Fractals: A Natural Model Technology Supported Learning Outside

by

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BEd, Ontario Institute for Studies in Education, University of Toronto, 2005
BA, University of Toronto, 1994

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Abstract

Fractals are repeating, recursive, diminishing patterns often found in nature. Imagine a tree, starting with the trunk, held strong by its roots that expand into the soil in support of the branches, stems and twigs that extend up and out. As the tree grows in every direction, the branches and roots are increasingly finer, more delicate, fluid and growing versions of the original trunk. New schools, inquiry projects, and this paper share this model of growth. All start with a big idea, extend out in divergent directions and uncover new questions as the inquiry lives and grows. This paper is part of a larger inquiry project looking at developing a land-based middle school at the new school I am fortunate to help co-create. That school is Mill Bay Nature School, on Vancouver Island, in British Columbia, Canada.

To support this inquiry, these chapters attempt to summarize a small part of the current literature on pedagogical best-practice and the use of technology in education. The large central trunk themes arising from the literature on current pedagogy include experiential learning, land-based learning, place-based learning, place-conscious learning, Indigenous pedagogy and its connection to 21st Century Learning. Other branches of literature reviewed include a view of the accelerated use of technology in education, student and teacher engagement, the dynamic needs of modern learners, and the current focus on twenty-first century skills. The sources are primarily published in the past five years. As much as possible focus on the local context, issues and opportunities specific to the Province of British Columbia, Vancouver Island and ultimately my own school. This collection represents the serendipitous wonders that became the branches, stems and twigs of my inquiry my goal of bringing educational technology and learning outside together.

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Chapter 1: Introduction

The Goal

An important insight into learning by Loris Malaguzzi, founder of the Reggio Emilia approach to teaching, was the impact of the environment in which learning took place. Malaguzzi argued that social learning preceded cognitive learning (Biermeier, 2015). He believed that the environment represented a third teacher, along with the classroom teachers and community that helped to shape the space. The environment as a teacher is dynamic, responsive to the needs of children and reflecting the values of the community to the students (Biermeier, 2015). Teachers, community members, and children co-create their own environment out of whatever space they are given to learn within. My third teacher happens to be one of the most spectacularly beautiful outdoor classrooms in the world, Vancouver Island, British Columbia (BC), Canada.

To anyone visiting a school for the first time, the physical space communicates much about what matters to the people leading the learning in that space. For many, the image evoked by the mention of school would be largely familiar and consistent (e.g., blackboards, desks in rows facing a teacher's desk). If Malaguzzi is correct, that the environment is central as a third teacher to the engaged learning of children, then our present vision of school seems highly systematized and stifled. Fortunately, this idea that where you learn is important to how you learn is being revisited in modern educational settings, including outdoors.

The school I am fortunate the be able to co-create is Mill Bay Nature School. It was founded with the idea of offering children, educators and community partners an opportunity to co-create a school that leveraged the beautiful natural surroundings of the land to learn through exploration, inquiry and experience. The central question of the larger inquiry project is: How can we co-

compose - with our elders-in-residence, Coast Salish elders, students, school staff, district leadership, university researchers, and community members – an embedded, land-based Coast Salish immersion middle school at Mill Bay Nature School?

My project is a small part of a larger visionary goal to use the physical environment as a positive influence on student learning, which leads to the central question of my inquiry project: Is there a role for information and education technology in the service of developing and sustaining an embedded, land-based Coast Salish immersion middle school at Mill Bay Nature School? This paper represents only the very first steps of a long-term journey to co-create, with the communities of people who live in the Cowichan Valley and across BC, an engaging middle school program that enables our beautiful natural environment to become a powerful third teacher.

The Problem

For me, this journey started with a conversation that followed a presentation at a conference. The subject for the morning included a slide that showed the positive impact distributed learning had on the improvement of graduation rates in the province. There was demonstrated evidence that flexible learning environments, supported by teachers and technology, made learning more engaging and helped more students graduate. I made an immediate connection with my home district. An unmet need in District 79, Cowichan Valley, and now clearly across many other school districts in BC, is to offer engaging educational pathways for all adolescent students that are flexible, student focused and extend beyond the walls of traditional schools. This challenge in our community and in the province, has had a long past, an incrementally hopeful present and a possibly rapidly shifting future.

The past demonstrates why change is needed. Using high school graduation rates as a measure, gains have been made from past low levels of public high school completion across BC.

The most current published data shows overall graduation rates increasing over the last 16 years starting in 2003 at 79% to 2019 at 85% (BC Teachers' Federation, 2019). These data include encouraging improvements in the graduating outcomes for males at 83% (an increase of 8% from 2003 to 2019), and for Indigenous students at 70% (an increase of 23% from 2003 to 2019) (BC Ministry of Education, 2020). These improvements represent a focused effort by all educational stakeholders to initiate the changes needed to make learning environments more inclusive and engaging for all students.

At present however, these data highlight two critical issues that this project hopes to begin to address. First, an overall success rate of 85% means that 15% of students are not finding a pathway to graduation within the current system. For Indigenous students, 30% do not graduate across the province. Furthermore, looking at provincial level data and averages across large geographic areas can mask local stories. For example, in District 79, the graduation rate for Indigenous students frequently dips below 60% (BC Ministry of Education, 2020). It is possible to argue that graduation rates represent only one measure of success, but it is an important measure and one that matters for future student pathways. The present BC curriculum does offer more flexibility and liberty than in the past, however graduation rates for Indigenous students represent an ethical challenge that is beyond debate, and we need to explore more options and find more ways to close this gap.

The future of this project depends upon leveraging all the tools and permissions that the current curriculum offers to try to address this need. The BC Curriculum enables a highly progressive vision of what learning can be. It marks an opportunity to move away from a narrow view of what success is and finally try to include those left out. A broad coalition of educators, administration and academics from around the province have committed to digitally meeting to

lend their wisdom to the creation of this bold vision. Despite their powerful voices, all have agreed that for this project to succeed, the voices of the students and our elders must speak first and loudest. Their stories, which will be explored in this paper, are the reason this project exists.

The Project

Our school, Mill Bay Nature School on Vancouver Island, Canada, is a nature based educational program. Central to our programming are multi-age, cross-grade groupings, Reggio teaching practices, an emphasis on the relational nature of learning together, the importance of student voice in inquiry-based learning, enabling children to have a strong genuine democratic voice in the direction of the school, and our connection to the land and the Indigenous people with whom we share this place. Presently our students range in age from kindergarten to grade 5. This project would not exist without the vision of a few critical stakeholders, who have developed bold goals for the future of education in District 79, Cowichan Valley.

This project is part of the plan to extend our programming to allow our students to continue on to grade 7 and beyond depending on individual student needs. This will allow older children to take advantage of the opportunities of a nature school, and also allow students who have started at the nature school to continue their education with the same model. At this stage, one teacher is primarily responsible for a class of older students (grades 5 and 6) who are immersed in inquiry-based programming within and outside the boundaries of our school and supported by our school elders. The plan is to gradually extend this program to more students in higher grades.

As part of our growth plan, our school applied for and received a generous grant from the Vancouver Foundation. The pressing need addressed in the application process reflects both our current focus as a school and our hope to extend that vision going forward. We continuously work

on developing the complex, historical, and emerging relationship between our school, our Coast Salish Elders and the larger local communities. The proposal recognizes:

- The need for embedded, lived, hands-on learning experiences for youth ages 11-16
- The need for youth to experience the deep, ancestral wisdom of the Coast Salish Peoples both as a response to the Truth & Reconciliation Commission and the global climate crisis.
- The need to design a school that is rooted in Indigenous pedagogy and ways of being, and to develop this as an educational option to the Coast Salish Youth in our community some of whom are disconnected from school, and resultantly, whose learning and growth are impacted.
- An opportunity to offer inspiration to others in the province, nationally and internationally of an alternative pedagogy steeped in Indigenous ways of being which takes up the unique challenges of educating youth in positive and productive ways.

This model of learning represents an alternate vision of an educational system that has needed to change. Mill Bay Nature School models a way of being that honours the inherent wisdom of children and the ancient wisdom of the land. The school models the impact of courageous leadership and the power of families and educators to create a community that puts children at the core and believes in learning through experience.

This project is also enabled by the recently redesigned curricula in BC and its focus on concept-based learning and developing critical core competencies in students. While content delivery remains a component of the curriculum, the emphasis is on the understanding of concepts over memorizing facts and information (BC Ministry of Education, 2012). An important goal of this project is to achieve this balanced approach to teachers and students co-developing an

understanding of the core competencies, content and curricular competencies together. Central to both the curriculum and the project are the focus on personalized learning, Indigenous perspectives and knowledge, ecology and the environment, and building flexible learning environments. This project is fully aligned with the new curriculum and intends to extract all of the educational liberty and utility it offers to the benefit of all of our students and staff.

My role within this project is as a co-creator, witness and academic. As a co-creator, I support the students and their teacher at school intermittent guidance as needed and frequent enthusiastic encouragement for the wonderful educational environment they are co-creating. I am also a part of the online team of educators that meets monthly to explore, envision, challenge and support this important work. As a witness, I am acting in the Indigenous meaning of the role: I observe the wonderful growth and challenges of the community as they try to build something extremely unique and share back what I have seen. As an academic, I hope to accurately record only the very beginning of an educational journey that I am most fortunate to join.

Conclusion

I am confident that the momentum built by all of those backing this project will ensure this progressive middle school in the Cowichan Valley will move forward and succeed. For the purpose of the paper, my role is to plan for the future use of educational technology in support of the continued future and outward expansion of this project. In the future, my role will be to integrate into an expanded middle school program that will continue to grow into whatever it the students and Elders co-create. Whatever does happen, I hope to accurately document what I have witnessed, and to share with others who might consider also following this educational journey. The challenges of 2020 around the increased pressure to support learners using technology has made the purpose of my project become more focused. I will identify a framework online and distributed

learning in support of our developing middle school students and our pedagogical practices at MBNS.

The literature review will support this exploration by looking at three major areas. First, I will explore the progressive practices of pedagogy and reconciliation that are central to this project and the goals of MBNS. Next, I will explore the need for change in educational practice to support modern learners. I will go on to review some of the literature on the impact of nature-based pedagogical structures for learners. Finally, I will consider how to use technology to support learning outside in nature, beyond the boundaries of the school and providing the flexibility for those learners who need all these dynamic conditions to learn and see themselves as successful.

Chapter 2: Literature Review

Introduction

In nature, fractals are an ever-diminishing recurring pattern, each successive extension of the pattern mirroring the previous. In forests and oceans and the spaces in between, fractals abound. A circular shell with ever decreasing interior chambers leading to the centre, the gentle leaves of a fern that extend out and narrow to the littlest leaf or the scales of a pinecone that concentrate to a point are examples. For the purpose of this paper, the most apt metaphor is a large tree. The trunk through to the branches down to its twigs mirrors the journey of learning in this project paper in many ways.

A tree represents the personal journey I have taken from the foundation that represents my beliefs as a human and as an educator (trunk), the ways I have grown over time during a career (branches) and the newest ideas that have grown and extended my thinking during this project (twigs). A tree also represents MBNS as the emblem of our school. Our representation adds the roots to the metaphor as the foundation that both holds our community of learners up and helps sustain us. A tree also represents the inquiry-based learning that we practice as our school and is a central part of this project. The trunk representing the goals and interests of our learners, and the branches and twigs resembling the many paths of learning as teachers and students explore those interests in ever greater detail. The fractal quality of the tree, exploring up, and down and out all at once, some parts unseen and others visible and always evergreen represent the iterative and organic life of this project and the core of the research and literature review well.

Theoretical Framework

This section describing the theoretical underpinnings behind this paper will focus on experiential learning, place-based learning (PBL), place-conscious learning (PCL), land-based

learning (LBL), and Indigenous learning. These specific frameworks are to be considered within the larger framework of this report with a particular focus on learning outdoors, student engagement of Indigenous and non-Indigenous new millennial learners, and educational systems built for the needs of 21st Century learning. Wherever possible, the resources selected have focused on the most current content in the Canadian context and experience.

Experiential Learning

Simply put, experiential learning is learning by doing. The act of completing a project and learning from the successes and challenges through the process, are an emotionally impactful method of engaging students in the work of learning and developing the skills needed to build the 21st Century personal competencies and take on even inquiry learning projects of modern curricula. This is a relatively old solution applied to a modern problem. One of the first proponents of modern experiential learning was the educational philosopher, John Dewey. For Dewey, experiential learning is experience as learning based on the pragmatic problem-solving connection between living and learning, and the do-it-yourself learning of his own youth (Quay, 2019). More modern models based on the work of Dewey and others continue the focus on the central role that experience plays in learning. Students are given the opportunity to engage in problems of interest by imagining abstract solutions, experimenting to see the impact of their solution, reflecting on what worked and what did not, then taking what they have learned to continue to solve the problem or to use in solving future challenges (Kolb, Boyatzis, & Mainemelis, 2001).

Experiential learning outside is not new. In fact, it is far older than Dewey. In many ways, it describes a traditional, even ancient way of learning. Aristotle and Plato both observed the centrality that experience plays in learning and in human understanding of the world. The argument for outdoor experiential learning opportunities is often a response to the perceived loss of skills

development caused by modern society and the educational system that supports it. Outdoor educational experiences are a response to the need to rebuild personal fitness levels, strengthen self-discipline, build general practical skills, encourage self-discovery, develop the imagination, and to provide opportunities to both collaborate with others and provide opportunities for being comfortable in solitude (Allison, 2019).

Place-Based and Place-Conscious Learning

PBL builds upon and includes experiential learning. PBL pushes learning experiences beyond the walls of the classroom by taking students and educators out into the community, and providing shared experiences within the local geography, heritages, cultures, landscapes, and opportunities. By acting in their own community, student's experiences are intended to become more real, visceral, engaging and meaningful. Furthermore, their understanding of their connectedness to the world, their role in maintaining and sharing resources, and the need to work to act as stewards of that space are all elevated by their experiences in their space. PBL is a method of teaching and learning that can meaningfully and emotionally connect people directly to their world in hope of making it a better place (Corbett, 2019).

The practical understanding of PBL seems straight forward and generally easy to support. Many organizations such as national parks, community organizations and academic institutions all can make a connection to the value of exposing learners to experiences in their communities. However, the meaning of place needs to be examined in greater detail, not so much as a criticism of PBL, but as a way to make it more inclusive of all of the communities in a geographic area. Any place is both generative and mutable. A defined place exists as a dynamic and ever-changing space within a larger place and contains many smaller spaces.

The complexity of envisioning the overlapping, networked and interconnected space, including different groups of people and ways of learning and knowing, is a modern challenge to our understanding of place (Corbett, 2019). Furthermore, as people experience learning in any place they reshape and modify that space. That space also has a reciprocal impact on those who go out and learn in it. A classroom or school is set up to communicate what happens in that space and in some ways limits what is learned there. We fail to experience our world fully by forcing the world beyond the walls to be an abstraction we describe in a classroom, view on a screen at school, drive through on our own commute or students witness as a passing glance on their bus ride through their community.

If PBL is the act of taking learning outside into the community, PCL is the lens through which we see the broader world we are observing. PBL offers an opportunity to expand our understanding of our space and connect with all of the people who have been on that space over generations of time. Moving learning outside is a challenge to the isolating impact of educational systems and structures and our modern understanding and human relationship to the land (Schnellert, 2019). As students and teachers explore the local community using a PCL lens, they begin to critically explore the local social and environmental issues in the space they travel through and have the opportunity to develop an understanding of their impact, agency and responsibility they have in that space (Schnellert, 2019).

Land-Based Learning, Indigenous Pedagogy and 21st Century Learning

Land-based learning (LBL) and Indigenous pedagogy are modern terms that describe the ancient methods of Indigenous education. It takes an environmental approach recognizing the deeply rooted connection of Indigenous peoples to the land. LBL occurs on the land, focuses on learning about the land and is intended to build a strong connection to the land and the natural elements

around it. While rooted in Indigenous wisdom and ways of knowing, it offers much to both Indigenous and non-Indigenous learners. LBL and Indigenous pedagogy contributes greatly to many modern, progressive and environmentally sensitive bases of pedagogy. Experiential learning and PBL mirror the act of taking teaching outside and living the learning. The lens that LBL brings to our understanding of issues, like our connection to the environment and our impact and responsibility to it, is copied in PCL.

LBL has many benefits as both a pedagogy and a way of advancing reconciliation. It happens literally on the land in our shared community, providing Indigenous and non-Indigenous learners the opportunity to meet together in the same space and explore the very different perspectives about our connection to the land (Wallin and Peden, 2019). It provides a place for genuine inclusion and respect to occur and promotes transformational learning and reconciliation to happen (Wallin and Peden, 2019). LBL can also disrupt the romantic and homogeneous vision of rural communities (Scott and Louie, 2019) that can stand in the way of building trust, bringing people together and building a common understanding.

Most importantly, LBL provides an opportunity for non-Indigenous educators to see beyond the deficit model of teaching that can be inherent in Western pedagogy. LBL can provide a route for Indigenous learners to develop their self-determination and reclaim their identity (Scott and Louie, 2019). However, it is important to be mindful that there is no one universal notion of Indigeneity. Care needs to be taken that, in the development of LBL structures, another unwise external standard is not created that Indigenous youth must once again try to live up to (Donald et al, 2012). Building self-determination and identity in a safe educational space, which does not impose singular universal standard, is not just a need for Indigenous learners, but for all modern learners. This connection between the needs of all learners and pedagogies can be seen in the

development of more responsive learning environments focusing on the development of 21st Century learning skills. Those skills include problem-solving, critical thinking, communication, collaboration and citizenship. Teresa Papp (2020) argues that Indigenous pedagogy is rooted in these skills and that it aligns with the development of any 21st Century curriculum or pedagogy being created for all learners. Beyond serving as a model for a progressive vision of education, recognizing the modern value of an ancient teaching practice is another step to reconciling two systems.

Bartmes and Shukla (2020) argue on behalf of a potentially transformative third space that brings together all learners. The third space they describe brings together two separate cultural spaces in a third new shared space. This would give students an opportunity to explore that space together, seeing that place in unfamiliar ways of seeing and expanding their worldview and their ability to think critically. In this third space, students are given the opportunity to go beyond the boundaries of focusing on academic learning and explore their world and investigate different ways of interpreting that space. This idea is similar to the third teacher in Reggio pedagogy, primarily in that both have less to do with defining what is to be learned and more to do with getting out of the way of the inherent natural human skill that is learning.

Fractal Educational Model

My initial wonder in starting this project was to uncover a framework to support nature based pedagogy using educational technology. In short, how best to take technology outside. Since asking that initial question, the landscape of learning at our school has changed dramatically. Our school has expanded to include a dynamic, distributed and progressive middle school. In addition, we have started a MBNS blended learning school to support students in the larger district community of learners during COVID-19 and beyond.

A paper central to this project is written by Larisa Enríquez entitled *Fractal: An Educational Model for the Convergence of Formal and Non-Formal Education*. In it, Enríquez proposes a progressive, modern model of pedagogy to address the issues of post-secondary education. While its main focus is on online learning in higher education, its central ideas relate so well with the visionary part of my project. The model includes student-centered teaching, concept-based curriculum design, heutagogy, and openness, all of which fit with the pedagogical practices at MBNS. In many ways, the paper addresses my initial wonder and serves as the trunk of this project and my report to which the other fractals connect.

Visible Learning and Invisible Educational Technology

Successful systems are constantly evolving and improving. Education, which has often been criticized for having been slow to innovate and is now out of step with a world that has been changed dramatically by technology. That technologically transformed society has now evolved to the point where it will irreversibly change education. Parents use technology to be more directly engaged in their child's development more than ever before. Social media can popularize many ideas that can seem intuitive and quickly become accepted. Educators now face a public that increasingly demonstrates a willingness to question the systems that once seemed unassailable. Technology is integrated into education with varying degrees of success. The question remains, how can it be even more effectively adopted in the future.

Larry Cuban (1986), in his book *Teachers and Machines: The Classroom Use of Technology Since 1920* argues that enthusiastic external educational reformers have often tried to introduce innovation into schools. Cuban asserts that a demonstrated cycle of educational technology innovation exists in which the initial claims of transformative change fail to materialize. Cuban found that the teacher's apparent unwillingness to fully utilize these new

technologies is often cited as the cause for this failure. Policy makers repeatedly invest optimistically in transforming classrooms with great expectations. It seems that outside observers constantly approach education as being in need of fixing. Cuban asserts that there are a number of contradictory goals and the inflated expectations of external stakeholders that make it very difficult for teachers to successfully utilize new technology.

Despite this history, the enthusiasm of external innovators persists. The challenge that anyone faces in trying to introduce innovation into schools is the complexity of the task of learning. While his work is widely criticized, if John Hattie's ranked list of 252 (as of 2018) *influences* on student learning definitively demonstrates one incontrovertible fact, it is that there are a lot of strategies, theories, programs, frameworks, hypothesis, instructional practices and approaches in education. Despite years of research, educators can still only infer which strategies for learning are best and no one strategy works always and with everyone (Hattie, 2012). The size and scope of the system and the wonderful diversity of the population that seeks to learn only make the task even more complex. Despite the fact that it is unlikely that robots will replace humans as teachers any time soon, they do excel at complex tasks (Stylianou et al., 2015). Educators will continue to need to consider how they will adapt their practice to take advantage of what technology does well. It is a question of when, not if, change will happen, and the events of 2020 have only accelerated that change. Perhaps educational technology is the frame around a painting. Subtly there but not overpowering the beautiful work it supports. Visible, yet when doing its best work, almost unnoticed.

Education for the Twenty-First Century

For me, this learning journey began when I read an article written in The Economist, which was sponsored by Google, entitled *Tailoring education for the 21st century: perspectives from*

educators (Lara, 2018). The thesis of the article is that, although artificial intelligence (AI) and robots are unlikely to ever entirely replace humans, we do need to shift the focus of education to include soft skills education along with the study of the traditional hard skills of math, science and literacy. Soft skills, such as problem solving, collaboration, communication, creativity and critical thinking, are highly in demand workplace skills and will continue to be important in a world of work where automation will replace the types of jobs that did not require these skills.

Fortunately for us, humans excel in two critical skills: learning and communication. Unlike computers, humans can learn, with specific training and practice, to solve complex, ill-structured problems that have uncertain outcomes. We can then communicate what we have learned in a convincing manner with complexity and subtlety (Lara, 2018). Children who are given the opportunity to learn these soft skills, along with social, emotional and self-regulatory skills, are able to accept and work successfully with others. In a future where knowledge is accessible and ever-developing, children will need to develop the cognitive ability to be able to solve emerging problems.

The Economist article suggests that another fortunate fact for us is the complexity of the interaction and communication that occurs between people as they learn together, which remains a most human skill. The article states that there are four key learning strategies that are most effective going forward in education: active learning, project-based learning, cognitive activation and personalized learning (Lara, 2018). While technology cannot yet use these strategies, it can be highly effective in supporting the interaction of the learning by helping to engage students and allow educators to integrate soft skills into lessons about the foundational literacies. Technology's role in education, therefore, is not to educate directly but facilitate the learning process.

One unfortunate outcome described in the article is not about technology replacing humans but about humans being reluctant to adapt to a new model of teaching. It claims that conservatism and cautiousness of educators is the main impediment to the success of this endeavour. The article suggests that while current educators accept that change is needed, many are reluctant to make those changes and a new generation of educators is needed to facilitate the change. This belief that present teachers are the impediment is popular. However, it stands in contrast to Cuban's (1996) argument that inflated expectations should share more of the blame for a lack of expected results. This research provided me an opportunity to uncover what 21st century learning might look like.

Technology is now an integral part of a student's daily life, and there is an opportunity to increase the use of technology in education to positively change and improve student engagement and student learning. Unfortunately, early attempts to integrate technology into teaching practice were not necessarily successful and left a perception of high cost for limited benefit. A recent study published by the Organization for Economic Co-operation and Development (OECD) entitled *Students, Computers and Learning: Making the Connection,* definitively states there is little evidence of improved student achievement in math, science and reading despite the vast amount of money spent globally on information and communications technology (OECD, 2015).

Technology may never completely replace the human interaction component that is required for effective learning. However, it is possible that technology can enhance the learning process and improve engagement and student and parent perceptions about their learning. The quality of a teacher and effectiveness of their practice remain the key determinants of the success of a student. As stated above, research has demonstrated that there are four highly effective teaching strategies that can be supported and enhanced by technology: cognitive activation, project-based learning, active learning and personalized learning. Cognitive activation is the

thinking required to analyze a problem and find a solution. Project-based learning involves students working on real-world problems which take time and complex thought to solve. Active learning involves participating in the learning rather than passively receiving information on worksheets. Personalized learning is simply addressing the specific learning needs of each child.

Research has shown that one major challenge for teaching using technology is that it is more effective for some students than others. The cognitive demands of online learning require strong self-regulation and metacognitive skills in order for a student to regulate their learning (Gregory & Barrister-Tyrrell, 2017). Digital learning shows great promise for those who have the skills required to benefit from the system, however this could rapidly separate students into those who are collaborating together and benefiting from the new approach from those who are still developing self-regulation and metacognitive skills.

Other challenges to online learning are the size and complexity of the learning environment, the platform restrictions of the technology, and the heterogeneity of the participants. Cooperative learning, learning through simulations and gaming, and interactive multimedia show promise in this area (Davis, Chen, & Hauff, 2018). Davis, et al.'s research shows that this type of learning has great promise and has the ability to incorporate many of the most effective learning strategies that Hattie lists in his meta-analysis of learning strategies. The key limiting factor for this use of technology is that it is not yet able to deliver support for instruction at the scale that can meet the needs of a large population of learners, and particularly not those with diverse learning needs. Although promising, these strategies still require greater development.

One of the greatest promises of technologically based learning is personalized learning. The connection between the ability of technology users to customize their experience and its potential to do the same for education and learning seems to be an intuitive enough proposition. In

fact, the idea that learning could be personalized to the needs of the learner has been a recurring trend in both government policy makers and popular culture for a number of years, although a method of effectively implementing this approach remains elusive (FitzGerald et al., 2018). Technology has not yet delivered on the promise of personalizing a person's learning in the same way and to any extent similar to its ability to customize an entertainment experience. Personalization of education through technology enhanced learning is at this point challenged by its complexity, expense, and the requirement of very powerful and advanced technology (Lee, Huh, Lin, & Reigelieth, 2018). A possible reason for this is that the amount of money to be made by entertaining people is at this point far greater than the amount to be made by educating them.

Students will benefit from having the opportunity to develop their own vision of what their learning journey will look like (Fullan, 2013). These new goals must be recognized by all involved as a moral imperative (Fullan, 2013). Problem-based Learning (PBL) and Project-based Learning (PjBL) are inquiry based learning methods that have roots in the constructivist philosophy. In PBL, students are given a problem to solve and PjBL begins with an end product or artifact in mind. Inquiry learning involves creating questions, doing research to address the questions, analyzing and interpreting data and coming up with solutions (Dole et al., 2016). Transforming the learning environment from teacher-centered, based on perceived tried and true pedagogy, to learner-centered requires a tolerance for ambiguity, greater flexibility, and a willingness to accept a different relationship with the student. The results are consistently showing more positive relationships in classrooms and better learning outcomes for students (Dole et al., 2016).

Constructivist Online Game-Based Learning has been offered as a possible alternative format for learning that suggests great promise (Jong, Dong, & Luk, 2017). Using a computer game structure to educate students remains challenging because, despite the tremendous amount

of success building video game platforms, it is proving far more difficult to blend effective learning processes with required curricular content in an entertaining manner. It seems to reinforce the idea that entertainment holds a lower threshold for engagement and asks for less effort from participants than learning does from students.

However, a study of the difficulties in building a practice of active learning, a key learning strategy used particularly in STEM based education, provides an example of one of the present limitations to trying to blend new methods of approaching learning with technology. The greatest challenges to adopting active learning strategies and incorporating technology are the resistance of students to view technological devices as a tool to enhance their learning, and the reluctance of teachers to modify their own practice to adopt a new style of teaching (Tarayil et al., 2018). For a generation of students who have grown up with technology as a seemingly ubiquitous part of their environment, it seems difficult for many to refocus the view of their devices. For teachers, memories of rooms full of underutilized or misused computers seems to have developed a mistrust in both the promises of technology and recommendations on the benefits of the latest strategies to engage student learning.

Blended learning environments, combining online digital media with traditional classroom teaching methods, have their own challenges. They need to incorporate flexibility with stimulating interaction in order to facilitate students' learning processes and foster an effective learning climate (Boelens, de Wever, & Voet, 2017). The research in this area shows that no system yet exists that can overcome all of these challenges. This research importantly demonstrates the need for more work on how to balance the flexibility offered to the student, in defining and controlling the pace, direction and amount and type of face-to-face interaction in their learning, with the need for external support and direction from instructors (Boelens et al. 2017). Once again,

the self-regulation skills required of a student appear to be a key limiting factor in the ability of that student to take advantage of this style of learning.

Educators work in one of the most complex human environments. Given its central role in the lives of most people, almost everyone has an opinion about it, which is often a strongly held opinion. Those opinions are built on the perceptions and remembrances of the people both inside and outside the system, and are charged by the hopes and aspirations of parents for their children. However, teaching is as much art as science, if not more. Of the two, the art dimension of teaching is likely to remain the more elusive, and yet is the most critical when trying to present complex material in an understandable format (Weisman, 2012). At this stage, digital technology does well in science, but has a far greater distance to go in the art of learning.

In his 1996 book entitled *Computers in the Classroom: Mindtools for Critical Thinking*, David H. Jonassen envisioned that computers in classrooms would be able to liberate students from simple learning and recall tasks, and help learners become self-directed critical thinkers. However, over 25 years later, we have made little progress towards this vision (Ertmer 2012). In fact, educators have been trying to integrate technology into schools for over 40 years, and yet schools have lagged behind the rest of society in terms of successful use of technology (Ertmer, 2012).

Although technology has the capability to target specific learning areas and accelerate specific processes in unique environments and schools, the application of technology has not yet provided a solution that can be generally applied to the wider system of education (Lucking et al., 2013). “The context in which digital technology is deployed needs to change if we are going to drive better education outcomes” (Nesta et al., 2013). What we are currently experiencing is “what it is to live in a networked society without necessarily realizing the potential of a true knowledge

society" (Pedró, 2006). In a knowledge society, students would have ready access to information that helps them develop their understanding of the world.

Core Competencies and 21st Century Skills

Many believe that students' ability to use what are referred to as "21st Century skills" are the key to their success in the workplace of the future (Gallup, 2013). These 21st Century skills, which Fullan argues are required for deep learning for modern students include character education (honesty, self-regulation, responsibility), citizenship (global knowledge, sensitivity and respect for others), communication (oral, written and listening skills), critical thinking and problem-solving, collaboration, and creativity and imagination (Fullan, 2013).

Students' successful acquisition of these skills require contemporary teaching frameworks (Erstad et al. 2015). A survey conducted by Gallup on behalf of Microsoft and the Pearson Foundation identified some startling findings: respondents reported that they learned most of the skills they use in their current job outside of school; those who have strong 21st century skills also have high levels of work satisfaction; most felt that real world problem-solving was a significant driver of work quality; there is a positive correlation between those who use 21st Century skills and student aspiration and engagement; and higher levels of student aspiration and engagement is correlated with higher levels of work quality later in life (Gallup, 2013).

The Necessity for Research into Online and Distributed Learning in Canada

Geographically, Canada is the second largest country in the world. It also has one of its lowest population densities. While the majority of the people live in a thin band of land along the border with the United States, many do not. Of those people who do not, many are distributed in small, remote agricultural, industrial or indiginous communities where provision of services and digital connection can be challenging. This geographical challenge is further complicated by the

13 provincial and territorial governments that divide up the country and by the federal government that oversees them. Each province has responsibility for education within its boundaries with varying degrees of success. (Council of Ministers of Education, n.d.). Meeting the needs of a distributed population requiring education at every level from kindergarten to graduate studies is a necessity in our country. From correspondence courses sent in the mail to massive online open courses (MOOC), Canada needs to be a leader in distributed education.

Nearly 60% of working aged Canadians (25- to 64- years old) have a college or university level education, which is the highest level among the G7 countries. Canada also has a high level of university educated people at 32% which is comparable with the OECD average. Canada also does well in ensuring that most citizens attain a basic level of education. While 8% of Canadians have not completed high school, the OECD average is 21%. BC is among the top performing provinces in Canada. BC is at or above the Canadian average for college and university completion, and the number of citizens with a university degree. It also has the lowest average number of people with less than a secondary school level of education at 5% (Statistics Canada, 2019). When compared to the OECD, Canada excels at educating its population, and BC is one of the strongest provinces in this regard.

The question remains, why is all of this focus on education important? There is a strong relationship between educational attainment, individual success, and economic growth and prosperity for the country (Conference Board of Canada, 2015). Statistics demonstrate that employability increases with educational attainment. Canada's employment rate for adults aged 25 to 64 without graduating from high school was 56%, compared to 83% for those who have graduated from college or university (Statistics Canada, 2019). Education is important to the individual and economic success of the country (Canada Council of Ministers, 2008). Success

throughout the learning journey from kindergarten through postsecondary graduation in the country and province is essential to our continued success in the 21st Century.

Currently, Open School BC, a section of the BC Ministry of Education, supports distance learning across the province. They provide Freedom of Information and Protection of Privacy Act (FOIPPA) compliant learning management systems (LMS), student management systems (SMS), Open School BC online courses, BC Learning Network courses (BCLN members only), as well as technical support and training in the use of these online tools. However, the move to more intelligent flexible learning tools and environments will require more than the Moodle based learning management systems presently offered by Open School BC. This type of learning environment requires a high degree of automation and student control to manage the content and interactive multimedia (Bates, 1999).

There are unique challenges in the Canadian educational context in the 21st century, and education is critical to our future success. Research in online learning in Canada will need to consider the challenges of educating a highly diverse and distributed population, the personal, social and economic benefits for the country, and need to manage our own data within our borders. For online and blended learning to continue to grow across Canada, more research into effective design, delivery and support is needed (Barbour, 2013).

The findings of my own research into educational technology have demonstrated various degrees of value and hope for the future. Technology-enhanced learning, flipped learning, gaming, and online learning are all continuing to grow as they prove to benefit certain learners in certain situations. The future research into technology-enhanced learning should focus on developing our knowledge and understanding of who benefits from what type of technological assistance and in what situation. If Cuban (1996) is correct, and we do not do this, then we will continue to jump

from one new educational technology fad to the next without an improvement in student learning. I remain optimistic that educational technologies are yet to be developed that will support student learning, and I hope to be part of this progress.

Outdoor Play and Learning

The feedback you get when you tell someone that you work at a nature school comes with a few typical responses. Returning to some past natural human state of working with and among plants and trees, being outside in all types of weather or even learning outdoor skills and even survival techniques are common images. Technology is rarely part of the picture. However, the two need not be thought of as mutually exclusive. The previous chapter examined the benefits and possibilities of the potential future of online learning and educational technology. This chapter will examine the numerous benefits that playing and learning outside, which may at first seem to call on a more traditional style of teaching and learning, actually addresses some very modern concerns in education and society.

Modern society has given children many advantages however for many children the opportunity to engage in play outdoors has become ever more limited. Furthermore, the play they do engage in is more programmed and the play structures and settings they use are far more designed, planned and prescribed. In a modern context, free play is viewed as unproductive compared to organized activities, potential physical risks are to be avoided and friendship groups are organized by adults. For many, play has become purposeful and directed at some specific outcome. Whether or not parents in the past recognized the benefit of allowing children to direct their own unstructured play outside, there is a growing movement to bring back some of that wisdom today. Well-intentioned grown-ups have a limited record of success in preconceiving structures and programs that engage children in deep meaningful play. Furthermore, in an effort

to meet the safety modern requirements of municipalities and parents, play structures and the rules used to govern the play in them have limited their potential as learning spaces.

Natural play environments have numerous advantages that over-structured safe indoor and outdoor spaces do not. More natural play natural elements and materials provide an important combination of challenge and risk. Risky play helps develop student's risk management skills (Woolley, 2008). Risky play does not entail an unsupervised free-for-all. The physical risks are age appropriate, allowing children to see peers succeed at a physical task, decide when they are ready to take on that challenge and then feel a sense of accomplishment and mastery when they themselves succeed. Play in natural environments is also more engaging, lasts longer and provides greater physical and mental health benefits (Lucas and Dyment, 2010). By removing structured games, sports with predefined rules, adult referees and other constructed limits on time and who can play, unstructured play is more gender neutral and offers greater equity of play opportunities among students with different abilities and preferences (Lucas and Dyment, 2010). When children are given the materials, space and scheduled time constraints of organized society, the natural work of play can happen. Somehow, we have come to switch play and work around and inserted a lot of adult ideas about what children already know despite our best efforts.

Outdoor learning environments, particularly at a young age have many benefits over indoor learning. They offer children an expectation of success that is more easily attained than in a structured space. Many children struggle with the heightened constraints, rules and structures necessary to maintain order in a classroom, hallway or school assembly. Rules around managing noise levels alone is one particular area where students and teachers struggle to maintain order. These structures tend to favour the learning style of children who can manage in that environment, who are in turn seen as successful.

Furthermore, outdoor spaces also allow children to exert greater agency over themselves and their school. They can explore the spaces they want, manage their physical needs by being still and quiet in a private space, or loud and boisterous with other peers. Out of necessity, conventional classrooms and pedagogy cannot offer these advantages to all of their students, even to those who can successfully navigate indoor spaces and rules. With the democratic support of adults, children can then help define and manage their environment. This offers an opportunity to develop understanding of environmental education. Children given responsibility over helping to define their own environment can learn to become stewards of the larger environment, extending their understanding of environmental problems, inequalities and sustainability that occur in their own smaller play space. (Ärlemalm-Hagser & Sandberg, 2017).

Nature based learning is very different from conventional school. Nature based learning is hard work. It requires people who understand the value of nature based learning for kids and their connection to it and a willingness to be hot and cold, wet, sweaty, chopping wood and lighting fires in snow or trudging through mud in the rain (MacQuarie and Nugent, 2017). Unfortunately, most technology was not designed with outdoor play in mind and are not ready to take on the same privations. A few digital tablets have been sacrificed in the name of trying to figure out how to bring technology outside. However, the experience and the resulting benefits for students and educators alike are well worth the effort. Modern students are deeply interested and engaged in technology and image-making. Their life experiences include many interactions with media of a variety of forms and consequently have the innate skills to create using image making technology. Video is a more accessible and engaging method of capturing and sharing student learning as well as a highly effective assessment tool. (Canning, 2017).

Conclusion

The question this inquiry hopes to begin to answer contains a central tension. Asking, Is there a role for information and education technology in the service of developing and sustaining an embedded, land-based Coast Salish immersion middle school at Mill Bay Nature School?, does not assume that the answer will be affirmative. The act of children developing and learning through play seems unquestionable and timeless. The wisdom and knowledge Indigenous peoples possess about learning on and from the land is as ancient as western educational philosophy. As outlined in this paper, the transformative power of technology has failed to live up to expectations before. This includes advances in information and educational technology. In many ways, interest in experiential learning, LBL, PBL, PCL, and Indigenous pedagogy could be seen as a response to the growth and ubiquity of information technology in life and education. The question remains, "Is there is a role for information technology in our outdoor education inquiry project?".

In an article entitled *Outdoor Play Spaces in Canada: As if Children Mattered*, the authors Susan Herrington, Sara Brunelle and Mariana Brussoni argue that modern social, political and parenting practices have impacted children's resiliency. They argue that targeted academic achievement activities and enrichment programming has left little time for play to be the work of children. Furthermore, the play spaces that adults build for children and the materials offered in those spaces are so contrived and so focused on avoiding any risk, that they have become uninteresting and dull. The resilience children once built exploring their world, making friends without parental engineering, and working through the cycle of trying, failing and trying again until they achieve success, is missing. There are consequences for having made these choices.

Another argument in support of the importance of genuine play in favor of the modern, fast-paced world children inhabit comes from the other side end of the educational continuum. In

their book *The Coddling of the American Mind*, Greg Lukianoff and Jonathan Haidt describe what they perceive as a dramatic decrease in the resilience of post-secondary students. The authors argue that there is a connection between the growth of social media over the lifetime of these students and the substantial increase in anxiety and depression in those same students. Lukianoff and Haidt argue that technology can be used as a tool to amplify feelings of anxiety. They suggest that the cause for decreased resilience is in part the lack of time and space to play. Busy students were never given the chance to develop the character traits and social experiences that are naturally built through play. In play, the authors argue, children learn how to navigate building friend groups and manage being excluded, how to assess physical risks, and how to persevere when challenges arise, particularly those presented by technology.

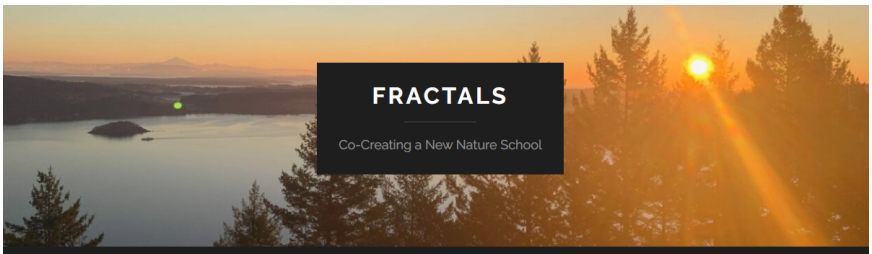
The Seven C's of outdoor play spaces - Character, Context, Connectivity, Clarity, Chance, Change and Challenge (Herrington, Brunelle, Brussoni, 2012) - are a guide to building stronger children, both physically and mentally, and also apply to modern educational practice, educational technology, and pedagogy. The Seven C's together suggest the powerful impact children's play can have on their development and suggest the possible impact their absence could have on older students. Outdoor play allows for big open spaces and private peaceful spaces, where big noise and big emotions can happen alongside quiet exploration and deeply engrossing play. Most importantly, they offer a safe place for children to challenge themselves, take risks, develop friendships and learn how to work with others.

Outdoor play, which seems old-fashioned, offers so much of what is needed today. It brings forward the instinctual learning faculties naturally built into how we construct ourselves as humans. Outdoor play is itself a fractal, a pattern of human development, repeating over human history, extending and thriving despite our best efforts to replace it with academic planning and

engineered learning opportunities. My project is an effort to see if modern educational and communication technology can be used to support, without distracting or detracting from, our natural way of learning.

Chapter 3: Fractals Website

The following is a series of screen captures of the Fractals website (https://wonderon.opened.ca/) that I created as part of an application of knowledge project. The audience for this website was originally the community of learners, parents, educators, district administration and local community members who intersect with our school. The website portion was intended to act as a past, present and future look at our school and the overall pedagogical stance, learning opportunities and vision for the future. The blog portion of the site is intended to document the ongoing growth of the school. I started this program at the same time that I started working at Mill Bay Nature School. The work in this program documented above was always intended to inform my understanding of the issues and opportunities that led to our school. The role of this site is to put that learning in context for the audience listed above. While working on this project, the number of inquiries from external educational boards, schools and parent groups that are interested in some or all the work we are doing at the school has grown consistently. Consequently, the site continues to grow and adapt to serve a wider audience.



An Inquiry

Fractals as an Educational Model for New Schools, Inquiry Projects and this Blog

Fractals are repeating, recursive, diminishing patterns often found in nature. Imagine a tree, starting with the trunk, held strong by its roots that expand into the soil in support of the branches, stems and twigs that extend up and out. As the tree grows in every direction, the branches and roots are increasingly finer, more delicate, fluid and growing versions of the original trunk. New schools, inquiry projects, and this blog share this model of growth. All start with a big idea, extend out in divergent directions and uncover new questions as the inquiry lives and grows.

I initiated this website and blog as part of an inquiry project while studying for my Masters of Education at the University of Victoria. In it, I try to document a larger, very ambitious project to build a nature school from the ground up. At this point, Mill Bay Nature School is in its third year and continues to grow larger. My inquiry project exists within the larger project to expand the school to develop along with our oldest students while continuing to add new students in kindergarten.

To support my inquiry project, these pages and posts attempt to summarize a small part of the current literature on pedagogical best-practice, learning outdoors and the use of technology in education. The large central trunk themes arising from the literature on current pedagogy include experiential learning, land-based learning, place-based learning, place-conscious learning, Aboriginal pedagogy and its connection to 21st Century Learning. Other branches of literature reviewed include a view of the accelerated use of technology in education, student and teacher engagement and the dynamic needs of modern learners. The sources are primarily published in the past five years.

As much as possible focus on the local context, issues and opportunities specific to the Province of British Columbia, Vancouver Island and ultimately my own school. This collection represents the serendipitous wonders that became the branches, stems and twigs of my inquiry my goal of bringing educational technology and learning outside together. It is only the start of a longer project and the scope of my work only captures a sliver of present research and thought on the content.

This inquiry began because of a wonder and a word. I wondered, What is a nature school? I think I thought I knew at the time. In asking others that question, the response was never the same, and at times, highly divergent. So a journey begins. The word that stuck was fractals. It provided the imagery for the prose, the framework by which to connect the ideas and the paper that provided the first gust of wind that began to push the work along. That paper is written by Larisa Enríquez entitled *Fractal: An Educational Model for the Convergence of Formal and Non-Formal Education* (Enríquez, 2017). In it, Enríquez proposes a progressive, modern model of pedagogy to address the issues of post-secondary education. It is not about learning outside or even K-12 education, but it shared a vision of education that would fit in both of those spaces.

I owe an infinite debt of gratitude to my family, all my friends at MBNS, SD79 (Cowichan Valley), the extended group of educators and academics that have supported this work from UVIC, UBCO and VIU. Most importantly, I am grateful to the Hul'qumi'num' people for sharing their wisdom and the beautiful land on which we learn and grow together.

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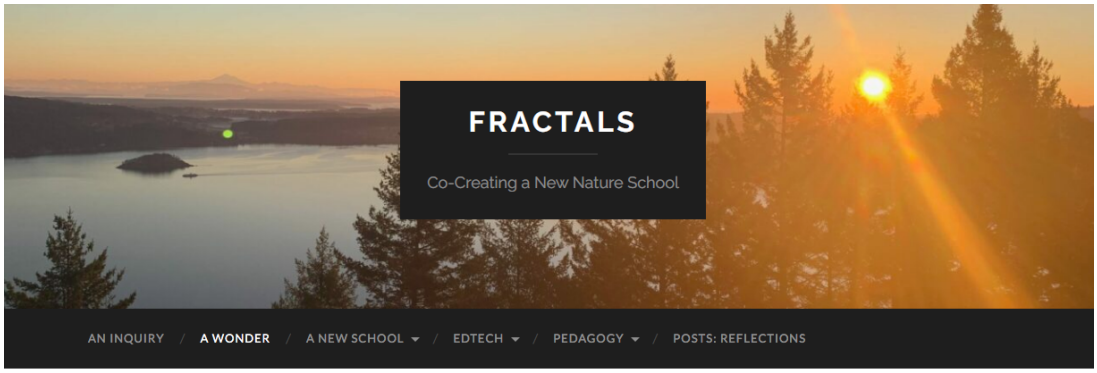

It Began with a Wonder

What do you think of when you hear the phrase Nature School?

The purpose of this website and the ongoing blog is to begin to answer that question for myself and hopefully share some of what I have learned with others who might be considering this journey. Interest in this concept of what a school can be and the pedagogy it enables is growing based on the local interest and queries from around the Province of British Columbia. Since I joined this journey at Mill Bay Nature School (MBNS) two years ago, my answer to the question above has far exceeded my original conception of what a nature school could be. As of right now, my short answer to the question above would be that patience, trust and hope have allowed something amazing to happen. More on that to follow.

Central Themes

My initial wonder in starting this project was to uncover a framework to support nature based pedagogy using educational technology. In short, how best to take technology outside. While technology is part of this journey, my learning about learning outside has been as important, highly rewarding and deeply inspiring.

There are four main themes to this site.

In A New School I explore the need for progressive pedagogy and reconciliation that are central to this project and the goals of MBNS.

In EdTech I consider how to use technology to support learning outside in nature, beyond the boundaries of the school and providing the flexibility for those learners who need all of these dynamic conditions to learn and see themselves as successful.

In Pedagogy I will highlight some of the nature-based pedagogical structures.

In Reflections I share some of what I have learned as our team have done the hard work of exploring what a school can be outside.

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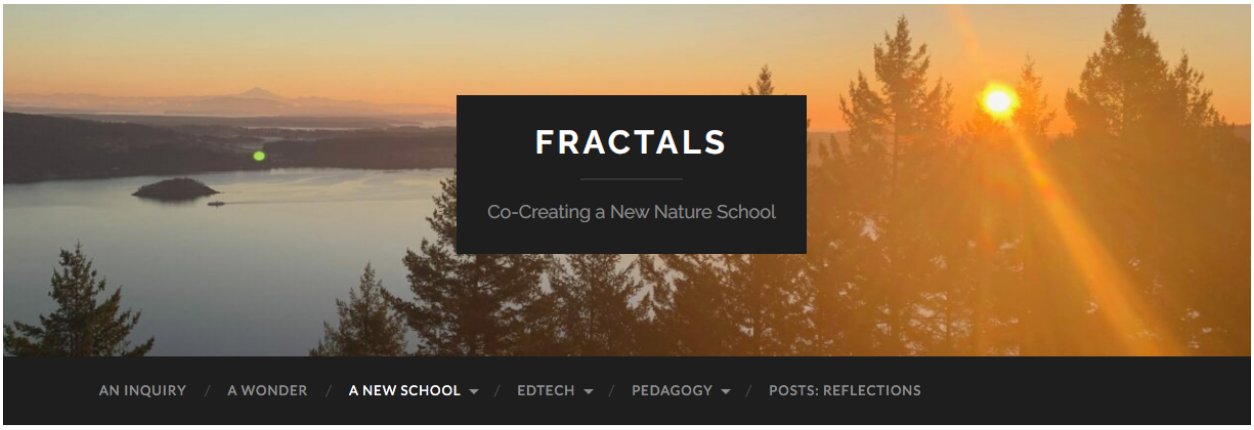

My Inquiry Based Learning

In nature, fractals are an ever-diminishing recurring pattern, each successive extension of the pattern mirroring the previous. In forests and oceans and the spaces in between, fractals abound. A circular shell with ever decreasing interior chambers leading to the centre, the gentle leaves of a fern that extend out and narrow to the littlest leaf or the scales of a pinecone that concentrate to a point are examples. For the purpose of this paper, the most apt metaphor is a large tree. The trunk through to the branches down to its twigs mirrors the journey of learning in this project paper in many ways.

A tree represents the personal journey I have taken from the foundation that represents my beliefs as a human and as an educator (trunk), the ways I have grown over time during a career (branches) and the newest ideas that have grown and extended my thinking during this project (twigs). Roots and trees are emblematic of our school. Our representation focuses the roots beneath the soil as the metaphor for the foundation that both holds our community of learners up and helps sustain us. A tree also represents the inquiry based learning that we practice as our school and is a central part of this project. The trunk representing the goals and interests of our learners, and the branches and twigs resembling the many paths of learning as teachers and students explore those interests in ever greater detail. The fractal quality of the tree, exploring up, and down and out all at once, some parts unseen and others visible and always evergreen represent the iterative and organic life of this project and the core of my inquiry-based project.

This section explores:

- The case for offering different educational opportunities to meet the needs of all students in Change Matters.
- The connection between learning and being outside in Our Nature School.
- An outline of our MBNS project to build a New Middle School.

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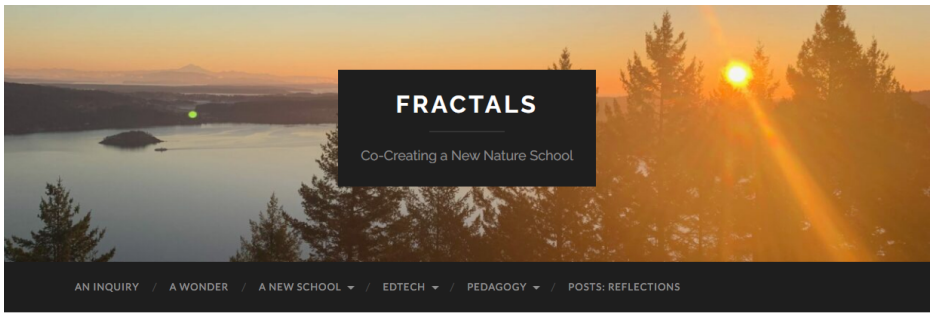

Change Matters

A pivotal moment in this learning journey started with a conversation that followed a presentation at a conference. The subject for the morning included a slide that showed the positive impact distributed learning had on the improvement of graduation rates in the province. There was demonstrated evidence that flexible learning environments, supported by teachers and technology, made learning more engaging and helped more students graduate. I made an immediate connection with my home district. An unmet need in District 79 (Cowichan Valley), and now clearly across many other school districts in British Columbia (BC), is to offer engaging educational pathways for all adolescent students that are flexible, student focused and extend beyond the walls of traditional schools. This challenge in our community and in the province, has had a long past, an incrementally hopeful present and a possibly rapidly shifting future.

The past demonstrates why change is needed. Using high school graduation rates as a measure, gains have been made from past low levels of public high school completion across BC. The most current published data shows overall graduation rates increasing over the last 16 years starting in 2003 at 79% to 2019 at 85% (British Columbia Teachers' Federation, 2019). These data include encouraging improvements in the graduating outcomes for males at 83% (an increase of 8% from 2003 to 2019), and for Aboriginal students at 70% (an increase of 23% from 2003 to 2019) (British Columbia Ministry of Education, 2020). These improvements represent a focused effort by all educational stakeholders to initiate the changes needed to make learning environments more inclusive and engaging for all students.

At present however, these data highlight two critical issues. First, an overall success rate of 85% means that 15% of students are not finding a pathway to graduation within the current system. For Aboriginal students, 30% do not graduate across the province. Furthermore, looking at provincial level data and averages across large geographic areas can mask local stories. For example, in District 79, the graduation rate for Aboriginal students has dipped to below 60% (British Columbia Ministry of Education, 2020). It is possible to argue that graduation rates represent only one measure of success, but it is an important measure and one that matters for future student pathways. The present BC curriculum offers much greater flexibility to help students find a pathway to success. Current graduation rates represent a challenge that we continue to explore in order to offer more options and find more ways to close this gap.

The future of this project depends upon leveraging all the tools and permissions that the current curriculum offers to try to address this need. The BC curriculum enables a highly progressive vision of what learning can be. It marks an opportunity to move away from a narrow view of what success is and try to include those left out. A broad coalition of educators, administration and academics from around the province have committed to digitally meeting to lend their wisdom to the creation of this bold vision. Despite their powerful voices, all have agreed that for this project to succeed, the voices of the students and our elders must speak first and loudest. Their stories, which will be explored in this blog, are the reason this project exists.

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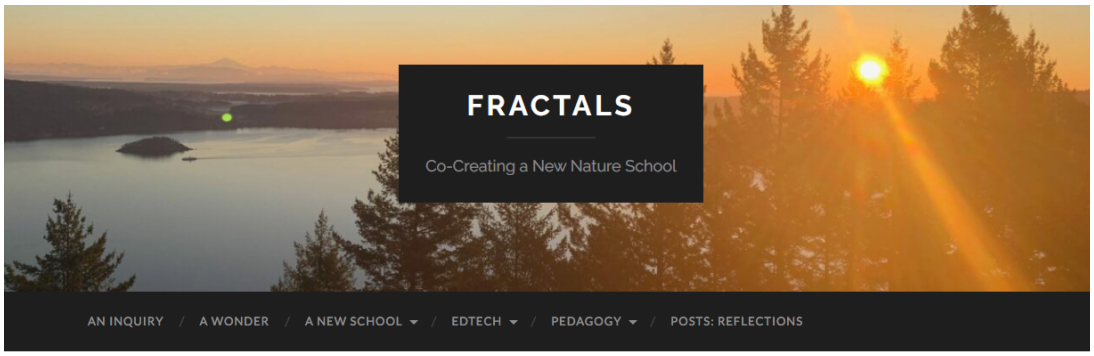

Our Nature School

Using the Outdoors as a Third Teacher

An important insight into learning by Loris Malaguzzi, founder of the Reggio Emilia approach to education, was the impact of the environment in which learning takes place. Malaguzzi argued that social learning preceded cognitive learning (Biermeier, 2015). He believed that the environment represented a third teacher, along with the classroom teachers and community that helped to shape the space. The environment as a teacher is dynamic, responsive to the needs of children and reflecting the values of the community to the students (Biermeier, 2015). Teachers, community members, and children co-create their own environment out of whatever space they are given to learn within. My third teacher happens to be one of the most spectacularly beautiful outdoor classrooms in the world, Vancouver Island, British Columbia, Canada.

To anyone visiting a school for the first time, the physical space communicates much about what matters to the people learning in that space. For many, the image evoked by the mention of school would be largely familiar and consistent (e.g., blackboards, desks in rows facing a teacher's desk). If Malaguzzi is correct, that the environment is central as a third teacher to the engaged learning of children, then the third teacher we offer to children encourages uniformity and systematization. Fortunately, this idea that where you learn is important to how you learn is being revisited in modern educational settings, including outdoors.

The school I am fortunate to be able to co-create is Mill Bay Nature School. For anyone visiting the outdoor learning space at Mill Bay Nature School the first time, the response is always strong and it is never familiar or consistent. It was founded with the idea of offering children, educators and community partners an opportunity to co-create a school that leveraged the beautiful natural surroundings of the land to learn through exploration, inquiry and experience. It is muddy and messy and beautiful and open all at once and the weather is always.

Our school continues to grow with our eldest students, many of whom helped open the then K-4 school in 2018. This left our staff with an inquiry question of our own: "How can we co-compose – with our elders-in-residence, Coast Salish elders, students, school staff, district leadership, university researchers, and community members – an embedded, land-based Coast Salish immersion middle school at Mill Bay Nature School?" This blog represents my experience of only the very first steps of a longer journey. How do we co-create, with the communities of people who live in the Cowichan Valley and across British Columbia, an engaging middle school program that enables our beautiful natural environment to become a powerful third teacher?

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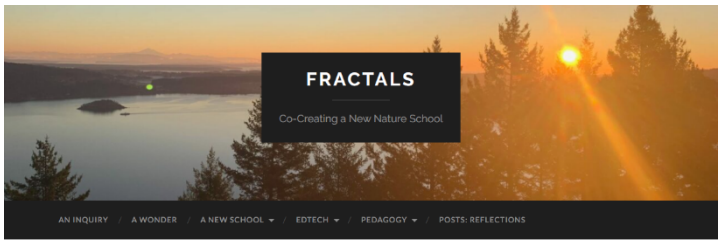

New Middle School

Learning on the Land

Our school, Mill Bay Nature School on Vancouver Island, Canada, is a nature based educational program. Central to our programming are multi-age, cross-grade groupings, Reggio teaching practices, an emphasis on the relational nature of learning together, the importance of student voice in inquiry-based learning, enabling children to have a strong genuine democratic voice in the direction of the school, and our connection to the land and the Indigenous people with whom we share this place. Presently our students range in age from kindergarten to grade 5. This project would not exist without the vision of a few critical stakeholders, who have developed bold goals for the future of education in District 79, Cowichan Valley.

This project is part of the plan to extend our programming to allow our students to continue on to grade 7 and possibly beyond. This will allow older children to take advantage of the opportunities of a nature school, and also allow students who have started at the nature school to continue their education with the same model. As part of our growth plan, our school applied for and received a generous grant from the Vancouver Foundation. The pressing need addressed in the application process reflects both our current focus as a school and our hope to extend that vision going forward. We continuously work on developing the complex, historical, and emerging relationship between our school, our Coast Salish Elders and the larger local communities. The proposal recognizes:

- The need for embedded, lived, hands-on learning experiences for youth ages 11-16
- The need for youth to experience the deep, ancestral wisdom of the Coast Salish Peoples both as a response to the Truth & Reconciliation Commission and the global climate crisis.
- The need to design a school that is rooted in Indigenous pedagogy and ways of being, and to develop this as an educational option to the Coast Salish Youth in our community some of whom are disconnected from school, and resultantly, whose learning and growth are impacted.
- An opportunity to offer inspiration to others in the province, nationally and internationally of an alternative pedagogy steeped in Indigenous ways of being which takes up the unique challenges of educating youth in positive and productive ways.

Mill Bay Nature School models a way of being that honours the inherent wisdom of children and the ancient wisdom of the land. The school models the impact of courageous leadership and the power of families and educators to create a community that puts children at the core and believes in learning through experience. This project is also enabled by the recently redesigned curricula in BC and its focus on concept based learning and developing critical core competencies in students.

While content delivery remains a component of the curriculum, the emphasis is on the understanding of concepts over memorizing facts and information (British Columbia Ministry of Education, 2012). An important goal of this project is to achieve this balanced approach to teachers and students co-developing an understanding of the core competencies, content and curricular competencies together. Central to both the curriculum and the project are the focus on personalized learning, Aboriginal perspectives and knowledge, ecology and the environment, and building flexible learning environments. This project is fully aligned with the new curriculum and intends to extract all of the educational liberty and utility it offers to the benefit of all of our students and staff.

My role within this project is as a co-creator and witness. As a co-creator, I support the students and their teacher at school intermittent guidance as needed and frequent enthusiastic encouragement for the wonderful educational environment they are building. I am also a part of the online team of educators that meets monthly to explore, envision, challenge and support this important work. As a witness, I observe the wonderful growth and challenges of the community as they try to build something extremely unique and share back what I have seen.

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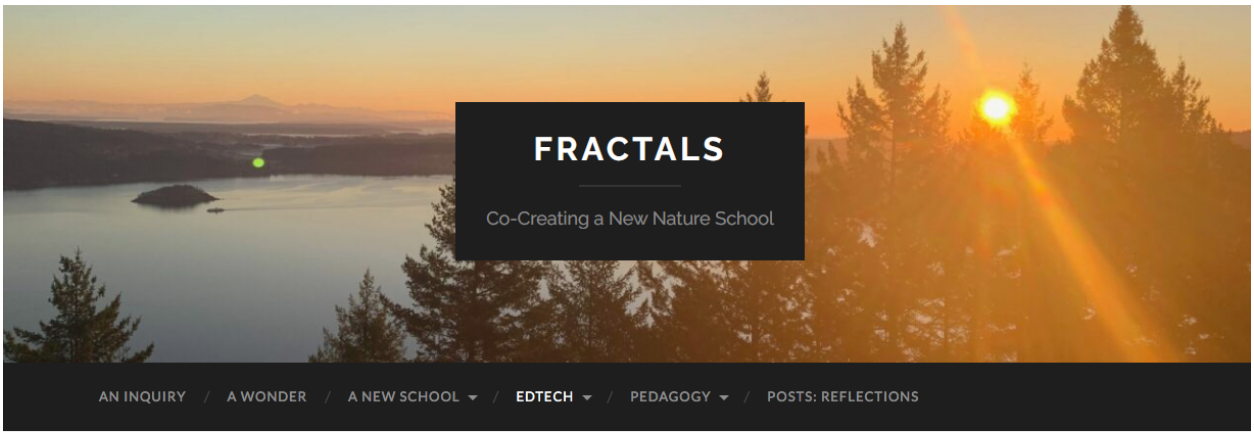

Invisible Learning

That Little Box on Top of a Pole

Our wifi router rests on on top of a pole, almost invisible until it stops working. Having the ability to connect our outdoor space to the Internet, especially considering the limitations of rural cellular access, is so powerful. Yet technology could possibly be seen as being opposite to the goals of learning outside in nature. Extending learning beyond the boundaries of the school is an important part of our school providing the flexibility for those learners who need all of these dynamic experiences to learn and see themselves as successful.

This section explores:

- A brief history of implementing educational technology in schools in Visible Learning and Invisible Educational Technology.
- The current state of the implementation of technology in schools in Education for the Twenty-First Century.
- The future opportunities to incorporate technology into learning in The Science and Art of Learning.

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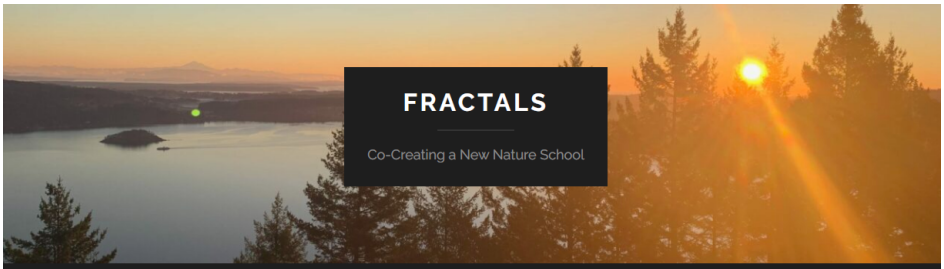

Visible Learning and Invisible Educational Technology

Successful systems are constantly evolving and improving. Education, which has often been criticized for having been slow to innovate and is now out of step with a world that has been changed dramatically by technology. That technologically transformed society has now evolved to the point where it will irreversibly change education. Technology is integrated into education with varying degrees of success. The question remains, How can it be even more effectively adopted in the future?

A wifi router set against a background of clouds.

Larry Cuban (1986), in his book *Teachers and Machines: The Classroom Use of Technology Since 1920* argues that enthusiastic external educational reformers have often tried to introduce innovation into schools. Cuban asserts that a demonstrated cycle of educational technology innovation exists in which the initial claims of transformative change fail to materialize. Cuban found that the teacher's apparent unwillingness to fully utilize these new technologies is often cited as the cause for this failure. Policy makers repeatedly invest optimistically in transforming classrooms with great expectations. It seems that outside observers constantly approach education as being in need of fixing. Cuban asserts that there are a number of contradictory goals and the inflated expectations of external stakeholders that make it very difficult for teachers to successfully utilize new technology.

Despite this history, the enthusiasm of external innovators persists. The challenge that anyone faces in trying to introduce innovation into schools is the complexity of the task of learning. While his work is widely criticized, if John Hattie's ranked list of *252 Influences on Student Learning* (as of 2018) definitively demonstrates one incontrovertible fact, it is that there are a lot of strategies, theories, programs, frameworks, hypothesis, instructional practices and approaches in education. Despite years of research, educators can still only infer which strategies for learning are best and no one strategy works always and with everyone (Hattie, 2012).

The size and scope of the system and the wonderful diversity of the population that seeks to learn only make the task even more complex. Despite the fact that it is unlikely that robots will replace humans as teachers any time soon, they do excel at complex tasks (Stylianou et al., 2015). Educators will continue to need to consider how they will adapt their practice to take advantage of what technology does well. It is a question of when, not if, change will happen, and the events of 2020 have only accelerated that change. Perhaps educational technology is the frame around a painting. Subtly there but not overpowering the beautiful work it supports. Visible, yet when doing its best work, almost unnoticed.

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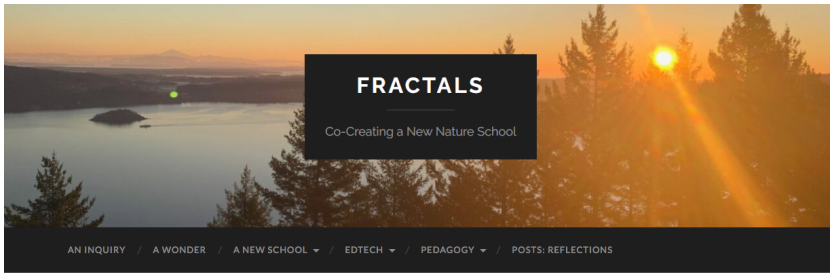

The Science and Art of Learning

Technology is now an integral part of a student's daily life, and there is an opportunity to increase the use of technology in education to positively change and improve student engagement and student learning. Unfortunately, early attempts to integrate technology into teaching practice were not necessarily successful and left a perception of high cost for limited benefit. A recent study published by the Organization for Economic Co-operation and Development (OECD) entitled *Students, Computers and Learning: Making the Connection*, definitively states there is little evidence of improved student achievement in math, science and reading despite the vast amount of money spent globally on information and communications technology (OECD, 2015).

A wifi router cast against the clouds.

Technology may never completely replace the human interaction component that is required for effective learning. However, it is possible that technology can enhance the learning process, and improve engagement and student and parent perceptions about their learning. The quality of a teacher and effectiveness of their practice remain the key determinants of the success of a student. As stated in a previous post, research has demonstrated that there are four highly effective teaching strategies that can be supported and enhanced by technology: cognitive activation, project-based learning, active learning and personalized learning. Cognitive activation is the thinking required to analyze a problem and find a solution. Project-based learning involves students working on real-world problems which take time and complex thought to solve. Active learning involves participating in the learning rather than passively receiving information. Personalized learning is simply addressing the specific learning needs of each child.

Research has shown that one major challenge for teaching using technology is that it is more effective for some students than others. The cognitive demands of online learning require strong self-regulation and metacognitive skills in order for a student to regulate their learning (Gregory & Barrister-Tyrrell, 2017). Digital learning shows great promise for those who have the skills required to benefit from the system, however this could rapidly separate students into those who are collaborating together and benefiting from the new approach from those who are still developing self-regulation and metacognitive skills.

Other challenges to online learning are the size and complexity of the learning environment, the platform restrictions of the technology, and the heterogeneity of the participants. Cooperative learning, learning through simulations and gaming, and interactive multimedia show promise in this area (Davis, Chen, & Hauff, 2018). Davis, et al.'s research shows that this type of learning has great promise and has the ability to incorporate many of the most effective learning strategies that Hattie lists in his meta-analysis of learning strategies. The key limiting factor for this use of technology is that it is not yet able to deliver support for instruction at the scale that can meet the needs of a large population of learners, and particularly not those with diverse learning needs. Although promising, these strategies still require greater development.

One of the greatest promises of technologically based learning is personalized learning. The connection between the ability of technology users to customize their experience and its potential to do the same for education and learning seems to be an intuitive enough proposition. In fact, the idea that learning could be personalized to the needs of the learner has been a recurring trend in both government policy makers and popular culture for a number of years, although a method of effectively implementing this approach remains elusive (FitzGerald et al., 2018). Technology has not yet delivered on the promise of personalizing a person's learning in the same way and to any extent similar to its ability to customize an entertainment experience. Personalization of education through technology enhanced learning is at this point challenged by its complexity, expense, and the requirement of very powerful and advanced technology (Lee, Huh, Lin, & Reigelieth, 2018). A possible reason for this is that the amount of money to be made by entertaining people is at this point far greater than the amount to be made by educating them.

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Students will benefit from having the opportunity to develop their own vision of what their learning journey will look like (Fullan, 2013). These new goals must be recognized by all involved as a moral imperative (Fullan, 2013). Problem-based Learning (PBL) and Project-based Learning (PjBL) are inquiry based learning methods that have roots in the constructivist philosophy. In PBL, students are given a problem to solve and PjBL begins with an end product or artifact in mind. Inquiry learning involves creating questions, doing research to address the questions, analyzing and interpreting data and coming up with solutions (Dole et al., 2016). Transforming the learning environment from teacher-centered, based on perceived tried and true pedagogy, to learner-centered requires a tolerance for ambiguity, greater flexibility, and a willingness to accept a different relationship with the student. The results are consistently showing more positive relationships in classrooms and better learning outcomes for students (Dole et al., 2016).

Blended learning environments, combining online digital media with traditional classroom teaching methods, have their own challenges. They need to incorporate flexibility with stimulating interaction in order to facilitate students' learning processes and foster an effective learning climate (Boelens, de Wever, & Voet, 2017). The research in this area shows that no system yet exists that can overcome all of these challenges. This research importantly demonstrates the need for more work on how to balance the flexibility offered to the student, in defining and controlling the pace, direction and amount and type of face-to-face interaction in their learning, with the need for external support and direction from instructors (Boelens et al. 2017). Once again, the self-regulation skills required of a student appear to be a key limiting factor in the ability of that student to take advantage of this style of learning.

Educators work in one of the most complex human environments. Recent events have driven that complexity forward dramatically as we all adapt to new opportunities to learn and teach. However, teaching is as much art as science, if not more. Of the two, the art dimension of teaching is likely to remain the more elusive, and yet is the most critical when trying to present complex material in an understandable format (Weisman, 2012). At this stage, digital technology does well in science, but has a far greater distance to go in the art of learning.

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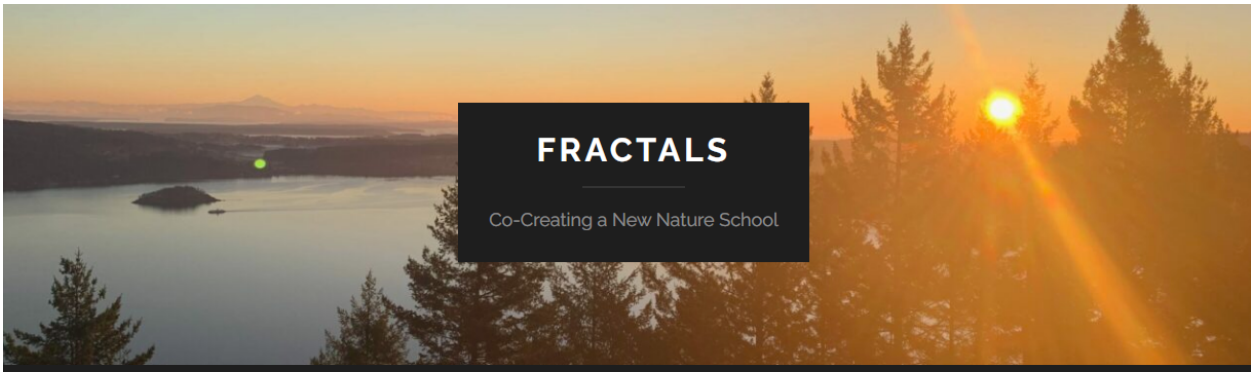

Learning Outside

Learning about Learning Outside

This section focuses on some of the key concepts about our project and more generally the learning outside of the walls of the contemporary classroom. Topics include:

- Experiential Learning
- Land-Based Learning and Aboriginal Learning
- Place-Based Learning and Place-Conscious Learning

These specific frameworks are to be considered within the larger framework of this report with a particular focus on learning outdoors, student engagement of indigenous and non-indigenous new millennial learners, and educational systems built for the needs of 21st Century learning. Wherever possible, the resources selected have focused on the most current content in the Canadian context and experience.

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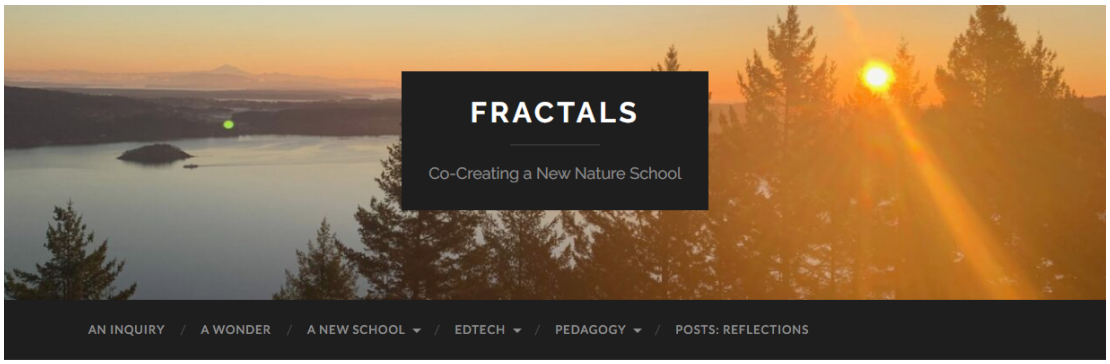

Experiential Learning

Simply put, experiential learning is learning by doing. The act of completing a project, and learning from the successes and challenges through the process, are an emotionally impactful method of engaging students in the work of learning and developing the skills needed to build the 21st Century personal competencies and take on even inquiry learning projects of modern curricula. This is a relatively old solution applied to a modern problem.

One of the first proponents of modern experiential learning was the educational philosopher, John Dewey. For Dewey, experiential learning is experience as learning based on the pragmatic problem-solving connection between living and learning, and the do-it-yourself learning of his own youth (Quay, 2019). More modern models based on the work of Dewey and others continue the focus on the central role that experience plays in learning. Students are given the opportunity to engage in problems of interest by imagining abstract solutions, experimenting to see the impact of their solution, reflecting on what worked and what did not, then taking what they have learned to continue to solve the problem or to use in solving future challenges (Kolb, Boyatzis, & Mainemelis, 2001).

Experiential learning outside is not new. In fact, it is far older than Dewey. In many ways, it describes a traditional, even ancient way of learning. Aristotle and Plato both observed the centrality that experience plays in learning and in human understanding of the world. The argument for outdoor experiential learning opportunities is often a response to the perceived loss of skills development caused by modern society and the educational system that supports it. Outdoor educational experiences are seen as a response to the need to rebuild personal fitness levels, strengthen self-discipline, build general practical skills, encourage self-discovery, develop the imagination, and to provide opportunities to both collaborate with others and provide opportunities for being comfortable in solitude (Allison, 2019).

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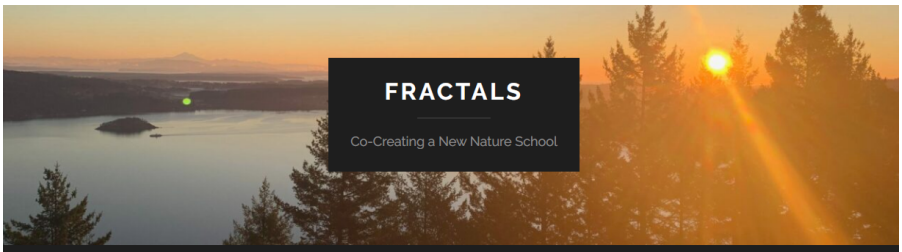

Land-Based Learning and Aboriginal Pedagogy

LBL and Aboriginal Pedagogy as 21st Century Learning

Land-based learning (LBL) and aboriginal pedagogy are modern terms that describe the ancient methods of Indigenous education. It takes an environmental approach recognizing the deeply rooted connection of Indigenous peoples to the land. LBL occurs on the land, focuses on learning about the land and is intended to build a strong connection to the land and the natural elements around it. While rooted in Indigenous wisdom and ways of knowing, it offers much to both Indigenous and non-Indigenous learners. LBL and Indigenous pedagogy contributes greatly to many modern, progressive and environmentally sensitive bases of pedagogy. Experiential learning and PBL mirror the act of taking teaching outside and living the learning. The lens that LBL brings to our understanding of issues, like our connection to the environment and our impact and responsibility to it, is copied in place-conscious learning.

LBL has many benefits as both a pedagogy and a way of advancing reconciliation. It happens literally on the land in our shared community, providing Indigenous and non-Indigenous learners the opportunity to meet together in the same space and explore the very different perspectives about our connection to the land (Wallin and Peden, 2019). It provides a place for genuine inclusion and respect to occur and promotes transformational learning and reconciliation to happen (Wallin and Peden, 2019). LBL can also disrupt the romantic and homogeneous vision of rural communities (Scott and Louie, 2019) that can stand in the way of building trust, bringing people together and building a common understanding.

Most importantly, LBL provides an opportunity for non-Indigenous educators to see beyond the deficit model of teaching that can be inherent in Western pedagogy. LBL can provide a route for Indigenous learners to develop their self-determination and reclaim their identity (Scott and Louie, 2019). However, it is important to be mindful that there is no one universal notion of Indigeneity. Care needs to be taken that, in the development of LBL structures, another unwise external standard is not created that Indigenous youth must once again try to live up to (Donald et al, 2012). Building self-determination and identity in a safe educational space, which does not impose singular universal standard, is not just a need for Indigenous learners, but for all modern learners.

This connection between the needs of all learners and pedagogies can be seen in the development of more responsive learning environments focusing on the development of 21st Century learning skills. Those skills include problem-solving, critical thinking, communication, collaboration and citizenship. Teresa Papp (2020) argues that Indigenous pedagogy is rooted in these skills and that it aligns with the development of any 21st Century curriculum or pedagogy being created for all learners. Beyond serving as a model for a progressive vision of education, recognizing the modern value of an ancient teaching practice is another step to reconciling two systems.

Bartmes and Shukla (2020) argue on behalf of a potentially transformative third space that brings together all learners. The third space they describe brings together two separate cultural spaces in a third new shared space. This would give students an opportunity to explore that space together, seeing that place in unfamiliar ways of seeing and expanding their worldview and their ability to think critically. In this third space, students are given the opportunity to go beyond the boundaries of focusing on academic learning and explore their world and investigate different ways of interpreting that space. This idea is similar to the third teacher in Reggio pedagogy, primarily in that both have less to do with defining what is to be learned and more to do with getting out of the way of the inherent natural human skill that is learning.

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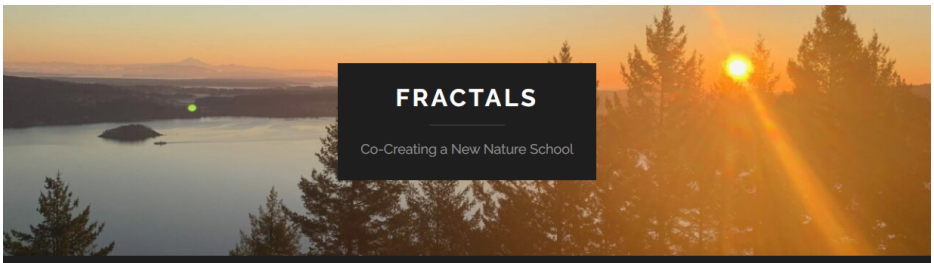
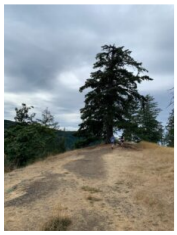


Place-Based and Place-Conscious Learning



Place-Based learning (PBL) builds upon and includes experiential learning. PBL pushes learning experiences beyond the walls of the classroom by taking students and educators out into the community, and providing shared experiences within the local geography, heritages, cultures, landscapes, and opportunities. By acting in their own community, student's experiences are intended to become more real, visceral, engaging and meaningful. Furthermore, their understanding of their connectedness to the world, their role in maintaining and sharing resources, and the need to work to act as stewards of that space are all elevated by their experiences in their space. PBL is a method of teaching and learning that can meaningfully and emotionally connect people directly to their world in hope of making it a better place (Corbett, 2019).

The practical understanding of PBL seems straight forward and generally easy to support. Many organizations such as national parks, community organizations and academic institutions all can make a connection to the value of exposing learners to experiences in their particular communities. However, the meaning of place needs to be examined in greater detail, not so much as a criticism of PBL, but as a way to make it more inclusive of all of the communities in a geographic area. Any place is both generative and mutable. A defined place exists as a dynamic and ever-changing space within a larger place and contains many smaller spaces.

The complexity of envisioning the overlapping, networked and interconnected space, including different groups of people and ways of learning and knowing, is a modern challenge to our understanding of place (Corbett, 2019). Furthermore, as people experience learning in any place they reshape and modify that space. That space also has a reciprocal impact on those who go out and learn in it. A classroom or school is set up to communicate what happens in that space and in some ways limits what is learned there. By extending our experience of the world beyond the walls of the school the community can become less of an abstraction that we attempt to describe in a classroom, view on a screen, drive through on our commute or students witness as a passing glance on their bus ride through their community.

If PBL is the act of taking learning outside into the community, place-conscious pedagogy is the lens through which we see the broader world we are observing. PBL offers an opportunity to expand our understanding of our space and connect with all of the people who have been on that space over generations of time. Moving learning outside is a challenge to the isolating impact of educational systems and structures and our modern understanding and human relationship to the land (Schnellert, 2019). As students and teachers explore the local community using a place-conscious lens, they begin to critically explore the local social and environmental issues in the space they travel through and have the opportunity to develop an understanding of their impact, agency and responsibility they have in that space (Schnellert, 2019).

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Chapter 4: Conclusion

Summary of Learning

Sunrise from the Malahat.

The second law of thermodynamics states that the entropy of a system always increases. Entropy can be defined as the measure of disorder or randomness of a system. Think of wildflowers reclaiming a once manicured garden. Without the continued investment of energy, any system returns to a more random and arguably more natural state. Whether by the gradual decline into disorder of entropy, the collision of materials of erosion, or the slow and seemingly unmoving fading of weathering, everything changes over time. Education can sometimes feel like it moves at geologic speed.

I began this program wanting to learn how to use educational technology to improve the outcomes for learners that needed the system to change in order to succeed. I hoped that my work would identify how educational technology could accelerate a progressive vision of learning space, pedagogy and practice. My assumption then was that change based on innovation would be slow. Recently, that change has been rapid and seismic. Many things that once seemed fixed were quickly moved and ideas that seemed theoretical were adopted.

However, the fact that change can happen quickly is not the great learning that I take from all that has happened. Throughout this program in educational technology, I have learned just how essential the connection is between humans in learning. Teachers were able to adapt quickly, using a patchwork of suddenly accessible systems to maintain, and even extend, the connection between us and our learners. We continue to succeed despite inconsistent access to connectivity and digital devices.

Of the many provocations to my thinking encountered during my project and program, two ideas have changed my thinking most. First, I have begun to see that, like an official at a sporting event, educational technology works best when it is least visible. Educational technology should be about education first. Technology is the vehicle for that most human interaction. It allowed us to continue to offer students a learning environment and maintain human connection during a difficult time. Being thrown into online mediated learning, some of our youngest learners might not remember a time without it. Whatever they do remember, it will more likely be how cool it was to make faces at their classmates online than the technology that enabled it to happen.

Second, I now have a deeper understanding of the discrepancy, between school districts and even within districts, in access to the knowledge, tools and internet connectivity required for digital learning and educational technology. The points of imbalance in education have been rapidly exposed and exist at every level from primary to post-secondary. Call it an opportunity, a challenge or a crisis, we are at a moment when the imbalance of access and outcome have been exposed in our system of education. Change is not a choice now. Hopefully, we choose tectonic and bold action over declining into a state of disordered entropy.

Reflections on Growth

Passage to the open ocean.

BC, Canada has a long history of using the technology of the time to reach and teach students living in remote places across a large and rugged landscape. Over 100 years ago, the B.C. Elementary Correspondence School was first to use the postal system to meet the needs of parents and children who lived in places far from schools such as the lighthouses that dotted the vast coastline. Canada is the second largest country in the world in terms of geographical area with one of the lowest population densities. While most of the people live in a thin band of land along the southern border, many do not. Of those people who do not, many are distributed in small, remote agricultural, industrial or Indigenous communities where provision of services and digital connection can be challenging.

Unique challenges in the Canadian educational context are not new to the 21st century. Living in a beautiful, rugged and often remote country has always required that we be adaptive in order to meet the needs of students everywhere. My school is rural, and my district is small compared to those in larger urban centres. It is made up of agricultural, industrial and Indigenous communities, all overlapping and intersecting. My project work was to try to understand how technology might help me offer a more progressive version of school to learners in our

environment. I realized in the moment how powerful technology can be in beginning to address some of the concerns in rural education.

During my project, I worked with educators from around the province and from other rural universities. We connected by teleconference to discuss how to build more progressive and supportive school environments that take advantage of the unique spaces that our communities offer for students. In one epiphanous moment, I stepped back from the conversation and realized that the group of people on my screen were from all over the province. We had a common purpose and a shared interest in driving education forward in support of rural, land-based education, and we were talking. We had all powered through the technological challenges of adopting a new platform and stumbled through the new meeting protocols needed to converse in an awkward two-dimensional digital space. In the time it took me to complete this program, the distances of my province had shrunk and the collective power of my learning community to share had grown immensely. Over one hundred years after correspondence learning started here in BC, the rural educational space once again felt a lot less remote.

The Gulf Islands, BC.

Recommendations for Future Research and Practice

At the start of this program two years ago, our initial teleconferences felt futuristic and driven by technology. In a short time, many of us have leapt forward to the point where talking online was familiar and the technology invisible. The recent growth of teleconferencing has created a more human space in which I am personally much more comfortable working. Technology mediated face-to-face active conversations online are for me much more genuine and powerful than the static, image-focused, click-driven space of social media. Images are powerful though, and a few from the website I developed help to frame some ideas for future research and developing practice.

Wi-Fi at dawn.

This image of the lonely unseen Wi-Fi router atop of a pole at our school has, for me, become a symbol of the power of technology to change education for the better. A little Wi-Fi router on top of a pole enabled me to connect with students wherever from the familiar setting of our field as my background. Every day, it allows us to extend our learning outside now that we are back together. The cost of this router is small when compared to the value it delivers to all of

us at our school. Recent events have driven interest in educational technology forward and exposed the inconsistencies in digital access and tools. Where, how and how much we choose to invest digital resources, both across the province and within our systems, needs to be examined more carefully in order to sustain all that is positive about the growth of educational technology.

The Fire Pit: The circle at the centre of our school.

This image of the fire pit at the centre of our school grounds has become a symbol of the need for reconciliation with Indigenous communities and learners in education that needs to happen. The elders that teach at our school joined us over a few days, both online and in person, to share the structure of their community which was best represented by a circle, in contrast to the pyramid structure of western society. So much of what they were describing was implicit in what we were trying to teach at our school. In that moment, I realized another place that has circles and triangles is the BC curriculum document. During the program, I realized that the BC Core Competencies offers one of the best and most important opportunities to connect with and infuse Indigenous knowledge and perspectives into teaching.

Building outdoor learning structures.

Wandering cloud visits our class.

These final images are of some of the beautiful outdoor classroom spaces that BC offers. Our nature school was created to offer an engaging opportunity for learners to access education within and beyond the walls of a school. More unique and engaging varieties of learning opportunities are needed to address the needs of all learners in our community. The future research into technology-enhanced learning should focus on offering primary and secondary level learning opportunities where time, place and content are dynamic. Once established, the resources required to build and maintain that system by enhancing access to digital resources wherever people live is critical to sustainability. This is particularly important for more rural communities in the province. For over 100 years, BC has found a way to maintain a small, basic but important link to education for students who needed something different from a physical school to succeed and learn.

Final Thoughts

At the beginning of this project and program, I thought my focus would be on technology. It was, but the emphasis on technology proved to be a bit misplaced. My initial wonder about supporting nature-based pedagogy using educational technology was only the

starting point for even greater learning. The necessary role of play in the education of young children, the power of outdoor spaces to act as the most beautiful and captivating classrooms and wisdom of the community of people around us that we can access if we step out of our walls has been the most important learning for me. The question remains: Is there a role for information technology in our outdoor education?

I believe the answer to that question is, and must be, yes. During my program, I explored how modern technological, social and political practices have impacted children and young adults. I also had a chance to investigate ideas which on the surface seem to promote the opposite of those practices. Experiential learning, LBL, PBL, PCL, and Indigenous pedagogy could be a response to the growth and ubiquity of information technology in life and education. However, they may be a response to modern society, they are not a repudiation of it. The importance of children developing and learning through play continues to remain unquestionable and timeless. The wisdom and knowledge of Indigenous communities is beginning to be recognized for its potential impact on modern educational philosophy. The transformative power of technology, despite a history of struggling to impact education in a way that benefits all learners, offers hope for the future.

There is no way to disentangle technology from society nor try to avoid it in education. Offering more progressive forms of learning outside of the limitations of educational buildings and structures is an important way to better prepare children for a technological society. Children exploring their world independently helps them build an understanding of who they are as people. Making and losing friends with limited teacher or parental interference or engineering builds the resilience needed to navigate the vagaries of friendships built over digital social networks. Learning through the cycle of trying, failing and trying again until they achieve

success, helps build the determination to follow dreams. For all our students these challenges, disappointments and successes will happen in a digital world.

At the end of this project and program, I feel I have found the answer to my initial wonder. My project was an effort to see if modern educational and communication technology could be used to support, without distracting or detracting from, a more natural way of learning. My experience during this program suggests that adults and technology should play a remarkably similar role in the learning of young children. Always be present but largely unseen, set the stage for children to learn through play, provide teaching and support when needed, avoid interfering when not needed, and then document and celebrate the growth that occurs naturally. Play has a pivotal role for both children and adults, a fact which kept popping up in my research. Play brings forward the instinctual learning faculties naturally built into how we construct ourselves as humans. Play is itself a fractal, a pattern of human development, repeating over human history, extending and thriving despite our best efforts to replace it with academic planning and engineered learning opportunities. I plan to take this important learning about play and start an action-research project for myself - I wonder what I will do…

Panorama of the Gulf Islands

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