The Sustainable Middle School of Vancouver

A Middle School Combining Traditional and Environmental Education

Graduate Design Thesis by Mandel Mertz
The Sustainable Middle School of Vancouver

A Design Thesis Submitted to the Department of Architecture and Landscape Architecture of North Dakota State University

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In Partial Fulfillment of the Requirements for the Degree of Master of Architecture

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Fargo, North Dakota
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Abstract

There is a lack of awareness of what we are doing to our ecosystems and how we can reverse the trend of harmful practices that threaten our environment. Through education and observation, a more widespread movement of sustainability can be reached. My thesis project is a middle school that combines environmental and traditional education. The building itself educates by employing sustainable practices, and the teachers within educate by teaching ground breaking and classical sustainable practices. The site is in the center of Vancouver, British Columbia, Canada. The site is centrally located within a variety of neighborhoods, economic and social backgrounds, amenities and parks. Having a site within a city is more practical and sustainable because of transportation, close amenities and the re-use of developed space. The site is 510,200 square feet, which is more space than would be needed for a middle school, this is one of the reasons why I have chosen to include a Farm Sanctuary Program. The Farm Sanctuary program will use the space that the school does not, which will mainly consist of open field space for the rescued farm animals. The students will have a class where they work with the farm animals, this will be taught by a licensed veterinarian. The Farm Sanctuary program will teach the students companion and the necessity of other solutions for our food resources. Among this animal interaction class there will be gardening, an arts class, green technologies class and traditional middle school classes. These classes will be taught outdoors as frequently as possible and the school design will accommodate for this.
Problem Statement

How can we create a more widespread knowledge of sustainability?
**Statement of Intent**

<table>
<thead>
<tr>
<th>Typology</th>
<th>A Middle School combining traditional and environmental education. The site also includes a farm animal rescue program.</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Claim</td>
<td>Through education and observation of sustainable practices, people can better understand their surroundings and become more knowledgeable of the actions needed to care for their environment.</td>
</tr>
<tr>
<td>Premises</td>
<td>With a partnership of educators and designers, an extensive knowledge of sustainability can be gained through seeing sustainable building strategies and being educated on how to care for our ecosystems.</td>
</tr>
<tr>
<td></td>
<td>A sustainable building educates its neighbors and its surroundings. The students that occupy this building will gain knowledge from the building and the classes that they take within it.</td>
</tr>
<tr>
<td></td>
<td>The Sustainable Middle School of Vancouver, a middle school that combines traditional and environmental education, will be an alternative to traditional middle schools.</td>
</tr>
<tr>
<td>Theoretical Premise/</td>
<td>People need to be more aware of how valuable our natural resources are and take the steps necessary to protect them.</td>
</tr>
<tr>
<td>Unifying Idea</td>
<td></td>
</tr>
<tr>
<td>Project Justification</td>
<td>If we keep treating our environment as we do, we will use up all of our natural resources and destroy our ecosystems. The solution is education.</td>
</tr>
</tbody>
</table>
The Narrative

The Introduction

There is a lack of awareness of what we are doing to our ecosystems and how we can reverse the trend of harmful practices that threaten our environment. Through education and observation a more widespread movement of sustainability can be reached. My thesis is a middle school that combines environmental and traditional education. The building itself educates by employing sustainable practices, and the teachers within educate by teaching ground breaking and classical sustainable practices. The on-site Farm Sanctuary program teaches the students compassion and provides a home for farm animals that were rescued from inhumane living conditions.

The Discussion

There’s a trend right now to be “green,” but how many people actually realize what it means to live a sustainable lifestyle; from my observations, not many do. How can actual environmental awareness be reached? Can people with a higher knowledge of sustainability educate students so that they spread the knowledge?

Will students be passionate enough about their environment to gain real knowledge of sustainability? How will having this knowledge base of environmentalism benefit the students in their futures? Who will the teachers be?

Can this school become a sanctuary for the students and a place to embrace nature even though they are in the center of Vancouver, British Columbia? Can a building that employs sustainable practices become a model for other schools and even a city?

The Conclusion

A real understanding of our environment and the state of ecosystems is needed in order for real change to happen. At the Environmental Middle School of Vancouver, students will get the chance to go on field trips to local reserves, parks and beaches. An appreciation of nature is the first step to wanting to help protect our environment.

The Middle School is in the center of Vancouver, British Columbia. This sets a realistic scene for learning how to balance nature with our built environment. The school itself will also educate students about sustainability through sustainable building practices.

How a building can educate by example, creating an educational sanctuary and all of the questions I have debated in The Discussion will be the basis of the research into the character of the Theoretical Premise/Unifying idea for my thesis.
The User/Client Description

The Users of my facility will be the students, their parents, the faculty, the community, and farm animals.

A middle school is generally 6th, 7th, and 8th grade. Vancouver Sustainable Middle School will start out relatively small, with two classes of each grade. The classes will have about twenty students, equaling forty students in each grade and 120 students total. There would be six main teachers for the grades and around six specialty teachers. With additional faculty such as a principle, secretary, and nurse, the total amount of people using the school at one time would be about 135.

The peak usage of the school will be from about seven AM to six PM. The school will be used year round, with breaks for winter, spring, and summer. The school will go year round to supplement an education that emphasizes nature and its cycles. With the school being open year round, the building will be used more and the education system of the school will benefit from summer activities. The school will be open for tours and community events.

The school will have a minimal amount of parking. The students will most likely be dropped off by a parent, arrive on the sky train, by bus, walking or ride biking. The parking lot will have enough parking for faculty and a number of guests, however; faculty will be encouraged to use alternate modes of transportation.

Due to the nature of a school and its changing users, all possible physical and mental restrictions will be taken into consideration.

The sustainable Middle School of Vancouver will offer a very different type of education from the traditional middle school. This type of school will be desirable to more than just the upper class. Because of this, scholarships and other programs will be offered to lower class students so that they may also have the chance to attend the school. Vancouver has a very diverse culture. It can be expected that the school will as well; this will be taken into consideration in the design phase and also in the classes.

The sustainable Middle School of Vancouver will also include a "Farm Sanctuary" Program. Farm Sanctuary is a program that takes in farm animals that are in inhumane conditions. People can take tours of the farm sanctuary center and students will work with the animals.
Major Project Elements

The Environmental Middle School of Vancouver consists of a variety of outdoor and indoor spaces.

**Indoor Spaces**

There will be six classrooms that include a lecture space, a breakout space with more relaxed, comfortable seating, an indoor green space, computer space and an entry “wet” space. There will be separate spaces for a science lab, the gymnasium, locker rooms and, a space for larger art projects, such as pottery, sculpture and large canvas art. To accommodate the Farm Sanctuary program there will be barns and a Farm Sanctuary office.

The school will also include an indoor greenhouse and an indoor cafeteria which could double as a gathering space on rainy or cold days. There will be a food preparation area, rest rooms, a nurse station and faculty offices.

**Outdoor Spaces**

The major outdoor space consists of four main areas, a landscaped entrance area, an outdoor eating space, an open multipurpose field that can be used for a variety of sports and activities, and a series of gardens ranging from vegetables and fruits to flowers and trees. There are also smaller outdoor spaces, which include outdoor class areas and accessible green roofs.
British Columbia is an excellent place to learn about and appreciate nature. British Columbia has 141 ecological Reserves, 35 provincial marine parks, 7 Provincial Heritage Sites, 6 National Historic Sites, 4 National Parks and 3 National Park Reserves. British Columbia is a hub of sustainable building and businesses with sustainable practices.
Vancouver, British Columbia, Canada

Map of Parks and Land Reserves
Because of the close proximity of land reserves, parks, museums and its central location between many different economic and cultural neighborhoods, I feel that this is the perfect urban location for The Sustainable Middle School of Vancouver. An urban location is desirable because it creates a realistic situation for learning to balance the natural with the built world.
The Project Emphasis

Sustainable building methods will be my project emphasis, I will also branch off from this and emphasize built and natural environments as a source of education. A built environment can educate by displaying its passive energy technologies, having proactive waste management practices and having displays that educate people on green building technologies that might otherwise go unnoticed.

My thesis will also emphasize alternative education and the importance of site context.
Definition of Research Direction

The research for the project will be conducted in the following areas:

The Theoretical Premise/Unifying Idea - Research any existing education facilities that occupy a similar mode of thought. Research architecture that is sustainable to the level of being educational.

The Project Typology - Look at case studies, including all types of educational facilities. Some of the schools I will study are the “Green School,” “Chum Creek Sustainable College,” and “The Willow School.”

The Historical Context - Research the history of education, sustainability and the history of Vancouver.

Site Analysis - Analyze existing conditions of the site and the overall conditions of Vancouver.

Programmatic Requirements - Explore case studies of similar buildings to gain perspective as to appropriate programming and corresponding space allocations. I will also speak with faculty from various schools and find out what their schools have and what they think would be beneficial additions.
Plan for Design Methodology

I will follow a Mixed Method, Quantitative/Qualitative Approach for my design methodology. The strategy will be guided by the three premises that the Theoretical Premise/Unifying idea was developed from and that were discussed in the narrative. The qualitative and quantitative data that I collect will be collected concurrently. Data on sustainable design methods, educational design, alternative education, and the importance of site context will be continuously gathered and implemented into the design concepts. My analysis, interpretation, and reporting will occur throughout the research process in text and graphic form.
The Plan for Documenting the Design Process

I will keep record of my design process by scanning in my design documents weekly. Design documents along with research and computer process will all be saved in weekly files and then compiled into one final design thesis folder. This folder will be saved onto personalized design thesis disks, some of the pertinent information will be included in this thesis manual and eventually that information will be made available online.

At the conclusion of my thesis, the information that I select will be presented in a pdf presentation from InDesign, this will be presented along with my final presentation boards and models.
# Previous Studio Experience

<table>
<thead>
<tr>
<th>Term</th>
<th>Instructor</th>
<th>Course Number</th>
<th>Project Name</th>
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<tbody>
<tr>
<td>Fall 2006</td>
<td>Darryl Booker</td>
<td>271</td>
<td>Fargo Tea House</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Mississippi River Rowing Clubhouse</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Rocky Mountain Dwelling</td>
</tr>
<tr>
<td>Spring 2007</td>
<td>Joan Vorderbruggen</td>
<td>272</td>
<td>Priarie Dance Academy</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td>Woodlawn Waldorf School</td>
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<td>Fall 2007</td>
<td>Ron Ramsey</td>
<td>371</td>
<td>Agencourt Historical Addition</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Barn...</td>
</tr>
<tr>
<td>Spring 2008</td>
<td>David Crutchfield</td>
<td>372</td>
<td>Fargo Mixed Use Development</td>
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<td>Fall 2008</td>
<td>Bakr Aly Ahmed</td>
<td>471</td>
<td>San Francisco High Rise</td>
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<tr>
<td>Spring 2009</td>
<td>Frank Kratky</td>
<td>472</td>
<td>Santo Domingo Research and Housing Development</td>
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<tr>
<td>Fall 2009</td>
<td>Frank Kratky</td>
<td>771</td>
<td>FM River Keepers Visitors Center</td>
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<td>772</td>
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The Program
Theoretical Premise Research

Main Areas of Research:

- Environmental Awareness
- Sustainable Development in Vancouver
- Schools with a Sustainability Emphasis
- Youth Activism
- The Security and Safety of Children
Environmental Awareness

Environmental awareness is not a new concept. The Environmental Movement can be traced as far back as 1739, though at that time it was still considered Conservation, the term “Environmentalism” was not coined until the 1950s. There were many early historical figures that took a stand for the environment. “Benjamin Franklin and other Philadelphia residents, cited “public rights,” and petitioned the Pennsylvania Assembly to stop waste dumping and remove tanneries from Philadelphia’s commercial district.

Henry David Thoreau, now a famous author was interested in peoples’ relationship with nature and studied this by living close to nature in a simple life. In 1854 he published his experiences in the book Walden, which argues that people should become intimately close with nature.

John Muir (1838 – 1914) was an author and early advocate of preservation of U.S. wilderness, came to believe in nature’s inherent right, especially after spending time hiking in Yosemite Valley and studying both the ecology and geology. He successfully lobbied congress to form Yosemite National Park and went on to set up the Sierra Club (Hall, Jerimiah, 2009).” The Conservationist principles as, well as the belief in an inherent right of nature were to become the bedrock of modern Environmentalism.

Conservation is an important aspect of current Environmentalism, however, the Environmental Movement has become concerned with much more than simply conserving our natural resources, over the years our environment has gained many more threats. The problems with our environment don’t just threaten one area, they are capable of affecting the whole world. Our major current environmental issues/threats are climate change, air pollution, ozone depletion, fresh water shortages and water pollution, shrinking wetlands, and deforestation. These threats are grave but with awareness and action we can take steps to heal and reverse the damage to our environment. This is why education that teaches sustainability is so vital.

More people are taking a stand in their community and become leaders for sustainability. Vancouver has many reputable environmental groups that have made an effort to keep Vancouver an environmentally friendly city some of the groups include; Society Promoting Environmental Conservation (EST.1970), Rescan Environmental Group, Environmental Youth Alliance, and the Vancouver Environmental Protection Branch.
Environmental Action in Vancouver

The provincial government of Vancouver is continuing the effort to reduce greenhouse gas emissions and overall energy consumption. As part of this effort, the government has more than tripled its number of hybrid vehicles since 2005 to become one of the leaders in public sector use of hybrid cars. Hybrids emit much less pollution than conventional gas and diesel powered vehicles and thus help to reduce greenhouse gases in our environment. They can also be more cost-effective as fuel savings offset the higher initial cost. As of 2007, all new cars purchased or leased by the B.C. government are to be hybrid vehicles. The province also has new financial incentives to help local governments shift to hybrid vehicle fleets and help retrofit diesel vehicles (The BC Energy Plan, 2009).

The Province government of Vancouver has committed $40 million over four years to help build cycling and pedestrian pathways, improve safety and accessibility, and support children’s activity programs in playgrounds.

This fund will help local government shift to hybrid vehicle fleets and help retrofit diesel vehicles which will help reduce air pollution and ensure vibrant and environmentally sustainable communities. This investment will also include expansion of rapid transit and support fuel cell vehicles (The BC Energy Plan, 2009).
Vancouver is surrounded by a wonderful variety of natural landscapes and is often cited as one of the best cities in the world to live, work, visit or invest in. Vancouver also has one of the smallest carbon footprints of any city in North America and is a leader in green building, planning and technology. “In February 2009, Mayor Gregor Robertson launched the Greenest City initiative, with a goal to map out how Vancouver can earn that title by 2020 (Sustainability, 2008).”

Vancouver has many sustainable buildings; a few places to see green buildings are at the University of British Columbia, the City’s National Works Yard, B.C. Cancer Agency Research Centre plus expansions to the Vancouver Aquarium, the Vancouver Convention Centre and a sustainable community is being built in Southeast False Creek (SEFC), it is a large-scale green construction project unlike anything ever undertaken in Vancouver. The new sustainable community will only be about one mile from the site of The Sustainable Middle School of Vancouver.
Vancouver Convention Center

The Vancouver Convention Center is located in downtown Vancouver. The facility covers 1.2 million ft² (111,500 m²), or four city blocks, with the west building built 60% on land and 40% over water. The Vancouver Convention Centre is the first ever repeat winner of the International Association of Congress Centres (AIPC) award for ‘World’s Best Convention Centre’ (2002, 2008).
A number of sustainable practices and environmentally conscious design features make the Vancouver Convention Centre one of the greenest convention centres in the world. (The Facilities at VCC, 2009).

- Commitment to advanced energy management with experience hosting ‘zero waste’ events.
- Extensive facility-wide recycling program recovers nearly half the total volume of waste generated.
- The West building is constructed to LEED (Leadership in Energy and Environmental Design) Gold certification standards.
- The West building features a unique marine habitat, a sophisticated drainage and water recovery system, and a seawater heating and cooling system.
- A six acre ‘living roof’, the largest green roof in Canada and the largest non-industrial living roof in North America, the west building features more than 400,000 indigenous plants and four beehives.

Elevation of the Vancouver Convention Center

All local materials were used

Some interior walls are made from scrap lumber that would have otherwise been thrown out
Schools with A Sustainable Emphasis

At Teachernet.gov.uk/sustainableschools, they describe sustainable schools as a school that prepares young people for a lifetime of sustainable living through its teaching, its fabric and its day-to-day practices. It is guided by a commitment to care for oneself, for each other (across cultures, distances and generations) and for the environment itself (far and near).

Sustainable development can build coherence among a range of initiatives and school practices. It offers schools a bigger picture in which to join up their work on a range of policies and initiatives, such as Every Child Matters, school travel planning, healthy living, school food, extended services, citizenship and learning outside the classroom.

Above all, sustainable schools contribute to sustainable development. They make a positive effort to demonstrate responsible practices for their young people and communities and engage them in learning about the issues and potential responses.

“There is nothing more dangerous than to build a society, with a large segment of people in that society, who feel that they have no stake in it; who feel that they have nothing to lose. People who have a stake in their society, protect that society, but when they don’t have it, they unconsciously want to destroy it.”

-Martin Luther King Jr.
Green School

Located in Bali, Indonesia, the school is comprised of students from all corners of the world, many relocating with their parents just for the experience of attending. Amongst them, 20% are local Balinese children funded by scholarships from generous donors. The curriculum for younger children is influenced by the work of Rudolf Steiner, who pioneered the idea of holistic education. Older students have the opportunity to study for Cambridge IGCSE’s and a planned IB diploma/certificate course will take them to graduation. Green Studies, which focus on sustainability, and a quality Creative Arts program complement the academic curriculum.

The campus is remarkable. Green School is striving to have the lowest carbon footprint of any international school anywhere, through use of bamboo and rammed earth for its buildings, growing its own food in its gardens, and plans to generate its own power from the river. The central building, “Heart of School”, is one of the largest bamboo structures in the world and has an architectural beauty usually witnessed only in cathedrals and opera houses (Welcome to GreenSchool, 2009).
The class rooms and outdoor spaces provide for a curriculum that includes yoga and martial arts, building, carbon footprint analysis, health and nutrition, community outreach, organic gardening and sustainable farming, ethics, water studies, Hindu studies, Balinese culture, world religion and much more.

The Green School curriculum encourages and triggers a heightened social consciousness, a sense of responsibility, spirituality & morality, earth awareness with a commitment to save it, collaboration, social entrepreneurship, creative thinking, compassion & open mindedness. A curriculum, which if nothing else, gives our children the capacity to think on their feet and to figure things out.
School of Environmental Studies

The School of Environmental Studies is an optional, two-year high school in Apple Valley, Minnesota. The school is also known as “Zoo School” because of its partnership with the Minnesota Zoo and its 12 acre site on the zoo’s property. The school embraces project based learning with an environmental theme.

The School of Environmental Studies opened during 1995 in the Twin Cities suburb of Apple Valley as a public, 400-student, 11th and 12th grade “high school of choice”. The school’s two-year program culminates with a series of senior capstone activities. As a rite of passage, this program requires the students to initiate sustainable service experiences, proclaim their evolving environmental ethic, and present an environment issue of choice at a forum attended by the general public, family, and significant individuals in the student’s life.

Design

The School of Environmental Studies was designed in a manner very different from most schools. The committee charged with planning SES conducted almost two years of research before commissioning an architect. What emerged was a clear vision of the kinds of learning experiences they hoped to provide: interdisciplinary, project-based, and real-world.

Architect Bruce Jilk was commissioned to design The School of Environmental Studies, the central building block was the focus of Jilk’s design. The central building block is comprised of student workstations (desk with bulletin board and storage area). This feature simultaneously meets two objectives: that students take on the role of workers (the workstation resembles an office cubicle) and that the learning environment promote a sense of identity (students can decorate workstations to reflect personal tastes).

Individual workstations are clustered in groups of 10, forming a “pod.” Ten pods form a “house.” The term “house” refers not only to the grouping of 100 students with three teachers, but also to their common workspace: a large, flexible-use room (nearly half of one floor) with tables and partitions that can be arranged to accommodate small or large group work.

Architecturally, the “heart” of SES is a forum spanning two floors at the center of the building. Each of the school’s four houses faces it and/or the adjacent library. Another example of flexible-use space, the forum serves as cafeteria, display center, gathering place, and auditorium, depending on how tables, chairs, and partitions are configured.
Much of the building's architecture is transparent and serves as a teaching tool. As an example, the exposed ductwork and air distribution systems allows students to construct a better understanding of issues of indoor air quality. Seniors examine the building's airflow with the lead custodian during their investigations related to environmental health.

Classes
The school is unique from the other high schools in the district in that it offers a different range of classes. It offers elective classes such as art, chemistry, physics, animal care, wildlife management and mentor. SES teaches math classes from Algebra II to Advanced Placement Calculus. SES also has a language program, currently teaching French and Spanish. The core classes offered at SES are wrapped together in an interdisciplinary learning period called house. Classes are split up into a unique schedule where there are four class periods a day, two of which are house (either 1 & 2 or 3 & 4), and the other two are electives. SES has a rotating schedule in that there are two schedules that alternate day to day, Sky and Earth days this allows students to take four electives, and also experience a class schedule closer to that of college (School of Environmental Studies, 2009).

Youth Activism
There are many types of programs that could raise awareness of environmental issues. I feel that a school is a good opportunity because it teaches environmental responsibility at a young age. The students will carry the knowledge they gain from The Environmental Middle School of Vancouver with them throughout their continuing education and careers. They will apply the knowledge they have gained to every aspect of their life.

One question that I raised in my Theoretical Premise was, Will middle school ages children care enough about environmental/ world issues to take the school seriously? From some of the information I have gained while researching youth activism, I have come to the conclusion that if the students are interested enough to attend The Environmental Middle School of Vancouver they definitely have the capacity to be very passionate and environmentally active.

Vancouver has many youth volunteering programs and youth activism groups that volunteer throughout Vancouver. The programs that are already offered in Vancouver could easily be incorporated with the students at The Sustainable Middle School of Vancouver.

- Environmental Youth Alliance (EYA) is a youth driven, non-profit organization dedicated to the health of the urban environment, the planet and the well-being of its people. By providing young people with meaningful experiences in projects that benefit our communities, they support our environment socially as well as ecologically. The EYA Vancouver has been awarded the Most Outstanding Environmental Youth Organization in B.C. from the B.C. government.
• Since EYA was established in Vancouver 15 years ago they have:
  • Engaged 13,000 children and youth in EYA projects
  • Planted 3000 youth gardens
  • Presented 2000 climate change education lectures
  • Presented 2000 food security education lectures
  • Presented 500 transportation education lectures
  • Held 3700 youth driven conferences
  • Held 795 mapping and capacity building workshops
  • Saved 331 Tones of GHG’s each year
  • Saved 180 trees each year
  • Saved $12,414 each year through business greening
  • Distributed 5000 plants
  • Distributed 3000 seeds
   (All About EYA, 2009)

• “Youth4Action” is comprised of youth leaders from across Metro Vancouver
  they are taking action for sustainability and making real change in their schools
  and communities every day. Youth4Action aims to support these youth leaders
  and helps them achieve their vision and actions for sustainability.

• Green Street is a national program that supports environmental and sustain-
  ability education programs to teachers and students across Canada. Green
  Street was started by an organization called the J.W. McConnell Family
  Foundation. Under Green Street, Canadian environmental groups develop
  and deliver high quality environmental and sustainability school programs.
  Over 18 environmental organizations are currently involved in Green Street!

Through these programs, students are actively engaged in learning about
the environment and are motivated and supported in taking action. The Youth
Engagement Program is a special part of Green Street. Its purpose is to con-
nect with all the students out there that have gone the in-class school pro-
grams with other, on-going environmental opportunities.
The Security and Safety of Children

Because the typology of my thesis project is a middle school, the security and safety of the children will be a big factor for the research and the design. When thinking about safety in schools it is hard to say which is safer; do you build your school so that it is a fortress, or do you instead open the school and invite the community within. While researching I found a dissertation titled, “Feeling Safe at School,” it stated that the whole community is an integral part of the school. In any situation where the community is cut off from the school, the school suffers greatly. For example, in the US, an unfortunate affect of bussing, which was suggested as partial solution to racial integration, has, in many instances, inadvertently hurt the concept of the community school.

Feelings of safety and security are related to a person’s experience of feeling like they belong (Haigh, 1996). When a child feels that they are part of a group, they feel more secure and at ease, this not only relates to a feeling of physical safety but also to a feeling of emotional security, the child feels more open to be themselves. Feeling safe is also clearly related to the effectiveness of public safety, keeping and maintaining a low level of community violence. “In studying the social context of bullying, it was found that feeling safe in a community was related to the presence of adult supervisors and the lack of negative influences. Children feel safer when they can see and feel their protectors and when their protectors are effective in combating the negative influences leading to bullying (Twemlow, 2001).”

An interview done by Sommer (1990) revealed that adolescents had a high need for a secure retreat, preferably a natural setting, in order to feel safe. Feeling safe may require this escape or “safe haven,” where children can go to feel safe and protected. This highlights the potential role of parks, recreation programs, and community centers as ways of assisting community members’ feeling of safety.

Twemlow suggests that a child’s feelings of safety rely on twelve main areas these twelve areas are: 1. Quality of the caregiver and child relationship, 2. Exposure to family and community violence, 3. Presence of protective adults, 4. The rules of the social system, 5. The presence of drugs and alcohol, 6. Media reports concerning the safety of a community, 7. Media violence, 8. The presence of a safe haven or retreat, 9. Training in personal safety techniques, 10. Good relationships with peers and friends, 11. Engaging in altruistic behaviors, 12. A sense of belonging to a community.

Not all of these twelve factors can be controlled in a school setting, for example, a school can not control if a child watches violent television at home or the quality of their caregiver. But, The Sustainable Middle School of Vancouver can strive to provide protective and caring faculty, a sense of a safe haven, strong connections and feelings of belonging, well thought out rules and a drug free environment.
Theoretical Premise Conclusion

For my Theoretical Premise Research, I decided to research; Environmental Awareness, including its history and Vancouver’s level of environmental awareness, Sustainable Development in Vancouver, Schools with a Sustainable Emphasis, Youth Activism, and the Security and Safety of Children. Researching these topics helped me answer questions like; What is a common level of environmental awareness?, What is Vancouver’s level of environmental awareness?, Are other people in Vancouver developing sustainably?, Is Vancouver the right environment for a sustainable school?, Are there many other sustainable schools?, What type of environment do other sustainable schools provide?, What type of curriculum do other sustainable schools provide?, Will middle school aged children be interested enough in sustainability to become passionate about the schools teachings?, and How do I design a safe environment for the children at the school?

Through my research I have realized that there are many locations around the world that now offer schools with a sustainability emphasis. Sustainable education schools work in all kinds of sites and Vancouver would be no exception. Vancouver will be an excellent location for the Sustainable Middle School of Vancouver not only because of its scenic wilderness, but also because sustainability is something that the entire city seems to be readily embracing. Vancouver’s government is embracing sustainability at every level, they are adding bike and pedestrian paths all over the city, replacing their government vehicles with hybrids and Mayor Gregor Robertson has even made an initiative to be the greenest city in the world by 2020. Vancouver building is also embracing sustainability with more environmentally friendly housing developments and the Vancouver Convention Center, which is one of the greenest convention centers in the world.

Vancouver has many youth volunteering/action programs already in place, which shows that a lot of the young people in Vancouver are already passionate about taking care of their city and the environment that surrounds it. A few of these groups are; Environmental Youth Alliance, Green Street and Youth4Action. These groups do a variety of work varying including planting trees, planting gardens, handing out pamphlets, raising money to educate their communities and educating people on hoe to make their buildings more environmentally friendly and sufficient.
Another thing I realized I would have to research is the security and safety of children at school. While designing The Sustainable Middle School of Vancouver I will need to constantly be thinking about what makes children feel safe and secure in their environment. Leading child psychologists say that in order for children to have a successful learning environment they must always feel safe and secure. There are some varying opinions on what makes children feel safe but the major consensus was that children feel safe when they are in an open, friendly environment and can freely express themselves.

This research can be interpreted to mean that students do not feel safest when they are shut out from their environment but rather when they have nothing to fear from their surrounding environment. I think the best way to achieve this would be to embrace the community by opening parts of the school to its neighbors. This will have to be done in places where faculty can always be monitoring the surrounding environment. The end goal will be a school that embraces the community and a community which embraces the school. Achieving a feeling of safety should be easier inside the classroom, which unfortunately is not always the case in a lot of middle schools. A feeling of safety can be achieved in the classrooms by having open communication embracing every students differences. The school will teach a variety of subjects and in a variety of learning styles. Each classroom will only have fifteen students, which will make it much easier for the teacher to work one on one with students. It is common for current middle school classrooms to have anywhere from twenty to forty students in a classroom.

Large classrooms and not considering different learning styles is a big part of why the education system often fails. In middle aged students there is also the growing problem of Attention Deficit Disorder and various types of Autism. The design of the Sustainable Middle School of Vancouver will have an open classrooms plan that can be rearranged to circular group discussions, group project work or individual study. The instruction of the school will lend to more hands on work that is done in groups, this will help combat the problem of A.D.D. and alternative learning styles.

The design of The Sustainable Middle School of Vancouver will be a combination of safety, sustainable design, and layouts that lend to alternative styles of educating.
Typology Case Studies

The Willow School

Chum Creek Outdoor Education Centre

Strawberry Vale School

St Leonard's College, Sustainability Centre
The Willow School
Gladstone, New Jersey, USA
Farewell Mills Gatsch Architects, LLC

“The Willow School is a gold level, LEED certified, K-8 independent school located on 34 acres in Gladstone, New Jersey. The small private school was designed to reflect a curriculum rich in the lessons of environmental stewardship where children could experience a sense of wonder about the natural world and a connection to place. The program stresses the connection of indoor and outdoor spaces and the linkage of historical and contemporary experience.

Environmental stewardship meant preserving both a historic farmstead as a piece of cultural history, conserving and stabilizing ecological zones such as wetlands and woodlands, and minimizing the impact of new construction on ecosystems. The building are low and linear, with the long axis oriented east and west to respond to the sun and wind. The facade is a composition of local stone, salvaged heavy timbers, wood siding and glass organized in agrarian structures along the spine of the sun space corridor (Ford, 2007).”

The children feel connected to nature at all times. Each classroom has a large row of windows that frame the wooded, natural beauty of the site and each classroom also has its own door so children can move outside at a moment’s notice. The site includes many outdoor learning spaces and constructed wetlands for the filtration of wastewater. Natural meadows, butterfly gardens, rainwater harvesting and hedgerows are incorporated into the design of the campus. The school’s goal is very similar to what The Sustainable Middle of Vancouver’s will be. Their goal is not only to have a building in which they teach the students, but have it also serve as a model to study responsible living. The schools curriculum actively incorporates sustainable-living principles at each grade level.

“The school building includes the latest in environmentally-sensitive and energy-efficient design. Clerestories provide passive-solar heating, supplemented by high-efficiency gas heating. Rainwater runoff is recycled to flush
The building’s toilets and maintain the surrounding planting, and the remaining wastes are processed in the most environmentally sensitive method.

The entire school features rainwater collection, the Lower School Academic Building runoff is captured in an approximately 50,000 gallon (189,500 liter) below ground tank made out of recycled plastic. The tank was installed below the frost line (i.e. about 2 feet, .6 meters) using the earth’s insulating capabilities to prevent the water from freezing during the winter school term. With over 40 inches (101 centimeters) of rain in a typical year, the school is capable of capturing nearly 400,000 gallons (1.5 million liters) a year. Rainwater is used both for irrigation as well as in the low-flow toilets.

Sixty-thousand native grasses and perennial plants that require limited or no irrigation were planted. The plants were installed partly to cut down on water use, but also to reduce the need to mow and fertilize the large site as well as open up the soil for better water absorption.

Rainwater is stored in the large underground tank and is then cleaned before being stored in a 600 gallon (2,274 liter) holding tank in the basement. Sediment traps eliminate the large debris entering the system, which is further filtered with another smaller filter before entering the large tank. Water entering the smaller holding tank is treated with an ozone sterilization system. The water in the holding tank is clean and always available for use by the irrigation system and the toilets, eliminating the need for portable city water for these uses. An added benefit of the ozone system is the lack of colorization in the water, so water in the toilets looks just like clean potable water.

Flushed water and any rainwater overflow go to the on-site constructed wetlands that process waste. These wetlands are simply a rubber-lined rock-filled pond, where plants are grown hydroponically in septic water and the micro-organisms and plants feed off the pollutants. The cleaned water is then pumped into the ground to help recharge the local aquifer.

The school’s water system is continually monitored and displayed so students can monitor how much water is reused. This beautiful, progressive facility is truly an active learning center, with kids surrounded by wonderful, interactive facility, and yet, it is not using any drinking water for either irrigation or flushing toilets.

“We are a school that sees sustainability as a key element in our relationship with the natural world as much as with our social world. Children learn to share intellectual resources with peers to sustain a community. They also learn to share, respect, and conserve nature’s resources. As we marvel at the gifts nature provides, we also learn that nature, like our social relations, must not be wasted by profligacy or indifference,” states Richard Eldridge, Head of the Willow School, explaining the school’s vision (Pushard, 2008).”
Floor Plan

The Willow School site plan addresses woodlands, wetlands, setbacks, and circulation.

Floor Plan

Rooms are clustered facing the interior courtyard on the site. Each room has two doors, one to the interior hallway and one that goes to the outdoor spaces.
Study Sketch
This sketch shows the implementation of sustainable interventions.

Exterior view of the classrooms.
From the outside each classroom appears to be a separate “pod,” but they are actually connected by an interior hallway.
Interior view of hallway
In this view you can see how the salvaged heavy timbers were used in the structure of the building, and how the structure emphasizes sustainability and their surrounding environment.

Interior view of a classroom
In this image you can see that The Willow School decided to keep the interiors natural colors. The interior spaces all have off white walls accented with wood and a lot of windows for day lighting.
From this figure/ground, it is obvious that the designer’s goal was not to occupy the entire site, but rather to leave a lot of the natural environment for the students to explore and experience.

Site Map
These orange arrows show the exits from the classrooms to open green spaces. I wanted to emphasize this because the green spaces that are accessible from the classrooms are very open; there’s really no division for different classes or activities. Some studies of child security suggests that a strong community is vital for children to feel secure, this openness could lend to that or maybe smaller individual outdoor spaces would lend to a stronger and smaller sense of community.
Chum Creek Outdoor Education Center
Chum Creek, Victoria, Australia
FMSA Architects

“The learning program for this outdoor education is called “earth education” and focuses on hands on learning to assist the students to understand the functioning of many environmental elements. The design of this building specifically incorporates sustainable building systems that require and invite user participation for their management. Students manipulate the buildings heating, cooling and ventilation system by closing louvers, turning on the water drip system, opening windows, and pulling out awnings. These features demonstrate how, natural systems can be controlled by simple physics and geometry.

Intensive life cycle assessment of materials was undertaken, including minimizing embodied energy, maximizing durability of materials, and where possible ensuring recyclability of building fabric by designing demountable connections between materials. Recycled timber and macrocarpa reclaimed from farm windbreaks is featured in the veranda and wall claddings (Ford, 2007).”
Some of the sustainable features of Chum Creek include:

- Passive Evaporative Cooling, this is achieved by coupling water retention tanks that are controlled through ventilation on the south side of the building.
- Operable Windows
- Solar Chimneys, provide heated air in winter and induce cross ventilation in the summer.
- Double Glazed Windows
- The building form deflects heavy winds from the south and shields the veranda and outdoor activity areas.
- Wastewater is biologically treated using mini ecosystems to produce a clean by-product that is used for irrigation.
- Double Glazed Windows
- Evaporative cooling aka “wet-wall” below the water tanks.
- Darkened roofs enhance preheating of air supply to solar chimneys.

View of internally expressed corrugated metal rainwater tanks

View of the interior fire pit space next to “Mess Hall”
Plan of Chum Creek Outdoor Education School

Chum Creek is not like most schools because it has no hallways and no classrooms. The school teaches all of its classes outside and when it cannot, everyone meets as a group in the “Mess Hall.” This makes the building much smaller than a typical school and lends it to needing less interior spaces. The interior spaces are limited to: one rest room, a mess hall that includes a fire pit, an office, kitchen, food storage, first aid, and a drying room.
Chum Creek Outdoor Education Center

Analysis

Like Willow School, Chum Creek appears to be on a fairly large site, but for the designed outdoor space, they choose to visually enclose part of it with their wrap around deck. I like that both Chum Creek and The Willow School have untouched wilderness and designed outdoor space. It creates an interesting contrast to learn and work. Outdoor designed nooks are nice spaces for students to go outside and work alone or in groups. According to studies on child security done by B. Sommer, outdoor spaces in nature are often children’s favorite places.

Figure/ Ground of the designed site

- The built environment on the site (figure)
- Landscaped site
- Deck
Strawberry Vale School

*Victoria, British Columbia*

*Patkau Associates*

Strawberry Vale School is a State Elementary School for 488 students aged 5-11 years. The site is 1.8 hectares, and it is located in a semi rural community on the edge of Victoria. To the north of the site there was an existing school beside an oak woodland, which forms the edge of a small park.

The school includes sixteen classrooms arranged in groups of four with associated areas located in or off of common areas, including a library, computer room and additional corridor areas.

Due to its wooded location, timber was selected as the primary building material. The wood is cedar externally with birch ply for internal carpentry. The major structural elements of the building are steal with reinforced in-situ concrete foundations and floors. The shallow roof slopes are clad in aluminium coated steel. Wet areas are polished concrete, and carpet is used in classrooms and in the library.

The hydrology of the site has been displayed to form part of the education curriculum. This begins on the south side of the school where rainwater from wall and roof surfaces is collected in concrete trenches located below roof overhangs. The water is piped towards the lower north side of the school where it is discharged into an open watercourse. This leaks out into the lower site area and creates a shallow marsh. Children plant and monitor cat-tail grasses and bulrushes and enjoy nesting birds and waders.
Spaces between classrooms and service areas not only form the corridor link between each block, but they also become inhabited by small group activities.

The Building is oriented towards the south, symbolically turning its back toward the city. All classrooms look out towards the woods and distant hills. By placing windows, clearstories, and roof lights to optimize views and daylight, the building gives form to the rural site and environmental forces. In order to limit the perceived length of its corridors, the four blocks of classes have been staggered. The “shortening” of these hallways also lends to the scale of the children that attend the school.

The school’s dialogue with the surrounding landscape and its rich social program make it a refreshing and radical approach to the architecture of schools (Dudek, 2000).
Strawberry Vale School Analysis

After closely analyzing the floor plan of The Strawberry Vale School, I found a couple things that I wasn’t sure about. One thing that I found odd was that each class has a main classroom and a workroom. I’m not sure why they decided to make them two completely separate rooms when they are right next to each other. Couldn’t this be one room? Or they could have the doors go from the room to the workroom, instead of having to go out into the hall and then into the workroom.

At first I thought all the doors to the exterior spaces seemed excessive, but after looking closer, all the doors are necessary for an emphasis on the constant connection to nature.
St Leonards College, Sustainability School

Victoria, British Columbia
Patka Associates

"The sustainability center at St Leonard’s College has been designed in response to a curriculum that looks forward to offering an education for a sustainable future. The model of sustainability looked to the 1992 Earth Summit in Rio De Janeiro, which provided a base for students learning in a hierarchy of four overlays:

- The first overlay, centered on the notion of personal sustainability, seeks individual learning in health and education, and balance in the demands of life.
- The second overlay relates to socio-cultural sustainability and looks to understand the history, geography, social studies, politics, and economics of our societies.
- The third concentrates in the sustainable understanding of the environmental overlay, which encompasses the challenges of global warming, loss of biodiversity, dwindling reserves, and comprehension of the impacts and ways to reduce our environmental footprint.
- The fourth overlay focuses on urban sustainability, which considers our infrastructure and how we organize the way we live, systems of education, transport, health, and essential services.

The Sustainability Center aims to touch all these overlays of understanding and exploration of our future. Not only is the building a working example of minimizing and conserving resources, it also acts as a working model in which students can participate in managing their environment. The flexible space within allows student project groups to work, display and store their results, promoting the exchange and continual evolution of ideas (Ford, 2007)."
Sustainable Features at St Leonards College:

- Solar Chimneys, provide heated air in winter and induce cross ventilation in summer
- Reversible ceiling fans redistribute rising heat in winter and enhance cooling effects in summer
- Passive cooling through louvered ventilation evaporative panels coupled to rainwater storage tanks
- Cross ventilation is encouraged by large sliding doors to both north and south facades and operable skylights
- Thermal mass is incorporated through the use of concrete floors
- Materials include lightweight, high insulation wall cladding, natural timber plywood on interior wall lining, and compress straw ceiling panels
- Drought resistant native vegetation minimized water use
- Intelligent metering system to monitor buildings energy use
- Photovoltaic panels and wind turbing generate electricity
- Twin rainwater storage tanks (Ford, 2007)

![Solar Panels](image1)

![Southern Facade of the Solar Wall](image2)

Analysis (some facts about photovoltaics): Solar photovoltaics (PVs) are arrays of cells containing a material that converts solar radiation into direct current electricity. Materials presently used for photovoltaics include amorphous silicon, poly crystalline silicon, micro crystalline silicon, cadmium telluride, and copper indium selenide/sulfide. Due to the growing demand for renewable energy sources, the manufacture of solar cells and photovoltaic arrays has advanced dramatically in recent years (Jocobson, 2009).

Photovoltaics can be combined with wind turbines and other electricity providing systems. These energy sources can be used for on grid or off grid buildings, in locations where a grid is available, the photovoltaics are connected to the grid that you already have in place.

Photovoltaic production has been doubling every 2 years, increasing by an average of 48 percent each year since 2002, making it the world’s fastest-growing energy technology. Driven by advances in technology and increases in manufacturing scale and sophistication, the cost of photovoltaics has declined steadily since the first solar cells were manufactured (Jackobson, 2009).
General Analysis

Like Chum Creek Outdoor Education Center, St Leonards College is mainly comprised of one main space. Both colleges have one main learning space with smaller adjacent spaces. St Leonards College seems to be missing a lot of the common spaces that you typically see in schools. St Leonards does not appear to have a cafeteria, gymnasium, faculty offices or a nurse’s office.

With smaller schools or schools that spend most of their time outdoors it makes sense to have just one large classroom. However, with a larger group of children who do most of their learning indoors, large groups are proven to be distracting. The open classroom was a design that became popular in the 1960’s. It was a new design for schools that had all of the students in one large learning space. Once the design began being used, it failed due to noise and visual distraction.
Solar Chimney Analysis

Analysis:
The solar Chimneys at St Leonards provide heated air in winter and induce cross ventilation in summer. A solar chimney works because during the day solar energy heats the chimney and the air within it, creating an updraft of air in the chimney. The suction created at the chimney’s base can be used to ventilate and cool the building below. There are many forms of solar chimneys. They can be as simple as the sketch above or slightly more complex, like the solar chimney at St Leonards.

As seen in the diagrams of St Leonards, absorption of heat from the sun can be increased by using a glazed surface on the side facing the sun. Heat absorbing material can be used on the opposing side.
absorbing material can be used on the opposing side. In order for a solar chimney to work, the chimney must be higher than the roof level and has to be constructed on the wall facing the direction of the sun.

The solar chimney has been in use for centuries, particularly in the Middle east, as well as by the Romans. There are also variations on the solar chimney, one variation is called the “Badgir”, or “Wind Tower.” The Wind Tower is also a very successful method for cooling and ventilating a building, however, it works best in warm climates, so it would not be appropriate for Vancouver’s climate.
Case Study Conclusion

The case studies that I reviewed were all very different, but also similar in many ways. They were all school’s that decided to have an emphasis on sustainability, not only in their design, but also in the educational programs. At Chum Creek Education Center the architect went as far as making sure the contractors that he employed were dedicated to sustainability and limiting their waste. All of the schools not only all had sustainable design methods but they also had interactive designs, each school had sustainable elements that the children could control and monitor. At Chum Creek students raise and lower sunshades, open accessible windows, check the water tanks, plant vegetation, gardening, and are responsible for observation and up keep of marshes that they helped create.

The schools that I reviewed varied in two major ways: two of the schools were mainly comprised of one large classroom, and two were more traditional with hallways and multiple classrooms. I like the idea of all of the students knowing each other, but for a larger school like The Sustainable Middle School of Vancouver, I think that smaller groups of classrooms would be more practical for a successful learning environment. But I think something can still be learned from these small one room schools; having one large common room gives students a feeling of camaraderie, its a place the entire school can come together and feel like one instead of feeling distant from other grades and classes. At the Sustainable Middle School of Vancouver it will be important to have spaces that the entire school can come together and share, these spaces can be eating spaces, play spaces, sports and arts spaces, or spaces where they come together for large discussions.

Another thing that the four case studies have in common is that all of them have the same secondary spaces. All schools have some form of classroom, which to me seem to be the main point of a school, but there are also secondary spaces that a school needs. All of the schools had rest rooms, a cafeteria, eating spaces, faculty offices, storage, a multi-purpose room, a health room and outdoor spaces. The larger schools with individual classrooms according to grade both had gymnasiums, technology centers, lots of access to the outdoors, and more offices.

Both of the larger school that had a series of smaller classrooms, choose to group the classrooms in a “pod” like arrangements. The classrooms bunch together and create a negative space between them that becomes a common space. These common spaces that are shared among different classrooms help to create a feeling of community that is sometimes lacking in larger schools. When there are spaces that are shared among
different classrooms help to create a feeling of community that is sometimes lacking in larger schools. When there are spaces that are shared among different grades, students are more likely to see and interact with other classes throughout the day instead of only ever seeing their own class-mates.

All of the case studies I researched emphasized sustainable design in some way; some choose to focus more on sustainable teaching methods and incorporate some sustainable design features, some choose to be sustainable with how they handled their site and the materials they used, and some boldly incorporated sustainable design into every design feature. The four case studies I choose all put a lot of consideration into how they developed their site. This is essential when designing a sustainable school, in order to maximize daylight and have the lowest possible impact on the site the designer has to be very careful with placement of buildings and their design. The schools that seemed to take sustainable design almost as far as it could go incorporated features like, water collections systems, a water wall, solar panels, a solar chimney, indoor gardens, outdoor gardens, wind turbines, accessible windows and reconstructing ecosystems that once inhabited the site. I am going to take all of these design features into consideration while designing The Sustainable Middle School of Vancouver. Due to the openness of my site and the mild climate, all of these sustainable design methods could be incorporated into the schools design.

I already knew about a lot of the sustainable technologies that were used in the case studies I chose, but I hadn’t heard of a school trying to reconstruct the sites original ecosystem. I think this is a very interesting idea that could be done at a lot of sites. In this case they knew that the site had originally had a marsh so they reconstructed it to try and recreate the ecosystem that had once been there.

St.Leonards also has an interesting sustainable element that I wasn’t too familiar with before doing these case studies. St.Leonards design includes a “Solar Wall,” which is the primary source of heating and cooling for its entire building. A solar wall could be employed in Vancouver to heat and cool the school, the climate in Vancouver is mild enough that it could work well.

The Description of Strawberry Vale school said something very important about the choice of their design, they said it accommodated the scale of the children that attend the school. The scale of the main user of a facility should always be considered. Scaling the school to its user was done successfully in all of the schools I studied, however, I think that they could have considered scaling more when it came to their outdoor spaces. If a school is really going to emphasise nature, then the students should spend a lot of time outside, and if so, the landscape should be designed accordingly with the variety of spaces that you would see in a well designed architectural plan.
Historical Context

History of Place
History of Vancouver
History of the Site

History of Education
History of education and the Schoolhouse in the USA
Historical background of Japanese School Building
The Historical Development of School Buildings in Germany
History of the Canadian Education System
History of Vancouver

Vancouver has been a city for 118 years. Before that, the Vancouver area was inhabited only by First Nations people (First Nations is a term of ethnicity that refers to the Aboriginal people in Canada) and wildlife. Many events have combined to transform the once wild setting into the thriving cultural and business center it is today. Yet, the city retains its natural beauty, now set around a diverse urban core.

When British explorer Captain James Cook first arrived in 1778, the natives in Nootka Sound mistook the captain and his crew for a boatful of strange, transformed salmon. The First Nations had lived undisturbed for thousands of years. The region’s temperate climate, coastal location and excellent food supply made it an ideal place for natives to subsist comfortably for most of the year. Many, including the Musqueam, Kwantlen and Squamish lived and thrived along the shorelines of Burrard Inlet. But then the white European settlers came and claimed the land as their own, altering years of relatively peaceful living.

The city’s transformation began with explorers seeking the Northwest Passage, a sea route through northern America. In 1791, Spanish explorer Jose Maria Narváez came through the waters but decided not to go ashore. In June of the following year, two more explorers showed up. England’s Captain George Vancouver led his ship, the sloop H.M.S. Discovery, into Burrard Inlet and later went on to chart the area’s waters. He exchanged information with Spanish explorer Dionisio Alcala Galiano, who showed Captain Vancou-
ver maps he had already made of the area.

Though Vancouver was a British controlled area, it wasn’t until 1808 that they sent Simon Fraser to set up trading posts in the region. The fur trade, which was followed by gold rush mania, would forever alter the region.

Settlers thrived on fish, lumber, fur and farming. In 1858, gold was discovered on the Fraser River and, within weeks, nearly 30,000 Americans had flocked to the area in search of bounty. Fearing a takeover by the Americans, the British declared the mainland a British colony, thereby keeping the prosperity under its control.

Meanwhile, a talkative gentleman named John Deighton pulled his canoe into Burrard Inlet and decided to capitalize on the area’s industry. The village he founded was eventually named Gastown after him, the name derived from his loquacious nickname: “Gassy Jack.” Deighton opened up a successful saloon, serving hundreds of thirsty mill workers and prospectors in the budding town. Gastown began to fill up with small shops and services. Deighton was more than just a notorious saloon owner, though. Some historians say he was the founding father of Vancouver because he had faith in its potential before anyone else did. Gastown is still a large part of Vancouver with nice restaurants, shops and living.

As the population grew, people moved outward to settle in areas now known as Burnaby and Delta. The first newspaper went to the presses in 1861, and the first hospital was built the following year. Vancouver soon became well known for its logging industry, extensive logging cleared much of Vancouver, but there are also lands that are now protected from logging, ensuring that Vancouver will always be scenic and maintain much of its natural resources and wildlife.

Canada was confederated in 1867, and the sweeping effects of this change were felt almost immediately in Vancouver. One of the pivotal moments in the history of the city was the extension of the Canadian Pacific Railway in 1884. The railroad now reached clear across the country and brought thousands of people to the area to do business and settle. Rapid development began, and the population grew from 400 to 13,000 in four years.

In 1886 there was a great fire that destroyed virtually the entire downtown area in just 20 minutes. That same day, after the smoke had cleared, with just half-a-dozen buildings left standing, the citizens of Vancouver began to rebuild. Buildings erected that year still stand today. One of the most significant changes brought by the fire was the transformation of the town’s military reserve into the now famous Stanley Park, the city’s oasis.

By 1928, the Lower Mainland’s population had reached more than 150,000.
The Great Depression hit Vancouver hard just like anywhere else, but World War Two pulled the city out of its economic lull: shipyards, factories, parts exporting and real estate boomed. Human rights also got a positive injection when East Indian and Chinese-Canadian citizens finally got the provincial vote in 1947. Japanese-Canadians and First Nations people, however, had to wait until 1949 for the same right.

The 1950s was an era of rapid growth and prosperity, including the extensive development of suburban Vancouver. The population rose to 800,000 by 1961. Vancouver is a fairly young city, with a brief but interesting history. The city has become the third largest in the country, with an international reputation as one of the best places in the world to live and visit (Maxwell, 2001).”
History of the Site

My site is located between Station Street and Prior Street, next to the historic Pacific Central Station. This site was chosen for a variety of reasons, such as its close proximity to amenities like “Science World” and Stanley Park, and its access to a variety of neighborhoods, and its historical appeal.

Pacific Central Station was built in 1913 and renovated in 1955. Station Street was a center of railway activity through Vancouver’s developing years from the time that the east end of False Creek was filled in right to today.
False Creek is a historical area within Vancouver. The False Creek area simply defines the areas that line the waters of False Creek; the site I choose would be described as being in the Southeast False Creek area. The False Creek area was the industrial heartland of Vancouver through to the 1950s. It was home to many sawmills and small port operations, as well as the western terminus of the major Canadian railways. As industry shifted to other areas, the vicinity around False Creek started to deteriorate.

The future of False Creek south was subsequently shaped by debates on freeways, urban renewal, and the rise of citizen participation in urban planning. Through the 60s, the ruling NPA city government and senior city bureaucrats had hatched a plan - with little or no public consultation - to run freeways through the city. A group of influential citizens formed The Electors Action Movement (TEAM) to oppose the freeway and to radically change the way decisions were made on land use. A key figure amongst these people was Walter Hardwick, a Geography professor at UBC who envisioned the retrofit of this brownfield industrial site into a vibrant waterfront mixed-use community.

First elected to City Council in 1968, Dr. Hardwick led the City's redevelopment team and helped secure the participation of the Federal Government. A major public involvement and co-design process followed which established public priorities for an accessible waterfront seawall; mixed-tenure housing including market condominiums, co-op and low-income housing and live-aboard marinas; and a vibrant waterfront market. These plans were formalized in a 1972 Official Development Plan. The form and mix of development were revolutionary for Vancouver at the time. A third of the site was set aside for housing at 40 units/acre with the balance converted to park, waterfront and community uses.

Vancouver’s experience with South False Creek and the public participation that shaped it was key to developing NFC as a livable, high-density community. The 1991 Official Development Plan enabled significant new density commensurate with the provision of significant public amenities including streetfront shops and services, parks, school sites, community centres, daycares, co-op and low-income housing.

On December 1, 1998, Vancouver City Council adopted a set of Blueways policies and guidelines stating the vision of a waterfront city where land and water combine to meet the environmental, cultural and economic needs of the City and its people in a sustainable, equitable, high quality manner.

South East False Creek is now under development and will serve in 2010 as the athletes’ village for the 2010 Winter Olympics. Fully built out, South Ease False Creek will eventually become a residential area for 16,000 people (Station Street History, 2003)."
History of Education

Concern with the designs of schools is not a recent phenomenon. As early as a hundred years ago, educators began to study the effect of school buildings on children. Analysis of schools buildings and school systems was done throughout the world with similar and, at times, contrasting outcomes. For the history of education I choose to research education systems that would contrast on many levels, not only in their teachings and geographical influence, but also because of their governments and economic systems. Although the education systems of the US, Japan, Germany and Canada had a lot of contrasting elements, they also had a lot of similarities and commonalities in school design solutions.

History of Education and the Schoolhouse in the USA

One Room country Schools

The architectural form and layout of the schoolhouse has historically been influenced by educational philosophy and goals, curricular objectives, educational methods, and cultural values of schools. For example, the architecture of the small one room country school building was an appropriate design response that served the basic educational and social needs for over 200 years. Traditionally, houses were grouped around central public meeting spaces that contained public structures such as the church, a meeting hall and a school. The school was a main social center of a community where town meetings, voting and fund raisers took place. Early education centered around survival and practical career education, when English settlers arrived in New England, they quickly established Latin grammar schools and colleges. State mandated education did not exist prior to the 19th century, but rather, was run by parents and trustees.

The traditional one room school house was multi-aged by necessity. School houses in urban areas were variations of the country school, often containing two, four or six self contained rooms with their own entry (Walden, 2009).

The Common School Movement

With the publication of his book, School architecture or contributions to the improvement of school-houses in the United States in 1838, Henry Barnard is credited with raising the standards of school buildings serving the common school movement. Barnard is credited with defining the character of school architecture in the United States by integrating concerns architecture with pedagogy.

Starting in the mid 19th century, urban schools could be found on tight sites of less than a quarter acre, with no landscaping. During the first quarter of the 20th century, as school populations grew due to urbanization, schools started to add many more types of auxiliary spaces. Auditoriums, laboratories, art studios, gymnasiums and home art spaces were routinely added to the educational building program (Walden, 2009).
The Modern School Building

The information age has seen new innovations in educational architecture, although many school boards continue to miss opportunities to create better school facilities as they struggle to cope with their ever increasing enrollments. Many schools were built too inexpensively, creating poorly insulated roofs and walls and poor quality building systems.

In the 1960’s and 1970’s many different types of layouts were explored for new forms of learning, the “Open Plan Schools were attempted during this time but quickly failed once they were occupied due to noise and visual distraction. Pod-style and house-type school plans were also developed in the 1960’s, both layouts allow for the creation of families of students; the intent is to foster a sense of community (Walden, 2009).

“Educational research indicates that participation in school activities, extracurricular activities, student satisfaction, social connections and achievement are all greater in small school relative to large schools, while disciplinary problems, incidents of vandalism, truancy, drug use, and drop out rates are lower (Fowler & Walberg, 1991).”

Historical Background of Japanese School Planning

“There were no public school in Japan before Meiji era (1868-1912) other than private schools called “Hanko” which were feudal clan-owned schools established for educating samurai. The modern public schools system was started in 1872 by the central government in the Meiji era, this school system grouped children in classrooms by age and ability. Public schools spread through the country very quickly, for example about 25,500 public schools were built in five years. Meiji era school building can be classified in two types: the Japanese traditional style, and the style of combining Western and Japanese planning. At the beginning local governments were building Western style schools, but this did not last long because the budget demands were too great (Walden, 2009).” The Japanese built cheaper schools by using fewer and less expensive materials and having less extracurricular spaces. An example of a Japanese school that I saw repeated a lot was a U-shape of class rooms with a cafeteria and a central courtyard.

In 1984 the central government started to promote the construction of open style classrooms. A lot of these school’s feature hallways that are twice the width of traditional hallways and large common spaces that are shared between classes. Some architects criticize the open style classroom because it lacks a sense of human scale (Walden, 2009).
The Historical Development Of School Buildings in Germany

The cathedral schools of the middle ages are considered the original seeds of the entire Western school system. In 16th century Germany, education was still solely the domain of the church. As commercial activity increased and trades and industry flourished, little by little, the schools were opened to students who were not prospective clergy. However, education still remained a privilege of the church, wealthy citizens and nobility until the 17th century.

The schoolhouse, part of the church complex, initially only contained one classroom and a living and sleeping space for the teacher. In the classroom the teacher supervisor his students, often more than 100, from his elevated lecture seat. Everything in these schools was designed for adults: the windows, the doors and the long hallways. Education focused on respect for your elders and religion. In 1685, laws were enacted that made school mandatory for children.

Early Reform Pioneers

In 1685 the pioneer of modern pedagogy, Johann Amos Comenius, made his proposals for humane, student friendly schools in his Didacia Magna (Great Instruction Guide). He championed new teaching methods and advocated aged based classes, which would make it possible for the teacher to work with all of the students. He also, for the first time, in his book suggested “adorning the walls of the classroom with excerpts from books, pictures and drawings.” He also suggested that outside there should be a space for walking around and playing games, as well as a garden into which pupils should be sent every once in a while, to feast their eyes on the site of trees, flowers and herbs.

In the 18th century, with the increasing pace of industrialization, a change came which produced the most depressing form of school. Schools were dedicated to supplying a capable and obedient work force; this tradition persisted unbroken until the 20th century.

Ellen Key & Hermann Lietz

Ellen Key and Hermann Lietz were two of the earliest reformers of education in Germany. In 1900 Ellen Key published her pedagogy blueprint for the “Century of the Child.” Some authors consider Ellen Key the starting point. They credit her with creating the new pedagogy and the new school. Her plan centered around the dignity and individualism of each student. Hermann Lietz had school located outside of the cities. He believed children should be imbued with “love of nature, and the experience of nature as the original, pure and healthy world.” His schools included a clear daily schedule, academic instruction took five hours in the morning. After lunch and some free time, the afternoon was devoted to practical work in the workshops, studios or gardens and fields (Walden, 2009).
Maria Montessori

Around 1900, the Italian physician Maria Montessori opened her first children’s homes. Her educational philosophy was dominated by the principle of individual; self guided activity and her self guided approach. She started from the belief that from the moment of birth every child has the ability to develop into an independent human through active exploration and learning processes. At Montessori schools the teacher remains in the background, while children do planned activities and work. In literature this type of learning is referred to as the “Montessori Phenomenon.” It creates the conditions for the children to develop their abilities from their own inclinations and interests.

Montessori believed that to facilitate such learning, that it was important to provide an environment that was pleasant and comfortable. She special ordered cabinets, shelves, chairs and tables which children could carry around effortlessly.

Peter Peterson

Peter Peterson abandoned the concept of separation of grades, and instead introduces the “tribe” groups of students who were teamed up according to subject interest. They included two or three age groups, which brought different aged students together to work and learn. Peterson saw educational reform not only as organizational change but also as a change of design. For this he proposed redesigning classrooms to “school living rooms.” Tables and chairs instead of school benches provided more flexibility and individual arrangement opportunities. According to Peterson, other necessary spatial conditions for a positive community life are “easily integrated outdoor areas, inviting entrances, spacious break areas, and generously designed hallways and assembly areas.”

Rudolf Steiner

The founder of the Waldorf School Movement, Rudolf Steiner recognized the connection between space and human education early on, paid special attention to the spatial dimension of the school building and focused on color design and a shift away from the right angle. The typical pastel color scheme of the Waldorf schools with its alleged transcendental, moral, and spiritual effects, was supposed to contribute to the holistic development of the students.

75 years now, can be recognized at a glance in most places in the world because of their special individual architecture: The building forms are asymmetrical and vault-like. Often the classrooms are reminiscent of cathedral naves. The interiors are color coordinated to the last detail. Rudolf Steiner saw schools as both life communities and cultural center (Walden, 2009).
National Socialist Takeover and Current Education in Germany

In 1933, the National Socialists took over the government in Germany, and created a new education known as “The German Peoples School.” School now served a single political mission; education now taught and uncompromising National Socialist way of life. Racism and anti-Semitism were dominant premises, race consciousness was to be the primary instructional principles in all subjects. The commands of the power structure were implemented in all schools, according to the maxim “the individual is nothing, the nation is everything.”

The 1970’s seemed to be the worst time for German school construction, because of the thought that windows were distracting and buildings were easier to heat and cool without windows, there was a new trend of windowless schools. The intolerable atmosphere of windowless schools lead to an increase in vandalism and graffiti.

The education and the educational facilities in Germany have an interesting past, what resulted from it is a handful of people that influenced education around the world and current school construction in Germany is finally taking into account the advice of its users. Children now have a say in their future schools, usually through surveys, and architects are starting to design for a space that promotes learning and growth (Walden, 2009).

History of the Canadian Education System

“The Canadian insistence on the collective concerns of peace, order and good government has meant that state projects such as schooling are seen in terms of their overall impact on society. For this reason, more public funds are spent on school systems in Canada than in any other country.

During the French regime in Canada, the process of learning was integrated into everyday life. While the French government supported the responsibility of the Catholic Church for schooling, the family was the basic unit of social organization and the main context within which almost all learning took place. In the labour-intensive economy of the 17th and 18th centuries, families relied on the economic contributions of their children, who were actively engaged in productive activity. Children learned skills such as gardening, spinning and land clearing from other family members. Young males were trained for various trades through an apprenticeship system (Canadian Education History, 1).”
The school systems in Canada were very similar to those in the United States in the 1700 and 1800s; schools were largely comprised of small one room school houses, the only larger schools were in larger cities and were church run.

The concept of schooling became more widespread among social leaders during the early 19th century. In these years, politicians, churchmen and educators debated questions of educational financing, control and participation, and by the 1840s the structure of the modern school was designed.

Leading educators throughout Canada communicated to reach the same goals in Canadas education system. “The leading figure in Ontario, Egerton Ryerson, worked in collaboration with Jean-Baptiste Meilleur in Québec, as well as John Jessop in British Columbia. In turn, these school promoters operated in an international context. For example, Egerton Ryerson visited more than 20 countries during 1844 and 1845 when he was developing his proposals for a public school system.

The characteristic conviction of the school promoters was that mass schooling could be an effective instrument for instilling appropriate modes of thought and behavior into children; in their minds, the purpose of mass schooling did not primarily involve the acquisition of academic knowledge. School systems were designed to solve a wide variety of problems ranging from crime to poverty, and from idleness to vagrancy (C.E.H., 2).”

In mid-19th century Ontario, the predominantly rural population (only broken by smaller commercial cities) meant that fears about the impact of massive economic change were based on developments elsewhere rather than immediate experience.

“Canada was not born in revolution, as was the US but, during the Rebelions of 1837, rural and village leaders in a variety of communities in central British North America took up arms in pursuit of coherent demands for political change. The various uprisings gave considerable credence for community leaders to the argument that school systems were needed to form the rising generation of citizens (C.E.H.,2).”
One result was that school promoters in Ontario often adopted an anti-American and anti-Republican stance which included opposition to the employment of teachers or textbooks from the United States; from their perspective, a society born in revolution had to be viewed cautiously. Instead, they imported certain components of Irish schools; most notably, the Irish readers which had been written to accommodate a Protestant and Catholic population. This strategy also made sense in that Irish immigrants formed the majority in mid-19th century Ontario.

"Later in the century, the relative importance of immigration, economic change and state formation to the official projects of school-building continued to reflect regional variation across Canada. On the West Coast, for example, immigration was the primary factor in shaping the mass schooling movement, but it did so in ways quite different from those on the East Coast of the continent (C.E.H.,4)."

In the case of British Columbia, the key distinction was the arrival of substantial numbers of Asians, beginning with Chinese men who worked in the mines of the Cariboo and then as labourers for the railway. In the early 20th century, Japanese immigrants became a significant group in the fishing industry. To this day nearly half of the population is made up of residents from: South Asia, Korea, China, Japan and Southeast Asia.

In the context of a predominantly British-origin population, significant Asian immigration fuelled fears about the future of British Columbia as a “white province” and about immediate economic competition. Anti-Asian riots and pressure by groups such as the Asiatic Exclusion League resulted by 1923 in legislation to curtail Asian immigration (including a closed door to the Chinese). During WWII continued nativism led to the uprooting from coastal villages of those considered to be “Japanese,” including Canadian-born residents of Japanese ancestry, and their forced relocation to internment camps.

20th Century
“The development of agrarian, merchant and industrial capitalism heightened perceptions of economic insecurity. Everyone became aware that while great fortunes could be made, they could also be lost just as quickly. The obvious insecurity of even well-paying jobs or successful businesses came to loom increasingly large in the minds of parents planning for their children as well as themselves as elders in the context of declining land availability.

One response was to have fewer children and to invest more in their education. By the mid-19th century, many parents across Canada were practicing contraception in an attempt to raise a smaller number of “higher-quality” children. Changing parental strategies help explain why children were sent to school in increasing numbers and for longer periods during the course of the 19th century. Slowly and in complex ways, schooling came to complement land as a key way in which families hoped to materially reproduce themselves. Compulsory attendance legislation was passed in the Canadian
provinces as a key way in which families hoped to materially reproduce themselves. Compulsory attendance legislation was passed in the Canadian provinces during the later 19th century.

Children’s regularity of attendance varied seasonally, particularly in rural areas, where family labour demands were the first priority. In this sense, the articulation of schooling with the labour market was informal and complex. There was no neat transition from school to work at any point in growing up. Rather, many children worked and attended school with changing frequencies during the year and from year to year; and, in most cases, their final departure from school was not strongly related to the acquisition of a diploma (C.E.H.,7).”

The development of public school systems in the 19th century was marked by the standardization of textbooks, teacher training, classroom organization and curriculum. All children followed the same academic path and were expected to produce the same outcome. Over time it was realized that each student was unique and distinct with varying levels of potential (ie, seedlings that had to be cultivated according to their individual natures).

The changing view of children contributed to the growth of new educational programs (especially at the secondary level) designed to accommodate the differing abilities and potential of different students. Most importantly, technical and vocational courses were developed for students who were deemed unsuitable for further academic study. Not surprisingly, the criteria used for assigning children to various courses reflected cultural and social prejudices more than intellectual assessments. Measures such as IQ tests, developed by the 1920s, revealed unintentionally more about the school administrators than the students, but they were nevertheless used to place different students in different courses of study after the elementary years.

Similarly to the United States, the history of Canadian education includes the establishment in the 19th century of separate schools for blacks in Ontario and Nova Scotia and special regulations for Asians in BC. Such discrimination is no longer official policy in Canada, but more subtle and informal racism is still apparent in some educational programs and textbooks.

tries, has evolved in its methods of education, which like the U.S. is funded by taxes and supervised by the state. Unfortunately, just like the United States, Canada has its darker periods of its educational history, but has now reached a level of education that focuses more on the individual and social equality.
Historical Context Conclusion

British Columbia has a rich history that is very similar to many areas in the U.S.; Vancouver is a fairly new city in comparison to many other Canadian cities, but its history is diverse and intriguing. The area of Vancouver has been inhabited by First Nations people for longer than we can know. The First Nations people of British Columbia have a very extensive and strong sense of cultural pride. Vancouver has only been a city for 118 years, and before that was inhabited by First Nations people for hundreds, maybe even thousands of years, for this reason I think it will be important to incorporate some First Nations culture into the school. The First Nations people lived in harmony with nature and represent a sense of history that will be important to integrate into the school design and curriculum.

While researching my site I learned a lot of things about the Southeast False Creek area that I did not know. I think it is very interesting how much an area of land can change over time. First the land was all trees and native vegetation with only First Nations inhabiting the area. A while passed and the settlers arrived, then logging and development cleared the area. With the exception of a few transport stations, the land was mostly used for industrial, factory purposes, once the factories moved out, the neighborhood started to get run down, the land could have easily became an eyesore within the city, or a space a new highway could go through but the community took a stand together and petitioned for an urban renewal project. The urban renewal project turned out to be very successful, and now there is a wonderful variety of homes, shops and other amenities. The area surrounding the end of False Creek is now also home to a wonderful science museum, a renowned concert hall and athletic stadium and there are more projects to come that will be designed in areas that were just vacant lots.

The educational history that I read in “Schools for the Future” did a very good job of giving a variety of different histories of education, I really enjoyed learning about United States and Canadian educational history in correlation with Japanese and German education. The education system of the United States, Japan, Germany and Canada all have a very interesting and complex background. I found it very interesting that philosophers were writing about the importance of combining nature with education already in 1900. Some of the educational theories from the 1900’s and earlier seem so far ahead of their time. The theories that early educational philosophers were writing about seem as if they could have been written today; there are still many school systems and school buildings all around the world that are desperately in need of creative reform. There are far too many schools that still follow the idea that children should be shut off from the outdoors as to hinder distraction. These buildings not only unhealthy environments but also creatively hindering for students. While there are many schools that feel as if they are stuck in the time of the industrial revolution, there
are more than embrace the outdoors and a more nurturing system for education. Along with the growth of children friendly schools, Waldorf and Montessori schools are also on the rise in the U.S.

Germany seemed to be the country with the most educational philosophers, which is interesting because the educational history of the U.S., Canada, and Germany are all very similar. Each country started out with small country schools or private schooling at home and grew larger with industrial revolutions. Japan was slightly slower to have large schooling. This is largely because schools were not run by the church in Japan; in other countries schools began to get larger when they became church run. Japan's only large early schools were schools for Samurai instruction. All of the countries education systems started quickly developing into large, organized entities when each countries government took over the education systems.

The United States and Canada have a more extensive history of cultural prejudice and segregation because of the two countries vast diversity. The U.S. and Canada both had major problems with discrimination until very recently in their countries history. Vancouver never practiced any form of slavery but the city does have its own history of prejudice and bigotry; in 1923 Anti-Asian riots and pressure by groups such as the Asiatic Exclusion League resulted by 1923 in legislation to curtail Asian immigration (including a closed door to the Chinese). During WWII continued nativism led to the uprooting from coastal villages of those considered to be “Japanese,” including Canadian-born residents of Japanese ancestry, and their forced relocation to internment camps. Vancouver like other countries that implemented these practices look back on that time with great regret, the city is now a location of great cultural diversity and has few problems with ethnic prejudices.

The mistakes that were made in these countries must be learned from and remembered. The Sustainable Middle School of Vancouver will have a variety of students from different ethnic and economic backgrounds. There were a lot of commonalities between the US, Japan, Germany, and Canadian education. They made a lot of the same mistakes and are also starting to get a lot of the same things right. After seeing repeats of the same ineffective school designs and seeing the concepts that work, a few things became clear to me; education should be individually focused, not only through education but also in design. Buildings should always be scaled to their users. Open style classrooms usually aren’t successful due to distraction and lack of private spaces for students, and a connection with nature is a fundamental part of any good education. Learning from not only Canada’s educational history but also the educational history of different parts of the world is a great source of knowledge for constructing a successful school design.
Thesis Goals

Project Goals

To create a sustainable school that can educate and engage its users and become an inspiration for the city.

To create a school that is designed for the students, a design that will always consider their scale and individualism.

To help students, parents, and neighbors reach a higher level of environmental awareness.

To connect the theories and ideas discovered through my research of educational facilities and their history.

To respond appropriately to the project’s context, both the location and the time.

To celebrate the diversity of students that will attend the school, and the diverse history of Vancouver.

To design in a way that inhabits the natural and historical spirit of Vancouver.

To present my design in a way that informs and interests the viewer.

To fulfill the requirements of the NDSU Department of Architecture and Landscape Architecte.
Thesis Goals

Project Goals

To expand my knowledge and abilities in architecture and sustainability.

To develop skills that can be used in a professional career.

To synthesize all the knowledge that I have gained throughout my education.

To maintain the goals set forth in my project goals and to maintain a successful timeline.

To create a project that I can take pride in throughout my future career.

To meet all the requirements asked of me and obtain a Master of Architecture degree from North Dakota State University.
Site Analysis

Main Areas of Research:

**Qualitative Site Analysis**
- Analysis of Site Amenities
- Analysis of Vancouver Neighborhoods
- Site Images

**Quantitative Site Analysis**
- Transit Analysis
- Population Analysis
- Education Analysis
- Weather Analysis
Qualitative Site Analysis

The site for this thesis is located in the center of Vancouver, British Columbia. It is one of the oldest parts of the city. Once an industrial area, the neighborhood has undergone urban renewal projects and will be undergoing another addition of the largest sustainable mixed use community in Vancouver. The area is known for its rich cultural heritage and its close proximity to a multitude of amenities.

The site that I have chosen is in a close proximity to a wide variety of neighborhoods. The site is located in the Southeast false Creek area. Just north of the site is Chinatown, north of that are high-end high rises in a community called “West End.” North of “West End” there is “North Vancouver” and “West Vancouver,” these are two of the wealthiest areas in Vancouver. East of the site just past “Southeast False Creek” is one of the oldest, historical neighborhood in Vancouver, this is also a wealthy community, and one of the more artsy communities in Vancouver. To the south and west of the site there are large residential areas, these are mostly middle class to lower class, and beyond those is the suburban sprawl, those areas range from lower-class income to high incomes due to the variety of homes (apartment complexes to mansions). I think it is important to be aware of all the neighborhoods in the area because The Sustainable Middle School of Vancouver will be a private school that could have students from all of these neighborhoods.
I also chose my site because it is within a close proximity to a lot of areas that would make great trips for the school. Within walking distance there is Science World, BC & GM Place, China Town, Strathcona Park and the SkyTrain Station. A quick trip on the skytrain and the students can be at any of the beaches located in Vancouver or at Stanley Park. Stanley Park is 10% larger than Central Park in New York. Much of the park remains forested with an estimated half million trees that can be as tall as 76 metres (250 ft) and hundreds of years old. Vancouver is a great location for a sustainable school not only because Vancouver is very enthusiastic about sustainability but also because British Columbia offers such a wonderful variety of places to go camping, hiking and kayaking.
As you can see from the map, the site (the white dot) is centrally located within the various cities that make up Vancouver.
Map Of Building Usage in the Sites Neighborhood

The site I have chosen is in a very diverse neighborhood, not only culturally but also in the form of services and building usage.
Qualitative Site Analysis

Currently, the site is a vacant lot with residential to its north, an industrial area to the east, the historical Central Station to the south, and a small park to the west.

View from Site Looking North to Residential

View from Site Looking East to Industrial
Historic Train Station to the South of the Site

The Pacific Central station is to the southwest of the site. The views straight to the south, are of the back of the station and various industrial looking buildings. This view and the eastern industrial view will be shielded more than views to the north and west.

View from Site Looking West looking past Thorton Park to high-rise residential.
Site Images

View of Thorton Park, Just to the southwest of the site

Thorton Park
Site Images

The SkyTrain Station is almost visible from the site, its only two blocks.

The weekly farmers market is just one example of the educational amenities the site has to offer.
The site is fairly quiet, it is not located on a main street, the only street that borders it is “Station Street.” I attribute this to one of the main reasons there is so little noise. Station St. is mainly used for dropping and picking up people from the station, and also parking if people come to the park or a local store. The houses to the north seem distant, the site is larger than I had imagined from maps, the industrial buildings to the east and southeast are not attractive but I would not call them an eye sore either. The historic Central Station to the South is in very good condition, it is an attractive building that reminds viewers of some of this history of Vancouver. The high-rise apartments and mixed use developments to the west are shielded a bit from the site due to the trees that inhabit and surround Thornton Park. The wind seems to be coming from the west, but this is not surprising because the site is only two blocks from a channel fed from the Pacific Ocean, called False Creek. The site is 565,950 square feet, which is about eight square blocks, the entire site will most likely not be used.

Microclimate: Quiet - due to lack of major traffic  
Slightly Windy - The site is more windy than surrounding spaces because the site is so open  
Sunny - The site doesn't have any major elements blocking the sun so the site almost always has direct sunlight.
Transportation Options Available

Map of the Bus Transit in Vancouver

Map of the Bus Lines That Go By the Site
Map Of the Sytrain, located one block south of the site

Having such a close location to the Sytrain is a very nice amenity; the Sytrain has over twenty stops at the city’s hubs and attractions. With the Skytrain so close the students can easily take a train to museums, parks and beaches.
Population

“The city of Vancouver has a population of just over 578,000[1] and its Census Metropolitan Area exceeds 2.1 million people. Its residents are ethnically diverse, with 52% having a first language other than English. Vancouver has been called a “city of neighbourhoods,” each with a distinct character and ethnic mix. People of English, Scottish, and Irish origins were historically the largest ethnic groups in the city, and elements of British society and culture are still visible in some areas, particularly South Granville and Kerrisdale. Germans are the next-largest European ethnic group to settle in Vancouver and were a leading force in the city’s society and economy until the rise of anti-German sentiment with the outbreak of World War I in 1914. The Chinese are by far the largest visible ethnic group in the city, and Vancouver has a very diverse Chinese-speaking community, with several dialects represented, including Cantonese and Mandarin. Neighborhoods with distinct ethnic commercial areas include the Punjabi Market, Little Italy, Greektown, and (formerly) Japantown (Davis, 2009).”

Vancouver visible minority population characteristics (Census 2006)
Education

“The Vancouver School Board enrolls more than 110,000 students over its elementary, secondary, and post secondary institutions, making it the second largest school district in the province. The district administers about 74 elementary schools, 17 elementary annexes, 18 secondary schools, 7 adult education centres, 2 Vancouver Learn Network schools, all which include 18 french immersion, a Mandarin bilingual, a fine arts school, gifted, and Montessori. More than 46 independent schools of a wide variety are also eligible for partial provincial funding and educate approximately 10% of students in the city.

Vancouver’s university scene is dominated by the two major public universities in Metro Vancouver, the University of British Columbia (UBC) and Simon Fraser University (SFU), where more than 80,000 undergraduates, graduates, and professional students enrolled in 2008. In 2006, UBC was listed as the 27th most highly ranked university in the world by Newsweek Magazine, and SFU ranked as the 2009 most comprehensive university in Canada by Maclean’s University Rankings (Davis, 2009).”

Population of Vancouver by Education Level
The University of British Columbia Campus

UBC’s campus is a quick bus ride away from the site of The Sustainable Middle School of Vancouver; on UBC’s campus there is a heritage museum, a variety of LEED certified buildings, Jericho Beach Park and the University Endowment Lands.
Vancouver’s Weather

Vancouver is not a particularly windy city, this is due to the mountains and islands that surrounds it. When there is wind, it typically comes from the east or west, this is also true for the site. Currently, the site is very open so even the most subtle of winds are noticeable.

Wind Rose of Vancouver

These are the average winds in Vancouver, the data was compiled over the course of a year.

“Vancouver’s climate is temperate by Canadian standards and is usually classified as Oceanic. The summer months are typically dry, often resulting in moderate drought conditions, usually in July and August. In contrast, the rest of the year is rainy, especially between October and March.

The average annual precipitation is 1,199 millimetres (47.2 in), though this varies dramatically throughout the metro area due to the topography. In winter, a majority of days receive measurable precipitation. Summer months are drier and sunnier with moderate temperatures, tempered by sea breezes. The daily maximum averages 22 °C (72 °F) in July and August, with highs occasionally reaching 30 °C (86 °F). The highest temperature ever recorded was 34.4 °C (93.9 °F) on 30 July 2009. On average, snow falls on eleven days per year, with three days receiving 6 centimetres (2.4 in) or more. Its winters are the fourth warmest of Canadian cities after nearby Victoria, Nanaimo and Duncan, all on Vancouver Island. Vancouver has daily minimum temperatures below 0 °C (32 °F) for an average of 46 days per year and below −10 °C (14.0 °F) on two days per year. On average, 4.5 days a year have temperatures staying below freezing (Davis, 2009).”
Programmatic Requirements

- Welcoming Entrance
- Landscaped Entrance
- Outdoor Classrooms
- Breakout Spaces
- Gymnasium
- Cafeteria
- Art Spaces
- Outdoor Eating Space
- Multi-purpose Field
- Gardens
- Indoor Green House
- Science Labs
- Offices

Legend:
- Indoor Private Spaces
- Indoor Shared/Common Spaces
- Outdoor Spaces (all common spaces)

(All Indoor spaces will have an access to the outdoor spaces.)
**Classrooms**

There will be six classrooms, two classrooms for each grade that include a lecture space with small bundles of studio style desks. The rooms also include breakout spaces with more relaxed, comfortable seating, an entry space, restroom, computer space, an indoor green house and a green roof. All classrooms will have direct access to an outdoor classroom space, these classroom spaces will be semi private.

**Cafeteria & Eating Spaces**

The main cafeteria space and food preparation spaces are indoors, but they are connected to a large outdoor eating space that is the primary eating space when weather allows; this space has covered and uncovered seating. The outdoor eating space can also double as an all school outdoor meeting space. The cafeteria also has roof access, with an outdoor fire place and a view west to the ocean.
Fitness Spaces
Along with environmentalism, The Sustainable Middle School of Vancouver encourages an overall healthy lifestyle. A healthy lifestyle includes plenty of exercise and time spent outdoors, this is why the schools site will have a variety of activity spaces available. The school will have an indoor gymnasium, an outdoor sports/multi-purpose field and a variety of smaller open fields.

Elective Spaces
There will be a separate art and science lab space outside of the classrooms. These are set apart so that they can be easily shared by all grades and because they will require different codes.

Garden Spaces
On the site there will be vegetable and fruit gardens, flower gardens, and natural vegetation gardens, including indigenous trees. These gardens are an important aspect of the schools philosophy, the students spend time caring or the plants and growing their own food. There will also be an indoor garden, for year round gardening.
Administrative and Community Spaces

There are four main spaces along the west side of the site. This is the portion of the site that is closest to neighboring businesses. These four main spaces are; the main school office, the farm sanctuary office, a show space for school projects and an outdoor space for the community. The outdoor community space has signs that describe farm sanctuary program, signs that describe the school, trees and benches. The offices open to the street and the school. People from the community can stop in and ask questions and students can also enter from the school side. There will be tours of the animal barns, but this is slightly more private as these will be guided tours.
Design Process
Site Analysis and Plan

This rendering of the site and its surroundings shows the continuation of surrounding lines onto the site. The intention of this drawing was to analyze all the surrounding city lines and use them to help organize the spaces that make up The Sustainable Middle School of Vancouver.

This site plan was done before analyzing the surrounding roads and paths, this plan was just a starting point of my overall idea of spatial organization and views.
Sketch of an early bubble diagram placing spatial organization.

This site plan was also done before analyzing the surrounding roads and paths. This site plan, as well as the site plan on the previous page did not engage the community enough.
This site plan was the first one I did using surrounding city roads to help organize the site. I was happy with a lot of the layout but after thinking about sun angles and day lighting I realized the North classrooms would not get enough sunlight.
These are two more options I explored for classroom layout, the option on the right still didn't allow for enough day light and the option on the left didn’t work because the southern sides of the classrooms were too narrow.

Fourth class room layout plan, I like this pan but decided to edit it further so that the classrooms had a more interesting layout.
Classroom Design Process
Initial Design Ideas

This was an early sketch I did inspired by one of Architect Terunobu Fujimori’s designs. This was a concept for one single standing classroom unit.

These were two more early design concepts I had for the design of the classrooms. The bottom design is another design inspired by Fujimori, I originally wanted each classroom to have a tree house feel, but I realized that actually elevating each classroom would be impractical. The top drawing is based off of what I seemed to see a lot of while I was researching sustainable schools.
Although I did not have the design finalized I knew that I wanted to use timber braced frame construction. This is a drawing of how timber would be used in the classrooms. PISE would be used in some structural outdoor spaces, PISE is a type of packed earth construction that is environmentally friendly, strong and aesthetically pleasing.

Along with structure I began thinking about materiality, I realized I could use materiality to help emphasize my metaphor. Each building could have a stone base with wood siding and a window that appears to reach toward the sky, a design like this would be very reminiscent of my parti, which among other things was a stacking of materials that you often see in nature.
These are the first drawings I had combining my initial design ideas with the size and shape of my classrooms from my plan (this was the plan where the rooms were square and connected). These drawings became irrelevant once I changed the classroom layout but they were still useful for realizing aspects of my design that would be important.

These are some concept sketches I did when I first decided that the classrooms should be separate.
Elevations
I did an analysis of sun angles on my design to see how far apart they would need to be. The buildings need to be about 30 feet apart so that the peak doesn't block the sun for the building to the north of it. Having 30 feet between the buildings should work out fine, and allow for plenty of outdoor space.
Analysis of Sun Shading on Design...

This is a perspective of the classroom design from the week of February 21.

North Elevation

East Elevation

South Elevation

West Elevation

These elevations were completed for the thesis midterm on March 14. They start to finalize daylighting and material choices.
I originally planned on using earth-berm structures along the roads to block unwanted views. In my later designs this became unnecessary but I still decided to have the cafeteria be an earth-berm building so that the roof could be an accessible place to eat and have a view to the ocean. The structure of an earth-berm building is not very different from a normal building, the building just needs to have a heavier structure where there is heavy soil. Another consideration for earth-berm designs is getting light into the back of the building.
Before I began design for my cafeteria I knew that I wanted it to be a dominant structure on my site plan. The cafeteria is at the center of multiple merging points on the site plan and the cafeteria is a place where the whole school will come together and gather.
This is the design that I had for my cafeteria at the time of midterm presentations. The main change in the cafeteria was the outdoor covered seating. A large portion of the cafeteria was subtracted to allow for a sheltered outdoor eating space. This subtraction to the southern portion of the building also allows for more southern light exposure.
The Final Design for The Sustainable Middle School of Vancouver
* The open green spaces on the site have a combination of open grass and tree cover. The trees will provide some shelter on days when there is a light rain.

* The mound adjoined to the cafeteria provides a visual barrier to the industrial view of the back of the train station and when students sit on top of the mound they can see the ocean.
Community Space Perspective

This is a designed space entirely for the community. It has benches, vegetation and info panels that tell about the school and Farm Sanctuary. This space is adjacent to a heavily used park and bus station. In the summer the fence gates in this space can open, providing the community with an open field for summer fairs or shows.
* The parking lot has been lowered to help minimize the emphasis of the parking lot and cars.
Classroom Perspective

* Balance of Indoor and Outdoor
* Coverings for Outdoor Spaces Account for Vancouver's Rainy Climate
Classroom Plans
Classroom Elevations

**Materiality:**

- **Siding:** FSC (Forest Stewardship Council) certified cedar siding from Vancouver Island.
- **Sun Shades and Overhangs:** C/S Sun Shades, manufactured in Langley, British Columbia
- **Roof:** Green Roof and Cedar Shakes
- **Windows:** 3M Windows in Victoria, BC makes windows that block 97% of solar heat gain.

Heavy timber frame construction is the main structural material.
Interior Sectioned Perspectives of Classrooms
Solar Wall

* A “Solar Wall” is used for the primary control of heating and cooling in the classrooms, in addition to this, there is cross-ventilation, thermal solar panels and radiant floor heating.

* Blue Jean Insulation
Final Design

Thermal Solar Panels
Thermal Solar Panels use the sun to heat water instead of photovoltaic panels. Thermal Panels have a lower carbon footprint than photovoltaics, twice the life span and they are cheaper.

Sustainable Features:
Cafeteria Perspective

* The outdoor covered space allows for outdoor seating in all types of weather, and it also provides openings for southern light exposure.
The inside portion of the cafeteria is very open and flexible with movable tables that canter around the fireplace. The fireplace also opens on the roof deck.
Classroom Elevations

Most of the windows are to the south and north. Southern openings allow southern light exposure, and northern openings allow day lighting for the back food prep spaces.

The cafeteria has sliding barn style door that open to the west. This allows the inside portion of the cafeteria to become very open and capture eastern ocean breezes.
Perspective of Cafeteria Roof, with Ocean View

Cafeteria Perspective

The End
Reference List


- “School of Environmental Studies” Absolute Astronomy. 2009 <http://www.absoluteastronomy.com/topics/School_of_Environmental_Studies>


- “Sustainability.” City of Vancouver Sustainability Group. 2008 <http://vancouver.ca/sustainability/>


Reference List


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“There is nothing more dangerous than to build a society, with a large segment of people in that society, who feel that they have no stake in it; who feel that they have nothing to lose. People who have a stake in their society, protect that society, but when they don’t have it, they unconsciously want to destroy it.”

-Martin Luther King Jr.