# Environmental STEM in Urban Context

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Seattle, Hazel Wolf K-8

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#### It happened here ..... [on a 3.2 acre triangular site]

#### It can happen anywhere... Correct?



## If YES, let us see how it happened If NOT.....Why Not?

Optimistic take: YES, it can happen anywhere

Key ingredients: Awareness of the community about our environment

Community commitment for project support

# How did it happen at Hazel Wolf?

#### Founding Process:

A strong vision - Unique program educationally

Environmental program as a glue for a K-8 school

Community Support: Interim condition

Placement on the Bond for a permanent home

Keys to Success: Teachers on the same page

Teacher training



Founding Process: Unique program educationally Environmental program as a glue for a K-8 school

Accessible for All Ages



K-2Soils and geologyFallen leaf scavenger huntSit Spots: observing and sketching

History of native cultures

- 3–5 Jellyfish sculptures Earthquake/structures analysis Species population statistics





Water testing for pollutants Soil filtration tests Sit Spots: creative writing/poetry Native plant cataloguing and web design QR code plant tags



Founding Process: Unique program educationally Environmental program as a glue for a K-8 school

	art	Jellyfish sculptures Sit Spots: observing and sketching	
Accessible for All Subjects	science	Water testing for pollutants Soil filtration tests Native plant cataloguing	
	reading/ writing	Sit Spots: creative writing/poetry Web design	
	math	Earthquake/structures analysis Species population statistics	
	tech	Web design QR code plant tags	
	history	History of native cultures Soils and geology	

Community Support:

Interim condition

Placement on the Bond for a permanent home



Keys to Success:

Teachers on the same page

Teacher training - connect outdoor indoor teaching



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## **A Mission Driven School**

Design Goals:

Provide as many varied multi-sensory individual experiences on the site as

possible

Maximize the use of the site for outdoor learning



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Design Goals:

Maximize the use of the site for outdoor learning



Design Mindset: Purpose driven custom design Every unusual solution should be explored

## **A Mission Driven School**

Design Goals: Provide as many varied multi-sensory individual experiences on the site "as possible"





#### Key Educational Philosophy

- "We teach everything through an environmental lens"
- "We explain curriculum through understanding of the earth systems"

Research foundation

Empirical evidence



# **Key Educational Philosophy**

Social, emotional, and physical benefits of exposure to nature

Outdoor education is the **ultimate teachable moment**.





#### **Key Educational Philosophy** Research foundation: Benefits of outdoor learning

Evidence:

Less crime in housing with trees

Hospitals patients recover faster in contact with nature

Prisons with trees are less violent

Introduction of environmental program in a school in Texas led to less disciplinary reports in the following year

# **Key Educational Philosophy**

# social, emotional, physical benefits

nature & child development



# Key Educational Philosophy



#### Selection of Supporting Research

Fuller, R.A., Irvine, K.N., Devine-Wright, P., Warren, P.H., & Gaston, K.J. (2007). Psychological benefits of greenspace increases with biodiversity. *Biology Letters*, 3, 390-394.

Kellert, S. R. (2012). *Building for life: Designing and understanding the human-nature connection*. Island press.

Maller, C., Townsend, M., Brown, P., & St Leger, L. (2002). *Healthy parks, healthy people: The health benefits of contact with nature in a park context: a review of current literature.* Parks Victoria, Deakin University Faculty of Health & Behavioural Sciences.

Townsend, M., & Weerasuriya, R. (2010). *Beyond Blue to Green: The benefits of contact with nature for mental health and well-being*. Burwood: Deakin University.: Deakin Australia.

Nature can help us achieve **skill integration** and **social-emotional development.** 

#### Nature can lead to **real-world experience & application** and **better grades.**

**Nature increases** 

### engagement & enthusiasm

for learning.

#### Design Goals: Maximize the use of the site for outdoor learning



- 1 Botanical Garden
- 2 Living Wall
- 3 Learning Terraces
- 4 Nature Cycle Courtyard
- 5 Butterfly Garden







Botanical garden Informal outdoor learning area Community park in the off hours



Botanical garden = informal outdoor learning area = community park in the off hours



**Site as a lab** Rain garden as a teaching station

#### **Outdoor Indoor Program Connection**



Environmental learning outdoors relates to science experiments

**Outdoor Indoor Program Connection** 



Maximize informal learning spaces





Variety of teaching stations Variety of curriculum offering Create a spirit of the place that stimulates students to pursue their inquiries



#### Maximize informal learning spaces

Create a spirit of the place that stimulates students to pursue their inquiries



#### **Social Emotional Learning**

Academic benefits of movement



Outdoor education is the **ultimate teachable moment.** 

# Social, emotional, and physical benefits of **exposure to nature**



#### **Design Goals**

Create school's own ecosystem



**Primary School for Sciences & Biodiversity** Boulogne-Billancourt, France

#### **Design Goals:**

Building envelope as an ecosystem and a teachable moment



**Primary School for Sciences & Biodiversity** Boulogne-Billancourt, France

#### **Design Goals**

Outdoor education is the ultimate teachable moment

Teaching phenology



**Primary School for Sciences & Biodiversity** Boulogne-Billancourt, France

#### **Design Goals:**

Green school design featuring rainwater harvesting for roof-top gardens.





#### **Sidewell Friends Middle School** Washington DC, United States

#### **Design Goals:**

Key features include water treatment through onsite wetland and rainwater harvesting for roof-top gardens.





**Sidewell Friends Middle School** Washington DC, United States

#### **Design Goals:**

Create school's own food growing education



**Farming Kindergarten** Bien Hoa, Dong Nai, Vietnam

#### **Design Goals:**

Create school's own food growing education





**Farming Kindergarten** Bien Hoa, Dong Nai, Vietnam





#### **Design Goals:**

Maximize the usage of small site by incorporating sustainable features, such as rooftop playgrounds and storm water retention.

**Ogden International School of Chicago** Chicago, United States



#### **Ogden International School of Chicago** Chicago, United States



#### **Design Goals**:

Provide a significant increase in density within a tight urban site

#### MARLBOROUGH PRIMARY SCHOOL,

litt

London, United Kingdom



**First High-Rise High School** New South Wales, Australia

#### **Design Goals:**

Create high-rise social infrastructure with wellbeing and playfulness arising out of the integration of the physical and the environmental





#### **First High-Rise High School** New South Wales, Australia





#### **Design Goals:**

Create a cooler environmentally friendly building

**School of Arts,** Singapore, Singapore







#### **Design Goals:**

Create urban oasis to provide outdoor learning in the dense urban living environment

#### **QIDE ELEMENTARY SCHOOL,** Hong Kong, China







#### **Design Goals:**

Create a "sustainable learning landscape" to promote optimal learning by establishing a deep connection with the surrounding landscape and local community

#### Hong Kong Island School Competition Hong Kong, China



#### **Design Goals:**

Create an environment in which students can learn valuable lessons in sustainable living.

**Green School,** Stockholm, Sweden

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**Green School,** Stockholm, Sweden

# A catalyst for an experientially more inspiring learning environments

Space that creates opportunity to spark innovation Get students to ask questions and pursue those questions

Creativity Collaboration Communication Critical Thinking

STEM standards: New engineering standards

## 3 Dimensions:

#### Disciplinary Core Ideas Science and Engineering Practices



#### **Crosscutting Concepts**

#### **Disciplinary Core Ideas**

PHYSICAL SCIENCES

PS1: Matter and Its Interactions

PS2: Motion and Stability: Forces and Interactions

PS3: Energy

PS4: Waves and Their Applications in Technologies for Information Transfer

#### LIFE SCIENCES

- LS1: From Molecules to Organisms: Structures and Processes
- LS2: Ecosystems: Interactions, Energy, and Dynamics
- LS3: Heredity: Inheritance and Variation of Traits
- LS4: Biological Evolution: Unity and Diversity

#### EARTH AND SPACE SCIENCES

ESS1: Earth' s Place in the Universe ESS2: Earth' s Systems ESS3: Earth and Human Activity

ENGINEERING, TECHNOLOGY, AND APPLICATIONS OF SCIENCE ETS1: Engineering Design ETS2: Links Among Engineering, Technology, Science, and Society

#### Science and Engineering Practices

- 1. Asking Questions (for science) and Defining Problems (for engineering)
- 2. Developing and Using Models
- 3. Planning and Carrying Out Investigations
- 4. Analyzing and Interpreting Data
- 5. Using Mathematics and Computational Thinking
- 6. Constructing Explanations (for sci) and Designing Solutions (for eng)
- 7. Engaging in Argument from Evidence
- 8. Obtaining, Evaluating, and Communicating Information

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#### **Crosscutting Concepts**

- 1. Patterns
- 2. Cause and Effect: Mechanisms and Explanation
- 3. Scale, Proportion, and Quantity
- 4. Systems and System Models
- 5. Energy and Matter: Flows, Cycles, and Conservation
- 6. Structure and Function
- 7. Stability and Change







So others can do it.....we can do it....

#### What are we waiting for?

