beyondbenign
green chemistry education

Green Chemistry Connections: Inspiring Students with Innovation

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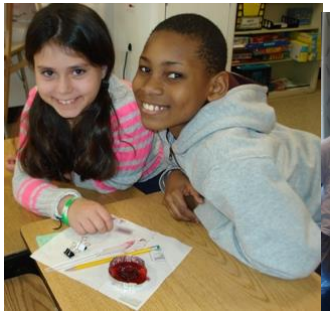
MISSION AND VISION

Located in Wilmington, MA co-founded by Dr. Amy Cannon and Dr. John Warner

Beyond Benign is dedicated to providing future and current scientists, educators and citizens with the tools to teach and learn about green chemistry in order to create a sustainable future.

Beyond Benign's vision is to revolutionize the way chemistry is taught to better prepare students to engage with their world while connecting chemistry, human health and the environment.



www.beyondbenign.org

Beyond Benign Programs

K-12

- Curriculum Development and Teacher Training
  - Green Chemistry
  - Green Math & Engineering
  - Biotechnology
- On-line Courses
- Professional Development Workshops
- **K-12 and Community Outreach**
- **College Student Fellows program**

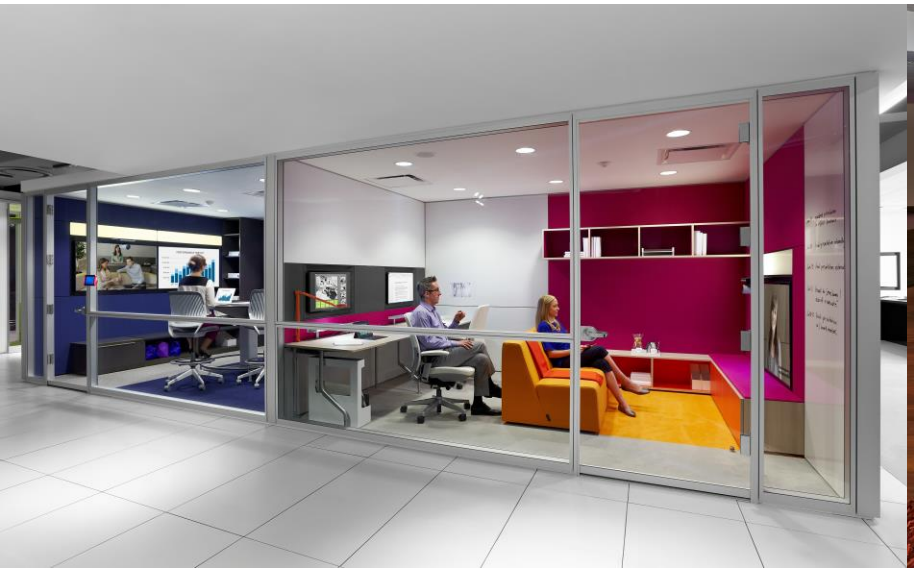
College/University

- The Green Chemistry Commitment
- Curriculum Development and Training
  - Technical Training
  - Green Chemistry training for workers
  - Green Chemistry tools

About Steelcase

World's largest office furniture manufacturer

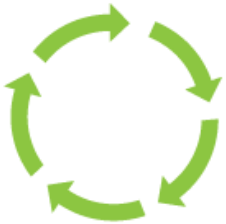
- Research and innovation company
- Translate insights into products, applications, & solutions
- Reimagining workspaces & creating new ways of working



Global Sustainability Team

MATERIALS CHEMISTRY

LIFECYCLE ASSESSMENT



RECYCLE AND REUSE

Steelcase Partnership

- Active member of the Green Chemistry and Commerce Council
- Sponsored curriculum development work with Beyond Benign and team of 9 teachers from NY, MI and MA

Outreach Pilot & Programming

- High Schools: Skyline HS (Ann Arbor, MI), Pentwater HS (Pentwater, MI), Hesperia HS (Hesperia, MI), MA & NY
  - Research projects
  - Pilot Lab Development
- Summer Programs
  - Boston Leadership Institute
  - I2 Camp
  - Teen Zoo Summer Program
- After School Programs
  - Girls Inc. Lynn
  - Young Einstein's Club
  - Upward Bound –Boston University

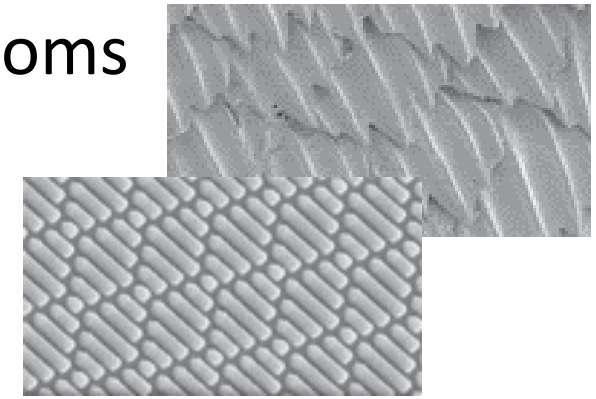
Biomimicry:
Inspiration from Nature

- Shark Inspired Technologies:
  - Faster boats & submarines
  - Sharkskin swimwear
  - Sharklet
  - And more…

Sharklet

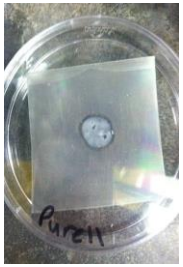
How can we keep germs from making us sick?

- Let's rethink the way we are handling bacteria
- Shark denticles keep barnacles from growing
- The distinct diamond pattern keeps bacteria from growing as well (26 microns x 3 microns)
- Films are being applied to everything from hospital instruments to public restrooms

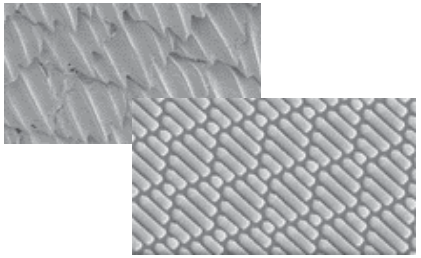


Steelcase Application:

- Levers on chairs



Sharklet Pilot



- Students tried out “looking” at the surface of sharklet material using laser beams.
  - Bedazzled lab recreating the surface
- Students compare bacteria growth simulation of a smooth plastic surface against sharklet’s surface

  -Testing different acids and bases
- What else could be tested?

PBS NOVA video: Making Stuff Smarter-
Sharklet segment
http://video.pbs.org/video/1786635771/

Are Mushrooms the new plastic?

Ecovative Design

- Mycelium binds and grows around agricultural waste to create the mushroom materials.
- Replacement for polystyrene: packaging, insulation, insides of surfboards, etc…

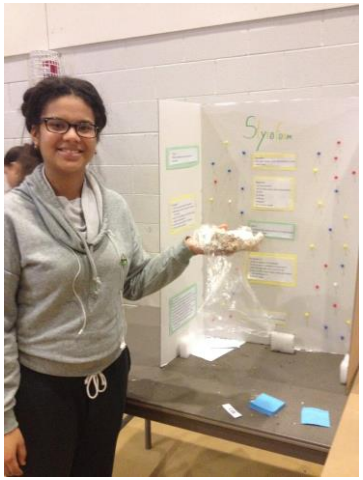
Steelcase Application:

- Packaging for shipping furniture
- Researching viability of mycoboard use

Mushroom materials

Research Projects & Inquiry based projects

- Students research life cycle of polystyrene
  - How produced
  - Pros and cons
- What application do you want to test?
  - Thermal insulation
  - Impact insulation
  - Water resistance
  - Biodegradability



GIY-Grow it yourself kits!

http://giy.ecovativedesign.com

Ecovative GIY Kits

- 4th Graders at Cherry Creek Elementary - Lowell, MI
- Innovation
- Hands on and fun in science class!

Steelcase

Cogent

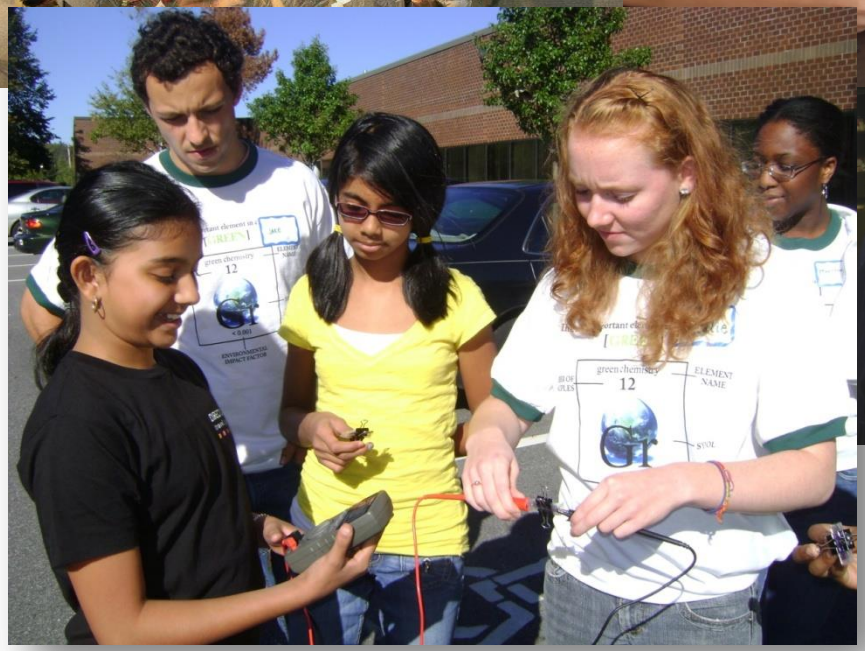
Can we make fabrics without using heavy metals?

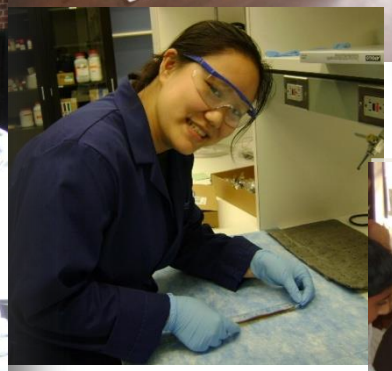
- Steelcase product line
- Collection of textiles antimony-free*
  - Process of making polyester fabric
- Certified Cradle to Cradle™ (C2C) Gold by McDonough Braungart Design Chemistry (MBDC).
- Safer dye chemistry
- http://link.brightcove.com/services/player/bcpid61485843001?bckey=AQ~~,AAAAAGqBAD0~,q_9NhF3Dkp55DzY9AntYPoll-MkO-u1a&bctid=1042446570001

Cogent:
Natural Dyes Lab

- Investigate red onion, carrot tops, chamomile tea
  - Chemical bonds
  - Fibers
  - Pigments
  - Dyes
- Experiment with pH and mordants
- Tie Dye Lab extension
- National Chemistry Week Theme:
  - COLORS

Aiming to inspire the next generation of inventors, innovators, scientists and game changers!





Thank you!

Visit our websites:

http://steelcase.com/

www.beyondbenign.org

www.greenchemistrycommitment.org

Contact Us:

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