Climate Literacy in an Informal Setting

March 18, 2010

Jeff Lockwood, TERC, Kiku Johnson, Girls Inc. of Alameda County

Melissa Koch, SRI International

girls inc.® Girls Incorporated® of Alameda County

SRI International

TERC

InnovaTE3

NSF

Presentation Overview

- Who We Are: Project Background and Partners
- InnovaTE³: Mission, Goals, Curriculum, Participants
- STEM Continuum Programming
- Strategies for Building Relationships
- Youth Development Approach
- Evaluation
- Successes & Challenges
- Discussion

Project Background

STEM continuum for girls across 2 after school ITEST programs:

Build IT	InnovaTE^3
• 2 yr middle school program	• 4 yr middle & high school program
• Design-based curriculum that integrates computer science and mathematics	• Earth system science, Environmental engineering and innovation curriculum; develop ecologically sustainable innovations
• Promotes girls' IT fluency and knowledge of IT careers	• Value and persist in STEM learning and see pathways for STEM coursework and careers
• Prior 3-year project, 2005-2008 (now in scale-up)	• Current project 2009-2013

Partners

girls inc.®

Girls Incorporated® of Alameda County

Girls Incorporated of Alameda County

- Part of a national organization with 1,500 program sites
- 800,000 K-12 girls nationally served each year

•**Inspiring all girls to be Strong, Smart, and Bold:** out-of-school experiences that address the whole girl: sports, STEM, health, leadership & interpersonal relationships, homework help, career & college preparation

SRI's Center for Technology in Learning

- Part of a nonprofit scientific research & development organization
- Improve learning and teaching through innovation and inquiry
- Research, development, and evaluation expertise
- Focus on formal and informal learning environments

SRI International®

TERC

- Mathematics and science education K-12 tand college
- Curriculum and technology development, professional development, research, and evaluation
- Focus on formal and informal learning

TERC

InnovaTE³

Girls Innovating with Technology as Entrepreneurial Environmental Engineers

Youth-centered environmental engineering and innovation curriculum (summer and school year)

- Uses a cradle to cradle paradigm (rather than cradle to grave)
- Aims to intrigue and challenge girls to develop ecologically sustainable innovations using technology tools
- Motivate girls to explore the STEM fields and careers needed to address these important problems

InnovaTE³

InnovaTE³ Goals

InnovaTE³ encourages girls to:

- Value and persist in STEM learning
- See pathways to STEM career
- Understand concepts in Earth system science
- Become fluent in innovation and engineering practices

InnovaTE³ also builds ***Girls Inc.'s*** staff capacity to implement and sustain the InnovaTE³ program

InnovaTE³

InnovaTE³ Curriculum

Year 1: Ecological Impact: Healthy Buildings & Communities

- Exploration of the causes and impact of global warming
- Girls investigate and redesign their own communities, including new buildings for greener living using Google SketchUp and Google Earth
- Girls iterate on their own innovations with the support of STEM professionals

Year 2: Ecologically Sustainable Energy

- Girls explore the challenge of tapping into Earth's energy systems in sustainable ways to achieve ecologically-sustainable energy flows
- Girls iterate on their own innovations with the support of STEM professionals

Years 3 & 4: Pursuing Interests

- Self-directed science inquiry into specific environmental issues and technologies
- Internships w/STEM professionals and focus on college preparation for STEM areas of interest

InnovaTE³

InnovaTE³ Participants

- 135 high school girls in Alameda County, CA
- More than 80% are African American and Latina
- Majority comes from low socioeconomic households
- Girls are recruited to InnovaTE³ through Girls Inc.'s community relationships and existing high school programs
- Eventually reaching more than 300 girls in Alameda County annually

Teaching Climate Literacy in an Informal Setting

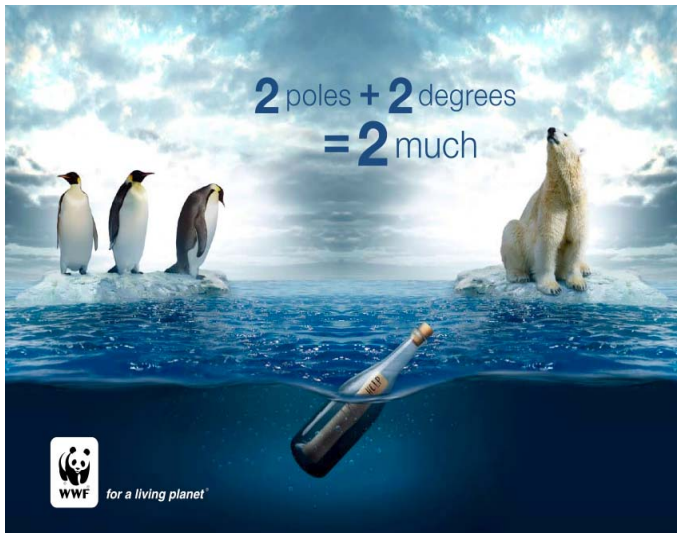
How can we teach principles of Earth system science and climate literacy in a way that engages girls and leads to an awareness of their environment and the changes that are occurring on their planet?

- Create a fun, non-threatening, collaborative atmosphere
- Girls learn by doing, designing, building, facilitators guide activities
- Invite girls input--reflections, feelings, concerns several times per day
- Keep things moving! Limit seat time and other school-like activities (e.g., scripted directions, worksheets)

Learning Structure

- A series of units spread over three years
- Summer session units = 4 weeks in duration, 2:15 per day, 3 day-long field trips included
- School year units = Each semester has 12 two-hour-long sessions, one per week
- Girls go on field trips and interact with STEM professionals several times each unit

Unit Structure



- Each unit has the following elements
  - A single essential question for girls to consider
  - A final product or project
  - A series of activities that lead girls to a deeper understanding of the essential question.
  - A number (3-5) of curriculum-related field trips where girls interact with STEM professionals
  - A final showcase for girls to present and for STEM professional comment of girls work in a “critical friends” session.

Event Schedule For Each Day

- Warm Up - Designed to pique girls interest, get them up and moving out of their chairs
- Challenge - Present a problem, a short investigation to introduce a concept or process
- Main Activity - A longer investigation that examines a particular part of the essential question for the unit
- Reflection - Girls reflect on what it all means to them. Their families? Their community. Tie up loose ends, answer any questions

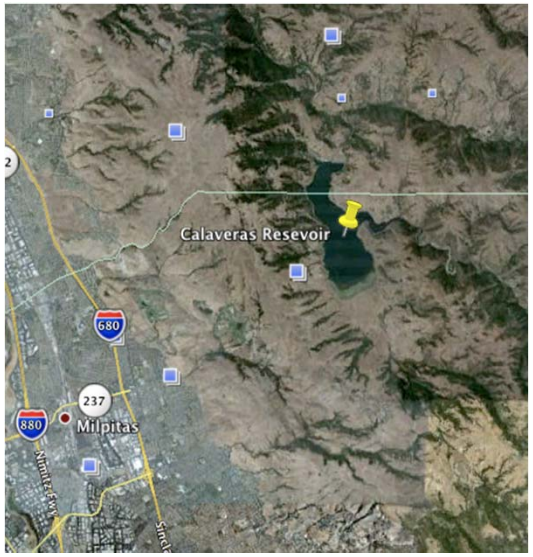
Nuts and Bolts

Warm Ups are 15 - 20 minute introductions to the day's activities

Examples:

- Ecosystem Pictionary
- Polar Ice Cap Melting
- Dry Ice Fun
- Earth System with cMap

Nuts and Bolts



Challenges are 30 – 45 minute activities that pose a problem to solve or a process or concept to investigate

Examples:

- Inputs and Outputs of Your Community Using Google Earth
- Designing a Mini Ecosystem
- What is Your Carbon Footprint?
- Global Mall game

Nuts and Bolts

Inuit Fisherman & Hunter

I am a member of the Inuit tribe. I live in Canada and make my living by fishing and hunting.

Tuvalu Islander

I live on the island of Tuvalu with my husband and four children. I raise vegetables and go fishing.

Main Activities are 35 – 55 minute activities that explore a concept or process in more depth

Examples:

- Who Emits CO2?
- NetLogo Global Warming Simulation
- The Best Green Jobs
- Global Friends Bingo

InnovaTE^3

Nuts and Bolts

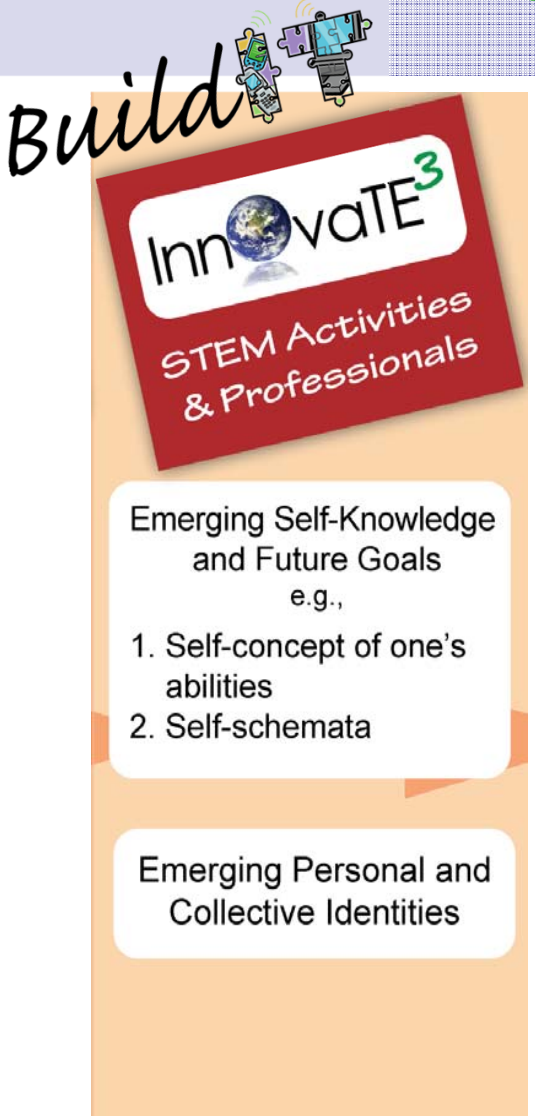
Reflections are 15 minute discussions that summarize the day's activities

Examples:

- Girls reflect on something they learned that is personally relevant to them using their Innovation notebooks.
- Connections to the Earth system and the environment
- Summary discussion

InnovaTE^3

Knowledge & Emerging Self



- Connecting STEM to girls' lives and sense of emerging selves
- Learning science and youth development-based programs InnovaTE3 gives girls experiences to expect success in STEM and to see its value
- STEM learning situated in the strong youth development context

Youth Development Approach

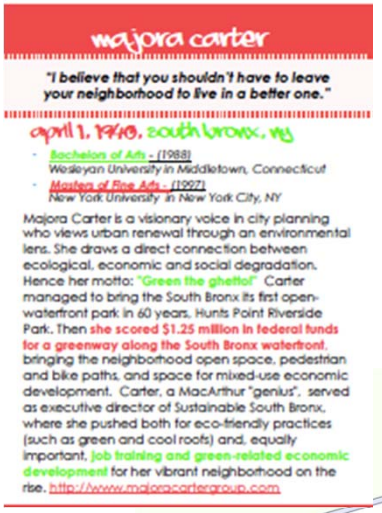
Core setting expectations and tools that foster the learning process

1. Safety
2. Supportive Environment
3. Active Learning
4. Choice
5. Community Involvement
6. Cooperative Learning
7. Leadership Development
8. Meaningful Involvement
9. Skill Building

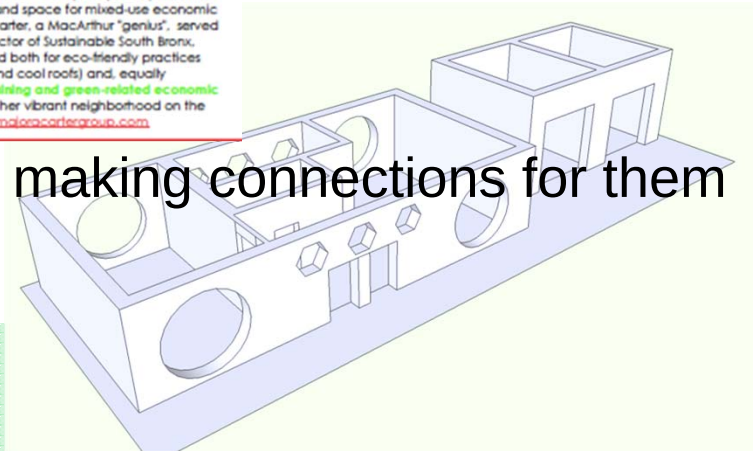
InnovaTE3

InnovaTE^3 Curriculum features bridging girls, staff & STEM professionals

- Field Trips and visits from STEM Professionals
- Innovation Pitches (presentations) to STEM professionals, peers, and community
- Staff referring to careers throughout curriculum (e.g. trading cards)

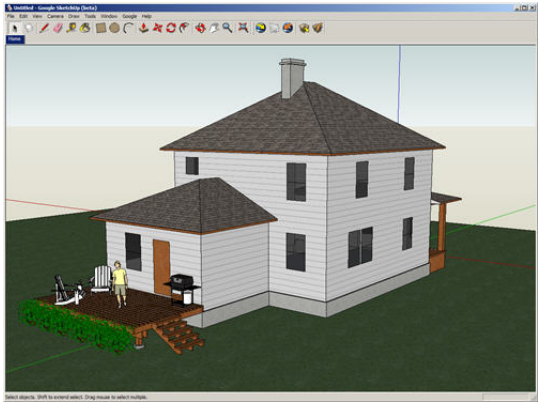


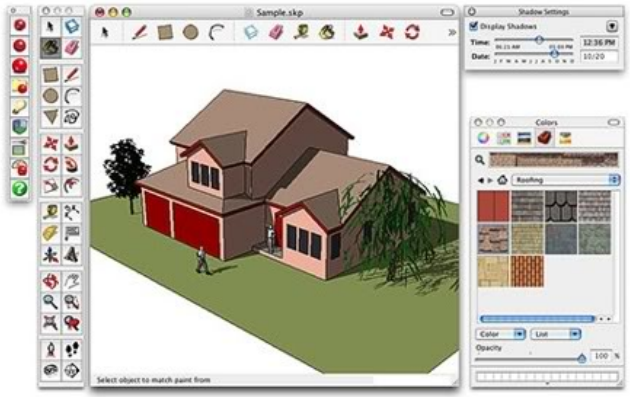
- Staff co-leading with STEM professionals, making connections for them and girls to the curriculum



InnovaTE^3

InnovaTE^3 Curriculum features bridging girls, staff & STEM professionals





- Girls using similar tools and practices that STEM professionals use (e.g., Google SketchUp)
- Girls working on topics and issues similar to those confronting STEM professionals (e.g., designing, prototyping, evaluating)
- Internships (To be developed in Year 3 of InnovaTE^3)

InnovaTE^3

Strategies for Building Relationships with STEM Professionals

1. Establish relationships with several individuals from the organization
2. Make available short and convenient opportunities for interaction
3. Co-plan, schedule, follow up & confirm goals and expectations
4. Discuss how to maintain the relationship, making it a mutually meaningful community giving opportunity
5. Youth agency program manager needs to lead initial charge of contact as the project is in the hands of youth agency

Structures for Building Relationships with STEM Professionals

1. Having program & protocol in place which becomes part of the curriculum and process
2. Ongoing contact and bi-directional feedback
3. Training for STEM professionals is essential

Preliminary Findings: What We're Learning

- InnovaTE³ is finishing it's first year of curriculum implementation
- What we're seeing as important:
- Staff scaffolding career connections
- Interactions with STEM Professionals helps girls to view STEM coursework and careers as appealing and attainable
- Intentional science activities that relate both to girls everyday lives and to STEM generates enthusiasm, pride, and increased interest in science and their communities

InnovaTE³

What We're Learning: Challenges

- It can be daunting to get past the hurdle of reaching out to professionals
- Staging and sequencing the multiple components of the program
- Easier to bring the STEM professionals in, but harder to bring the girls to the professional sites
- Linking important science concepts and processes in a coherent, non-text-bookish way

Discussion

Jeff Lockwood, TERC

jeff_lockwood@terc.edu

For more information about Innovate^3, email :

Melissa Koch, SRI

melissa.koch@sri.org

Kiku Johnson, Girls Incorporated of Alameda County

kjohnson@girlsinc-alameda.org