Curriculum Exchange: Studio STEM, Engineering After School

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Dr. Christine Schnittka is an assistant professor in the College of Education and the Department of Curriculum and Teaching with a joint appointment in the College of Engineering. Her current research involves developing and evaluating engineering design-based curriculum units that target key science concepts and environmental issues through the contextual lens of problem-based learning. Prior to receiving her Ph.D. in science education at the University of Virginia, Dr. Schnittka was a middle school teacher and administrator for 10 years, and prior to that, worked as a mechanical engineer. She has published her work in journals such as the International Journal of Science Education, the International Journal of Engineering Education, Advances in Engineering Education, The Science Teacher, and Science Scope.

Research-based

Research about student science learning, motivation to learn STEM concepts, engineering design concepts, and attitudes toward engineering have demonstrated the efficacy of the Studio STEM model.

Schnittka, C.G., Evans, M.A., Drape, T.D., & Won, S. (accepted, in press). Studio STEM: Looking for learning in all the right places in after-school spaces. Submitted to *Research in Science Education*.

Schnittka, C.G., Brandt, C., Jones, B., & Evans, M.A. (2012). Informal engineering education after school: A studio model for middle school girls and boys. *Advances in Engineering Education, 3*(2).

Evans, M.A., Schnittka, C.G., Brandt, C., & Jones, B. (accepted, in press). Studio STEM: A model to enhance science and technological literacy through engineering design practices. In L. Annetta & J. Minogue (Eds.) *Achieving science and technological literacy through engineering design*. New York: Springer.

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Curriculum Exchange: Studio STEM

Engineering After School

Featuring the Save the Animals Engineering Teaching Kits for Grades 6-8

Penguins
Sea Birds
Snails
Ferrets

Studio STEM: Engineering After School

Studio STEM is an after-school program designed to increase middle school youth's understanding of science, technology, and engineering through issues related to energy security and sustainability. Youth are given the challenge to design and construct devices that apply what they have learned about what energy is, how it is transferred and transformed, and how electricity is created, used, and stored. Youth design motion-generated electric lights, solar powered vehicles, a town that stores its energy in capacitors and batteries, and insulated dwellings. The studio model places emphasis on:

1. A science and engineering curriculum that emphasizes design and problem solving,
2. Links youth to their environment,
3. Helps them learn science at a deep conceptual level
4. With the support of face-to-face discussions with peers, teachers, and mentors,
5. And with the support of a social networking forum (Edmodo) that connects peers, teachers, and mentors across sites and within sites.

The informal character of this program allows youth the freedom to explore and self-identify with STEM topics. As a result of the Next Generation Science Standards, more schools are adopting the STEM framework for curriculum development and implementation, with engineering being a key component. Studio STEM is at the forefront of this movement and is a model for STEM integration in informal settings.

Q&A

What do kids do?

Save the Penguins has youth designing dwellings for penguin shaped ice cubes to keep them from melting. Save the Sea Birds has youth designing solar vehicles for mass transportation. Save the Snails challenges youth to design and build a light that runs on gravity. Save the Ferrets has youth designing and creating a town "off the grid" that uses a super capacitor.

What science concepts do youth learn?

Heat transfer, experimental design, insulation, conduction, convection, radiation, energy transformations, torque, gears, friction, mass and weight, gravity, electromagnetic induction, voltage, current, series and parallel circuits, capacitance, open and closed circuits, plus more.

What else do they learn?

How to use the engineering design process, how power plants work, what coal is really for, how solar cells work, how LEDs work, how wind turbines work, how climate change affects penguins, how oil spills affect birds, how the lack of electricity impacts learning, and how towns can survive off the grid!