

I hope to have conveyed the practical significance of my primary finding: *doing what you're talking about* as it came into my research and learning process throughout this project. In *doing what I'm talking about*, I most of all feel I am being myself as an evolving entity. I believe that everyone is unique, with their own unique abilities and unique learning styles, but there may be ways that hermeneutic *doing what you're talking about* could come into mathematics education for the better. It can be part of a way of learning, in which students can feel authentically themselves and active in their own learning process. I hope those reading this can consider ways that these ideas can apply to their own lives, and teaching/ learning practices. I hope to have shared some of my understandings and ways of knowing, as someone diagnosed with a learning disability, who has her own positive, and unique position in relation to, and relationship with, mathematics.

I believe positive framing is impactful, and that we could all better "avoid a deficit approach" to many challenges, such as math education (Lambert & Harriss, 2022, p.90–91). I also hope we can consider ways to avoid disabling children and people with "disabilities" as a society, largely by allowing and encouraging people to engage in the project of becoming in ways that feel true to them. Throughout this project, I aimed to use my abilities and do things I like, allowing me to feel like I am being me. I took this masters capstone project as an opportunity to engage in dialogue with my family and to use my artistic ear to create audio collages. My hope is that teachers and teacher educators might be able to use my project and

findings to help them in their imagination and creation of better educational experiences for everyone, especially within the field of mathematics. I invite you my reader to contemplate art making, or other practices that feel true to your own processes of exploration and expression, and consider how these practices can be further incorporated into your life.

Appendix A: Contextualizing the Three Audio Collages

This appendix has a section for each of the "completed" audio collages and is meaningful to read (only after?) having listened to the audio collages (multiple times), because it provides context for the voice clips used. Listening and then reading the context around the clips, makes the parts heard familiar, and recognized as significant within the context. The context given for each of the three collages differs in format.

1)Dialogic (A Method)

"Any true understanding is dialogic in nature."

(Bakhtin, p.102, as seen in Bakhtin et al., 1994, p35)

For the following written analysis of the first audio collage, I have provided some conversational context for each voice clip heard in the audio, in the order they are heard/appear, putting some of the words in bold to emphasize their presence.

"To be with them and get to know them" (Bube):

I clarified that I was interested in talking about "general philosophy around education."

"Not specific questions or age groups, but the feeling the concept, I understand."

"Yeah, the feelings of learning or of teaching, and the relationship between the teacher and the learners, and the subject matter (I was thinking about Kiyo's triadic relationship), all of those relationships, as humans."

"Yes, definitely… once I got into this, I just loved it. And I really enjoyed my students…[...]... It was just so nice **to be with them** and get to know them." Bube Hannah was once a high school science teacher, and she told me: since then, "I've had some wonderful experiences after teaching certain students, with seeing them years later, with how they reached out to me and reacted to me."

I am interested in being-with. And my time with Malakai brought forward the relevance/importance of getting to know each other (such as things that the other person likes). Additionally, being with them, and getting to know them, is in my experience a large part of my role as a mathematics tutor.

"And really engaging" (Mom):

We were imagining—what if in education the child was asked if they were enjoying what was being talked about. "What's it like for you to learn math right now? Are you enjoying what we are talking about, are you feeling bored? How could we make this more fun… what would bring out more enthusiasm in you… how can we make this exciting and relevant?"

"Imagine if you asked a kid what would make this more fun, they would probably come up with great ideas…"

"So, I really think you're talking about how do we create a world where children are actually listened to and valued… […] …I think I'm hearing you talk about education itself as being relational. Not a top-down model, but instead a peer to peer, even if we are talking about someone who's five… you're viewing them as having their own inner knowing and wisdom on what speaks to them, **and really engaging**… Which is what I think you did with Malakai."

I believe the following quote of Bakhtin relates to really engaging: "To understand another person's utterance means to orient oneself with respect to it" (Bakhtin et al., 1994, p. 35). Orienting oneself with respect to something means to really be there, and be with/in relation to it, and pay attention. Bakhtin suggests placing oneself in relation to what the other is saying, which involves really engaging. (Another common meaning of orienting, is to be oriented within a space, which is interesting to me as it relates to mathematics and spatial thinking but is also

something that people often find to be especially one of their strengths or one of their challenges, and feeling oriented can relate with feeling comfortable in a place.)

"In the conversation" (Dad):

My dad noted that it does seem like a common experience for people to have been turned off math at some point, like "I saw it in high school when I was helping friends, that some people were just lost." We might all have experienced this being lost at some point in some scenario, "that feeling of being in a different world, because that's what it feels like. I know it, even, I went to one of my bridge classes where I wasn't prepared, and I was following for a little while, and then I got lost, that feeling of getting lost, you can kind of feel when you get lost..[…]…it doesn't feel good to be lost, people are talking around you…when you get at a certain point, and you hear the people around you talking, it's like they're talking about something,.. you're just not **in the conversation**, they're talking in another language."

I wanted to change it into the positive context, to being part of the conversation, because that's what I'm talking about, and that's dialogic, to be part of the same world, and in conversation. The opposite of being lost is being oriented and a part of things. For a conversation, to be a part of things is to be a part of an exchange, as stated by Buber: "We live in the currents of universal reciprocity" (Buber, 1996, p67).

"Walking around the neighbourhood" (Aunt Margot):

We were talking about some ways that math can be incorporated with other interests, or things in your life. Like in baking and cooking, even just to understand quantities with the measuring cups. As the mother of three previously young children: "We did a lot of cooking together, and a lot of counting. We did just **walking around the neighbourhood, and looking**

on mail boxes, and what's the number on there. It's not really a hobby, but I think I tried to bring math into all kinds of experiences."

This made me think a lot of how I think math can be incorporated into experiences, by being outside, walking, and just noticing things together, and chatting about them. This is largely how I think of the way math may have been integrated into my time with Malakai, by having conversations about what we are noticing, while we are out walking around. Margot elaborated: "what's the number on this… it was just part of a walk, but it helped reinforce for him to know his numbers instead of sitting with flash cards or something." I remember recently pointing out to Malaki some common signs like open, closed, and exit, for him to notice while practicing his reading. Seeing things in the world, interacting with others and the world, makes things feel alive, and a part of your life (/and possibly also a part of yourself).

"Interaction with other people and other things. It makes it real" (Bube Hannah):

Bube recounted a sad time in high school geometry: "My poor teacher, sadly, he passed away. ...and there I am in tenth grade with no teacher. It was pretty sad. I had to sort of teach it to myself. And I remember realizing how important the teacher is." … "Learning by yourself, it can be boring, you know—you need **interaction** with other people and other things. It makes it real. That is what I remember, the word real, yes, I tried to make it real and fun." Bube cared about making the science material real and fun for students when she was a teacher.

These five spoken clips that I have now provided more context for came together, to express my dialogic understanding of the importance of dialogic ways of being with others and the world. This collage expresses the importance of dialogicity for learning and the development of further/deeper understanding.

2) Me and My Likes (A Method)

This audio piece is about being me and bringing together my interests. There was a lot of material to work with, especially from my call with Bube and Zaide on this topic. This topic can be understood as a goal, a method, and a response/ exploration to reflecting on Malakai's answer to my question from last spring when he said those are "things that you like" about the connection between math, art, etc.

There were many clips used to make this collage, so I chose to organize this expansion and contextualization by person/ conversation, instead of by clip. The parts heard in the audio collages are underlined and presented in the order they originated in—within the context of the conversation.

Bube

We were talking about my math tutoring. "Well Eden, it sounds like you have found the right path for yourself."

"I feel like everything I do, helps me to figure out what to do next. So, I kind of think, I don't have to know exactly what I'm doing, but I can keep trying things and keep directing it like that."

"Well since I've known you so long, I know that you are artistic, and you are musical as well as mathematical." …

I explained that I am interested in trying to bring together all these interests/ aspects of myself, and that in terms of this project, I would see how I can bring in the musical element. Bube thought that sounded wonderful, and asked if it would be harp music. She brought up drawing as well, that I did a lot of especially as a kid and asked, "is there any way that can be incorporated with all this?".

I suggested, that maybe drawing can be incorporated if I make an album cover. “I’m interested in bringing together my different interests, and really getting to be myself in what I do and get to be creative.”

Bube recalled my making of fancy napkins and folding. “Well, you know, I suspect this will all come to you gradually. You’ll work in one direction and then you’ll say hmm maybe I can add this.”

Bube and Zaide

Bube recalled talking with me about adding and subtracting as a little kid, and then how later we also talked about infinity. I remarked how nice it is to talk with people who know me for my project, and who may even have memories from when I was a kid.

The memory of the squirrel eating a bagel came up, and it was fun to try remembering together. It was something we saw and never forgot. It was like a joke of ours. Zaide remembered it happening at Bester Plaza, but Bube wasn’t sure. It was fun to think back on and I said, “I’m now thinking about the significance of the squirrel eating the bagel.”

“Well you’ve got to make it fun, for kids” …

Zaide said I could ask others about what they think of a squirrel eating a bagel. The significance. Then I realized a fun math connection.

“…Topology.... a big part of it is about the shape of the surface of a bagel… and how the surface of a bagel is different from the surface of a ball, then a sphere.”

“Were you gonna come up with the mathematics of a Women’s hairdo?”

“Oh, I love braids.”

“Yeah, I thought you were going to come up with the Mathematics of Braids.”

"Yeah, I've learnt a bit about mathematics of braids as well, and these are my favourite parts of math, these really cool shapes and patterns and symmetries and…"

It was cool that Zaide remembered that I was interested in the Mathematics of Braids (and knots). These areas of math are so cool to me, the fact that there is such thing as mathematical Knots and Braids, because these are things that I really enjoy making with my hands, and feel I have experiential understanding of, with rope, or hair. This hands-on knowledge that I have does help in understanding the basics of these math topics.

Bube brought it back to my drawing as a kid, how with a pencil and paper, I would just draw anywhere, for a long time. Then Zaide said, "We were at Bester Plaza, and I saw a squirrel drawing a bagel."

… "You saw a squirrel drawing a bagel."

"In my mind, as we were talking, that flashed in my head."

I realized all these things can relate, and that Zaide sees how different things all can exist in one picture. "It relates to my idea of that I can have all these different interests and all these different aspects of myself and bring them all together. That I don't need to only do one thing that I like—that I can do all these things that I like." (said with emotion)

Bube said: "Well that's what I've always hoped for you…Oh what about your sailing!?, So how do you bring it all together, I don't know."

And Zaide suggested: "Yeah, Just keep an open creative mind, and you can put it all together."

I love that suggestion, of keeping an open and creative mind and it can all come together.

Bube agreed: "Yes, yes, definitely, music, everything, drawing, sailing, what am I missing?"

Zaide added: "Symmetry."

Mom

We were talking about some of my experiences in math education, and my mom suggested that some of these moments can be incorporated into my project, showing how they were already informing some of my current ideas.

I agreed that my project was based on my own experience, that I'm interested in these things, because my whole life "I have been doing learning math for a long time… and now doing tutoring math…and that's why I'm interested in this because it relates to my own life…that's also why I'm thinking that its cool to talk to family…as kind of an extension to understanding my own self."

"I love that…Like what are you learning about you so far with this would you say?" I thought that was an interesting question and I thought back to my project with Malakai.

"Well one of the big take aways from last year, the project with Malakai, was that what I like comes into the relationship. A lot of what he's learning are that, oh these are things that Eden likes. And that what we like—that that's being shared, that you can share things that you like."

"So, where you have enthusiasm, it can make you an inspiring teacher. Where you get, yeah, I mean I guess that's why I like being a therapist. Because I'm enthusiastic about that process and the change that can happen for the better for people. And you've got enthusiasm in certain areas, and you get lit up. So that spreads to whoever you're talking to."

This reminded me about Miyazaki's triadic relationship, and the importance of always learning as a teacher, because I find I am much more "lit up" if I am actively learning something, in contrast to a topic I'm not actively learning about(anymore), which could make it feel old (or

dead). So, I brought up my big take aways from reading Miyazaki: the possibility of the teacher learning; and learning specifically from the students' answers to questions. She agreed, that as a therapist she's also learning from her clients all the time and learning through the dialogue. My mom brought up Martin Buber's "I and Thou," which is a huge part of the foundations to gestalt therapy's relational approach. My mom explained that contact is a big part of gestalt, and that what happens at the relational boundary is where the magic happens. She said that I'm talking about a whole other approach for education and told me about her vision for my project: "So I see you in your paper weaving all, you know, your philosophy, your personal story," which I believe I have accomplished to some extent.

Dad

We were saying bye, and he suggested that I will see how what the family members say support my ideas, or maybe make me revaluate them.

"But it sounds like you're having fun with it."

"Yeah, it definitely makes sense for me to turn it into something that's fun and relates to my own life, my own interests, my own aptitudes, my own family. Like I think it's really cool that I'm using audio because I love (like) listening, that I'm using discussion because I love learning through conversations… That I'm using my family because its meaningful to me and relates to my own self."

"This is your life."

3) The Body

It was fun to make a collage about math and the body. There are different connections there that I am interested in, and the different voice clips I used highlight relationships between math and the body in different ways.

One aspect is our emotion, and how something feels in our bodies. As we are learning math or doing math, our bodies will be experiencing—and we may feel any multitudes of ways, that are highly relevant to our experience of and feeling towards mathematics.

This collage starts with clips that refer to the hands—some may be innate to our human relationship with mathematics, while others might just be cool math-body connections. For example, the clip about the Martians with six fingers who have a base twelve number system, may remind us that mathematics was developed by humans based in our experiences and understanding of the world. I believe it is a well-regarded theory that we humans developed our number system using base ten, because of our own ten fingers.

I always like when a metaphor comes into our language, and some metaphors when noticed can be quite meaningful. The metaphor/ common phrase "I had a grasp" for the subject matter reminded me of my friend Harrison who wants to hold *it* in his hands in order to better understand. The concept of knowing in our body, of embodied knowledge is important, and one that I think could be incorporated into mathematics education where possible. When my aunt mentioned children's early understanding of size, it made me think. I suspect that a lot of early understanding is more like a feeling in the body, and that when a small child recognizes that there is a tall/adult human present, that they have a sense that there is a large presence, whereas the presence of someone child sized might feel different. This is in contrast with a formal analytical comparison. So, in many ways we might find ways that we "know math before we know math" in a formal analytic way.

Finally, I didn't mean to make an assertion on what makes someone more beautiful, because we are all beautiful, but it is interesting how mathematics and our aesthetic/psychological senses may relate, and the way nature plays into that, into our assertion

of what is beautiful. There is both symmetry and lack of symmetry apparent in nature, our bodies, and our aesthetics sense.

As described, this collage is made of voice clips which all refer to a different kind of connection between the body and mathematics. These many meanings and significances of the body for mathematics can be further investigated.

Appendix B: "All I Can Do"

I am very inspired by all my friends, and I'm so grateful to know many fantastic artists and musicians. The artist (and friend) Stefani Bondari recently released a music video for her song "All I Can Do," which addresses ideas that I believe are related to this work. For this reason, I have included a short reflection on Stefani's song and video, which proved to be especially relevant to my work, based on how emotional I became when watching it. The YouTube music video can be accessed at the following link: https://www.youtube.com/watch?v=9di8jSRV-qs.

Reflection on "All I Can Do"

The song and music video by Stefani Bondari "All I Can Do" (Bondari, 2024), is a beautiful and meaningful expression of self, and self-struggle to be oneself and accept oneself. I interpret the other people in the video as representative of both other people (including and especially children) and as representations of parts of one's own self. We must not interpret other people or these parts of ourselves as having deficits or being wrong. Instead, we can all collaboratively live and learn together in the world, and all be in the process of becoming together—bringing our whole selves to the party…The last scene in the video to me depicts this possibility of dialogically being-with, and being ourselves, as becoming.

References

Adams, T. E., Linn, S., & Ellis, C. (2015). *Autoethnography*. Oxford; New York Oxford University Press.

Bakhtin, M. M., Morris, P., Voloshinov, V. N., & Medvedev, P. N. (1994). *The Bakhtin reader: Selected writings of Bakhtin, Medvedev, and Voloshinov* (P. Morris, Ed.). E. Arnold.

Bondari, S. (2024, April 8). *Stefani Bondari - All I can do (official video)*. Www.youtube.com. https://www.youtube.com/watch?v=9di8jSRV-qs

Buber, M., & Walter Arnold Kaufmann. (1996). *I and thou*. Touchstone.

Dialogicity. (2021). In *Wiktionary*. https://en.wiktionary.org/wiki/dialogicity

Ferholt, B. (2009). *The development of cognition, emotion, imagination and creativity as made visible through adult-child joint play: Perezhivanie through playworlds*. https://lchc.ucsd.edu/Projects/FerholtDissertation.pdf

Ferholt, B., & Schuck, C. (2023, May 30). *THE CONSTANT or person-as-place, and research-life: Sustaining collaboration between university-based and field-based co-researchers*. Brill.com; Brill. https://brill.com/display/book/9789004548664/BP000013.xml

GSE, R. (2018). Brown bag series - Anderson Norton. In *www.youtube.com*. https://www.youtube.com/watch?v=WG7_M36pUis

Heidegger, M. (1927). *Being and time*. Blackwell.

Huber, M., & Karaali, G. (2015). *Humanistic Mathematics: A Philosophy, a Journal, and a community*. https://www1.cmc.edu/pages/faculty/MHuber/Research/talks/huber_talk2015a.pdf

Lambert, R., & Harriss, E. (2022). Insider accounts of dyslexia from research mathematicians. *Educational Studies in Mathematics*. https://doi.org/10.1007/s10649-021-10140-2

Landau lectures| prof. thurston | part 1 | 1995/6. (2014). In *www.youtube.com*. https://www.youtube.com/watch?v=o6SucT2Zzys

Lehesvuori, S., Hähkiöniemi, M., Ketonen, L., Lerkkanen, M.-K., Pöysä, S., & Pakarinen, E. (2021). Reflections on dialogicity: Challenges and suggestions by mathematics student teachers. *Learning, Culture and Social Interaction*, *31*, 100567. https://doi.org/10.1016/j.lcsi.2021.100567

Miyazaki, K. (2019). Dialogic lessons and triadic relationship among pupils, learning topic, and teacher. *Dialogic Pedagogy: An International Online Journal*, *7*. https://doi.org/10.5195/dpj.2019.239

Shirkhani, F., Nesari, A. J., & Feilinezhad, N. (2015). Bakhtinian dialogic concept in language learning process. *Procedia - Social and Behavioral Sciences*, *205*, 510–515. https://doi.org/10.1016/j.sbspro.2015.09.060

Thurston, W. P. (2005). Mathematical education. *ArXiv:math/0503081*, *1*. https://arxiv.org/abs/math/0503081

Quine, W. V. O. (1951). *Two dogmas of empiricism*. Philpapers.org. https://philpapers.org/rec/QUITDO-3

Wortham, S. (2021, November 29). Stop teaching? (Anna Stetsenko) - pulled up short (podcast) [Interview]. In *Listen Notes*. https://www.listennotes.com/podcasts/pulled-up-short/stop-teaching-anna-stetsenko-LbXT19ofkCF/

Additional Resources

Alexakos, K. (2015). Being a teacher | researcher. In *SensePublishers eBooks*. Sense Publishers. https://doi.org/10.1007/978-94-6300-295-0

Attard, C., Edwards-Groves, C., & Grootenboer, P. (2018). *Making waves, opening spaces* (pp. 122–129). https://files.eric.ed.gov/fulltext/ED592428.pdf

Bakhtin, M. (1981). *The dialogic imagination: Four essays*. University of Texas Press.

Bang, M., & Vossoughi, S. (2016). Participatory design research and educational justice: Studying learning and relations within social change making. *Cognition and Instruction*, *34*(3), 173–193. https://doi.org/10.1080/07370008.2016.1181879

Belbase, S. (2013). Images, anxieties, and attitudes toward mathematics. *International Journal of Education in Mathematics*, *1*(4), 230–237. https://files.eric.ed.gov/fulltext/ED547269.pdf

Boaler, J. (2002). The development of disciplinary relationships: Knowledge, practice, and identity in mathematics classrooms. *For the Learning of Mathematics*, *22*(1), 42–47. https://ed.stanford.edu/sites/default/files/flm_paper_2002.pdf

Boaler, J. (2015, January 28). *Fluency without Fear*. YouCubed. https://www.youcubed.org/evidence/fluency-without-fear/

Chang, H., Ngunjiri, F., & Hernandez, K.-A. C. (2016). *Collaborative autoethnography*. Routledge.

Crichton, S., & Childs, E. (2005). Clipping and coding audio files: A research method to enable participant voice. *International Journal of Qualitative Methods*, *4*(3), 40–49. https://doi.org/10.1177/160940690500400303

Ellis, C., Adams, T. E., & Bochner, A. P. (2010). Autoethnography: An overview. *Forum Qualitative Sozialforschung / Forum: Qualitative Social Research*, *12*(1). https://www.qualitative-research.net/index.php/fqs/article/view/1589/3095

Di Martino, P., & Zan, R. (2009). "Me and maths": Towards a definition of attitude grounded on students' narratives. *Journal of Mathematics Teacher Education*, *13*(1), 27–48. https://doi.org/10.1007/s10857-009-9134-z

Harada, M. O. (2013). Dialogical autoethnography. *Japanese Journal of Qualitative Psychology*, *12*(1), 157–175. https://doi.org/10.24525/jaqp.12.1_157

Hernandez-Martinez, P., Svitlana Rogovchenko, Rogovchenko, Y. V., & Treffert-Thomas, S. (2023). Collaboration between Mathematicians and Mathematics Educators: dialogical inquiry as a methodological tool in Mathematics Education research. *Educational Studies in Mathematics*, *114*(1), 129–148. https://doi.org/10.1007/s10649-023-10245-w

John, J. E., Nelson, P. A., Klenczar, B., & Robnett, R. D. (2020). Memories of math: Narrative predictors of math affect, math motivation, and future math plans. *Contemporary Educational Psychology*, *60*(5), 101838. https://doi.org/10.1016/j.cedpsych.2020.101838

Kullenberg, T., & Säljö, R. (2021). Towards dialogic metaphors of learning – from socialization to authoring. *Integrative Psychological and Behavioral Science*. https://doi.org/10.1007/s12124-021-09661-5

Little, S., & Little, T. (2021). An un/familiar space: Children and parents as collaborators in autoethnographic family research. *Qualitative Research*, *22*(4), 146879412199901. https://doi.org/10.1177/1468794121999018

McAuliffe, S. (2023). *Improvisation in music and philosophical hermeneutics*. Bloomsbury.

Mercer, N., & Littleton, K. (2007). *Dialogue and the development of children's thinking: A sociocultural approach*. Routledge.

Moore, C., & Dunham, P. J. (2015). *Joint attention: Its origins and role in development*. Psychology Press.

Paley, V.G. (2010). *Mollie is three*. University of Chicago Press.

Pink, S. (2011). Multimodality, multisensoriality and ethnographic knowing: social semiotics and the phenomenology of perception. *Qualitative Research*, *11*(3), 261–276. https://doi.org/10.1177/1468794111399835

Smiley, S. (2015). Field recording or field observation?: Audio meets method in qualitative research. *The Qualitative Report*, *20*(11). https://doi.org/10.46743/2160-3715/2015.2380

Timmermans, S., & Tavory, I. (2012). Theory construction in qualitative research: From grounded theory to abductive analysis. *Sociological Theory*, *30*(3), 167–186. https://doi.org/10.1177/0735275112457914

Walshaw, M. (n.d.). *The concept of identity positioning the self within research*. https://www.mathunion.org/fileadmin/ICMI/files/About_ICMI/Publications_about_ICMI/ICME_11/Walshaw.pdf

Webster, L., & Patricie Mertova. (2007). *Using narrative inquiry as a research method: An introduction to using critical event narrative analysis in research on learning and teaching*. Routledge.

Yuan, Y. (2014). Turning friends into research participants: Rationale, possibilities and challenges. *Www.repository.cam.ac.uk*, *1*(1). https://doi.org/10.17863/CAM.40965

Andrew, Harrison, and HEATTR's Published Music

Ames, A. (n.d.). *Andrew Ames*. Andrew Ames. Retrieved April 17, 2024, from https://andrewames.bandcamp.com/music

Andrew. (n.d.). *Flashbulb Iris*. SoundCloud. Retrieved April 17, 2024, from https://soundcloud.com/flashbulbiris

Harrison. (n.d.-a). *Office Ferns*. SoundCloud. Retrieved April 17, 2024, from https://soundcloud.com/arryc

Harrison. (n.d.-b). *Office Ferns*. Office Ferns. Retrieved April 17, 2024, from https://officeferns.bandcamp.com/?from=search&search_item_id=1290039767&search_item_type=b&search_match_part=%3F&search_page_id=3343880232&search_page_no=1&search_rank=1&search_sig=828729702a9883b3a642f039fe5143ad.

HEATRR. (n.d.). *HEATRR*. HEATRR. Retrieved April 17, 2024, from https://heatrr.bandcamp.com/?from=search&search_item_id=358404096&search_item_type=b&search_match_part=%3F&search_page_id=3343884489&search_page_no=1&search_rank=1&search_sig=fa8bfba6fe08a7bae87627435908d039.