The Beautiful Chaos of Inquiry

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Abstract

This autobiographical narrative details a veteran science educator's transformation from a traditional teacher into a scholar-practitioner within a long-term research-practice partnership (RPP). Prompted by mid-career stagnation, the author embraced the STEM-to-STEAM movement, integrating project-based learning and critical making. A 2017 collaboration with McGill University on student-directed inquiry (SDI) served as a critical turning point, forcing her to navigate imposter syndrome and cede classroom control. Over nine years, this work evolved into a robust cross-curricular framework that dismantles subject silos. Now a McGill PhD student and RPP mentor, the author models a "fail forward" mindset, demonstrating how shifting from an all-knowing expert to a curious co-creator enriches student agency.

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Where It All Began

My teaching career began long before I first stepped into a classroom of my own. Like many who grew up in the 90s, my early résumé was a patchwork of part-time jobs: cashier at a grocery store, making Dilly bars at the local Dairy Queen, and even a stint at my mother's dry cleaners where I was, admittedly, her least effective employee. However, my university summers revealed a clearer calling. Looking back, the true foundations of my pedagogy weren't laid in a lecture hall or a formal field placement, but on t-ball fields, tennis courts, and summer camp cabins. It was in those roles as a coach and counselor that my career as an educator truly began.

While I have always been a curious learner, nearly all of my science and education courses were taught traditionally. The teacher stood at the front, disseminating information while students frantically transcribed slide decks or recorded every spoken word. My undergraduate science labs were equally rigid; they were prescribed in such a way that a specific outcome was mandatory. We followed a procedure to attain the correct answer, and anyone who took a shortcut or diverted from the beaten path was penalized.

By 2015, I had been teaching sciences for ten years. My teaching load was stable, and I had mastered the curriculum. But while I felt at ease with the content, I was beginning to feel stagnant, and, if I'm honest, unchallenged. Despite the occasional lively discussion in class or field trip we took, I was still the person at the front of the room, dictating the what, how, and why of science. I realized I was simply teaching the way I had been taught: a "sage on the stage" model that was becoming increasingly boring for my students, and for me.

It was around this time that the Maker Movement was gaining momentum in North American classrooms. Our school librarian was particularly interested in making as a concept, and I jumped in wholeheartedly. It brought back memories of my wood shop and home economics courses in junior high and high school and how much I had loved them because the desk-bound passivity of a traditional lecture was replaced by working with my hands and creativity. As we began implementing small "maker" activities at school, I felt a spark of excitement I hadn't felt in years. I started diving into the literature, looking for ways to officially weave making and design thinking into the fabric of my science curriculum.

Recognizing my enthusiasm, my Head of School at the time suggested I attend a professional development conference on the transition from STEM to STEAM (Science, Technology, Engineering, the Arts, and Mathematics), hosted by the International Coalition of Girls' Schools. I didn't even know educator conferences were a "thing," let alone that I could attend one! The experience was transformative. While I was already experimenting with design thinking, the scale of innovation I witnessed blew me away. I returned home wide-eyed and inspired, ready to overhaul my entire approach to teaching.

Thinking back, the most surprising takeaway wasn't just what I learned from others; it was the realization that my own work with STEAM was just as robust as the projects being presented at the conference. Upon my return from that conference, I met with both my retiring Head of School and the incoming Head to debrief. As I described the high caliber of work I'd seen, I mentioned to the incoming Head, a former science educator herself, that our school was already doing work worthy of these national stages. She stopped me mid-sentence. "Why aren't we presenting what we do, then?" That question stopped me in my tracks. It was a pivotal shift in my professional identity: Why not us?

As I dived deeper into the principles of design thinking and project-based learning (PBL), I felt a strong conviction: I didn't want my students to engage in projects for the sake of making. I wanted them to acquire tangible life skills through the curriculum. To bridge the gap between my ideas and my technical limitations, I formed partnerships with community makerspaces and local sewing ateliers, bringing in the equipment and expertise I lacked.

This collaboration transformed my classroom. The classic "cell model" project, where students typically glued craft supplies to a Styrofoam base to create an animal or a plant cell, was replaced by a garment-making challenge. Students learned to follow a pattern and sew a dress, which they then "mapped" as a cell model. The academic requirement remained, they still had to demonstrate a mastery and understanding of organelle function, but they walked away with a functional, hand-made item and a new set of tactile skills.

Similarly, during a nutrition unit, I was struck by how few of my students participated in grocery shopping or meal preparation at home. In response, a colleague and I designed an authentic assessment: the Grade 9 Family Dinner. Students were tasked with planning, budgeting, and shopping for a healthy meal that incorporated specific nutrients from our curriculum. We took them to local grocery stores to hunt for sales and taught them to prep the meal safely in the school kitchen. The turnout was exceptional; nearly every family attended. Seeing the students explain their nutritional choices to their parents while serving

a meal they had made from scratch was monumental. What began as a lesson in biology became a milestone event that those former students still mention years later when they visit the school.

These successes gave me the evidence I needed to answer my Head of School's challenge. By the summer of 2017, I sought to formalize this intuitive shift in my practice by participating in a professional development boot camp focused on critical making and playful learning. It was a revelatory experience; I realized that I had already been unknowingly incorporating these frameworks into my pedagogy for years. This academic validation was the final piece of the puzzle. My confidence grew from experimenting in my own classroom to leading the conversation, and I eventually took that leap of faith to present my work at an international conference. I no longer had to ask, "Why not us?"; we were finally there. I have since presented my work at numerous conferences locally, nationally, and internationally, always hoping that there is at least one person sitting in on my presentation that walks away inspired to take something they saw in my work home to create something of their own for their students.

However, the real turning point in my journey occurred in the summer of 2017, when I received an email from a friend and professor at McGill University's Faculty of Education asking if I was interested in participating in a potential research project. I answered with an enthusiastic "yes," not yet knowing the scope of the research but curious to learn more. I didn't realize then that this innocuous email reply would set my career as both a teacher and a student on a new trajectory that has invariably led me here, to this point.

Student-Directed Inquiry: A Turning Point

The proposed research project focused on implementing student-directed inquiry (SDI) in my Grade 7 Science and Technology class. To be honest, I had never even heard the term "SDI" before the project was mentioned. A frantic, surface-level internet search suggested it was a model where students chose what they wanted to learn—a definition I now realize was a massive oversimplification, but at the time, it was all I had to go on.

Beyond the definition, I was paralyzed by a more practical question: what was my role supposed to be? For over a decade, my value as a teacher was tied to my ability to lead, to explain, and to maintain a tight grip on the narrative of the lesson. If the students were now the ones in the driver's seat, did I even belong in the room? Was I just a passive observer, or was there a different kind of leadership required that I hadn't yet discovered or mastered?

I would love to say I asked these questions out loud, but I didn't. I was a senior teacher with a decade of experience, and a certain level of professional pride kept me silent. I didn't want to disappoint the researchers by appearing out of my depth, nor did I want to admit that I was essentially "faking it" while trying to facilitate a project I barely understood. I nodded along to the jargon, masking my confusion with enthusiasm, all while privately wondering how I was going to hand over the keys to my classroom to a group of 12-year-olds.

I remember that first session as if it happened yesterday. I brought my Grade 7 class to McGill University, where researchers led an exploration activity designed to prompt students to observe scientific phenomena and formulate their own questions. To keep myself busy, I took photos of the students at work, documenting their progress from a distance. When a student approached me for help or clarification, I responded with vague, evasive questions of my own. I was terrified of overstepping; I mistakenly believed that for SDI to be authentic, students had to struggle through every answer alone. I worried that any teacher intervention would somehow diminish their experience. I spent most of that first class literally sitting in the corner with my hands tucked under my thighs, physically restraining myself from getting in the way.

We laugh about it now, but I still remember how frequently the researchers checked in on me during those early days. They reminded me often that we could pivot or stop the SDI work at any time, but my stubbornness, a trait I carry to this day, pushed me forward. I was determined to see this through.

Every two weeks, the researchers visited my classroom to lead activities that helped them get to know the students and encouraged the kids to identify their own scientific interests. Looking back, I realize I wasn't the lead teacher in those early stages; I was a co-participant. I was learning the rhythm of the room alongside my students, slowly becoming comfortable enough to drop the mask of the all-knowing expert and finally ask the researchers for the clarification I so desperately needed.

I happened to be away the day the students pitched their SDI ideas and voted on a direction for the year. When I returned, they were buzzing with excitement; they had collectively chosen to investigate and raise awareness about the crisis of Missing and Murdered Indigenous Women and Girls (MMIWG). I managed to slap a smile on my face, but internally, I was reeling. As a non-Indigenous educator, I was terrified, not only that we wouldn't do this gravity-laden topic justice, but also because I couldn't see the path forward. How did MMIWG fit into a science curriculum? It felt like a profound social justice issue, not a problem that could be solved in a lab with controlled experiments.

To find our way forward, we brainstormed with the students and the researchers. One researcher introduced the class to the work of Jaime Black-Morsette, the Indigenous artist behind *The REDress Project*. The students were deeply moved; they wanted to create their own dresses to raise awareness. To bring a scientific lens to the project, I suggested we construct the dresses entirely out of paper. We began experimenting with material strength, structural integrity, and various ways to manipulate paper.

I reached out to a local designer who taught the students the technical art of pattern-making, helping them scale their ideas into life-size paper sculptures. We also invited a member of the Indigenous community to share her story; she spoke of her sister's disappearance, the discovery of her remains on the South Shore, and how her sister's case remains unsolved to this day. She listened to each student's idea for their dress and offered suggestions and so much encouragement. My 12- and 13-year-old students handled her testimony with a level of grace and maturity that made me incredibly proud.

My classroom had truly transformed into a studio. The project culminated in a public vernissage where students suspended their paper dresses for their families, the school community, and university researchers. Alongside these works were artist statements, crafted with the support of the English Language Arts (ELA) teacher, which gave voice to the students' choice of design and the symbolism they incorporated into their creations. This collaboration was a revelation for me; it proved that while our project was rooted in science, there was definitely potential for our SDI work to become interdisciplinary.

Curriculum Connected to the Real World

Fast-forward to today, and our SDI project is in its ninth year. We have covered topics ranging from MMIWG that first year to fast fashion, escape rooms, hair, and marine biology, to name but a few. Much has changed since those uncertain days in 2017. I have grown far more comfortable ceding control. While I still act as a disseminator of knowledge when necessary, I have primarily embraced the role of facilitator. I've seen firsthand that learning outcomes are just as robust, if not more so, when students are granted genuine agency. This comfort has allowed me to better support my students in moving their own inquiries forward, and I now incorporate varying levels of inquiry across all my classes.

Most importantly, I no longer view myself as a mere participant in this research; I have evolved into a lead collaborator. As my mastery of SDI and my confidence in this role grew, I began to move beyond implementation and started posing my own scholarly questions about the pedagogical shifts I was witnessing. To find those answers, I am now in my third year of a PhD in Educational Studies at McGill University, where I am investigating the long-term impacts of SDI on student learning.

Today, I spearhead our bi-weekly planning meetings, using student reflections to strategically shape our next steps. We even experienced a "full circle" moment earlier this year with our newest research assistant. During a planning session, I noticed he seemed hesitant and unsure of how to engage with the students during the inquiry blocks. When I checked in to see how he was doing, my veteran colleagues stopped the meeting to laugh. The tables had completely turned: the teacher who once sat in the corner on her own hands was now the one mentoring a researcher on how to navigate the "beautiful chaos" of an inquiry-led classroom.

Our work with SDI has caused a paradigm shift in my teaching and in how we treat our junior school years (Grades 7 and 8). Over time, teachers from math, ELA, and visual arts have all joined the inquiry process. Welcoming them into my room sends a powerful message to my students: I don't have all the answers. By modeling this partnership, I show them that collaboration isn't just something teachers force them to do—it's how the real world solves problems.

I also try to "speak the language" of their other classes. When we look at graphs in science, I use the exact vocabulary they are learning in math to show them that those skills aren't just for a textbook—they are tools for life. The same applies to their writing; I'll often use the RAFT technique (identifying Role, Audience, Format, and Topic) to ensure their scientific communication is clear and purposeful. By constantly pulling threads from their other subjects, I'm helping them see that they don't learn in silos. Everything is connected.

Modeling the interconnectedness of the curriculum has paved the way for seamless collaborations across our junior grades. Several years ago, the arts department head introduced me to the work of Mona Chalabi, a data journalist for *The Guardian*. Chalabi is known for her hand-drawn, vibrant reinterpretations of bar, line, and circle graphs, using them to communicate complex, and not so complex, statistics to the general public. After a few brainstorming sessions with the math and visual arts teachers, we developed the Graphical Storytelling Project. This initiative synthesized units on the scientific method, statistics, and color theory, topics each of our courses traditionally used to open the academic year.

In the project's early days, students chose a topic of interest, researched relevant statistics, and embedded their findings into a whimsical, Chalabi-inspired visual. Students are incredibly observant; they pick up on far more than we often realize. I vividly remember one student's excitement when they realized their math lesson was taking place in the art room, led by their science teacher. That moment was a true testament to the power of breaking down traditional subject silos.

Now in its fourth iteration, the "Mona Project" has become a staple of our curriculum. Each year, the participating teachers meet, often over lunch or before school, to debrief and refine the process. One significant improvement has been the integration of the ELA teacher into the project. While students begin by formulating questions in science class, they now dive deeper into the mechanics of inquiry in ELA. Instead of simply searching for existing statistics, students now design their own surveys for the student body, gaining a practical understanding of sample size and population demographics.

In math and science, they learn that data representation is a shared language, utilizing tables and graphs to convey specific messages. They must actively reflect on which type of graph best serves their data's "story." While the final product remains a colorful, artistic data visualization, the process now culminates in a comprehensive report written in ELA. To mirror this unity, we now grade the projects jointly, discussing each student's progress as we complete a shared rubric. This collaborative assessment ensures that students see their work not as four separate assignments, but as a singular, cohesive intellectual achievement.

Lessons Learned

I am often asked what advice I have for those looking to weave inquiry, SDI, or PBL into their own pedagogy. The truth is, I have no "one-size-fits-all" blueprint to share; the path depends entirely on who you are and where you are starting from. Instead of a map, I offer these starting points for the different voices in our community:

- **For the preservice teacher:** Find a mentor in your school building. Pick their brain, shadow their "chaos," and don't be afraid to try, and fail at, new things while you have the support of an experienced hand.
- **For the inservice teacher:** You don't have to do this alone. Find a "pedagogical buddy," a colleague you trust and work well with, and commit to trying one new thing together. There is safety, and often a lot of laughter, in numbers.
- **For the administrator**: Identify the curious, restless educators on your staff and invest in them. Send them to that conference. It may seem like a costly item in a budget, but I guarantee the ideas and energy they bring back will pay dividends for your school culture that far exceed the cost of admission.
- **For the researcher**: Reach out to the practitioners in the classrooms. Teachers possess a localized expertise that cannot be replicated in a lab. With the right partnership and guidance, they can become unbelievable collaborators and researchers in their own right.

My own journey has been paved with ambitious, if occasionally half-baked, ideas that failed more often than I care to remember. But I kept going because we all fail; it is the most fundamental way we learn. As educators, modeling the "fail forward" mindset is worth more than a thousand pep talks to a student.

When we stop being the "all-knowing experts" and start being the "curious co-creators," we don't just teach science; we live it. It has been nine years since I first sat on my hands in the corner of that room at McGill, and while I have finally found my voice, I hope I never stop finding new ways to be a student of the beautiful chaos that is true inquiry.

Christianne Loupelle, first and foremost a science teacher, is Head of Science and STEAM Coordinator at Trafalgar School for Girls, where she has taught for over 20 years. Her work earned a 2019 Prime Minister's Award for Teaching Excellence in STEM and the international H. William Christ Award (ICGS). Since 2017, she has been the lead practitioner for a research-practice partnership on student-directed inquiry (SDI). She also serves on the CoLab steering committee, governing the broader Trafalgar–McGill institutional partnership. A SSHRC-funded doctoral scholar in her third year at McGill, Christianne investigates the long-term impacts of SDI, co-supervised by her RPP collaborators.