

Studio STEM: Engaging Middle School Students in Networked Science and Engineering Projects

Background

Studio STEM is a three-year afterschool and summer program aimed at educational and workforce needs. The project uses a design-based science approach to scaffold youth to learn about energy conservation. An interdisciplinary curriculum is infused with digital tools and social media to enhance and extend the experience.

A primary goal of Studio STEM is to engage middle school students in interesting projects related to environmental issues that allow them to acquire critical knowledge, skills, and dispositions. These experiences, in turn, are designed to lead to increased likelihood of youth electing and succeeding in STEM and information and communication technology (ICT) courses and careers. Our team proposes that the synergy of curricula, activities, technology, and mentoring in an informal setting will engage and motivate students from rural, low socio-economic communities. Using a social constructivist approach of action, preservice and inservice teachers (referred to as site leaders) and engineering and science undergraduates (referred to as facilitators) work with Studio STEM participants using a curriculum with real-life problems in energy sustainability. As one example, the *Save the Penguins* curriculum takes the plight of penguins and climate change as a way to motivate students to explore science topics such as convection, conduction, and radiation to apply engineering practices to construct a protective dwelling. The project places emphasis on (a) a content-rich curriculum that links students to their environment, (b) support and scaffolded discussions with mentors, and (c) an online network that supports the creation and maintenance of relationships among program participants. The informal character of this program allows students the freedom to explore and self-identify with topics.

The project has trained site leaders, facilitators, and other informal STEM educators through a series of professional development workshops and onsite training. The training is aimed at helping Studio STEM leaders become knowledgeable about engineering, engineering design, and ICT use to a level at which they can effectively work with youth on projects. As a result of increased STEM and ICT knowledge and skills, teachers, as indicated in preliminary analyses and informal debriefing interviews, likely have higher efficacy in using newer design projects and ICTs and will be more likely to integrate STEM and ICT projects and ideas into their formal teaching practices.

Studio STEM is also partnering with NanoSonic, Inc., a biotechnology company located in Giles County, VA. NanoSonic employees volunteer as facilitators to youth during the afterschool programs. Moreover, NanoSonic sponsors site visits to introduce youth to the technologies being developed in the area of nanotechnology. Studio STEM has also worked to offer experiences to youth to demonstrate that STEM-related careers are available in the New River Valley. Site leaders, facilitators, and youth have taken field trips to the New River Valley Regional Jail, home to the largest solar powered hot water system in Virginia. Opportunities and partnerships like these help students recognize that STEM-related careers in markets that involve sustainable (or green) technologies exist in their own communities.

Potential Applications

Studio STEM is serving as a model for partnerships between institutes of higher education and rural schools, science museums and centers, and related businesses. The model could be adopted to address local educational, professional development, and workforce needs in similar rural areas around the Mid-Atlantic Region. As a result of Studio STEM, students, teachers, site leaders, facilitators, and community partners have increased access to a range of online tools, materials, strategies, and activities. During the first 18 months of the project, Studio STEM has served over 100 students in grades 5–8 from rural Appalachia in low socio-economic communities. We also trained close to 30 middle school teachers and undergraduate students in how to implement the Studio STEM ETK and use the online network.

For More Information

<http://www.studiostem.org>