Teacher “...behaviours and emotions change before beliefs – we need to act in a new way before we get insights and feelings related to new beliefs” (Fullan, 2007).

Gently Down the Stream: Reflections on a Seaquarium Journey

Mary Felicitas Holmes

Abstract

This article reflects on student learning and teaching practice enacted with a 320 litre chilled saltwater aquarium (seaquarium) for curriculum delivery. At its best, teaching with a seaquarium represents the melding of the practical and theoretical in *phronesis* or Practical Wisdom. The wisdom of educational practice is in the moment – this instance, this child, this teacher, this topic, this activity, and in this place – with mindfulness of broader goals. Within the context of current research and trends in curriculum studies, this paper situates the seaquarium teaching/learning environment in place-based learning. Particular instances and examples will describe teaching/learning with a seaquarium in order to understand its innovation and to reveal relevant theories by revisiting pedagogical teachings of the Greeks and indigenous pedagogy of the Elders to improve our practice and children’s learning. Within this context, I will investigate the complex learning environment of the classroom, with human interactions and relationships and look for ways to increase our understanding of how to improve learning/teaching using an engaging focal tool such as the seaquarium.

Key Words: place-based education, informal learning environments, learning environment, integrated curriculum, differentiated instruction, constructivist conceptualization of learning, curricular wisdom; - *praxis, phronesis, theoria*, theory and practice, indigenous pedagogy of the Elders, intergenerational teaching, democratic education,

INTRODUCTION

Let us be clear about the terminology used in this article: seaquarium, *phronesis*, informal and place-based learning environments, ‘modern’ and traditional teaching, and indigenous pedagogy.

A *seaquarium* is a 320-litre salt-water aquarium equipped with a titanium chiller to maintain temperatures of our Pacific Northwest ocean environment and highlights a microcosm of our local marine ecosystem. The idea for Seaquaria in Schools was borne on the waves of caring for and commitment to our environment and educating the next generation to have the knowledge, skills, and will to care for our global environment. An empty aquarium and an idea...
to put a marine tank stocked with local marine invertebrates in the front foyer of their children’s school eventually brought marine biologists Cathy and Joachim (Yogi) Carolsfeld’s passion for marine invertebrates into thirty schools and community centres mainly on Vancouver Island and the lower mainland. ‘Seaquaria in Schools’ is a grassroots initiative, with longevity of more than ten years, and growing; this is so rare in the literature on curriculum change (Werner, 2008).

Some aspects of the success of teaching with a seaquarium may be the commonalities shared with informal and place-based learning environments, the opportunity provided for *phronesis* and connection to traditional indigenous pedagogy of the Elders.

**Informal learning environments** will denote those learning environments outside the classroom that allow for discovery through experience and hands-on activities and will include public museums, aquariums, science centers, and place-based learning environments. **Place-based learning environments** are a special subset of informal learning environments referring to settings in nature.

*Phronesis*, also translated as practical wisdom or practical judgment, attempts to move beyond the dualism of theory/practice toward a reintegration of knowledge and practice (Henderson & Kesson, 2004). James Henderson and Kathleen Kesson continue their discussion of phronesis citing:

Coulter and Weins (2002) argue that phronesis is best understood as “embodied judgment linking knowledge, virtue, and reason…the emphasis is mostly on perceiving more in a particular situation and finding a helpful course of action on the basis of strengthened awareness” (p. 15). There is an intuitive dimension to phronesis, the cultivation of responsiveness to people’s needs, desires, and interests: (Henderson & Kesson, 2004)

‘Modern’ curriculum, in this article, refers to a particular period in curriculum design based on discrete learning outcomes generated by going out into the factories and determining those skills that children needed to know (parts to whole approach) privileging linguistic and mathematical abilities. In contrast, the **traditional or Indigenous Pedagogy of the Elders** starts at the larger concepts and values shared in community and draws new learning back through these values.

The curriculum starts at our school, near a small stream, over the gravel beds where the salmon spawn, spilling into the river, to the estuary and ocean beyond. From the particular, with what we can change as in what we are pouring down the sink, or putting on our lawn towards a mindfulness of the vast ocean where it all eventually flows. “The surface of the ocean” Dr. Jeff Marliave of the Vancouver Aquarium tells us, “is the greatest barrier to the human imagination”
(Tse, 2005). However, with the seaquarium’s microcosm of an oceanic ecosystem, children begin to realize the depths to which their imaginations and actions can reach.

Despite my keen interest in marine life my initial resistance towards getting a seaquarium was, no doubt, a common response for teachers. I had been teaching for eight years and recently made a change from Special Education to Classroom Teacher. “Yes, it sounds terrific.” I thought, “However, am I ready to take on the additional work that a seaquarium will involve?” Experienced with the effort involved in the three-month Salmon in Your Classroom program, I was wary of what a yearlong or year-round responsibility would entail.

It may seem that this is a lot of extra work for a teacher to take on. Especially when so much is put on teachers as the front line deliverers of education through district, provincial, and societal initiatives. However, there are some crucial differences with using the seaquarium to deliver the curriculum. As a grassroots, teachers and parents bring the seaquarium to their school (voluntarily) in tandem with strong Parent Advisory Committee support of the initial capital outlay (approximately $4 500 at that time) and ongoing support from their yearly budget.

Initially, my intention was to use a seaquarium to engage all students in their learning and particularly to include those students who struggle in ‘modern’ settings. My goal was to validate each child’s unique talents, interests, and abilities through activities at the seaquarium. The seaquarium is a focal tool for children’s interests and learning therefore informing my teaching practice. However, what I learned at the seaquarium was that this focal tool gave me the opportunity to improve the learning environment for my students by providing the opportunity for uniting theory and practice in my teaching – *phronesis*.

In the six years, I have taught with a seaquarium I have seen the engagement factor sustain more than interest and motivation and have made a foray into the uncharted depths of learning/teaching with this microcosm of an ocean ecosystem. Through practice and reflection, I witnessed knowledge for the greater good built not merely in community but in relationships. In striving to re-envision teaching with a seaquarium, I began to perceive parallels in the traditional pedagogy of indigenous Elders. To say I hope to enact practical wisdom in teaching/learning with the seaquarium may seem an audacious statement. However, perhaps the first step towards practical wisdom is the intention to seek it.

‘Charting a Seaquarium Context’ (Figure 1) provides an overview of how the Practical or actions taken to teach and learn overlay the Theoretical or ideas of good teaching when teaching
with an engaging focal tool – the Seaquarium. Through my teaching practice and graduate seminars in Curriculum Studies I have come to see how teaching and learning at the seaquarium may be an exemplar of uniting practice and theory.

![Diagram](image)

**Figure 1 Charting a Seaquarium Context**

In the first of three sections in this paper, will look at just what the context of the seaquarium innovation in the teaching/learning environment and comment on resistance to such change. With this background understanding, in the second section I will present specific examples in practice of the effectiveness of teaching/learning with the seaquarium supported by current trends in the research of aspects affecting children’s learning. The third section will
present how *phronesis* and its enactment with the seaquarium may have much to learn from the indigenous pedagogy of the Elders.

## I. CURRICULUM CHANGE AND RESISTANCE TO CHANGE: THE CONTEXT OF TEACHING WITH A SEAQUARIUM

It might be difficult to recognize Plato’s notion of practical wisdom in the structure of schools today. Schools adopted a transmission model to deliver ever-increasing amount of information efficiently. However, Elliott Eisner contends that a transmission model is not likely to develop rational powers (Eisner, 1994). Rather, schools teach children to be alone in a crowd, delay gratifications, separate ways of knowing, complete assignments on time, accept such assignments rather than generating their own, compete, and regard intellectual ability in terms of linguistic and mathematical competencies (Eisner, 1994). It is important to understand how our ‘modern’ curriculum developed and recognize those aspects that are vestiges of outmoded and counter productive ways of envisioning curriculum.

Intensification of the demands on our time, creates the desire to manage, and detracts from our focus on teaching (Apple, 2004). The current daily physical education mandate is an example of increased demands on teaching time to address concerns over rising obesity and Type-Two Diabetes in school age children. This intensification started as Franklin Bobbitt went out into the industrialized world with “a pencil, notebook, and discerning intelligence” and determined the skills one needs (Bobbitt, 2004). The resulting ‘modern’ curriculum is a deficiency model; find out what students do not know and teach “…to correct errors, fill gaps, [and] address shortcomings…” (Bobbitt, 2004). However, will the focus on the discrete outcome of increased daily physical education be enough to combat all the societal pressures to sit and ‘stay connected’ (to any communication technology), indulge ourselves with foods satiating our appetite for sweet, fat, and salt, or save time and effort by hopping in the car? Perhaps now we need to determine those values to develop a curriculum that contributes to the greater good for people and their environment.

Bobbitt’s legacy includes the concept of education preparing for a future date and specifying objectives necessary for someday. I realized how acculturated our children to Bobbitt’s legacy when I asked my class why they study the human body. The answers were

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“because it might be on a test sometime” or “you might want to become a doctor” or “you might need it to help you learn something else next year.” The students may develop the ‘skills’ to memorize the parts of the human body or describe the functions of body systems, but none expressed any awareness of the personal relevance learning about the human body may hold for them.

Just as the children did not initially grasp the personal relevance and value of their learning at school, some parents acculturated in the same disconnected view of curriculum do not appreciate the broader goals of understanding, respecting, and caring for our environment that teaching with a highly motivational focal tool like the seaquarium can attain. A particular parent, of a child I taught, embodied the loudest and most vehement criticism of teaching with a seaquarium. This parent, I believe, was working within Bobbitt’s framework of curriculum by reducing teaching with a seaquarium to a discrete skill - “My daughter knows all she will ever need to know about keeping an aquarium.” This singularity of focus countered my explanation of the enhanced learning environment of all students with “I only care about my child.” However, her daughter’s delight and fascination of learning at the seaquarium met with the same reductionist treatment dismissed as mere play rather than the serious business of learning unaware of the integral role that play has in children’s experience of learning.

John Dewey proposed an approach to education as a continual reconstruction of experience, requiring the child to be actively engaged in learning guided by his or her interests (Dewey, 2004). The ‘Nature of Method’, Dewey asserts, is reducible to the order of the development of the child’s powers and interests: active before passive; expression before impression; muscular before sensory and movement before conscious sensations (Dewey, 2004). As the example of learning about the human body shows, the child in a passive, receptive, or absorbing attitude results in friction and waste (Dewey, 2004). However, in an active, hands-on, or discovery attitude the child learns naturally through play and story (D. Anderson, Piscitelli, Weier, Everett, & Taylor, 2002). Teaching and learning with the seaquarium we go beyond the 3Ps of passive, presentation, and preserved specimens to learning in an engaging way by stepping out of the classroom setting and provide hands-on, context rich, place-based experiences for children with live animals in an ecosystem (Carolsfeld & Carolsfeld, 2008). Teachers have long recognized the value of field trip experiences to museums, aquariums, and natural to enhance and
enrich their students’ learning by revealing the relevance of such learning to their lives within their society and their environment.

**Informal Learning Environments**

Informal learning environments are learning environments outside the classroom that allow for discovery through experience and hands-on activities including public museums, aquariums, science centers, and place-based learning environments. Conceptualizing learning in informal environments, many note the importance of object-based learning and learning-oriented strategies (Falk & Dierking, 1997; Feher & Rice, 1985; Wellington, 1990). Researchers find that children are able to develop scientific concepts through interactive museum exhibits. (D. Anderson, Lucas, Ginns, & Dierking, 2000; D. Anderson et al., 2002; Borun, Chambers, & Cleghorn, 1996; Borun, 2002; Diamond, 1986; Dierking & Falk, 1994; Falk & Dierking, 2000a; Feher & Rice, 1985; Hooper-Greenhill, 1994; Kelsey, 1991; Schauble, 2002; Wellington, 1990). At the seaquarium, the children monitor salinity, temperature, water and airflow, and overall water clarity to ensure a healthy environment for the marine flora and fauna therein - authentic tasks motivated by care for these living organisms provide similar learning opportunities provided through interactive museum exhibits.

Children learn through play, imagination, and story and by taking on the role of scientist in their care of the seaquarium, they shift from tasks-oriented to learning-oriented similar to the co-constructed learning in the group setting observed in museum settings ((D. Anderson et al., 2002; Myers, Saunders, & Gerjulin, 2004). My first experience of the power of co-constructed learning happened the year prior to getting the seaquarium, when a suggestion from a technology support teacher, James Hogan, caused me to view the learning environment in the classroom differently.

James made several wonderful suggestions about integrating technology into the classroom by creating a slide show of their readers’ theater plays, students writing and inserting the dialogue, and play the slide-show on a continuous loop on parent/teacher nights. I said, “James these students will be graduating from high school before I learn how to do this.”

“If you can free your more technological savvy children up for half an hour a day, they will figure the program out in a week and be able to teach the rest of the students,” said James. One of the technologically capable students had experienced social problems since he came to school. However, through exploring and learning the slide show program with other students demonstrated cooperation skills. Additionally, students recognized the special technological
talents he brought to the class. A positive change started and continued throughout the year in how this child related to others and how they related to him. Recalling the powerful unintended benefits of recognition for special knowledge and increased acceptance of differences freeing children up for informal learning opportunities became a part of seaquarium learning environment.

There is much research on learning in informal settings to help us understand introducing a seaquarium into the school setting. Informal settings present information and learning opportunities in a more integrated fashion than traditional educational settings typically do (Falk & Dierking, 1997). In this way, students experience the curriculum as integrated and connected to overarching or big ideas. Students prepare for their time at the seaquarium by learning about the importance of maintaining the health of the system by checking the seaquarium each day; the children learn what to do and why they do it. It would seem the value of and effectiveness of orientating students to the museum setting noted as important for enhancing learning ((D. Anderson & Lucas, 1997; D. Anderson, Piscitelli, Weier, & Everett, 2006a; Griffin & Symington, 1997; Griffin, 2004; McManus, 1993; Stevenson, 1991) would help enhance children’s learning at the seaquarium also.

Other factors that help enhance learning in informal environments are when children determine learning goals, and participate in follow-up activities to help make the connection explicit (Anderson & Lucas, 1997; Anderson et al., 2000; (Nix, Fraser, & Ledbetter, 2003; Zandvliet, 2007a; Zandvliet, 2007b). Falk and Dierking (1997) note the power of these one-day museum experiences to impact on learning many years. The next section provides examples of the power of many ongoing experiences with the seaquarium in the main foyer of the school and the rehearsal aspects provided by its prominent location. Indeed, several parents have come up to me years later, with the perspective of time, and tell me their child’s experience with the seaquarium was life changing.

The seaquarium has similarities to the informal learning environments of museum or aquarium exhibits. These informal learning environments have the ability to draw people in beyond social sets. The best exhibits are multi-sided, multi-user, accessible, multi-outcome, multi-modal, readable, connect to previous experience, and accessible to what children are almost ready to learn at their individual level depending on their experience (Borun, 2002). The outcomes are as varied as the people who engage with the seaquarium. This idiosyncratic nature of learning in informal settings, (D. Anderson et al., 2000) seems due to what the individual
brings with them to the experience. As Falk and Dierking (2000b) noted, this idiosyncratic learning is because people learn what they are almost ready to learn.

**Place-based Education**

In place-based education, teachers enhance children’s learning through field trips utilizing the local community as a starting point for teaching interdisciplinary concepts and connecting students to their world through their local environment. (Carolsfeld & Carolsfeld, 2006; Sobel, 1996; Stokely, 2004a; Stokely, 2004b). Key aspects of place-based education learning are high motivation, many opportunities for hands-on learning, authentic tasks, connection to, and retention of classroom lessons, and connecting students to experts in the field (Sobel, 1996; Stokely, 2004a); (Orr, 1994). Place-based education is a way to involve students in initiatives in our local community and environment in a “process [that] engages students in real work [making their] learning authentic and alive” (Stokely, 2004a). As the students become adept at caring for the organisms in our seaquarium, I hope to inspire them to transfer this skill to finding solutions to real concerns in our environment and to foster “a deeper relationship with [our coastal community] and a sense of caring and responsibility for it” (Stokely, 2004a).

Children’s natural wonder and joy in the created natural world (Orr, 1994; Sobel, 1996) is evident in their engagement in place-based environments as with the seaquarium and their desire to care for the animals (marine invertebrates) and plants therein. The seaquarium has aspects of place-based education and the informal learning environment of museums in that it recreates a portion of an ecosystem and provides opportunities for children to touch other living species in their school environment. In caring for the animals in their seaquarium, we come to realize “that deep understandings are built when children are immersed in situations that embody the characteristics of the hands-on-science museum and an apprenticeship” (Kydd, 1997). The apprenticeship with the seaquarium is learning to be stewards of our natural created world – our Earth. While the seaquarium is in the formal setting of the school, it in effect brings a microcosm of the ocean (place-based, informal setting) into the school and may have benefits of both. The seaquarium connects children to a place I cannot take them on a field trip – under the surface of the ocean. Through repeated opportunities to observe and experience this place, children build a caring connection to the life in the ocean.
Preliminary studies using the instrument Studying Myself In the Learning Environment Survey (SMILES) developed by Dr. David Zandvliet at Simon Fraser University suggest the use of the seaquarium in the school rivals field experiences for motivation and meeting expectations of the students’ preferred learning environment (Zandvliet, 2007a). In the study of learning environments, “few fields in education can boast the existence of such a rich array of validated and robust instruments which have been used in so many research applications” (Fraser, 1998). It is from this ‘rich array’ that Zandvliet draws to design the SMILES instrument for elementary students. The eight scales in the instrument, address those aspects important to the learning environment: Relevance/Integration; Critical Voice; Student Negotiation; Group Cohesiveness, Student Investigation; Shared Control; Open-Endedness; and Environmental Interaction relate to learning environments that support children in their efforts to make meaning of and think about their learning while working cooperatively to construct meaning with others in environmental education. The advantage of this participant-oriented approach is that “it responds to the needs of participants in a program” (Fitzpatrick et al, 2006 in (Zandvliet, 2007b)). SMILES is a useful instrument to inform teacher practice and to begin to unpack the complex learning environment as we continue studies of the particular contributions and impacts of teaching with a seaquarium.

Table 1 provides a comparison of the good-making criteria of three different organizations’ specifically to promote excellence in environmental education. With children’s innate interest in their natural world, it seems this criteria, is good for education of children in general. Ministry of Education document Environmental Learning and Experience: An Interdisciplinary Guide for Teachers (2007), North American Association for Environmental Education standards and the Ocean Literacy Network criteria for ocean literacy the table reveals the commonalities among the three sets of criteria. As evident in the table, the BC Environmental Learning and Experience acronym C.A.R.E. highlights four key components: complexity, aesthetics, responsibility, and ethics that serve to organize the essential concepts and principles in other environmental education guidelines. When we teach with focal tools or subject matter rich in their complexity, we allow for many points of contact for children. The next section presents examples of children finding their own points of contact to the complexities of the seaquarium through their interests. With the seaquarium, children have the opportunity to care for this small ecosystem and make these connections through their wonder and fascination with the beauty in the natural world (aesthetics).
Children take on responsibility each day for monitoring and maintaining temperature, salinity, water flow, airflow, and water quality. Ethically, we struggle with the fact that we bring these creatures out of their natural environment and if this is right.

Table 1  Good-making criteria for environmental education

<table>
<thead>
<tr>
<th>BC Environmental Education C.A.R.E.</th>
<th>NAAEE Excellence in Environmental Education</th>
<th>Ocean Literacy: Seven Essential Principles/Concepts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complexity</td>
<td>“Systems help make sense of a large and complex world…”</td>
<td>Complexity - “The Earth has one big ocean with many features.” The ocean: shapes the features of the earth; is a major influence on weather and climate; makes Earth habitable; and supports a great diversity of life and ecosystems.</td>
</tr>
<tr>
<td>Aesthetic</td>
<td>Learners develop knowledge &amp; skills through direct experience with the environment.</td>
<td>Inspiration, Recreation,</td>
</tr>
<tr>
<td>Responsibility</td>
<td>“Human well-being is inextricably bound with environmental quality”;</td>
<td>Everyone is responsible for caring for the ocean.</td>
</tr>
<tr>
<td>Ethics</td>
<td>To develop global commitment, to work toward solutions of current problems and to prevent new problems.</td>
<td>The ocean sustains life on Earth and humans must live in ways that sustain the ocean. The ocean is largely unexplored.</td>
</tr>
</tbody>
</table>

Our school wide participation in the TD Great Canadian Shoreline Cleanup each September, before we bring in new creatures, is a way to atone for our transgression of nature – to pledge that we will care for the ocean creatures - great and small.

II.  IN PRACTICE: EXAMPLES OF SEAQUARIUM LEARNING AND TEACHING

My own journey to the aquarium began when I moved to coastal British Columbia. Reconnecting with a high school friend, Cathy Carolsfeld, now marine biologist, I had many opportunities to go to the ocean and explore with a knowledgeable friend. Luckily, Cathy’s enthusiasm for educating matched my enthusiastic questioning. Over the years, those of us connected to Seaquaria in Schools have continued to meet at ‘Think Tanks’ to share our experiences and understandings. This ongoing professional development is an important component of effective curriculum change. Teaching with the seaquarium changes how we teach
and as we move into these uncharted waters, sharing our experiences helps to enhance our understanding of how and why the seaquarium changes the learning environment.

Table 2  Aspects of Teaching with a Seaquarium, Seaquaria in Schools Think Tank in February 2006

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Generates High Interest</td>
<td>Students are motivated; ‘hooks’ at risk students</td>
</tr>
<tr>
<td>Promotes Literacy Skills</td>
<td>Students are talking; making announcements; presenting; writing; and reading about creatures in the seaquarium</td>
</tr>
<tr>
<td>Builds Authentic Connections</td>
<td>To nature; to realizing our impact on our environment; to knowledge; to our school community (our class had a school trustee come in and do the ribbon cutting ceremony for the seaquarium opening); to the community at large; even globally e.g. with shoreline cleanup initiatives,</td>
</tr>
<tr>
<td>Encourages Stewardship</td>
<td>Children are involved in authentic work; they take ownership</td>
</tr>
<tr>
<td>Builds Leadership Skills</td>
<td>Mentoring: high school students to elementary students; elementary students to their buddy class; children to adults; the youth become ambassadors for our world;</td>
</tr>
<tr>
<td>Supports a Range of Approaches</td>
<td>Gifted programs; severe behaviour class; lunchtime groups; delivery of classroom curricula; class as caregivers</td>
</tr>
<tr>
<td>Supports a Range of Knowledge Bases</td>
<td>Grows with you as your knowledge does (teacher/learner); it will take you, your students, and your school community from basic to informed</td>
</tr>
<tr>
<td>Allows for integration</td>
<td>Encompasses all curricula; we can integrate into the community through conservation or community associations</td>
</tr>
</tbody>
</table>

The ‘Aspects of Teaching with a Seaquarium’ information (Table 2) is the result of a discussion at a Seaquaria in Schools Think Tank. Participating in a brainstorming session thirty classroom teachers (elementary, middle, and secondary), undergraduate and graduate students, marine biologists, and representatives of two local NGOs World Fisheries Trust and SeaChange Marine Conservancy noted the key aspects in teaching with a seaquarium. A discussion of these aspects organized under broader concepts contributing to children’s learning of the importance of
affect, motivation, and rehearsal along with examples from teaching practice will help to illustrate the key aspects.

**Importance of Affect (Emotional Connections) Through Aesthetics to Build Authentic Connections and Encourage Stewardship**

“Science without passion and love gives no good reason to appreciate the sunset, nor can it give us any purely objective reason to value life” (Orr, 1994). The motivational power of children’s feelings toward their learning is an important factor. “We have emotions for the same reasons we have arms and legs: they have proved to be useful over evolutionary time” (Orr, 1984). With threats the natural world faces from the impact of human actions, it seems now more than ever we need to ensure we teach the whole child if we are to have socially responsible citizens aware of their impact on the world with experience caring for ecosystems. We will only protect, that which we care about (Sobel, 1996).

The level of responsibility Claire and her classmates took for the care of the creatures we had in our tank became apparent on a morning when I was at home dealing with insurance agents and a flooded en suite, family room, and crawlspace. The children, during their morning check of the seaquarium, discovered an isopod (Wosnesenski idotea) caught in the first filter before the pump. This checking of the apparatus inside the cabinet had become standard practice ever since we discovered a shore crab in this same filter a few weeks before. The principal could not ease their concerns and finally at recess time allowed them to phone me at home to see what to do. By that time, the restoration crew was at my house and starting to take care of my disaster so I could attend to this seaquarium disaster. Claire, Kim, and Kent were at my side, noting each step as I shut off the valves, removed the filter, and returned the live isopod to the seaquarium. The children were determined if this should happen again, and I was not there, they would know how to perform the rescue.

Affect as demonstrated by enjoyment, smiles, and engagement are important in creating the conditions for learning in the informal setting (McManus, 1993; Piscitelli & Anderson, 2001). As the example of the rescuing of the isopod demonstrates, the children had an authentic reason motivated by caring connection to this marine cousin of the terrestrial wood or pill bug. Sobel (1996) defines their love of nature as “ecophilia - supporting children’s biological tendency to bond with the natural world.”
Encourages Stewardship

In the prime real estate of the main foyer, the seaquarium makes a big statement about who we are as a learning community - our local environment is important to us. During our official school opening, Education Minister Shirley Bond unveiled the mural of a phoenix that appears to be entering the gym through a large portal; an appropriate mascot for a school created by the closure and amalgamation of two older schools in the district. Surrey School District’s February 2007 EdCom Now Newspaper reported in the article ‘New Surrey school offers state-of-the-art learning’, “A notable aspect of the school is the 342-litre saltwater aquarium located at the main entrance. Students will take care of over 30 species of Pacific fish and ocean animals; learning about responsibility, environmental sensitivity and marine biology” (New surrey school offers state-of-the art learning.2007). As a teaching space the seaquarium is accessible to all classes, provides occasions for informal learning, and opportunities for vertical teaching (children acquiring special knowledge and teaching adults). The children in the class are in five marine teams. Each day one marine team goes out and cares for the seaquarium by checking the salinity, temperature, water and airflow, and water quality in addition to making observations of the animals (mostly marine invertebrates including urchins, seastars, crabs, shrimp, anemones, sea cucumbers, clams, muscles, barnacles, and nudibranchs and two vertebrates a Tidepool Sculpin and a Saddleback Gunnel).

In 2004, in a previous incarnation of our school community when we were two older schools, Surrey School Board chair Shawn Wilson honoured us by cutting the ribbon at a smaller unveiling ceremony for our new seaquarium. In a full-page article, ‘Seaing is believing’, columnist Tracy Holmes reported, “Principal Glen Middleton said few initiatives have elicited such a response. Students are eager to do everything necessary to keep the marine life thriving, and are quick to volunteer for daily must-dos such as testing salinity and water temperature” (T. Holmes, 2004). Over the past four years, marine teams alternate each week to take responsibility for setting up the ‘recycling depot’ as children from other classes bring their recycling to sort into the appropriate bins.
Motivation: Generates High Interest, Builds Leadership Skills, and Supports a Range of Approaches

Generates High Interest

What convinced me to bring the ocean to school? A folder bursting with individual student work that Cathy showed and the stories she told of students’ motivation and excitement in working with the seaquarium. In particular, one grade six student’s story resonated with the stories of students I had met over the years. Teachers said this particular sixth grade child had never completed any project and was reluctant to write. However, working with the seaquarium this child made a connection with the creatures, was motivated to work to completion on an individual project, and enthusiastically shared this project with others. It is here that numbers wash away on the incoming tide. There are many ‘ones’ teaching with a seaquarium has made a difference for in terms of motivation, affect, valuing special knowledge of individual students and knowledge acquired over time, and the importance of rehearsal for children to internalize their learning.

Claire was a natural fit for a class introducing the seaquarium to the school in her grade five year. Her love and interest in life in her environment revealed itself in her observations and the level of responsibility she took on for the care of these creatures. The seaquarium was not only a great area of interest for study, but also a motivator to complete work. As students finished required work, they could go out in the hall and observe, draw and write about their observations. On one such occasion, Claire and Kim came to me, during class to share what they noticed about the workings of a sea urchin’s mouth. They were so excited and related such detail that I started writing what they were telling me. In all, we spent about twenty minutes of class time thus. We went to observe the sea urchin together and, with magnifying glass in hand, I endeavoured to see what they described to me. I shared their observations with Cathy Carolsfeld, she confirmed their observations, and imparted more understanding from a marine biologist perspective.

It took precious class time to write down and get Claire and Kim to clarify what exactly they saw. However, this 20-minute encounter had far reaching effects. By taking the time to record and clarify their observations, all the students in the class could see that children’s observations were important. The children realized that they could discover things that teacher and students together, could research to find explanations or answers. Indeed, “When the students observe their teacher engaged in the same activity that they are doing, it helps provide assurance that the activity is important and worthwhile and, at the same time, is a learning experience.”
experience for the teacher” ((Stein, McNair, & Butcher, ). Students like to know that “Instead of ‘just learning something that is already known’ they [want to feel] that they [are] ‘making contributions’ (Holmes, 2002). Discovering alongside their teacher is a wonderful way to do this. In that exchange, I was able to connect the children to experts in the field – not just information on the page. The idea that education is about receiving information that is already known shifted to education as discovery. Authentic self-directed learning challenges children to ask questions and pursue answers through observation, investigation, and research. Five years later, then in Grade Nine Claire shared a copy of a power point presentation with me evidencing her continued interest and fascination with marine life and her photographic skills with a new underwater camera.

**Builds Leadership Skills**

*Our ‘buddy’ class, the first year with the seaquarium, was the kindergarten class. In addition to our weekly reading session with the kindergarten children, the students in my class took daily responsibility of operating the ‘seaquarium station’ during kindergarten centres time (our silent reading time). The grade four and five students in my class would take turns on their marine team day to go next door to the kindergarten class and see if anyone wanted to come to the seaquarium. Like any kindergarten centre, this was an opportunity for young students to explore and wonder. There was the added attraction of having a special time with their ‘big buddies’. Three years later in Grade 2, after a class visit to the seaquarium, a small group of girls worked on a poster in their spare time after they finished work. Their teacher allowed them to bring their finished poster to show me. I realized that two of these girls had been in the school since Kindergarten when they were our ‘buddy’ class that first year with the seaquarium in our school. Now, three years later, these same students present me with their poster – a drawing of an ocean scene with stylized boats and birds looking like wavy ‘m’s in the sky and detailed drawing of the life on the ocean floor including sea cucumbers, seastars, feather duster tube worms, anemones, urchins, clams, and crabs amongst the eel grass and sea lettuce. These young children’s awareness of the life in the water under the ‘fairy’ boat surpasses that of many adults (Figure 2). These same students are now in my grade 5 class.*
Supports a Range of Approaches

The examples with Claire and Kim and the kindergarten centre illustrate some of the approaches to learning that the seaquarium supports. Students can pursue personal interests independently, in pairs, or small groups. There is a sense of discovery and wonder of the beauty of the marine life in their school. Tank side whole-class instruction allows for concept development and understanding by using specific examples in the seaquarium. A centres approach, by placing creatures in smaller clear containers, creates a tidepool type experience for students so they can carefully examine, gently touch, and draw or write about their favourite marine friends in detail. Teachers and Student Educational Assistants (S.E.A.s) who work with children with special educational needs use the seaquarium as a reward for completing less favoured tasks or in celebration of significant accomplishments. Our principal, teachers, and
S.E.A.s have also noted the calming affect the seaquarium has on children when they are agitated or upset.

**Rehearsal Builds Authentic Connections and Supports a Range of Knowledge Bases**

Caring and knowledge developed over time is a prime value of teaching and learning with the seaquarium. In ‘A Feeling for the Organism’, Evelyn Fox Keller (Keller, 1983)) provides a richly descriptive account of special understanding developed over time in the life and research of Barbara McClintock and her in-depth investigation of the genetic code of corn. The use of corn and its larger chromosomes fell out of favour with advancements in microscopy and the shorter life cycle of fruit flies (twenty-eight days as compared to one year). However, throughout ‘A Feeling for the Organism’ one begins to appreciate there is a qualitatively different knowledge that builds slowly over time that is not present when expediency is a prime value. Over time, our questions model questioning, children’s hypotheses give us a basis to guide them in testing their hypotheses, and learning is not receiving the quick answer but represents accumulated experience developing a lived understanding. With each encounter, and engagement with each problem, knowledge grows.

The implications for teaching with a seaquarium are to make memorable events for key concepts; make it the child’s agenda; and provide many opportunities to rehearse learning in play/imagination, story, song, music, dance, and presentation.

The children have creative and imaginative ways to present their observations. Children make posters of key concepts and consider what souvenirs they can take to rehearse learning. David Anderson mused on the importance of the small souvenirs for rehearsing learning over time(D. Anderson, 2006). Every time someone asks about the souvenir is an opportunity to revisit the experience. Many researchers have confirmed the long-term impacts of memories on learning (D. Anderson, 2003; Bull, 1994; Falk & Dierking, 1997; McManus, 1989; McManus, 1993; Stevenson, 1991; Stevenson, 1991). The seaquarium by its prominent location provides ongoing rehearsal of experience to continue to construct meaning – students pass by with other students, parents, teachers, and other school staff continue to construct meaning long after the experience as researchers have found with other informal learning environments (Anderson,
Allows for Integration Supporting a Range of Knowledge Bases

Seaquarian Charter of Rights and Freedoms was a project that allowed children to explore the complexities of our Canadian Charter of Rights and Freedoms (Social Studies) by rewriting (Language Arts) it for the ‘citizens’ of Seaquaria. The children created their own charter document complete with a flag and coat of arms they designed (Fine Arts/Mathematics) and presented their finished project to the class (Language Arts). In their article, ‘My Place in My World: Literature for Place-Based Environmental Education, Rachael Wells and Pauline Davey Zeece’ propose, “A book can anthropomorphize an animal character (e.g. giving it a name) and also teach about the ecology of its habitat…” (Wells & Zeece, 2007). In the Charter of Rights and Freedoms children can use this more accessible way of knowing, anthropomorphizing, to make Social Studies concepts easier to relate to (insert Figure 3 – photo of charter project).

Under the Guarantee of Rights and Freedoms section Charles wrote, “These are the things we guarantee 1. Enough food for everyone. 2. Good air flow.” The list continues to include all the conditions the children monitor in the seaquarium. The Official Languages of Seaquaria states: The two official languages of Seaquaria are Sea-O-Fishies and Bubble. Every sea creature has the right to receive information and services in Bubble or Sea-O-Fishies. Legal Rights warns, "If a creature eats another creature, it will be put in the strainer. It is important that they feel safe.” In this project, children were able to take a complex document and make it understandable through imagination, creativity, and anthropomorphizing the seaquarium community.

For humans to think that they are the only beings that have rights is a fallacy. This kind of thinking is a disaster! To think that we have certain rights to intrude upon the living things and that the other beings do not have rights, this is a sacrilege. Every being has rights! Every being has free rights (Thomas berry on nature and humans - subtitled interview.2009).
The children have support from noted eco-theologian, Thomas Berry, for their perception of the rights of the creatures in the seaquarium, a natural affinity that grows stronger when given opportunity and permission to build the connection through interaction and observation. As will be discussed in the third section, when a culture recognizes and respects the rights of all living things their relationship with the natural world is qualitatively different from a culture that does know the natural world outside their back door. Naturalist painter, Robert Bateman lamented this disconnect and launched an education program ‘Get to Know Your Backyard Neighbour’. In a keynote address, October 2007 province wide professional development day, Bateman said children today can identify over a thousand corporate logos but cannot name ten species that live in their own backyard (Bateman, 2007).
Children not only learn the species in the seaquarium, they also name them and call them friend. Perhaps the capacity to be accessible to children on many different levels makes the seaquarium so effective. In one classroom, the teacher taught up to 90% of the curriculum in an integrated manner with the seaquarium (Burley, 2006).

**Promotes Literacy Skills**

The seaquarium inspires children to practice purposefully their language skills to communicate and celebrate their discoveries, interests, and observations. Children have something they are interested in and want to communicate. This was evident with Sonny. Journal writing day to day was a tedious activity and few words ended up on his page. However, after a high-powered experience at the seaquarium and words flowed onto his page! In Figure 4,

![Figure 4 Comparison of Journal Pages](image)

Sonny’s journal entries before and then after a meaningful experience - specifically the delivery of seaquarium creatures and Great Canadian Shoreline Cleanup – reveal more writing and writing more frequently help to develop writing skills.
The seaquarium provides students with a purpose for sharing observations with the class and the school. Over the course of the year, students become so at ease in front of the class many volunteer to make announcements for the whole school. In this setting, students can set purposeful goals and experience powerful learning.

As each Marine Team checks the Seaquarium they will have the time to work in their journals just as the great thinkers over the centuries who have used journals to explore thoughts and ideas, and record questions; Leonardo da Vinci, Thomas Edison, Charles Darwin, and Margaret Mead to name a few. All their journals are as unique as the individuals who created them. Sometimes seeing the progression or growth of an idea is as exciting as the new idea. Yet the back and forth, image and word, is like the tide, and ideas being shaped and formed and polished like pebbles rolling on the beach. Journals are dynamic, and shaped with us as we grow in our understanding, back and forth, back and forth…

Supports a Range of Knowledge Bases

You raise children with poetry and imagination. You raise children with a broad range of intellectual experiences. They respond to these and to the natural world—its birds, trees and plants. I am not convinced that children are very happy with the gadgetry that they have these days that pretty much take the place of experiences in nature. Rooms full of gadgets. They may be occupied, but not necessarily happy (Thomas berry on nature and humans - subtitled interview.2009).

Charles struggles academically in terms of reading and written output. However, put a tool in his hand or a motor in front of him and he displays talents beyond his years. When he finished a reading or writing activity, he could go out and continue working on the schematic of the seaquarium apparatus that captivated his interested (Figure 5). A teacher came in on the weekend and noticed a problem with the water flow. We discovered a crab in the first filter. At this time, we were using second hand cabinets and therefore non-standard configurations of the pump and chiller apparatus. The general idea was the same, but each setup was slightly different. Charles’ talent and interest in creating a schematic of the inner workings of seaquarium apparatus made it possible for Yogi, our seaquarium technical support in Victoria, to direct me over the phone. By numbering the shut-off valves in sequence, Yogi was able to direct me to shut off the valves in the correct order, remove the filter, retrieve the crab, and restart the system. Charles was a hero the next school day. The children in the class and soon everyone throughout the school had heard of his talent! (Figure 5 is a page from the widely distributed, class newspaper including revisions to labeling of Charles’ schematic provided by Yogi – note the articles on the discovery of the problem and on the fate of the crab.) People began to recognize Charles for his special knowledge and ability rather than the areas where he struggled.
Seaquarium Label Corrections (from Issue #3)

- Corrections for location of the pump and cooling exchanger, primary and secondary filters noted.

Mrs. Sayer Saves the Sea Creatures

On the weekend Mrs. Sayer came into our school. She noticed the water pipe was putting air bubbles into the water. The sea anemones were sucking up the air bubbles up and it made them float. Mrs. Sayer called Mrs. Holmes and Mrs. Holmes called Yogi and Kathy her friends (our tech support team) to ask them how to stop the air bubbles from coming in. I would like to thank Mrs. Sayer for saving the sea creatures in our tank.

Shore Crab and the Pipe of Doom!

On Wednesday, October 13 one of our shore crabs got sucked up by a water pipe. The crab had got underneath the shells, wire mesh, and plastic grate. It was discovered in the 1st (primary) filter. The pump and shut-off valves had to be turned off, the filter unscrewed and the crab taken out. We are all sad that the crab did not survive.

Figure 5 Charles’ schematic in the class newspaper.
Claire and Kim’s observations of the urchin’s mouth and that their special ways of knowing are valued in Charles’ schematic of the seaquarium apparatus led to a key understanding of the importance of interests.

These interests constitute, in the word’s most literal significance, something which interest, which lies between people and therefore can relate and bind them together. Most action and speech is concerned with this in-between...so that most words and deeds are about some worldly objective reality in addition to being a disclosure of the acting and speaking agent (Arendt, 1958).

At the seaquarium, we become concerned with the matters before us. The creatures we watch become the focus that provides us the opportunity to act and speak to reveal our innate interests...to reveal ourselves. We are “speaking directly to one another” (Arendt, 1958). The person beside us at the seaquarium is not the ‘other’ someone remote from ourselves – rather, they are equal and distinct. It is in this space, what Hannah Arendt calls the Space of Appearance, children feel valued for who they are. This is a powerful space in which to situate our learning environment. The unintended outcomes of students feeling that their observations are valued as in

The children naturally extend a ‘space of appearance’ to the plants and creatures in the seaquarium – the other living things in the seaquarium are not remote from the children, but equal and distinct. In their journals, writing, projects, and daily presentations, the children demonstrate not only their increasing knowledge but also their increasing care and affection for their friends in the seaquarium. In turn, the seaquarium provides a framework of authentic tasks on which to ‘hang’ the prescribed learning outcomes. It is easier to teach children when motivated to learn - when we arrange our learning environment and learning experiences to match how children learn. While the seaquarium is in the formal setting of the school, it in effect brings a microcosm of the ocean and aspects of informal and place-based learning environments into the school and appears to have the benefits of both. At the seaquarium, we come to realize that it is through the actions of individuals that we take care of our natural environment. Even activities I intended as motivation for completion of less favoured work, revealed unintended outcomes of valuing children’s observations and different ways of knowing, and learning through discovery and authentic tasks. The seaquarium allows children to make a connection with nature, specifically, to identify with some of the ocean’s inhabitants (flora and fauna). Children, through this
connectedness, are thereby empowered and more likely to adopt an orientation towards service that evidences internalization of learning. As our youth become aware that they can make a difference, they might take greater responsibility for their actions to see beyond the creatures in the seaquarium to the creatures in the ocean, and realize their inextricable connection to all life on our planet.

III. REENVISIONING CURRICULUM ENACTMENT

When the Creator made this world, the first thing He made were the trees. As He had much work to do, He asked the trees if they would watch over the land. The trees promised they would be steadfast and watch until the Creator returned. The trees waited and waited; as they waited they grew sleepy and sleepier still. It was a very long time that they waited. And finally all of the trees went to sleep except one. Only the evergreen was left still watching over the Earth. When the Creator returned He found the trees sleeping and He was very upset. He told them because they had broken their promise they would all lose their leaves in the winter. Only the evergreen would keep their leaves as a reminder of the sacredness of a promise.

Iroquois Legend

Ted Bernard and Jora Young (1997) presented this Iroquois Legend to introduce the Menominee people in Wisconsin and their steadfast watch over the forest on their traditional lands. “The Menominee forest is nothing short of a miracle. Eleven of the 16 major forest types found in northern Wisconsin flourish here…[and it is believed] that the understory composition, tree species mix, age and size class structure closely resemble the way the original uncut forest must have appeared.” The Menominee attained sustainable yield by following traditional directions “Start with the rising sun, and work toward the setting sun, but take only the mature trees, the sick trees and trees that have fallen” (Bernard & Young, 1997). In concluding the discussion of the Menominee’s award winning sustainable practices, “we know it is fitting that those who have kept watch over the forest are leading the rest of us who fell asleep” (Bernard & Young, 1997) connect new understanding to the Iroquois Legend. We have the opportunity to rehearse this knowledge of steadfast vigilance and the sacredness of the responsibility to protect the forest each time we see the bare deciduous trees next to evergreens.

If we consider the actions of the Menominee in terms of our definition of phronesis we see they ‘embodied judgment linking knowledge’ of the forest ‘virtue,’ in their desire to have forests last forever, ‘and reason’ for the good of the Menominee and all their relations. They ‘perceived in a particular situation’ these forests, this land, in this time and ‘found a helpful
course of action’ for this generation and successive generations ‘on the basis of strengthened awareness’ of the accumulated wisdom of their people.

Our schools focus on literacy, numeracy, and social responsibility but the many of us are woefully illiterate when it comes to reading our natural world. Even in the face of undeniable data that we would need several worlds if everyone in the world live as we do in North America we are bombarded with messages that we are entitled to more - even if it comes at the expense of those in the third world who barely survive (and the many more who do not survive). In ‘Curriculum Wisdom: Educational Decisions in Democratic Societies’, Henderson and Kesson propose a pedagogy of compassion to envision and enact a good educational journey creating a more just and peaceful world. Curriculum wisdom embraces a radical democracy that is culturally inclusive and values other ways of knowing such as self-reflective, soulful, and personal artistry (Henderson & Kesson, 2004). Perhaps nurturing other ways of knowing will make the pedagogy of the Elders more accessible to us to re-envision our curriculum.

The Potlatch in BC Coastal First Nations tradition, a generosity of spirit, functions as a redistribution of wealth wherein the chief’s honour is commensurate with how much he gives away. Can we create a space for the indigenous mind in mainstream education? If we seek to enact an education that enhances a child’s understanding of their indigenous nature, how do we educate when our own cultural perspective is so different? Can we see our ‘cultural blind spots’? It seems this is where the seaquarium can help to begin to change how we think about what is important in education, how we teach, and how we relate to others and our world. The strategies listed in Table 3 for example teaching the big ideas, helping children connect new learning to this framework, and teaching through authentic tasks and the arts seem to be compatible to the key aspects of teaching with the seaquarium.

Through the lessons learned at the seaquarium to honour life, we can make strides towards honouring relationships and the place that traditional teaching and learning have in Indigenous American’s life. Sandy Grande (2004) in Red Pedagogy: Native
| **Table 3 Seven Aspects Relevant to Teaching First Nations Learners** |
|---|---|---|
| **FIRST NATIONS (FN) (Pewewardy, 2002)** | **EUROCENTRIC** | **STRATEGIES (based on First Nations’ Pedagogy)** |
| **Learning**  
Speaking/Listening/Acting | **Learning**  
Reading/Writing |  |
| **Field Dependence**  
Parts and whole together (e.g. one ocean)  
Concerned with life and all its relationships,  
Develop in cultures highly collective and family oriented  
Listen to the views of others before making judgments | **Field Independence**  
Linear, hierarchical (e.g. name discrete parts of the one ocean as separate oceans) - show children the parts and build to the whole  
May push for the quick answer. | Teach Big Ideas and then help children connect the parts to the framework of the whole.  
(Complexity) |
| **Perceptual Strengths (Visual, Auditory, Kinesthetic)**  
Elder teaches by modeling and child watches, listens, and then does.  
Learns best with emphasis on visualization  
FN Math=count, measure, design, locate, explain, trade, dance, and play  
Beadwork is purposeful, hands-on math, | **Tends to be verbal, rational, abstract**  
| It is possible to teach all elementary math concepts through beadwork.  
Ethnomathematics  
(Integrated Approach, through Authentic Tasks, Aesthetic) |
| **Reflectivity**  
First Nation children tend to be reflective,  
tendency to stop and consider options before responding and often resulting in greater accuracy in conceptualizing problems,  
More open-oriented, delaying decision making | **Impulsivity**  
Value on coming up with the answer quickly | Allow more time for reflection and do not push for a definitive answer.  
Ask for understanding or restating of the problem to aid with other students’ understanding. (Value knowledge developed over time) |
| **Classroom Management and Behaviour**  
For Navajos, for example, “punishment, contingent reward, or any openly manipulative effort to control behavior of others, including children is a violation of cultural values. | **Classroom Management and Behaviour**  
Logical consequences, | Ignore misbehavior, lower one’s eyes, indirectly referring to the misdeed, praising honorable behavior, explanation of desired behavior, use of humor to bond community, relieve stress, reaffirm and enhance sense of community (use discreetly and in a culturally sensitive manner) |
| **Tribal Role of the Family and Elders**  
Collectivism  
Respect and honor elders; grandparents play a major role in rearing children through daily connection; children observe parents/grandparents’ lives to learn by example | **Individualistic**  
| Include parents and elders in classroom activities and curriculum. |
| **Teacher/Pupil Relationships**  
Process over product; legends and stories as traditional teaching paradigms; knowledge obtained from self; cognitive development through problem-solving techniques  
Cooperation – all are important, willingness to share, compete if benefits the group | **Teacher/Pupil Relationships**  
Product oriented  
Knowledge obtained from others  
Competition | Use culturally responsive techniques & culturally sensitive curriculum. Teachers need to understand their own worldview (as culturally based) to understand worldview of their students.  
Promote cooperation, belonging to the group; the child does not want to stand out above (read apart) from the group. |
American Social and Political Thought wrote, “At a time when 90% of American Indian children attend non-Indian schools (Gallagher, 2000) it is not only imperative for Indian educators to insist on incorporation of indigenous knowledge and praxis in schools but also to transform the institutional structures of schools themselves.” We must recognize that Indigenous children “…generally learn in ways characterized by factors of social/affective emphasis, harmony, holistic perspectives, expressive creativity, and non-verbal communication…underlying these approaches are assumptions that American Indian/Alaska Native students are strongly influenced by their language, culture, and heritage.” “…their learning styles are different – not deficient” (Pewewardy, 2002). The implications for instructional practice are that the teaching/learning relationship is the primary focus.

Conclusion/Discussion

In summation, beginning with the whole or big idea first we provide children with a framework on which to attach new learning and allow students to discover the relevant details to reveal the emerging pattern. By providing students opportunities to learn through stories, metaphors, imagination, play, song, and movement, we capitalize on their natural way to learn. All children must believe there is respect for their background and their ideas and teaching/learning at the seaquarium provides a ‘space of appearance’ for children to honour their unique abilities. The seaquarium as a complex microcosm of the ocean provides a place for children to explore their wonder of the natural world and other living organisms and build special knowledge over time. It allows children to see beauty in the created world, to touch other life, and come to care about and care for the life in our seaquarium. It is this ability to connect, I believe, that is a powerful motivator for learning through the seaquarium.

We have to begin the change, and behave differently, to change the way we are able to perceive and enact curriculum. Teaching with a seaquarium enables me to bring more aspects of myself to my teaching – my interests, passions, and curiosity. By changing the tools I work with, and learning alongside the children I teach, I can re-envision teaching/learning environment and begin to see each child in a more complete way – rather than just the part of their being that can or cannot do a particular skill. We have to be able to see possibilities and potential in our students, so they can begin to see these in themselves.
APPENDIX

1. Life Science beyond the Textbook - SCED 421: Jennifer Stonehouse

This course is built on the resources of the Engaging Science program, the Vancouver Aquarium and the surrounding ecosystems of the Burrard Inlet. It will provoke new ways of thinking about life science through a variety of instructional styles, field experiences and hands-on classroom activities.

This 3-credit course is designed for practicing teachers who have a background in Science Education, and is not suitable as an elective for students registered in other Faculties. This course is part of the Science Beyond the Textbook Certificate program, which is a 15-credit program; designed for elementary, middle and secondary school teachers; includes "hands-on" experiences in science-learning spaces including the H.R. MacMillan Space Center, Science World and the Vancouver Aquarium Marine Science Centre.

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2. EDUC 500: Introduction to Research Methodologies: Stephen Petrina, Franc Feng

General Course Description The purpose of this course is to provide an introduction to research methodology by addressing the nature and purpose of various methods—all of which are useful in understanding educational phenomena. The course will not provide an extensive technical (operational) competence in any single method of research. Specifically, the course will: (1) Familiarize students with a cross-section of methods available for the conduct of research in education (e.g., arts-based, experiments, surveys, field studies, discourse & historical analyses). (2) Familiarize students with resources available to them for the conduct of research (e.g., research library, computer facilities, faculty expertise). (3) Familiarize students with various rhetorical techniques for reading and writing research and provide an analysis of paradigmatic orientations to inquiry. (4) Familiarize students with the challenges of research ethics in post-structural, post-positivistic times.

3. SCED 520 – Science Learning in Informal Environments: David Anderson

This course explores themes, theories, research studies and perspectives concerning learning in informal environments such as, museums, science centres, zoos, and aquaria. These out-of-school environments are generally described in the literature as “museum” settings or “informal learning” contexts. Although visits to museums are commonplace experience, research of visitor learning and behaviours in these settings has only emerged as a filed of significance in the last two decades.
This course will explore the nature and character of learning in informal settings; key influencing factors shaping learning; methodological approaches and issues surrounding researching learning arising from experiences in informal contexts; and examine ways which educators might optimize experiences in and beyond museum settings. Classes will be typified by both instructor and student-facilitated seminars focusing on critical engagement and debate of the literature of the field in the light of various theoretical and methodological standpoints. Classes will also involve elucidation of key theoretical tenants through practical experiences examining learning in various informal settings, such as the Vancouver Aquarium and Science World BC.

4. CUST 562 (now EDCP 562) - Introduction to Curriculum Studies: e. Wayne Ross
History and development of the curriculum emphasizing the underlying perspectives that inform curricular choices and activities, principles and issues related to organization, development and evaluation.

5. CUST 563 (now EDCP 563) – Curriculum Evaluation : Sandra Mathison
This course will examine issues, practices, and approaches for curriculum evaluation. Because ‘curriculum’ has many meanings this course will focus on the application of the general logic of evaluation to a number of common conceptions of curriculum: statements of educational goals and intentions (like professional standards, BC Ministry IRPs); educational resources (like textbooks, software, online resources, simulations); pedagogical/androgogical strategies (like cooperative groups, field trips, practica, dialogic methods); and programmatic interventions (like reading programs, drug education, inquiry based science) at both organizational and classroom levels.

In this course, students will examine the relationship between education and democracy from a critical/indigenous perspective. Specifically, students will examine the U.S. democratic project from the point of first contact/invasion to the present, particularly as it interfaces with the historically parallel project of indigenous sovereignty and self-determination. The aim of the course is to define a “Red Pedagogy” that focuses on developing transcultural and transnational coalitions and solidarities among indigenous and non-indigenous peoples. The focus on coalitions stems from the fact that ever since Hurricane Katrina, the dilatory effects of colonization – dispossession, displacement, environmental degradation, identity (re)formation have become more visible in the United States. This “new” visibility coupled with an increasingly charged political climate on issues of immigration, foreign policy and empire building intimates a reconsideration of the notion of “colonized peoples” to include peoples of the Ninth Ward, undocumented workers from Mexico, and other structurally displaced and or dispossessed in the formation of the nation-state. Therefore while the primary goal of this class is to examine the notion of “Red Pedagogy” and its aims to build transcultural and transnational
solidarities among indigenous and non-indigenous peoples, the secondary goal is to develop a broader pedagogical paradigm that reconsiders the intersections of education, sovereignty, democracy, and citizenship in order to define political and pedagogical spaces free of imperialist, colonialist and capitalist exploitation.

7. EADM 565D 022 – Educational Judgment: David Coulter

Where is the Life we have lost in living?
Where is the wisdom we have lost in knowledge?
Where is the knowledge we have lost in information?

T.S. Eliot The Rock

Much professional development is aimed at improving teaching by contributing to teachers’ general knowledge (e.g. academic courses) or practical knowledge (e.g. in workshops). Knowledge, although necessary, is not enough, however. While teachers need to know what to do, they must also be able to do what is right at the right time, in the right way, with the right people for the right reason. In short, teachers need to possess and exercise judgment.

“Judgment” is much used in common speech, but little analyzed; indeed, its absence is more commonly noted than its presence. Yet our lives can be understood as largely composed of judgments: what to do, when, with whom, for what purposes?

Ironically, judgment has received relatively little contemporary academic attention in many fields including education until relatively recently when a number of scholars in Canada and Europe have revived the Western conversation about practical wisdom and judgment. Using both scholarly and literary sources, EADM 565D aims to begin a conversation among participants about educational judgment and is organized around four central questions:

1. What is educational judgment?
2. How can the goodness of educational judgments be tested?
3. Who is best qualified to make what kinds of educational judgments?
4. How might educational judgment be fostered?

Some themes/tensions to be explored: knowledge/experience, education/schooling, ends/means, general/particular, organizations/civil society, dialogue/monologue, public/private, actor/spectator, acting/thinking.

8. CUST 566 – Curriculum Change and Implementation: Walter Werner

Educational policies, school programs, curriculum materials, and organizational structures are constantly criticized and changed. This seminar examines selected perspectives used to explain the success and failure of planned educational change. Also discussed are some implications of these perspectives for planning, researching and evaluating different types of change. Activities include lectures, discussions, and small group presentations. Participants are encouraged to pursue their professional and academic interests through the course assignments.
9. CUST 580 – Directed Studies Research – Changing curriculum delivery to improve the learning environment in a seaquarium classroom: David Anderson

Purpose: To investigate how changes in the learning environment improve the effectiveness of an integrated approach to learning using a ‘seaquarium’ (marine aquarium chilled to eight degrees centigrade containing a microcosm of Pacific Northwest marine invertebrates and plants) to promote transformative learning.

Hypothesis: Providing the student subjects with more frequent and regular hands-on activities and field experiences, as part of the normal classroom curriculum, will enable them to pursue personally interesting topics and lead to learning that changes attitudes and behaviour.

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