



Girls InnovaTE³

Girls Innovating with Technology as Entrepreneurial Environmental Engineers

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Our Mission

SRI International (SRI), Girls Incorporated of Alameda County (Girls Inc.), and TERC are developing InnovaTE³, a comprehensive youth-centered environmental engineering and innovation curriculum that uses a cradle-to-cradle design approach to encourage high school girls' exploration of Earth systems science and interest in STEM careers.



Staff member works with girls reviewing parcels of land.

InnovaTE³ is part of our ongoing effort to create a six-year STEM continuum for middle and high school girls in an afterschool program. We previously developed Build IT, a design-based curriculum that uses communication and network technologies to foster middle school girls' IT fluency and interest in IT careers. Together, Build IT and InnovaTE³ provide 2 years of middle school and 4 years of high school STEM experiences for girls that help them to see science, information technology, engineering, and mathematics as relevant to their lives and as appealing and achievable career choices. InnovaTE³ and Build IT are cornerstones of the Girls Incorporated of Alameda County (Girls Inc.) afterschool program.



Goals

InnovaTE³ encourages girls to

- value and persist in STEM learning
- see pathways to STEM careers
- 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.

The Youth Development Approach

Girls Inc.'s Youth Development Approach offers programming that focuses on girls' needs, shows them the positive impact they can have on the world around them, and enables them to overcome gender and racial barriers in areas such as STEM. The InnovaTE³ curriculum engages the girls with women, much like themselves, who are innovating in STEM fields.

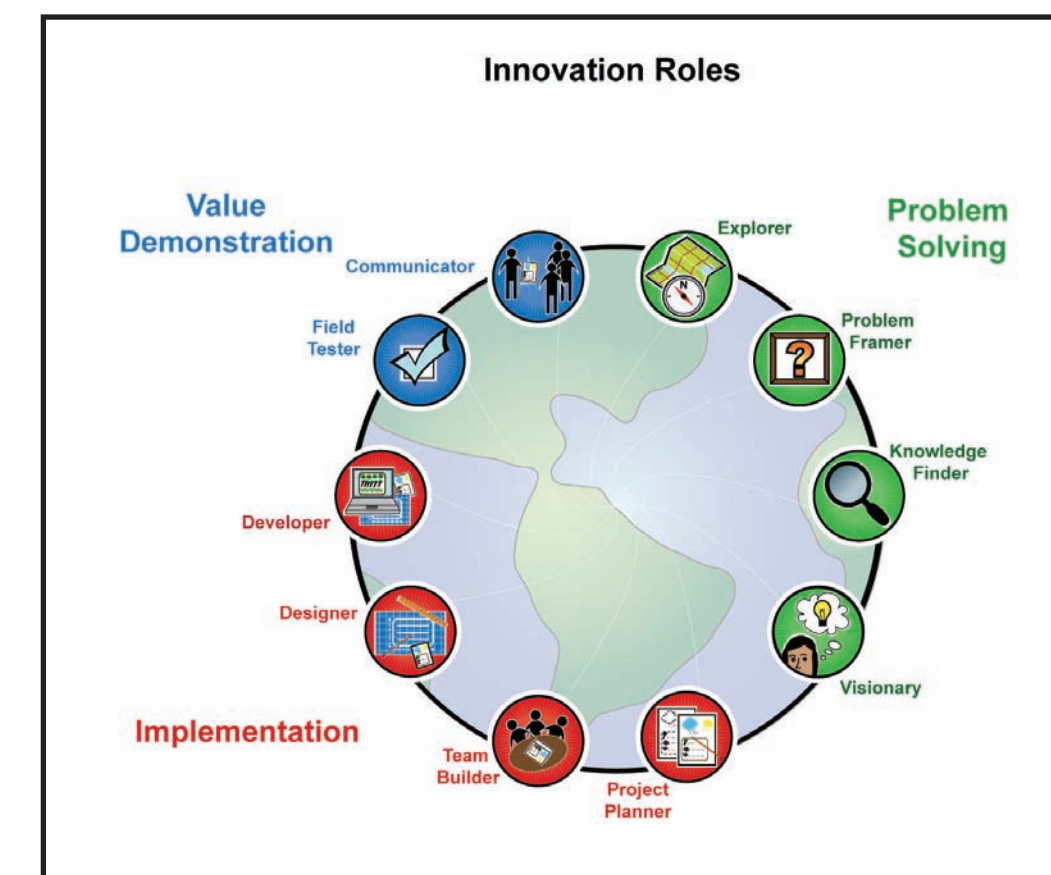
"Women Innovators" trading cards girls earn as incentives.



Our Process

Innovation Roles

Girls are able to try on roles at different junctures of the innovation process. The enduring understandings of innovation are captured in these roles of "Problem Solving", "Implementation" and "Value Demonstration". The enduring understandings include:



- Innovation starts with a problem that is recognized as an opportunity to meet users' needs.

- Implementing an innovation includes project planning, building a team, designing, and producing a product or service that is used in the real world.

- An innovation is unique among other possible solutions, and it has value to its users and, sometimes, the larger community.

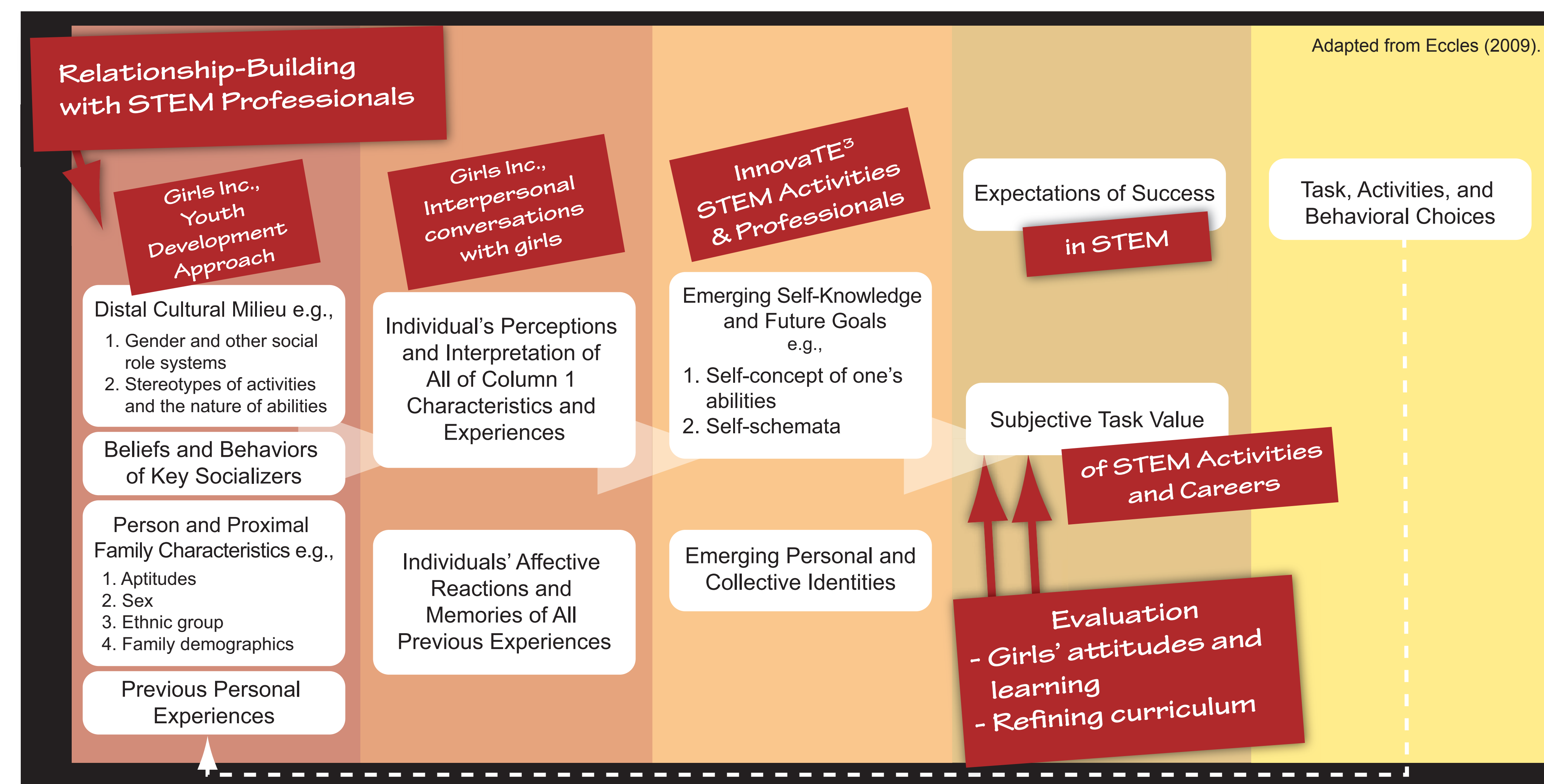
C2C

If humans are truly going to prosper, we will have to learn to imitate nature's highly effective cradle-to-cradle system. Three key design principles in the intelligence of natural systems can inform human design: (1) Waste Equals Food; (2) Use Current Solar Income; and (3) Celebrate Diversity (McDonough & Braungart 2003).



Influencing Girls' STEM Choices

Adapted version of the Eccles et al., Expectancy Value Model of Motivated Behavioral Choice that underlies InnovaTE³. Fundamental obstacles to girls entering the STEM workforce today are the value they place on STEM careers, their interests in STEM topics, and their perceived success in STEM fields. In InnovaTE³, girls see their interests reflected in Earth system science and innovation activities, and the STEM role models they meet who share their careers and provide the girls with feedback and encouragement. Girls are also shown a path to these careers – courses they need in school and college and internship opportunities.



McDonough, W., & Braungart, M. (2002). *Cradle to cradle: Remaking the way we make things*. NY: North Point Press.
Eccles, J. (2009). Who Am I and What Am I Going to Do With My Life? Personal and Collective Identities as Motivators of Action. *Educational Psychologist*, 44(2), 78–89.

The Curriculum

Year 1: Ecological Building.

- Girls investigate Earth System Science through the impact and causes of global warming.
- Girls redesign their communities, including new buildings for greener living using Google SketchUp and Google Earth.



Girls sketch floor plans with architects at a Perkins + Will field trip.

- 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.



Girls experiment with solar power.

Years 3 & 4: Pursuing Interests.

- Girls research science behind specific environmental issues and technologies.
- Girls choose internships and focus on college preparation for STEM areas of interest.

Our Participants

- 150 high school girls in Alameda County, California, during the curriculum development and research phase of the program; eventually reach more than 300 girls annually in Alameda County
- More than 80% of the girls 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 reach more than 800,000 middle and high school girls nationally each year through Girls Inc.'s 1,500 affiliate sites



Girls learn about site analysis.

Benefits to Girls

- Develop fluency in innovation and engineering
- Explore Earth system science in ways that connect to girls' everyday lives
- Address environmental issues and use technology tools to design solutions
- Interact with women STEM professionals
- Deepen understanding of STEM fields and pathways to STEM careers



Girls experiment with "pedal power" on Solar Living Institute field trip.



Girls research houses around the world.



Girls engaged in group planning with architects.

Evaluation

The formative evaluation plays a critical role in the iterative design of the curriculum, understanding what girls are learning and their attitudes towards STEM, and determining staff's capacity to implement the curriculum. It includes observations, interviews with staff and girls, written feedback from instructors, and performance tasks artifacts. The summative evaluation, through surveys and interviews, also captures girls' and staff STEM attitudes and learning over time.