Holistic understanding of the natural environment is becoming increasingly vital within the coming decades and is inadequately dealt with in an outdated educational system. I propose an educational hub for Portland Public Schools to teach children (k-8) the importance of a holistic understanding of our role within the world as well as push the boundaries of the current educational paradigm.

The beginning of the twenty-first century has seen many changes regarding the way in which humans in general regard the planet. We have seen most of the world acknowledge and confirm human influence on major changes to the planet. The most recent Nobel Peace Prize was awarded to Albert Gore and the Intergovernmental Panel on Climate Change "for their efforts to build up and disseminate greater knowledge about man-made climate change, and to lay the foundations for the measures that are needed to counteract such change" (The Norwegian Nobel Committee). Although the rhetoric may be becoming repetitive the fact remains that industrialized nations continue to rely on finite sources of fuel (British Petroleum, United States Geological Survey) for everyday “needs.” Terms such as global warming, peak oil, overpopulation, and others are commonplace in a world where humans are starting to realize their role in their own future. The goal of this thesis project is to propose the next step in this continuing process.

The City of Portland recognized this paradigm shift by, through Portland Public Schools, setting up a magnet school in which children are educated in natural processes and holistic concepts such as “cradle-to-grave” and inherent energy. While this is a great first step, the influence of a program like this has a very narrow spectrum. To reach a broader spectrum of children, this thesis proposes the development of an educational hub focusing on the environment and serving all children from kindergarten through eighth grade within the Portland Public School system as well as the public in general.

This design must be sensitive to its own impact on the environment. While education is the top priority, it is irresponsible to create an institution that serves the environment intellectually without serving it physically. Conservation of energy and limiting energy consumption is a top priority in the design of this building because of its interrelationship with other values and goals being sought. In addition to environmental responsiveness, these goals involve the well-being of the occupants, providing an environment that facilitates learning, and not burdening the public with high operation costs.
With new technologies becoming available at what seems like an exponential rate, it is possible to explore and incorporate many strategies to achieve the goals listed above. It is a goal to implement chosen strategies in such a way as to enhance the educational nature of this design. For example, while daylighting is a key factor in the creation of spaces people want to be in, it may not be feasible to incorporate it into all aspects of the building. Therefore, the design must involve the creation of a hierarchy of educational spaces so that daylighting can be fully exploited in its ability to aid in the overriding goal of education. Other strategies to create an environment in which energy conservation strategies serve a dual purpose of environmental responsiveness and education might involve simply allowing these strategies to be visible to the occupants. This involves, then, strategies such as locating energy sources such as solar collectors or wind turbines in a location that would allow a visual association for the occupants. This involves instantaneous feedback devices such as energy meters (showing the use of grid fed energy versus on site energy generation) as well as simply making on-site energy generation sources visible and even physically accessible to the occupants. Strategies such these not only aid in the creation of an environmentally responsive design, but if applied strategically, aid in the education of the occupants which, after all, is the ultimate goal of the design.

**bibliography**

<www.bp.com/statisticalreview>


<table>
<thead>
<tr>
<th>Functional Area</th>
<th>Type</th>
<th>Description</th>
<th>Square Feet</th>
<th>Room Type</th>
<th>Function</th>
<th>Preferred Use</th>
<th>Functional Needs</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seminar Spaces (2)</td>
<td>Open, soft light</td>
<td>Larger-sized rooms with adaptable characteristics</td>
<td>3,750</td>
<td>8'-0&quot; - 12'-0&quot;</td>
<td>Highly controlled spaces with capability for thermal zoning</td>
<td>High daylighting levels with supplemental task lighting, art installations &amp; visual &amp; acoustic separation</td>
<td>8am-4pm</td>
<td>Capable of handling up to 34 students at a time with 3-4 educators</td>
</tr>
<tr>
<td>Workshops (3)</td>
<td>Open, soft light</td>
<td>Larger rooms with workstations for use of tools and educational toys</td>
<td>3,000</td>
<td>8'-0&quot; - 12'-0&quot;</td>
<td>Highly controlled spaces with capability for thermal zoning</td>
<td>High daylighting levels with supplemental task lighting &amp; art installations; significant ventilation capability</td>
<td>8am-4pm</td>
<td>Capable of handling up to 10 students at a time with 1 educator</td>
</tr>
<tr>
<td>Common Spaces</td>
<td>Quiet, protected spaces throughout building</td>
<td>Small, defined spaces to aid in classroom overflow as well as provide quiet break space</td>
<td>10,000</td>
<td>8'-0&quot;</td>
<td>Moderately controlled</td>
<td>Frequent barriers with limited task lighting</td>
<td>7am-4pm</td>
<td>Velvet drapes but capable of handling from 10 to 15 people</td>
</tr>
<tr>
<td>Circulation</td>
<td>Very open, light spaces with strong feeling of connection to users and other people</td>
<td>Provide universal access to all spaces while allowing listening and reading</td>
<td>5,000</td>
<td>8'-0&quot; - 12'-0&quot;</td>
<td>Moderately controlled</td>
<td>High levels of daylighting with task lighting</td>
<td>7am-4pm</td>
<td>All</td>
</tr>
<tr>
<td>Bathrooms</td>
<td>Privacy</td>
<td>Going private</td>
<td>250</td>
<td>8'-0&quot;</td>
<td>Moderately controlled</td>
<td>Direct connection to core services including possible water reclamation and blackwater treatment</td>
<td>7am-4pm</td>
<td>Provide facilities for 2 people at a time</td>
</tr>
<tr>
<td>Library</td>
<td>Create a space that is energized and open</td>
<td>Easy access to educational materials</td>
<td>3,500</td>
<td>8'-0&quot; - 12'-0&quot;</td>
<td>Highly controlled spaces with capability for thermal zoning</td>
<td>Daylight reaching spaces with task lighting at workstations, Accessible separation between group and individual work areas</td>
<td>7am-7pm</td>
<td>Provide facilities for individuals or groups of students/parents for 1-3 hours at a time</td>
</tr>
<tr>
<td>University Garden</td>
<td>Protected public space, inviting yet enclosed</td>
<td>Provide public space using Sustainable Explainable and resource for student projects and social space</td>
<td>20,000</td>
<td>8'-0&quot; - 15'-0&quot;</td>
<td>Partially enclosed</td>
<td>Outdoor, non-conditioned space with access to covershield</td>
<td>7am-7pm</td>
<td>Provide access for all students and public visitors</td>
</tr>
<tr>
<td>Entry</td>
<td>Large, inviting space</td>
<td>Provide off-street access for public visitors with variation in level of space for wayfinding</td>
<td>1,500</td>
<td>9'-0&quot; - 15'-0&quot;</td>
<td>Moderately controlled with capability for thermal zoning</td>
<td>High daylighting levels with supplemental task lighting &amp; art installations; significant ventilation capability</td>
<td>7am-7pm</td>
<td>Space is provided for institutional and educational passage to public and private functions</td>
</tr>
<tr>
<td>Lecture Room</td>
<td>Larger, soft, and comfortable space</td>
<td>Directional seating providing occupants with direct visual access to speaker and demonstration</td>
<td>3,000</td>
<td>12'-0&quot; - 25'-0&quot;</td>
<td>Highly controlled</td>
<td>Limited daylighting required, General, adjustable lighting</td>
<td>8am-2pm (after required)</td>
<td>Able to handle full school occupancy times 100% for Public</td>
</tr>
<tr>
<td>Gallery</td>
<td>Inviting space, expressive of children's work and summary of educational functions. Public face</td>
<td>Provide quick on-access access for public to understand and explore the work of the students</td>
<td>2,500</td>
<td>9'-0&quot;</td>
<td>Highly controlled</td>
<td>Conditioned space with limited daylighting; Able to handle plug loads; Controlled lighting</td>
<td>7am-6pm</td>
<td>Provision of space for groups of people for up to 90 minutes</td>
</tr>
<tr>
<td>Circulation</td>
<td>Pleasant but not grand</td>
<td>Provide clear access to public functions with acknowledgment of wayfinding hierarchy</td>
<td>2,500</td>
<td>12'-0&quot;</td>
<td>Moderately controlled</td>
<td>Provide simple daylighting, Limited conditioning of space</td>
<td>7am-6pm (after required)</td>
<td>Universal access to public with supplemental access for students</td>
</tr>
<tr>
<td>Bathrooms</td>
<td>Privacy</td>
<td>Going private</td>
<td>250</td>
<td>8'-0&quot;</td>
<td>Moderately controlled</td>
<td>Direct connection to core services including possible water reclamation and blackwater treatment</td>
<td>7am-7pm (after required)</td>
<td>Provide facilities for 5 people at a time</td>
</tr>
<tr>
<td>Reception &amp; Waiting</td>
<td>Seating space with strong sense of centrality</td>
<td>Provide easy access for educators and public to address administrative questions of the school</td>
<td>900</td>
<td>8'-0&quot;</td>
<td>Highly controlled</td>
<td>Accessible separation with daylighting when possible. Avoid direct sunlight.</td>
<td>8am-5pm</td>
<td>Capable of handling individuals and groups for short periods of time with supplemental waiting space</td>
</tr>
<tr>
<td>Admin. Offices</td>
<td>Private, separated spaces</td>
<td>Provide a quiet personal space for public administration to perform daily tasks and school operation</td>
<td>600</td>
<td>8'-0&quot;</td>
<td>Highly controlled</td>
<td>Daylighting when possible but avoid direct sunlight.</td>
<td>8am-5pm</td>
<td>Single occupancy rooms or, possibly, one large office space with workstations</td>
</tr>
<tr>
<td>Break/Conference</td>
<td>Comfortable, private</td>
<td>Provide relaxation space for administration during breaks and adapt to accommodate meetings</td>
<td>600</td>
<td>9'-0&quot;</td>
<td>Highly controlled</td>
<td>Daylighting if possible. Conditioned, acoustically separated from other programmatic spaces</td>
<td>8am-5pm</td>
<td>Comfortable seat all administration personnel at once for up to 90 minutes</td>
</tr>
<tr>
<td>Circulation</td>
<td>Utilitarian</td>
<td>Provide universal access for administration to administrative functions</td>
<td>1,500</td>
<td>9'-0&quot;</td>
<td>Moderately controlled</td>
<td>Daylighting if possible, but not necessary</td>
<td>8am-5pm</td>
<td>Single user or groups of two</td>
</tr>
<tr>
<td>Bathrooms</td>
<td>Privacy</td>
<td>Going private</td>
<td>160</td>
<td>8'-0&quot;</td>
<td>Moderately controlled</td>
<td>Direct connection to core services including possible water reclamation and blackwater treatment</td>
<td>8am-5pm</td>
<td>Provide facilities for 3 people at a time</td>
</tr>
<tr>
<td>Mechanical Space</td>
<td>Centralized space without being dominating</td>
<td>Provide control for building occupants and educational potential</td>
<td>2,000</td>
<td>undefined</td>
<td>Unconditioned</td>
<td>n/a</td>
<td>As Needed</td>
<td>Access by 1-4 maintenance/operational staff for unexpected lengths of time, varies too greatly to be listed here</td>
</tr>
<tr>
<td>Storage</td>
<td>Utilitarian</td>
<td>Provide space for student projects, educational materials, and other intermittently-used items</td>
<td>200</td>
<td>12'-0&quot;</td>
<td>Ability to high control levels. Thermally zoned</td>
<td>Little to no daylight required. Zoned for varying conditioning requirements</td>
<td>As Needed</td>
<td>Accessed by individuals or small groups for short amounts of time</td>
</tr>
<tr>
<td>Bike Storage</td>
<td>Utilitarian but calibrated</td>
<td>Allow access for parking bikes</td>
<td>200</td>
<td>undefined</td>
<td>Unconditioned</td>
<td>Exterior, covered space with no conditioning</td>
<td>All Hours</td>
<td>Accessed by individuals or small groups for short amounts of time</td>
</tr>
<tr>
<td>Janitorial (2)</td>
<td>Utilitarian</td>
<td>Allow for storage and access of maintenance and cleaning supplies</td>
<td>200</td>
<td>9'-0&quot;</td>
<td>Loosely controlled</td>
<td>Daylighting not required. Conditioning and ventilation determined by nature of stored items</td>
<td>As Needed</td>
<td>Accessed by individual staff for short amounts of time</td>
</tr>
</tbody>
</table>

**Notes:**
- ECS criteria: Capable of handling up to 34 students at a time with 3-4 educators.
- Access time: 8am-4pm, 7am-7pm, 8am-5pm, 7am-6pm, 8am-3pm (later if required).
- Circulation: 10,000 8'-0" - 15'-0", 4,000 8'-0" - 12'-0", 3,000 8'-0" - 15'-0", 9,000 8'-0" - 12'-0", 2,500 12'-0" - 16'-0", 1,500 9'-0" - 12'-0", 1,000 9'-0" - 12'-0", 600 8'-0" - 12'-0", 300 8'-0" - 12'-0".
- Equipment: Computer workstations, projection equipment, equipment storage.
- Functional needs and adjacencies: Direct relationship to other educational functions as well as garden & entrance/exit.
- High Dependence on Lighting
- Tasklighting Required
- Large Equipment Load
- High Levels of Space Conditioning

12,750 SQUARE FEET

- Moderate Dependence on Lighting
- Low to No Tasklighting Required
- Moderate to Low Equipment Load
- Moderate Space Conditioning

24,000 SQUARE FEET

- Little Dependence on Lighting
- No Tasklighting Required
- Low to No Equipment Load
- Low to No Space Conditioning

24,500 SQUARE FEET

- Moderate Dependence on Lighting
- Low to No Tasklighting Required
- Moderate to Low Equipment Load
- Moderate Space Conditioning

750 SQUARE FEET

- High Dependence on Lighting
- Tasklighting Required
- Large Equipment Load
- High Levels of Space Conditioning

12,750 SQUARE FEET

branching in
energy hierarchy diagram
sean waldron
seminar spaces
workshops
educational circulation
toilet rooms serving education program
library
toilet rooms serving public program
public circulation
gallery
lecture hall
entry
art/student garden

PUBLIC

EDUCATIONAL

SERVICE

OPERATION

reception & waiting
administrative offices
break/conference room
admin. circulation
toilet rooms serving admin. program
bike storage
janitorial
mechanical
storage