

# EMBRACING AMBIGUITY: THE INTERSECTION OF BIOLOGY, MUSIC, AND ART IN SECONDARY SCHOOL TEACHING FOR STUDENT CREATIVITY

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**ABSTRACT.** In these conversational field notes, two teachers reveal their experiences with creativity in contexts where students are encouraged to dwell in spaces of ambiguity and vulnerability in learning. Using anatomy to inform music pedagogy empowers students to work through metaphor-rich instruction in order to develop a grounded approach to artistic interpretation, while using fine art in the science classroom allows students of anatomy to explore the artistic possibilities of imagination in relation to the human body. In both cases, the crisscrossing of pedagogical lines from biology into music and music into art helped to transform students' relationships with ambiguity from being negative and closed-off, to positive and constructive.

**S'OUVRIR ENVERS L'AMBIGUÏTÉ : L'INTERSECTION DE LA BIOLOGIE, LA MUSIQUE ET L'ART DANS L'ENSEIGNEMENT DE LA CRÉATIVITÉ AUX ÉLÈVES DU PALIER SECONDAIRE**

**RÉSUMÉ.** Dans les relevés de recherches conversationnels si-dessous, deux enseignants révèlent leurs expériences avec la créativité des élèves dans des situations où ceux-ci sont encouragés à vivre dans des espaces d'apprentissage à la fois ambigu et vulnérable. L'utilisation de l'anatomie comme outil d'influence sur la pédagogie musicale renforce un enseignement riche en métaphores ainsi permettant aux élèves de développer une approche fondée sur l'interprétation artistique, tout comme l'intégration des beaux-arts dans les cours de sciences permet aux élèves en anatomie d'explorer les possibilités artistiques de l'imagination en accord avec le corps humain. Dans ces deux cas, le croisement des lignes pédagogiques de la biologie vers la musique, et de la musique vers l'art, a contribué à la transformation de comment les élèves perçoivent le concept de l'ambiguïté – passant d'associations négatives et fermées à des associations positives et constructives.

**W**e write these notes from the field as neighbors and teachers, whose lives are inextricably linked through music, teaching, performance and art. In the week before a new school year, as sounds of Travis's trumpet students echo through the wall of our semi-detached homes, Tasha gets down to work on

deciding which piece of art she will draw for students on the chalkboard of her classroom in Gatineau, Quebec. Sometimes the pictures relate to teaching the biology courses she is assigned, and sometimes not. This year, she decides to welcome her grade nine students with a humorous drawing of the velociraptor from Jurassic Park (Figure 1).

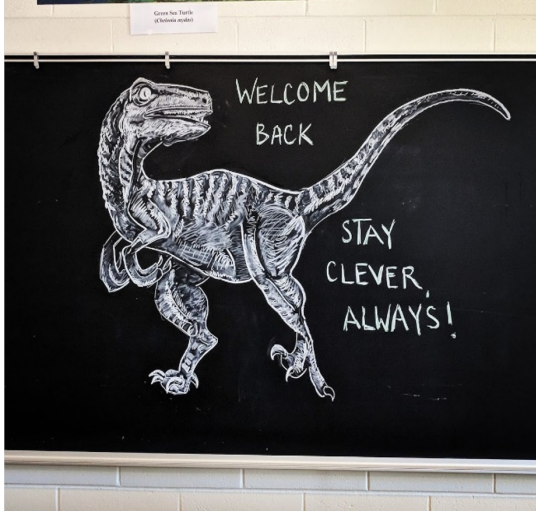


FIGURE 1: Welcome message to new science students drawn in chalk

Our entwined journeys take us between the spaces of music, biology, and art, as Travis teaches trumpet students at a French-language high school in Ottawa, Ontario, while Tasha's daily routine of biology teaching with splashes of artistic creation lead toward the 3:30pm dismissal bell when she welcomes the after-school band into the music room. Some of these band students come over to take trumpet lessons with Travis next door later on in the evening, and so the cycle of teaching and learning literally comes home for us both. Though Travis's performances as Principal Trumpet of the Ottawa Symphony and member of the Central Band of the Canadian Armed Forces are a great portion of his career, Tasha and Travis still find time to trek to the rehearsal of the Ottawa Chamber Orchestra on Sunday nights — a semi-professional community group that plays orchestral favorites throughout the year — and where Tasha is a bassoonist. Each Monday morning, we both begin our pedagogical and performance journeys again, bidding each other farewell on our shared driveway, and travelling to our respective high schools to teach, and to our university classrooms as part-time professors of undergraduate students. Contemplating the renewal of this familiar cycle on a hot evening in August before the new school year, we shared a meal on the patio, asking ourselves how we "got here" after being friends for over a decade. What is the meaning of our teaching, performing, and artistic lives? And why does what we do matter?

In reading through the Call for Papers about Creative Pedagogues, we began to talk freely about our teaching, what kinds of things might help to define the role of the creative pedagogue, and whether our roles as music and science teachers have an impact on students' lives, identities, and their future participation in creative economies – and what those economies might be. As we unpacked what we do, we located our lives at the interstices of art and science, two fields seemingly disparate but linked together in the ways that we teach. To that end, we offer these notes as both a method and meditation on how creative thinking might be the result of embracing ambiguity – between fields of study often categorized by separate class periods and curricula, subject-specific regimes of testing and performance, and particular didactics about mastering knowledge about the human body. We investigate instead the ways that our curricular and artistic worlds reside in the liminal spaces between human biology and artistic expression, practice and study. And we suggest that our interdisciplinary and embedded approaches invoke heightened consciousness about the visceral and emotional humanness that makes both music and science possible, for students now and into the future.

The concept of creativity in music education literature has long been explored, most often to define it through “competing explanations [that] place a strong emphasis on specific psychological states or processes of individual composers” (Burnard, 2012, p.6). These ways of characterizing creativity as primarily emerging from composition and improvisation have become the basis for pedagogical texts aimed at music educators, which encourage them to foster their creative thinking through the implementation of composition and improvisation classes in preservice teacher education (Bernhard, 2013). Abramo and Reynolds (2015) note, however, that,

...[t]his body of research has focused on creativity within music – the process of generating and having knowledge of music... [However,] becoming a creative musician or composer is not the same as, or guarantee of, becoming a creative educator, and thinking creatively about music does not necessarily lead to creative teaching. (p. 38, original emphasis)

Similarly, in science teaching, creativity is often defined by new teaching styles to reach predetermined objectives more interestingly. Davies and McGregor (2010) take aim at studies like those by Johnston (2005) who recommends,

Practitioners with subject and pedagogical knowledge need to adapt their teaching to suit the learning objectives, the children and the context, and that they should make their own decisions about teaching styles and learning experiences, producing novel ideas for achieving objectives for the benefit of the children's learning. (p. 15)

Davies and McGregor (2010) rightly point out that “[w]hile this advice is certainly helpful, it doesn't seem to readily distinguish 'creative' science teaching from 'good' or 'effective' teaching” (p. 15). What we see in literature

about creativity in both science and music is an emphasis on the teacher as embodying internal creativity themselves, but with little direction about how being creative transfers to teaching creativity versus teaching creatively. As teachers and artists, we distinguish between pedagogy as an act of creative production, and pedagogy (whether one might define it as explicitly creative or not) whose aim is to foster creativeness in our learners. No doubt, both are entwined, as the creative pedagogue has a repertoire of innovative ideas to share about the way they see the world through an artistic lens; however, we suggest that teaching students to think and be creative is the larger goal of our work inside and outside the classroom, and thus we shift the focus to highlight how our pedagogies help students become creators and creative thinkers themselves.

In what follows, we offer the conversation that unfolded about our pedagogy on that hot summer night in August, and what kinds of practices we employ to enable students to nurture their creativity. We present the evidence of our praxis through a series of images and vignettes, leading us toward the notion that ambiguity in creativity fosters heightened consciousness about the self, identity, and learning.

*Travis:* First of all, private lessons are about demystifying things. It's really easy to just play for them, to show them how it's done. I am trying to remove myself, instead of giving a mystical "this is how do we do this." I think removing yourself has been underused in teaching. Some great trumpet pedagogues will say certain things or show it, and you take it because they're great players and you assume that what they are telling you is correct, but when you look at anatomy and science, you realize that their suggestions are not grounded in objective facts. You become disconnected and not conscious about what goes on with your own body. When I teach my students, I want them to think about their bodies. We look at the muscles together using an anatomy coloring book [Figure 2] and what roles you can assign to those muscles. After all, it's inside the mouth. This specific muscle will help you with that technique, so you focus on it. You can control it, develop it, and improve your technique. We look at the depressor labii inferioris and mentalis and learn that the lower lip does all the work. You can't really move the upper lip when you play, which they didn't know and it's not obvious, but we can work with moving all the muscles in the lower lip and chin after looking at the diagrams, even coloring them sometimes.

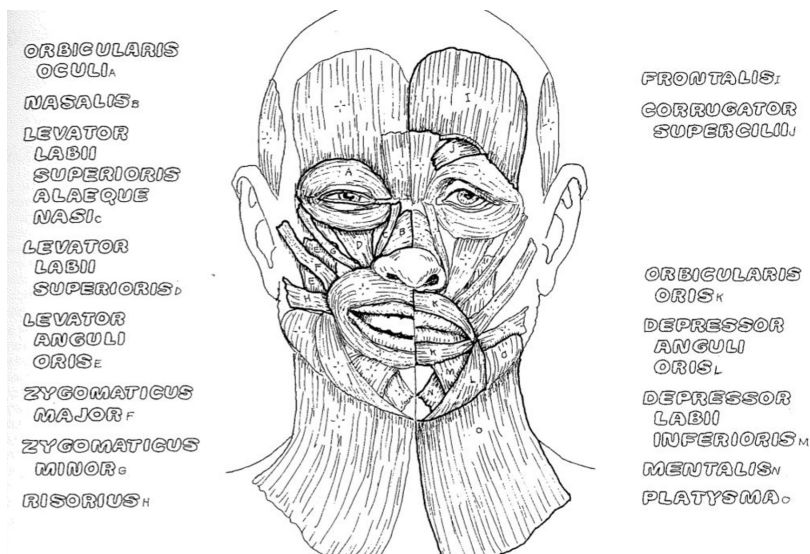


FIGURE 2: Facial Anatomy (Kapit & Elson, 2002)

*Tasha:* I've never thought about that in music teaching specifically. I mean, I talk about airflow and production from the diaphragm in wind playing with beginner band but I use a lot of metaphor with phrases like "think of it as a musical sentence" or try to "blow air to the back of the room" with a bunch of force and so on. But to point to the actual anatomy is new for me for my after-school band. It's not like in my science class because anatomy is front and center. I deal with it every day. The diagrams, the memorizing, but it used to be lost on some grade nine kids. There's so much information and they're like "why do I have to know this?" They're labelling parts of the lung with words from the digestive system like they don't get that they are living in this body. They're walking around with it not knowing what their own parts are, which is mind blowing to me. I kind of went the other direction, towards art and metaphor, not away from it.

*Travis:* In music pedagogy it's dangerous when all we have is that – metaphor. When anatomy and physiology are something we have extensive knowledge of at this point in the game. So there's no reason not to use it. You compare a sound to something in nature, or sometimes I use a pearl necklace. You seek definition between things that are linked together. You don't notice the individual pearl linking the whole chain together, just that there are distinct parts of a whole. But when you are teaching from a scientific perspective, you have the power to dwell in metaphor and spaces of ambiguity because you've started from a grounded position. From good technique, you can interpret. You can trust your technique will evolve, and you can actually understand and

apply metaphors like the pearl necklace better. Interpretation, personal taste, sound... they become a choice. Positive ambiguity is how I would define potential. Negative ambiguity is what causes self-doubt. Now you can go places with sound technique and you are empowered.

*Tasha:* Negative ambiguity is definitely hurting my grade nine science students. When they don't know what they are looking at or why it works, or why it matters, then they lose a grip on what I am trying to teach. The stress becomes evident with summative assessments, where they grab at answers that don't even make sense. Since I started putting my anatomy pictures on the board, and on Instagram, I am getting better results in our assessments. Kids find the pictures on Instagram and share them, or come into the room looking for this week's drawing. So I guess it's part of the formative process in the class. A heart diagram for a dissection one day started it all, but the ear got a great reception [Figure 3] because I saw it going around on kids' snapchats and students from other sections of the same course started coming in a lunch to take pictures.

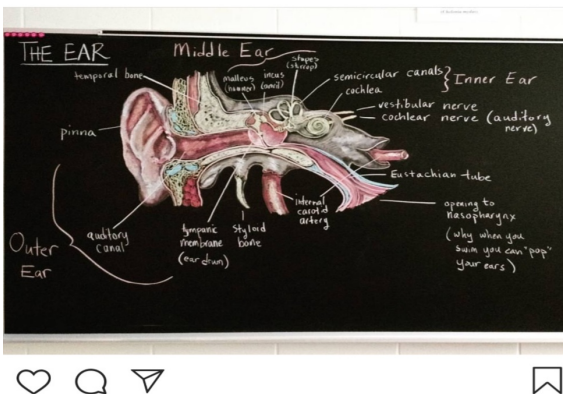


FIGURE 3 : Classroom chalk drawing of the human ear

What struck me the most were some quiet kids last year who were artists and dancers and musicians – who went home and, in some cases, drew their own pictures and brought them back to show me or give them to me as gifts. I had other kids popping in at lunch with their friends from other sections of the same course to show the drawings and explain the anatomy to them. So it kind of changed the morale overall. Some kids really treated it like a present and some asked why. Like, why are you doing this for us? But mostly there is a lot of excitement and anticipation so I just keep doing it.

### ***Ambiguity and student consciousness***

From our dialogue, it is clear that we both teach with and through the body in different ways. While Travis leans in towards anatomy as a way of demystifying trumpet playing, Tasha pulls away from the textbook diagrams to render them artistically for the primary reason of giving students something colourful and aesthetic to look at and contemplate – simply to show the beauty of the human body. By crossing curricular lines, we still did the work we hoped to do – demystifying and teaching the fundamentals of trumpet playing and scientific knowledge.

Davis (2004) asserts that creative people are comfortable with yet-unformed ideas, incomplete processes, and dissonant ideas. Abramo and Reynolds (2015) explain that the opposite of this is “cognitive closure” (p. 41), something DeBacker and Crowson (2009) found led students to

force conclusions, seize on obvious solutions, and assume the veracity of erroneous ideas. Students uncomfortable with ambiguity were also more likely to be satisfied with a generalized understanding of a topic; they were less likely to explore a topic more deeply, frequently seeking out opinions and strictures that conformed to their preconceptions. in Abramo & Reynolds, p. 41

By crisscrossing into one another’s conventional pedagogies to implement artistic modes of representation in the science classroom and scientific thinking for music education, we attempt to avert this kind of cognitive closure in our students, and our efforts seem to be gaining traction.

For Travis, giving the opportunity to understand one’s anatomy via a coloring book (itself an artistic intervention into conventional science texts) became the place from which students could begin to explore interpretation. His middle and high school trumpet students allow themselves to enter the metaphorical world of musical artistry from a place of heightened consciousness about their bodies and the relationship with the instrument. Given the safety and intimacy of a private lesson where a foray into the anatomy book is both possible and guided by a knowing pedagogue, we assert that students feel more comfortable exploring new and uncomfortable concepts when they belong to an environment that permits and encourages such explorations. Then, the confidence of technical improvement allows students to return to the trumpet day after day, and they begin to enter the interpretive space where they can explore metaphors like the pearl necklace. Furthermore, they don’t quit playing the trumpet early on, as many students do who become frustrated. By reducing negative ambiguity and self doubt, students seem to sense they are in good hands, and like in all good learning relationships, this feeling evolves over time. Students always entrust teachers with their learning up front, but it is up to us as pedagogues to curate this trust and to lead students to positive spaces of ambiguity, where opening the doors to imagination is possible.

For Tasha, the chalk art on the board resonated with students in its simplicity — pictures drawn quickly from a six-pack of Crayola coloured chalk between classes or at lunch. They saw that some of the things produced in a science classroom were not defined foremost by the binary of right- or wrongness, and that they could be beautiful. Drawing large pictures worked to demystify science in ways that textbook diagrams of a similar variety did not. It became evident that the intimacy of drawing for the students allowed the doors of their imaginations to be thrust open. While the students might have arrived in the space with negative ambiguity of not knowing labels and functions for which they were inevitably responsible on upcoming unit tests, they shared a common anticipation and excitement about the art awaiting them. What was unknown became something to explore and to challenge them. Perhaps on account of exhibiting joy about the drawings viewed as a “present” waiting for them each week, students could take rightful ownership of the gift given to them — leading them to draw, text, snapchat, and Instagram the board drawings and their own, and to enter the learning space more positively. Tasha saw a change from negative ambiguity to positive questioning on account of students’ awareness — a heightened consciousness about why being there matters — to the teacher and to them.

Finally, dwelling in the space of our own ambiguities in embarking on these learning strategies — stepping away from the ways we were taught as children to master the human body — literally puts on display our own vulnerabilities. Through our willingness to dwell in spaces of ambiguity as we embark on unusual entry points to teaching subjects we know well, we show children that part of being more conscious about creativity is to take risks, and to risk failure foremost. Though we continue to travel in opposite directions — Travis away from the subjectivity inherent in artistic creation, and Tasha towards it — the journey that students both witness and in which they partake, continues to embolden them to look outside the parameters of subject-specific learning. We might hope that as a new school year begins, the artists in the science classroom will continue to pull out their sketchbooks from under their notes and follow their instincts and imaginations. And we hope that Travis’s students will continue to reach into scientific knowledge to empower their artistic intuitions in ways that are reliable and grounded so that they can then interpret the metaphorical concepts such as tone colour and the storyline in phrasing with a grounded sense of their own bodies.



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