STARS: Students Tackling Authentic and Relevant Science

What does “authentic and relevant” science for youth really mean?
Agenda

• National Girls Collaborative Project Overview
• Science STARS Overview
• Intro to Project-Based Science
• Developing & Refining Good Questions
• Case of Seattle STARS
NGCP Vision

The National Girls Collaborative Project (NGCP) brings together organizations that are committed to informing and encouraging girls to pursue careers in science, technology, engineering, and mathematics (STEM).
National Network of Collaborative Teams
NGCP Goals: Maximize Access to Shared Resources

Building a Network Through Collaboration

Girl Scout Council
- Wants to host STEM program for girls but their facilities are booked and they are looking for exciting hands-on activities.
- **NEED:** Facility, exciting hands-on activities, role models to deliver activities
- **RESOURCE:** Access to girls

Science Museum
- Looking for ways to attract more Latino, African American, and American Indian visitors.
- **NEED:** Access to girls, particularly under-represented girls
- **RESOURCE:** Facility, exciting hands-on activities

University
- A college chapter female engineering students wants to get involved in bringing more girls into the profession.
- **NEED:** Access to girls, exciting hands-on activities
- **RESOURCE:** Role models to inspire girls

Girls Inc.
- An after-school program for middle school girls needs ideas for how to offer motivating and engaging STEM experiences.
- **NEED:** Exciting hands-on activities, role models
- **RESOURCE:** Transportation to the event

During NanoDays (week-long celebration of nanotechnology), the science museum hosted a STEM Expo and lunch with role models and engineering students for an audience of 100 Latina mothers and daughters from local Girl Scout troops and Girls Inc. members. Activities from SciGirls and NISE Network (nanotech) engaged girls in hands-on activities, introduced girls and their mothers to local STEM role models, and informed mothers about the educational pipeline for STEM opportunities for their daughters.
NGCP Goals: Strengthening Capacity with Exemplary Practices
NGCP Goals: Gender Equity in STEM
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April Luehmann, University of Rochester
Sara Hagenah, University of Washington
How can we design inquiry-worthy questions that require youth shaping? And do this in ways that stretch our images of what science is and can do?

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Introductions
Commitment to Social Justice Through Science Education

- Using youth’s different cultural, linguistic, and socioeconomic backgrounds as legitimate resources
- Critiquing canonical knowledge
- Taking action against oppression

Calabrese Barton, 2003; Calabrese Barton & Tan, 2009, 2010; Cochran-Smith, 2008; Gay, 2000; Gonzalez, Moll, & Amanti, 2005; Grant, 2012
Learning as Identity Development

- “Ways of combining and integrating language, actions, interactions, ways of thinking, believing, valuing, and using various symbols, tools and objects to enact a particular socially recognizable identity” (Gee, 2005, p.21)

- Identity Resources
  - Accountability
  - Agency
  - Feedback
  - Activity
  - Positioning
  - Support
  (Luehmann, 2009; Nasir & Hand, 2006)
Science STARS
students tackling authentic & relevant science

View the Full Video here: https://vimeo.com/103734860
Project-Based Science

- Start with problem or design challenge, stated as a question to pursue
- Explore the problem through inquiry (empirical studies, research, experts and models)
- Work toward a scientific explanation or evidence-based solution
- Process is guided through value and problematizing of youth voices
- Work is collective
- Tangible artifacts are created that address the problem
- Feedback (critique) and reflection hold work accountable

(inspired by list by Keith Sawyer, Joe Krajcik and others)
Art class was over, but Yashti sat glued to her chair.

Her paper was empty.

"I just CAN'T draw!"

Some examples to think with…

Why do we crave what we do? What is the science of teen depression? How do energy drinks impact our health? How many windmills does it take to power our school? Why is our beach always closed, and what can we do about it? How does BPA impact our health? What role does meat play in our lives? How germy is our school? How does music move us?

What are we looking for in a good question? How do we decide which of these are better or worse at doing the important work we need them to do?

Use the chat box to tell us what qualities you look for in a driving question.
Importance of a Good Question

Multiple opportunities to try & fail, opportunities to experience meaningful success, & reason to invest a lot of energy (Gee, 2003, pp.61-2)
Considerations & Tensions

- How can voices be heard?
  - Kids’ currency
  - Accessibility of the question
  - Expertise and limits of the facilitators
  - Content / practices / connections

- Structure and openness (malleability)

- Other targets
  - Embodied
  - Enticing (fascinating, personal, important)
  - Scientific instrumentation
  - Access to expertise – investigate the borders
Some Support Strategies for Collaborative Development

Use the chat box to share your tools and strategies for HOW YOU prepare or refine a question

- **STATION 1**: Clarity on what the “PROVACION” (driving question) is and why it’s worth studying (3 sentences)

- **STATION 2**: What are the “gotta have’s” (concepts) in the science explanation & what are possible sources of expertise?

- **STATION 3**: Inquiry Question & Series of Investigations, plus consideration of scientific tools

- **STATION 4**: Community resources and connections
1. “Provacion” (provocative question) – Bronwyn Bevan, Exploratorium
Youth’s Currency/Accessibility

Image yourself to be an urban high school teenager? What experiences might you bring to this question/lab team work? Use the chat.

- Provocacion: How do energy drinks impact our health?
  - Testable question: How do different concentrations of caffeine impact the heart rate of a water flea?
Youth’s Currency/Accessibility

Image yourself to be an urban high school teenager? What experiences might you bring to this question/lab team work? Use the chat.

- Provocacion: How do energy drinks impact our health?
  - Testable question: How do different concentrations of caffeine impact the heart rate of a water flea?

- Proacion: How do household cleaning products impact the amount of greenhouse gases produced?
Drawing a ring around a problem space:

- Sometimes we collaborate with the youth from the very beginning...
- Sometimes we create many big rings and invite youth to step into the one she can and wants to shape.
- KEY: The shape is loose.

How does music move us?  

Mad Dirty – is it or isn’t it?  

Me and Vitamin C – Do I really need more?  

How can we “grow” our cash?  

How can we bulk up with biology?
2.” Gotta-Have’s” – core science ideas that will be needed

How do we get the energy we need to do the things we do?

- We are made of cells.
- Food gets through the digestive system into our blood stream.
- The blood stream takes food to our cells all over our body.
- Both water and glucose can cross membranes to get in.
- Cells use glucose, produce waste for growth and energy.

Bryan Reiser, NGSS Slides for National Academies

3. Series of Investigations – what could we imagine?

**Questions**
- What is my body made of?
- Where does food go?
- Where is blood taking the food?
- Can food get into the cells?
- Can cells actually use the glucose?

**Investigations**
- Microscope investigations
- Food digestion, blood glucose
- Trace food in circ. system
- Onion cell, cell model exps.
- Use of glucose by yeast

**Explanations**
- We are made out of cells.
- Food goes thru digestive system into blood stream.
- Blood stream takes food to cells all over the body
- Both water and glucose can cross membrane to get in
- Cells use glucose, produce waste, for growth and energy

Brian Reiser, NGSS Slides for National Academies
4. Community Connections

2013 SUMMARY OF BEACHES REGULATED BY THE MONROE COUNTY DEPARTMENT OF PUBLIC HEALTH

ONTARIO BEACH:
Season - June 21, 2013 to September 2, 2013
Open Daily, 74 days
Open: 32 days 43%
Closed: 42 days 57%

Ellen Dennis - Psychiatric Nurse Practitioner

Morgan School Of Driving Inc.
“It becomes the first task of the teacher who would base her program with young children on the exploration of the environment to explore the environment herself. She must know how her community keeps house – how it gets water, its coal, its electric power, its food, who are the workers that make the community function. She must know where the pipes in her room lead to, where the coal is kept in the school, when the meters are read and by whom; she must know the geographic features which characterize her particular environment and strive constantly to see how they have changed by that work.”
“It becomes the first task of the teacher who would base her program with young children on the exploration of the environment to explore the environment herself. She must know how her community keeps house—how it gets water, its coal, its electric power, its food, who are the workers that make the community function. She must know where the pipes in her room lead to, where the coal is kept in the school, when the meters are read and by whom; she must know the geographic features which characterize her particular environment and strive constantly to see how they have changed by that work.”

“And when she knows all this and much, much more, she must keep most of it to herself! She does not gather information to become an encyclopedia, a peripatetic textbook. She gathers this information in order to place the children in strategic positions for making explorations... (Mitchell, 1934/1971, pp. 16-17).
The Case of Seattle STARS
Action-Oriented Science

- Ambitious science teaching practices with action-oriented component
  - Calabrese Barton & Tan, 2009
  - Windschitl, Thompson, Braaten, & Stroupe, 2012

- What puzzling phenomena can we explore that our girls could take action on?

- How do we develop rigorous science explanations together that we can take action with?
What do you take a stand for in and out of school?

“We want to speak up for those that can’t speak up for themselves.”
Why is our local lake polluted and why does it take so long to clean it up?
Gathering Evidence & Sharing Science and Personal Stories
Using Evidence-Based and Lived Ideas to Construct Science Models
Communicating With Our Community

- Signs around lake
- Working with local scientists and the park department
- Community film showing

Using Science to Take Action
Tensions & Challenges

- Anticipated and expected
  - Permissions for leaders to make decisions
  - Comfort in the not-knowing
  - Attending to the social and science aspects
  - Anticipating problematizing moments
  - Balancing inquiry and action
  - Creative ways to share findings and work

CHAT BOX: What other tensions or challenges can you imagine or have you experienced?
Thank you for thinking with us today!

Our website is under construction but you can still access links to watch the movies here: http://getrealscience.org/get-real-science-movies/

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Get Involved

National Girls Collaborative Project

What does NGCP mean to you? We often hear from you, our community, the phrase “I love NGCP...” and it means so much to us! This month NGCP is turning 12 and to celebrate we are taking collaboration love viral. Share why you love NGCP using the hashtag #LOVENGCP.

I♥NGCP
Get Involved

NGCProject
@ngcproject
Advancing K-12 Girls in STEM through Organizational Networks, Collaboration, and Discourse.

United States
ngcproject.org
Joined March 2009

46 Photos and videos

Tweets
Tweets & replies

NGCProject @ngcproject 47m
What does NGCP mean to you? Share why you love NGCP using the hashtag #LOVINGC & help us celebrate 12 years supporting girlsinSTEM!

NGCProject @ngcproject 2h
Whew, lots of #STEM happenings in our latest e-news, including @ncwit @SWEtalk @conradawards @SACNAS! ow.ly/B3JdP

NGCProject @ngcproject 4h
Registration is open for @verizon's App Challenge and Summer internship ideas!

National Girls Collaborative Project

Access STEM
American School Counselor Association
EDC
AWE
Google
Manufacturing Institute
Get Involved

NGCP Supports Science STARS Blogging Project
Science STARS, featured in the September 5th webinar, received NGCP mini-grant funding to produce a series of blog posts written by Science STARS students. STARS Blog Science: A voice for urban girls in science offers a unique look into the lives of a group of girls and how they think about science.

Collaborative Network Activities
Help our Collaboratives connect and serve local programs. Please let your colleagues know about these events happening around the United States. Each month we will send out a call to highlight the programming in our Collaborative network.

Live from New York, it’s the new NY STEAM Girls Collaborative!
Help NY STEAM Girls Collaborative spread the word to New York based organizations that are committed to informing and encouraging girls to pursue careers in STEM by joining their e-newsletter distribution list and adding your

NGCP Updates
Why Do You Love NGCP?
We often hear from you, our community, the phrase “I love NGCP…” and it means so much to us! This month NGCP is turning 12 and to celebrate we are taking collaboration love viral! Share why you love NGCP on social media, using the hashtag #LOVENGCP.
What does NGCP mean to you?

Quick Links
- Newsletter Archive
- NGCP Website
- NGCP Facebook
- NGCP Twitter
- NGCP Blog
- FabFems

In This Issue
- Collaborative Network Activities
- FabFems Spotlight
- Upcoming STEM Events
- Champions for Collaboration Resources
- Global Resources

NGCP Blog
FabFems

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Upcoming NGCP Webinars

Smithsonian Latino Virtual Museum (LVM)
October 2, 2014
11:00am-PST/ 2:00pm-EST