Polyphony of (Analytical) Scores, Co-Design, and Creative Methodologies

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Abstract

This experimental paper explores a form of neurodiversity-affirming qualitative data analysis labelled a polyphony of (analytical) scores and creative methodologies utilised in our research project. Our data examples come from a federally funded research study which co-designed sensory pedagogies for autistic students interested in computational thinking (CT). Four middle-school teachers, or teacher fellows (TF), from diverse disciplines were recruited to develop neurodiverse CT mini curriculum and pedagogies for middle-school students interested in STEM. Teacher fellows worked with the research team to co-design teaching and learning materials and technology to explore computational thinking. The research team and teacher fellows attended workshops that included creative ensemble activities using digital-physical musical technologies and CT concepts. Data from these workshops were used to create two polyphonic score compositions as ways to interact with data. A video creation addressed how TFs were impacted during the development and implementation of neurodiverse pedagogies. Quotes and keywords extracted for the video creation reflect how silence and sound collapse and expand in a rhizomatic fashion, indicating how TFs experience messiness, exploration, atypicality and more, which fully represent neurodiversity. The score analysis enabled us to diversify participants' experiences with neurodiverse pedagogies and illustrated the affective dimensions of musical composition as a form of data analysis.

Keywords

neurodiversity, polyphony, qualitative inquiry, score, score analysis

This paper is crafted as a musical composition with different movements to illustrate different layers and elements of qualitative data in neurodiverse ways. This article is designed to stimulate interdisciplinary collaborative methodological

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experimentation which builds on different senses, affects and sensory elements. Even though our analytical approach utilises music as one of its' main forms, these examples can be utilised across different fields, approaches, and research processes, and we have used lines and drawings in different ways during the analysis. We hope to encourage scholars and practitioners to move away from the typical and normative ways of engaging with data and data analysis and more towards more experimental and speculative analytic approaches.

It is important for us to move across fields and disciplinary traditions when we work in multidisciplinary projects. Thus, in this work, while we utilised auditory senses, we also asked participants to visualise their critical events in a timeline. Each participant created their own timeline, and their visually and temporally arranged critical events were connected by the research team members into moving lines. These lines were later digitised and the drawings from each line affected the musical components in different ways.

Movement 1[1]: dialogical inspirations

Author 3: I added a little side box of poetry just to be, like, where were we going with these side boxes to kind of be, well, we want to stretch it a bit. Ultimately, I ended up with the clefs in the background, and the poetry is overlapping with the different keys.

Author 2: The idea of using the sticky note rather than a box or square was that I really wanted to encourage during the critical event analysis. Participants were able then to go onto the sticky note and revise the wording if they wanted it revised. They could make the sticky note larger or smaller. They could move it around to a different area.

Author 1: I really like the temporality of the sticky note. The space–time associated with the sticky note added temporality and served as an invitation to think about time, space, and ordering differently. The scholarly knowledge that we produce in the projects, we tend to anchor it and stabilise it whereas sticky notes seemed more imminent and emergent. I think we need to invite readers and the users of this research to different modes of doing and thinking those modes that neurodiversity generates.

Author 2: Rather than drawing from the interrater reliability and generalizability across contexts, we wanted to come up with many different ways and perspectives, especially the neurodiverse perspectives, because there is no one truth.

Author 3: It also makes me question what analysis is attempting to do if it's trying to fix it or go back to structure versus just be left alone. It goes back into this more paradigmatic question of what's the need for analysing data here instead of just leaving it be?

Author 2: I was taking a walk in the woods, like a journey—going on a journey with someone with its ups and downhills. We experienced this journey with the teachers. I remember when Author 4 first put the heartbeat in, I felt like I was brought back to life; I strongly felt a human connection.

Author 1: I also think that music for me added a spatial layer to the experience that it was I think that with the maps we already moved to one dimensionality to two dimensions, but the music added an additional layer of depth, and it became a spatial musical experience.

Author 2: It would be interesting to see what would happen if we moved to the music now—if we then took time to move with the music and see.

Author 3: I remember multiple scores registered in the air and found me simultaneously. I was not capable of logically or systematically analysing the sensory overflow of lines, movements, and events teachers have shared with us. Lines crossed; events moved in all directions at once. Individual teacher lines blurred with lines I drew, and lines other teachers had drawn. The mess of memories and encounters with sensors and CT content begins to organise itself. While drawing and listening, following both strange and familiar (data) lines, I was pulled into the rhythm of data and flows of teachers' experiences. Scores emerged and grew.

Author 4: What strikes me after listening to the piece are the moments of stillness. They feel like moments of breath. There's tension and release as the unexpectedness, questioning, and perspective changes cumulate until the piece falls back into the stillness.

Movement 2: introducing polyphonic score and creative methodologies in (qualitative and experimental) inquiry

Creative, or inventive, methodologies 'variously enable the *happening* of the social world- its ongoingness, relationality, contingency, and sensuousness- to be investigated' and often do so in interdisciplinary and contextually relevant ways (Lury & Wakeford 2012, 2). Thus, creative methodologies include the design of methods or techniques that address a social problem as well as 'the capacity of what emerges in the use of that method to change the problem' (Lury & Wakeford 2012, 7). Moreover, creative methodologies are important tactics for social transformation because method is always positioned to make a difference (Lury & Wakeford 2012) and because 'we are all changed through our interactions' (Keating 2012, 177). White (2019) noted that creative thinking and methodology of serious play can support idea generation and design development even though it might include feelings of discomfort and a sense of concern.

Methodologies, as choices, are inextricably linked to 'the values, beliefs, backgrounds, bodies, and affects of the researcher and the research context' and, therefore, have the 'power to disempower, empower, and validate and invalidate experiences, data, lives, and material' (Koro-Ljungberg 2015, 79). The polyphonic score introduced in this paper is an example of a creative methodology that might be engaged in ways that empower and validate. The term 'polyphonic' alludes to the many sounds or 'voices' that intermesh through the technique of a musical score. This polyphonic score was created to address three problems. First, it was designed as a method to analyse teacher interview data about their experiences co-designing neurodiverse pedagogy in a research practice partnership (RPP). Second, it was designed as a tactic to subvert the status quo and extend inquiry to

engage wider modes of neurodiversity. Finally, it was designed specifically for/with the context of the research project which uses wearable music sensors. These techniques can be used in social research to address the creative, interdisciplinary, contextually specific and neuro-inclusive[2] design of data analysis methodology.

Neurodiverse and polyphonic approaches

Because one main goal of the curriculum and technology co-design was to develop neuro-inclusive instructional materials and strategies for teachers that would support neurodivergent students' STEM learning, the research approaches had to align. Neurodiversity approaches go beyond most inclusive and universal design discussions, bringing in ontoepistemological shifts from normative research. Therefore, a description of the neurodiversity paradigm and the resulting research approaches is warranted.

Neurotypical assumptions about being and knowing are based on divisions, categories, and separation. For example, it is a common belief that mind and body function separately, that individuals can be categorised by singular attributes, and that knowledge consists of distinct facts and skills that can be gatherable, usually through language (reading, writing, speaking and listening). Alternatively, neurodiversity has been theorised as fluid multiplicity without categorization or separation. This theorising alters the dominant, or neurotypical, perspectives on being and knowing by signalling that there is a 'multiplicity of modes of existence' (Manning & Massumi 2014, 8) and begins with neurodiversity's very definition as diverse human modes of thinking, learning, communicating and interacting.

Furthermore, to engage with neurodiversity is to engage with groups of people. First, people are always in relation to other people and things, and these relationships are constantly shifting as contexts change over time and space, a relational quality often referred to as the more-than-human (Manning 2013). Second, every person is also connected to various social groups and those social identities are also multiple, or intersectional. Intersectionality, the term used to describe the multiplicity of social identity, often foregrounds identities that are connected to groups that have been historically oppressed but can also encompass other identity markers as well (Sumi *et al*. 2013).

Neurodiversity does not just refer to *who* we are but also *how* we are, meaning that people's lived experiences move beyond their social identities. How a person thinks, perceives, interacts and feels are qualities that cannot be quantified or clearly articulated with words. The neurodiversity paradigm, accordingly, alludes to the multiple ways people might perceive the same event and considers that even for one individual, similar events might be perceived differently at different times or in different spaces (Manning 2013; Owren & Stenhammer 2013). As such, perception is intricately involved with thinking, learning and knowing or research (Manning & Massumi 2014).

Neurodiversity studies, including neuroqueer theory, takes a critical stance towards the medical model of disability, including psychiatric practices that reduce people to symptoms and where people are not 'understood within the social and economic context of the society in which they live' (LeFrançois *et al*. 2013, 2). Walker, a neuroqueer theorist, states that her 'central priority is the cultivation of human potentials for creativity, well-being, and beautiful weirdness …' (2021, 176). Neuroqueering is an action in which anyone can participate, including individuals who do not identify as neurodivergent[3]. It is a practice that some have described as an 'intentional reclaiming and exploration of ways of moving and

engaging with the sensory world that had lain buried under a socially instilled shell of neurotypicality since their early childhoods' (Walker 2021, 189). Overall, neurodiversity researchers aim to disrupt neurotypical assumptions about being and knowing, as well as to expand scholarly research to include wider ranges of neurodivergence.

Why are neurodiversity and neurodiverse research methods important? This research project focused on neurodiverse approaches to learning and teaching computational thinking. Thus, it was important for us to develop and carry out data collection and analysis methods which also exemplified neurodiverse approaches where we aim to disrupt neurotypical assumptions about being and knowing and encourage the fluid multiplicity in neurodiversity. We sought a 'fit' or commensurability between the practical and ethical aspects, and methodological innovations of our project (see Donaghey & Magowan 2022).

Our neurodiverse approaches were inspired by qualitative and art-based inquiry that have utilised multiplicity and polyphonic approaches in a variety of ways. Multiple conceptualizations of data (e.g. Koro-Ljungberg & MacLure 2013; Rantala 2020), art-based inquiry processes (Hickey-Moody & Page 2016; Denzin & Salvo 2020), more-than-human and affective scholarship (Rautio 2013; Murris 2016; Renold & Ringrose 2017), and experimental qualitative inquiry examples (Kaljonen *et al*. 2019; Koro-Ljungberg & Knight 2019; Koro 2022) have inspired scholars to experiment with texts, images, music, polyphony, and in our case with scores. More specifically, creative and experimental qualitative methods utilise experimentation and imagination among other artistic and interpretive techniques. The ways we have used polyphonic scores in this example draw from multiplicity, poly-dimension, and unthought associated with methodological experiments and continuously diversifying creative practices. In this paper, we draw from Deleuze and Guattari who proposed that 'to think is to experiment, but experimentation is always that which is in the process of coming about—the new, remarkable, and interesting' (1994, 111). Polyphonic data analysis and musical creativity, in our example, uses 'innovative temporal structure and … decentred narrative technique' for working collectively and nonhierarchically with multiple voices, structural complexity, and multiple ways of living and experiencing (see Akpome 2013, 25). According to Koro-Ljungberg and Knight, 'the polyvocality realizes that multiple voices, ideas, theories, practices, compositions, assemblages "speak" and perform differently about methodological experimentation, and that these stances and perspectives can sometimes be harmonious and sometimes cacophonic' (2019, 5–6). Furthermore, polyphonic data analysis and multi-layered interpretation integrates 'diverse voices that manifest in multiple data sources' (Pithouse-Morgan *et al*. 2014, 149) and multiple conceptualizations about what inquiry, plurality and sounds can, might, ought and inspire scholars to do.

We believe that there exists vitality in polyphony and pluralism. Worlds within worlds, methodologies within methodologies, scores within scores support multiplicity in its various forms. Similarly, methodological pluriverse, infinite multiplicity of methodological relations and strategies make each research project singular but always more than one. For scholars to live the plural and many methodologies (and scores), they have to create and compose. Qualitative scholars live their inquiries relationally through music and allow more infinite spaces for affects, concepts created and crafted by other scholars, surrounding materiality and sounds. Following Whitehead, experimental inquiry avoids routines

that force intellect to vanish and conditioned reflexes to take over, where 'the very essence of real actuality … is process. Thus, each actual thing is only to be understood in terms of its becoming and perishing' (1967, 274), or as 'a learned orthodoxy [that] suppresses adventure' (277). Foregrounding the doing and carpentry of philosophy and concepts, Barney explained how making and doing can create entryways and connection points to philosophy and onto-epistemological conceptualizations: 'concepts, or renderings, emerge in such a practice through committed reading, thinking, making, and actions' (2019, 622). Polyphonic work with scores forms a fertile ground for troubling our learned orthodoxies and interpretations of data and participants' experiences while simultaneously problematizing simplicity in data, affect and inquiry. In addition, methodological language and linguistic representation of (sound) experiences may not always be 'correct' and accurate, and more importantly, methodological relations and analytical tasks are independent from other processes of knowing, being, sensing and living. Methods and, in this case scores as methodological strategies, do not order or predict the world, but they may create an emerging and moving collective sense of worldly and affective events.

Study aims and context

This paper introduces and describes the polyphonic score as it was designed to (a) analyse teacher interview data about their experiences co-designing neurodiverse pedagogy during their first year participating in a research practice partnership (RPP), (b) extend inquiry to engage wider modes of neurodiversity, and (c) specifically 'fit' the context of the research project.

The RPP was composed of four teacher fellows (TFs), two employees from the Neurodiversity Education Research Center (NERC), and several researchers from two colleges within a large southwestern university in the United States. TFs were middle-school teachers who taught either STEM courses, music, or adaptive physical education; they also taught at least some students with autism labels[4]. Two of the TFs taught at a small private metropolitan school specifically for students with autism labels and one teacher taught at a school within a nearby federal Indian Reservation. NERC employees recruited the teacher fellows and managed all communications with the fellows. NERC's Research Officer also co-facilitated workshops and participated in data collection, data analysis, and dissemination of findings along with the university researchers. All researchers planned and executed the initial project enabling constraints and supported TFs with interactive and open-ended professional learning opportunities in neurodiversity, computational thinking (CT), music and movement, lesson plan co-design, and technology co-design.

The RPP also drew from recent research (Sha 2016; Mechtley *et al.* 2019; Thorn *et al.* 2020) to create a digital-physical system for musical-making in ensemble while centring gesture and embodied interaction. The goal was to create technologies and techniques adaptable to neurodiverse students—moving away from a cognitivist to an embodied approach for mastering CT skills. Two researchers designed the musical technology through iterative feedback provided by the TFs; the technology included small wearable microcontrollers with wristbands, or Internet of Things (IoT) motion-sensing devices, that connected to browser-based applications via Bluetooth protocol. Together, the research team and TFs designed prototype digital musical instruments, which then underwent an iterative cycle of refinement, modification, and simplification to become web-based instruments (e.g.

wearable jazz, rain stick, etc.) after the TFs tested and retested the technology with their students (https://playnewmt.github.io/app/instruments.html). Further, the TFs co-designed a neurodiverse CT mini curriculum and pedagogies that integrated into the wearable musical technology. For example, one TF strapped an IoT device to a baseball bat to teach their students basic batting techniques, pattern recognition, and cooperative gameplay. When set to a "ping" on the app, the device would activate the sound once a student swung the bat—making it easier and safer to teach baseball as part of adaptive physical education.

Professional learning regarding the lesson plan and technology co-design occurred mainly through Saturday co-design workshops where TFs learned about the capabilities of the wearable devices and apps through a balance of direct information, guided hands-on experimentation, and iterative co-design workshopping sessions. TFs periodically took their ideas back to their classrooms and implemented the wearable devices and apps with their students, solicited student feedback, and reported on their findings at subsequent workshops.

During most of the workshops, TFs participated in mini-interviews (12 total) and embodied interviews (four total). Qualitative data collection was designed to study the following questions: How do teachers experience the co-designing of neurodiverse pedagogies for computational thinking in an RPP? and, How do teacher participants modify and diversify their teaching practices of CT? Mini-interviews, which lasted 5–10 min during the workshops, included open interview questions. One-hour embodied semi-structured interviews (Brinkmann & Kvale 2015) provided more in-depth investigation into participants and their elaborated responses while engaging in play and musical exploration. Embodied interview data included audio and photographs. Interview audio was transcribed and then critical incidents (Flanagan 1954; Angelides 2001; Tirri & Koro-Ljungberg 2002; Williamson *et al*. 2009), or events that had specific significance or that made a considerable contribution to the lives and experiences of the participants especially in the context of neurodiverse pedagogies, were identified. These events were categorised as: (a) surprising or unexpected events that caused the TF to think differently, (b) a moment mentioned by the TF where new pedagogical possibilities were considered, and (c) the development of new or shifting pedagogical perspectives as expressed during the interview. Identified critical incidents were listed using a title, short description, and interview quotes, and then grouped by category.

The results of the critical incident analysis served as the basis for the subsequent score analysis. As a polyphonic score, the layers were not developed/developing in a linear fashion, but in parallel, intersecting, and overlapping ways. Additionally, we were inspired by musical scores in that musical scores represent the layering and construction of different musical components (instruments, ideas, motifs, etc.). These musical components interact with each other in a plethora of different ways which mirror our idea of the polyphonic data score. To continue in alignment with our ontoepistemological assumptions (values, beliefs), purposes, and chosen methodology, the rest of this paper will continue in layers, paralleling, intersecting, and overlapping in ways similar to our methodological process. At this point, we encourage readers to view our video creation for the first time (https://youtu.be/BCALYhDidE8) to experience how data was used to engage with the development and implementation of neurodiverse pedagogies.

Movement 3: dancing through the data and scores

We (the RPP) created an event-driven timeline of TFs' experience in the co-design of our curriculum that would later become the basis for our musical, poetic, and multimedia representations. Teachers in this study were experienced in working with neurodiverse students and as teachers of technology. Co-designing a new wearable technology in neurodiverse classroom settings also involved co-designing accompanying pedagogy. We call this event-driven timeline an' event score' ince it is being used to create music composition and derivative pieces. A musical score is a composition that has been notated to preserve its form and structure; it is an interface in which musicians interact with the history of some musical composition by interpreting the abstract symbolism of the notation. A score is not only preservation, but also organisation. Depending on the composition, a score also shows how each instrument, or voice, fits together among the whole. We employed similar layering in our event score method. Following the experiences of our teachers, each critical incident category in our data makes up only one voice of the composite timeline. Due to the ambiguity of the score, the musician makes their interpretation of the score unique through their skill variations and other stylistic decisions (Edlund 1996). This extends to stylistic choices in designing the modular synthesis system that we used to represent our final score.

Researchers conducted member checks over Zoom with our participating TFs to gauge the iterative process during the co-creation of our neurodiverse CT curriculum. We used a collaborative Miro Board for the member checks, and each TF had their own section of three rows to match the categories of critical incidents that were reported (Figure 1). The three critical incident categories form the narrative structure of our scores. In the first row, there are surprising or unexpected events that caused the teacher to think differently about pedagogy for neurodiverse children. In the second row, we have questions that the TFs had about the multitude of possibilities or experiences that made them want to explore further. The third row shows new or shifting pedagogical perspectives expressed by the TFs.

During the member checks, the TFs were asked to make any revisions or edits to the critical incidents and arrange the sticky notes on each row in a way that made sense to them. Some TFs chose to change the size of the sticky note to delineate importance, some grouped sticky notes that seemed to be related, and some TFs organised notes from most important to least important. The movement

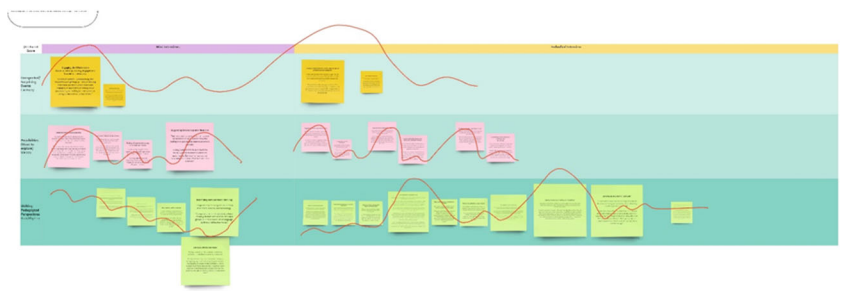
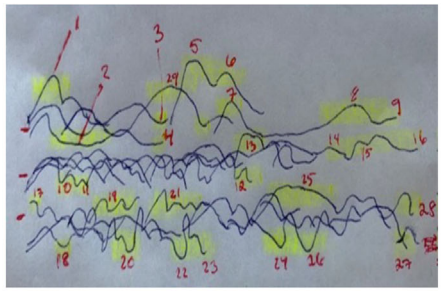


Figure 1
One Example of Miro Board Scores With Virtual Pen Line.



1. Encountering complexity of integration
2-4. Empty (no notes, learning to come)
5. Interacting with technology nontraditional ways
6. Different purposes in partnerships
7. Students helping teacher
8. Increasing student participation
9. Empty (no notes, learning to come)
10. Applying activities across ages
11. Finding a place for tech app in the curriculum
12. Support students to learn the app
13. Connecting tech to the curriculum
14-17. Empty (no notes, learning to come)
18. Encouraging improvisation and exploration
19. Opportunities for creative movement
20. Moving beyond initial students' reactions
21. Making learning a game
22. Expanding comfort zones
23. Discovering different apps with different affordances
24. Increasing students' comfort
25. Reducing teacher involvement
26. Teacher learning new vocabulary
27. Develop a culture of changes and modifications
28. Creating as a group
29. Enjoying noticing differences

Figure 2
Collective Scores With Critical Event Summaries.

in each row was indicated using a line drawn in with a virtual pen (Figure 2). This movement later became the driving force for our later analysis and artistic representations of the data.

The researchers then produced two polyphonic score compositions as ways to interact with data. First, the linear collective line score included all participants' critical event scores and movement lines compiled together in sequence. A second score further analysed the critical events by using only the extreme movements and their respective sticky notes, which we produced by overlaying each of the TFs event scores to create one composite event score (Figure 3). Using Meadows & Wimpenny (2017) and C. White's (2022) work as an inspiration, we used connections to arts, music, and improvisation to work through our data, critical events scores, and participants' collective experiences of embodied CT learning. Like Meadows and Wimpenny, the musical origins of data called us to think through 'how aesthetic experiences [of data] might be conveyed as they are synthesized' (2017, 165). One of our research team members created a musical score reflecting the structure and movement of critical events.

Figure 3
QR Code for the Final Video Creation.

Musical composition

The musical composition reacts in real time to the data lines drawn onto the linear critical event score. The framework for the composition is a modular synthesis network created by one of the researchers that takes in the data drawings and renders a different voice per line of the event score. The modular synth is a system composed of various building blocks for sound synthesis. One can create complex networks that act entirely on their own. We digitised the drawings from the critical event score; the drawings from each line affect the musical components in the piece in different ways. So, each line from the critical events becomes its own voice in the ensemble that changes sonically based on the height of the data line drawings. The sonic fluctuation narratively drives the piece, and each voice reacts differently to its corresponding data line. The top line controls the harmony, and when more unexpected events happen, as the teacher fellows taught our curriculum, the harmony becomes more distorted to cut through the mix as a surprising event would in the classroom. The middle line of the event score controls the melody. To represent teacher fellow questions and 'what ifs,' the melody gets washed out in echo as the data line grows in value. Finally, the bottom line of the event score got translated into a heartbeat since it signifies the pedagogical shifts of the TFs throughout the experiment. The heartbeat speeds up as more pedagogical perspective changes happen to show the excitement of listening and adapting to the classroom. Underneath all of this is a low bass drone acting as a tonal bed to centre all the other parts. Additionally, the TFs made some of their critical incidents extra-large in the collaborative Miro board. We represented these major perspective shifts in the music with a chord progression. Each time a major critical incident occurs on the event score, the tonality of the entire composition changes to a new musical key centre.

Musical scores as practical polyphony

Interweaving these components produced a complex, emergent composition to transcend individual parts. The modular synthesis system 'composed' music from critical event data points shows how different kinds of critical incidents (the different voices) interact. The temporal experience of the data reflects how various neurotypes might experience neurodiverse pedagogies, with the ebb and flow of continuous perspective shifting. The relationships between these three types of critical incidents present themselves in new and unique ways through the music. For example, both surprising events and pedagogical possibilities interacted synchronously (echoes in the melody increased as harmony distortion increased) creating a full and overwhelming sonic experience. Immediately after this 'musical chaos', the heartbeat accelerated, denoting greater excitement around pedagogical shifting post-questioning. The pivotal events that changed chord quality happened at peaks and valleys, meaning the chord changed during moments of high or low musical density. In other words, while teaching our curriculum the TFs had dramatic shifts in perspective during periods of intense questioning and surprise or during moments of stillness. Additionally, since the musical composition was based off the linear event score, each TFs experience sequentially follows each other. So, around every minute of the composition, the lens of experience changes. For example, the beginning of the linear musical score had strong surprising events, which influenced the flow of other pedagogical possibilities and shifts; however, towards the end, surprising events were fewer, leading to more unpredictability in the

melody and heartbeat. Listening to the voices altering over time brings focus to the interconnectedness between the different critical event categories, whereas, listening to the piece change over time demonstrates the differences in rhythm and texture between each TFs personal experience.

Our musical composition allows the listener to experience relationships in our qualitative data in a novel way, though each interpretation of a score is uniquely bonded to the performer or system that performs it. Our modular composition is only one musical interpretation of this data score. No two performances can be the same due to the ambiguity of notation. Because the piece is built upon a score, it could have infinitely many alternative interpretations. Not only does this mean that our data score could be endlessly reinterpreted, but differences in interpretation lead listeners to have different perceptions (Edlund 1996). Just as a modern performance of a classical piece of music can emphasise aspects of the piece that no one ever has before, a new interpretation of our event score could lead to different insights. One of the reasons we originally decided to use modular synthesis to create our interpretation of the score is that a new system or arrangement of modules with the same data score as input would yield completely different sonic experiences. Also, modular synthesis has a deep history with the sonification of natural processes whether that be movement, plant biometrics, or 'genetic music' (Järveläinen 2000). The variety of score interpretation by the musician or similar analogue (modular synthesis network) could be used to discover new connections within the data due to differing listener perceptions. An atonal noise-based interpretation may yield a different experience of the data than a heart-wrenching orchestral rendition of the same event score. However, perspectives could be solidified through the same process of re-interpretation. For example, most interpretations of any song, say Claude Debussy's 'Clair De Lune', follow the same pitch and time structures; though they may add embellishments to either, the original form remains recognisable. A data-driven score, like the one described above, opens data representation and analysis to the polyphony of performer and listener experiences, respectively.

Finally, a visual overlay was developed following the first score's cartographic and audio composition using Pinnacle Studio 25 for data analysis. The final video creation was used to analyse how TFs were impacted during the development and implementation of neurodiverse pedagogies. Quotes and keywords extracted for the video creation reflect how silence and sound collapse and expand through a rhizomatic fashion across the development and implementation of neurodiverse pedagogies. These indicate how TFs experience messiness, exploration, atypicality, and more, which fully represent neurodiversity.

Movement 4[5]: ode to musical experimentation

Teacher sticky notes arranged like musical quarter notes on a staff, beckoning lyrics and musical ties.

Repetition. iteration

Finding some new note, sound, harmony, or melody to floss the neurons in my brain. It was a reminder of my obsession with 100+ replays of a song that 'speaks' to my soul, until I was exhausted by sensory overload. The line composition beckoned movement, dance, and discovery. It welcomed the misophonic possibilities of my neurodiversity, collapsing and stretching what it means for me to be 'deaf' and

'hearing'. No longer did I need to be reduced to a binary—I am invited to be who and *how* I am.

No neurotypical readers.
No neurotypical listeners.
Something else.

The third layer of staticky that was bothering us. It goes back to the discomfort—the discomfort the teachers felt and the struggle that they went through this year trying to figure things out without having something ready made for them to use.

Musical effects invite.
Musical effects create complexity for the ear and body.

Lines invited a walk in the woods, going on a journey with someone with the forest's ups and downhills. When Author 4 first put the heartbeat in that I had some kind of reaction to that, and I can't remember exactly, but it reminded me of human connection. Surprising!

The music added an additional layer of depth, creating a spatial experience.
Bodies are responding in unexpected ways to entering the data differently.

Through vibration and rhythm.

Through movement and form.
We analyse data. But we feel art.
Art welcomes us to perceive based on our own polyphony of experiences.
When I could make out what the data was saying without understanding,
it reminded me about human storytelling. Unexpected!

When I can no longer think, I can still feel.
New avenues of discovery open up when I can *Listen*;
when I can hear the overlapping music.
that steps on itself sometimes, but isn't that beautiful?

Repetition, Iteration.
Data becomes Art which becomes. . .
Something else.

Movement 5: coda

During the early years of the COVID-19 pandemic (the same time this federally funded project began), visual arts teachers were prompted to shift their teaching and to create engaging lessons for hybrid learning through the use of new digital tools and techniques, especially for students with disabilities and neurodivergent labels (Stuart Whitehead & Duewer 2023). Yet, despite finding unique ways to expand their teaching toolboxes, teachers noted how virtual instruction lacked

inclusive curriculum development across stakeholders and also failed to address students' individual support needs and learning styles (Stuart Whitehead & Duewer 2023, 248). Addressing these systemic issues by designing neurodiverse pedagogies and technology can help educators cultivate meaningful, accessible learning opportunities for neurodiverse and disabled students (McKinney 2016) across disciplines. This study not only attends to this call, but also beckons an intentional and purposeful transformation for understanding neurodiverse data analysis and representation. Polyphonic score analysis was designed to align with teachers' critical incident experiences with the co-designed digital-physical technology. But the score compositions also encourage experiencing data multiply, by multiple co-researchers through multiple senses, and with neurodiverse sensibilities. It implores art to move beyond normative visual boundaries—to consider what is felt, heard, embodied, and/or sensed across varying disabilities and neurotypes. Our focus on embodiment, creativity, and ensemble made using performative, speculative, and experimental techniques pertinent, helping to shape new pathways for interpreting and representing neurodiverse data as expansions of human possibility (Dwyer 2022).

Conflict of interest statement

We have no conflicts to disclose.

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Endnotes

1. The first background image indicates a pluriverse of our neurodiverse thoughts, coalescing to compose a reflection of the music scores created in this study.
2. Recognising the neurodiversity of a group and actively leveraging the multiple modes of learning, thinking, and communicating.
3. Neurodivergence is 'a value-neutral term that encompasses *any* significant divergence from dominant cultural norms of neurocognitive functioning' (Walker 2021, 48).
4. We use this term to recognise that the students had been identified and categorised by school and/or medical systems, but we do not have information on how each student self-identified.
5. The second background image is musical sheets. This section is intended to reflect a full musical composition, styled as an ode, or a poem meant to be sung.

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