Education for Sustainability – Philly
Supporting teachers to develop lessons on Sustainability

Connecting Math Educators to the Wider Community

Victor Donnay
Department of Mathematics
Bryn Mawr College
Education for Sustainability – Philly

Goal:

1. Create model for STEM Teacher Leadership Development in Education for Sustainability for teachers in the School District of Philadelphia

2. Strengthen and expand an EfS-themed STEM Ecosystem
What are problems facing the nation and the world that you are concerned about?
What are problems facing the nation and the world that you are concerned about?

A goal of our presentation is to see how mathematics education connects to these issues you care about.
Math Modeling and Sustainability: Using Service Learning Projects to Deepen Student Engagement with Modeling.

MS32: Innovative Pedagogical Practices
8:30 – 10:30 am
Oregon Ballroom 204
EFS-Philly Project Overview

NSF

THE SCHOOL DISTRICT OF PHILADELPHIA

Community College of Philadelphia

BRYN MAWR COLLEGE

WEST CHESTER UNIVERSITY
The Investigators

Margaret Stephens
Victor Donnay
Paul Morgan
Philadelphia Regional Noyce Partnership

“Doing together what we cannot do alone.”
What is education for?

If we are not currently educating for sustainability, what are we educating for?

Education for ________?________.
Once upon a time...

- ACCESSIBLE FOOD AND DRINKING WATER
- HEALTHY OUTDOOR AND INDOOR AIR
- CLEAN AND EFFICIENT ENERGY
- CLIMATE PREPARED AND CARBON NEUTRAL COMMUNITIES
- QUALITY NATURAL RESOURCES
- ACCESSIBLE, AFFORDABLE, AND SAFE TRANSPORTATION
- ZERO WASTE

2018 marks more than a year of progress on the new Greenworks, and the ten-year anniversary of the creation of the Office of Sustainability. OOS is celebrating these occasions with several Greenworks updates.

IN YOUR HAND
Greenworks: A Year in Review
This magazine highlights Philadelphia residents and community groups working together to improve their neighborhoods for today and tomorrow. It also includes resources for individuals and communities to help achieve the Greenworks visions.

FURTHER READING
To learn more about Philadelphia’s progress toward the Greenworks visions, visit our website at www.phila.gov/green, where you’ll find the following information:

- Greenworks Initiatives Update
  Greenworks: A Vision for a Sustainable Philadelphia set out actions for OOS and other City departments to help achieve each of the eight visions. To learn about the progress on those actions and new commitments from the City of Philadelphia to advance Greenworks, check out the 2017 Greenworks Initiatives Update.

- Greenworks Dashboard
  OOS publishes data on achieving each of the eight Greenworks visions on the Greenworks Dashboard.

- Greenworks Equity Index
  This spring OOS will launch the Equity Index, a program to build relationships with communities not currently benefiting from sustainability, and improve outcomes for those Philadelphians.
A Sustainability Plan for the School District of Philadelphia
<table>
<thead>
<tr>
<th>Focus Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education for Sustainability</td>
</tr>
<tr>
<td>Consumption and Waste</td>
</tr>
<tr>
<td>Energy and Efficiencies</td>
</tr>
<tr>
<td>School Greenscapes</td>
</tr>
<tr>
<td>Healthy Schools, Healthy Living</td>
</tr>
</tbody>
</table>
Education for Sustainability

EFS is a holistic framework to equip students, schools, administrators, families and community with the skills, knowledge, and habits of mind that will prepare them to create and contribute to a world where economic prosperity, social justice, and responsible citizenship may be strengthened while restoring our health and that of the living systems upon which our lives depend.
THE 9 CORE EfS STANDARDS

- Cultural Preservation & Transformation
- Responsible Local & Global Citizenship
- The Dynamics of Systems & Change
- Sustainable Economics
- Healthy Commons
- Natural Laws & Ecological Principles
- Inventing & Affecting The Future
- Multiple Perspectives
- Strong Sense Of Place

From the Cloud Institute
Education for Sustainability (EFS) is a holistic framework to equip students, schools, administrators, families and community with the skills, knowledge, and habits of mind that will prepare them to create and contribute to a world where economic prosperity, social justice, and responsible citizenship may be strengthened while restoring our health and that of the living systems upon which our lives depend.
Driving Questions

■ To what extent can an EfS focus increase student and teacher engagement with STEM?

■ How can teachers be supported to implement EfS in their classes/schools?

■ To what extent can EfS serve as a catalyst to improve STEM learning by inspiring and mobilizing a wide range of stakeholders to realize a new vision of STEM education?
Education for Sustainability – Philly

Goal:

1. Create model for STEM Teacher Leadership Development in Education for Sustainability for teachers in the School District of Philadelphia

2. Strengthen and expand an EfS-themed STEM Ecosystem
while doing as much as possible
to support GreenFutures
this year.
The Process

- **Spring 2017: Recruit and Select Participants**
  - High School Teachers (STEM & Non-STEM) (14)
    - 8 Science, 2 Math, 4 Non-STEM
  - Community College of Philadelphia Faculty (3)

- **August 2017: 3-Day Intensive Institute**
  - Introduction to Sustainability (ATD Symposium)
  - Introduction to EfS (Jaimie Cloud)
  - Introduction to Place-Based Education (Field Experiences)

- **Sept 2017 – June 2018: Monthly 6-Hour PD on Saturdays**
Logistics

- Used our network to advertise to teachers in the SDP
- Application with letter of interest and Principal support
- Stipend ($2400)
Monthly PD Sessions

- **September** - EfS Standards Part I
- **October** – EfS Standards Part II + Biomimicry
- **November** - Pedagogy: Place-Based Education
- **December** – Workshop with Team Members
- **January** – Engaging Students (Ken Hamilton, Green-Allies)
- **February** – Community Connections & Assets (Field Experiences)
- **March** – Teacher Leadership & Change Agent Skills
- **April** – SDP Teacher Symposium Presentations
- **May** – Unit Presentations to Peers
- **June** – EfS-Philly Symposium (Public Presentations w/SDP)
Year-Long Project: Instructional Unit Development

- EFS & District Standards
- Pedagogy (Place-Based & Project-Based Learning)
- Collaborative Learning & Networking
- Student Engagement
- Teacher Leadership & Change Agent Skills
- Field Studies (Out-of-Classroom Experiences)
- Map Community Assets & Pursue Collaborations
- School as a System – Eco-Schools Pathways
- Authentic Assessment
3-Day EfS Summer Institute
Awakening the Dreamer
Changing the Dream

Pachamama Alliance
Students participating in Project Flow.
Photograph courtesy of the Fairmount Water Works
Eco-Schools USA
NATIONAL WILDLIFE FEDERATION®

- water
- school grounds
- energy
- sustainable food
- healthy schools
- healthy living
- biodiversity
- consumption & waste
- climate change
- transportation
- watersheds, oceans & wetlands
- learning about forests
Student Engagement

Ken Hamilton
The Cloud Institute
Education for Sustainability Framework
Community Connections

- Schools & communities learn and work together in partnership
- Schools serve as resources to the community
- Communities serve as resources to the schools
- Schools and communities reflect and celebrate together
Teacher Leadership/Change
Agent Skills

March for Our Lives
What’s your story about . . .

- An experience with change (system)

- Experiences with
  - Learning how the bureaucracy works
  - Identifying key levers of change (people, etc.)
  - Using outside experts strategically
  - Top Down and/or Bottom Up change
  - Being opportunistic
  - Effectively collaborating (not a lone hero)
  - Other?
The Change Leadership Dilemma

Original Plan

Actual Experience

Official Story

"Disconnect between how new things get done and the Official Story" by Isharp, is licensed for open sharing and adapting under Creative Commons CC BY-AS 4.0
Culminating Presentations

- April 28th: SDP Teacher Symposium Presentations
- May 19th: Presenting Units to the EFS-Philly group
- June 9th: School District *GreenFutures* Symposium
EFS-Philly Participant Stories

WHAT'S YOUR STORY?
# Math Teachers

Sridevi Somireddy

- Energy use in building, ways to reduce usage
- Can we get solar panels on our building?
- Calculate Carbon Footprint of your breakfast.

## Breakfast Footprint

<table>
<thead>
<tr>
<th>Cereal</th>
<th>Origin*</th>
<th>Miles**</th>
<th>Size (ft³)</th>
<th>Carbon Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cheerios</td>
<td>0.17</td>
<td>0.0000</td>
<td>lbs. of C02</td>
<td></td>
</tr>
<tr>
<td>Kellogg Flakes</td>
<td>0.17</td>
<td>0.0000</td>
<td>lbs. of C02</td>
<td></td>
</tr>
<tr>
<td>Oreo O’s</td>
<td>0.17</td>
<td>0.0000</td>
<td>lbs. of C02</td>
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</tr>
<tr>
<td>Frosted Mini-Wheats</td>
<td>0.17</td>
<td>0.0000</td>
<td>lbs. of C02</td>
<td></td>
</tr>
<tr>
<td>Milk</td>
<td>0.10</td>
<td>0.0000</td>
<td>lbs. of C02</td>
<td></td>
</tr>
<tr>
<td>Whole Milk</td>
<td>0.10</td>
<td>0.0000</td>
<td>lbs. of C02</td>
<td>Initial Assumptions</td>
</tr>
<tr>
<td>Organic</td>
<td>0.10</td>
<td>0.0000</td>
<td>lbs. of C02</td>
<td></td>
</tr>
<tr>
<td>Local Store Brand</td>
<td>0.10</td>
<td>0.0000</td>
<td>lbs. of C02</td>
<td></td>
</tr>
<tr>
<td>Fruit</td>
<td>0.08</td>
<td>0.0000</td>
<td>lbs. of C02</td>
<td></td>
</tr>
<tr>
<td>Oranges</td>
<td>0.08</td>
<td>0.0000</td>
<td>lbs. of C02</td>
<td></td>
</tr>
<tr>
<td>Fresh Strawberries</td>
<td>0.08</td>
<td>0.0000</td>
<td>lbs. of C02</td>
<td></td>
</tr>
<tr>
<td>Tangerine</td>
<td>0.08</td>
<td>0.0000</td>
<td>lbs. of C02</td>
<td></td>
</tr>
<tr>
<td>Fresh Raspberries</td>
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<td>lbs. of C02</td>
<td></td>
</tr>
<tr>
<td>Juice</td>
<td>0.04</td>
<td>0.0000</td>
<td>lbs. of C02</td>
<td></td>
</tr>
</tbody>
</table>

Initial Assumptions: 22.27 lbs. per gallon, 5.2 miles per gallon, 3200 ft³ trailer.

*Carbon Footprint of your breakfast depends on the origin of the food and the mode of transportation. The table above provides a breakdown of the carbon cost for different breakfast items. To calculate the total carbon footprint, multiply the carbon cost by the quantity consumed.**
Donovan Hayes

- **Goal:** Get students excited and engaged with where they ARE (place based education, respecting cultural context)

- **Sustainable Geometry:** Harnessing Joy in the Math Classroom. Symmetry – rotations, translations. [Choreograph transformation dances.](https://geometricfunctions.org/fc/present/nctm2018/)

- Engagement levels through the roof
THE FACTS ON FOOD WASTE

1/3 of ALL food produced IN THE WORLD IS WASTED

1.3 BILLION pounds

IN A WORLD WHERE 805 MILLION GO HUNGRY every year

FOOD WASTE DOESN’T MAKE SENSE

Amanda Fiegele
ESL Teacher
12 Gallons of Milk Per Day x 180 Days x 300 Philly Schools
648,000 Gallons of Milk Per school year
3,240,000 pieces of fruit per school year
Meraki Gets Innovative
“Wasted food makes me feel hurt because I know it can be used for a better purpose. Because I was raised in Haiti and know how it feels to not have food, I can relate and want to help.”

Duveltsanders Thomas
Next Steps?
Thank You!

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Education for Sustainability - Philly
http://prnp.org/efs-philly-education-for-sustainability-philly

This material is based upon work supported by the National Science Foundation under Grant #1660796. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.