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).

www.ngcproject.org
Current Collaborative Sites

Regional Collaboratives

California:  
www.ngcproject.org/california

Florida:  
www.ngcproject.org/florida

North Carolina:  
www.ngcproject.org/northcarolina

Northwest:  
www.ngcproject.org/northwest

Texas:  
www.ngcproject.org/texas

Connecticut:  
www.ngcproject.org/connecticut

Kentucky:  
www.ngcproject.org/kentucky

Maine:  
www.ngcproject.org/maine

Tennessee:  
www.ngcproject.org/tennessee

Great Lakes (IL, IN, MI, OH, WI)  
http://ngcproject.org/greatlakes
**Project Goals**

1. Maximize access to shared resources within projects and with public and private sector organizations and institutions interested in expanding girls' participation in STEM.

2. Strengthen capacity of existing and evolving projects by sharing promising practice research and program models, outcomes and products.

3. Use the leverage of a network or collaboration of individual girl-serving STEM programs to create the tipping point for gender equity in STEM.
"Effective Strategies for Working With Girls in STEM"

Suzanne Reynolds-Alpert, M.A.
Technical Assistance Associate, ITEST Learning Resource Center
Girls are Still Underrepresented in STEM

• Lower enrollments in STEM-related coursework

• Lower participation in STEM workforce

• Girls of color & ELL—greater disparity
Girls are Still Underrepresented in STEM, continued

- Gendering of educational trajectories remains a problem

- Implicit bias is a problem

- Women with graduate and post-graduate STEM degrees more likely to work part-time
New Research

Some new research is looking at:

- Women’s participation in STEM careers from a global perspective:
  - Linking of national economic success to women’s participation in STEM
  - “Attributes defined as ‘feminine’, such as teamwork and communication...are becoming increasingly attractive to employers, as they become increasingly tied to profits.” (Phipps, 2005)
New Research, continued

Some new research is looking at:

- Girl’s and women’s under-participation from a more critical feminist viewpoint
  - Too much focus on “the problem with girls” and not enough on the environment and structures girls operate in (i.e. Phipps (2006), Blickenstaff (2005), Kinzie (2007))

- “Leaky pipeline”—different viewpoints
  - “Athena Factor” looks at women in STEM in private sector
  - Increasing view of “pipeline” as socially-situated
Six Key Strategies to Engage Girls... updated

- Experiential learning
- Mentoring
- STEM career perceptions
- Importance of 21\textsuperscript{st} century skills
- Fostering persistence
- Creating a culture of high expectations
- Creating change at the institutional levels...
1 -- Experiential Learning

• Contextual STEM experiences that connect the subject matter to the real world
  – Opportunities for students to use STEM while researching in their neighborhoods; culture

• Embedding STEM concepts into meaningful cultural and human contexts

continued....
1 -- Experiential Learning, continued

- Project-based learning and scientific inquiry
- Linking formal and informal learning strategies
  - Formal learning strategies provide needed structure, e.g., a teacher to clarify steps, provide knowledge foundation
  - “Hands-on” and experiential learning translate to increased student interest, higher achievement, sense of mastery
2 -- Mentoring

- Relationships and career development
- Peer and near-peer mentoring, families, exposure to women STEM professionals
  - Women who are successful & comfortable in roles as scientists, mothers, etc.
- Use local/community resources
3 -- Positive Perceptions of STEM Careers

• Making a difference
• Impact on society
  – Environment, helping others, etc
• Not solitary occupations
• Combating the ‘geek’ factor…or embracing it!
  – “Revenge of the Nerdette” (Newsweek, June 2008)
4 -- 21st Century Skills

• Not just about academics
• Variety of skills needed in the workplace
• Quality STEM content + technical skill + exposure to 21st century skills. For e.g.,
  – Critical thinking and problem solving
  – Communication, collaboration and social skills
  – Creativity
  – Flexibility and adaptability
  – Leadership
5 -- Fostering Persistence

• “Once in, girls persist”
  - Overcome barriers to participation—key 1st step!

• Developing an overall sense of self-efficacy
  - Parental buy-in
  - Appreciation of girls’ individual identities
  - Dispelling myths and gender stereotypes about their capabilities
  - Maintaining open communication about all these issues
  - “You don’t have to be ‘the best’ in math & science!”
6 -- High Expectations

Begin program design with the assumption that girls *can* and *will* excel!

- Reinforce this message continually
- Design programs that are compensatory and intentional about battling negative stereotypes
- Allow girls to make big and interesting mistakes
- Provide a ‘safe’, supportive and judgment-free environment in which to succeed *and* fail
7 - Creating Change at the Institutional Levels

Programs that include mentoring, address the unique learning styles of girls and underrepresented populations, and engage these youth in hands-on intensive learning experiences have a positive impact and need to continue...
7 - Creating Change at the Institutional Levels, continued

But, the time has come to start advocating for change at the institutional levels:

- Require science- and math-intensive coursework
- Emphasize depth vs. breadth of subject matter in introductory science and math (Tai & Sadler, 2001)
- Increased integration of STEM within general curriculum
- Continue to increase teacher’s knowledge of STEM; the ways in which girls & underrepresented populations have “learned” to shy away from STEM
The Reality

• No “one size fits all” solution
• Women’s under-participation due to a myriad of factors which inter-relate
• When designing a program, know all you can about the culture of the students and/or teachers...and use the most effective solutions possible
A Final note...

“To make a real difference to gender equality within science, engineering and technology, a coordinated approach is needed, involving all organizations that impact on the sector, on the choices women and girls make and the experiences they face in education and at work.”

(Phipps, 2005)
Supporting Research & Resources


Supporting Research & Resources, continued

Resources

• The Innovative Technology Experiences for Students and Teachers (ITEST) Program (http://www2.edc.org/itestlrc/)

• Promising Practices in Afterschool (http://www.afterschool.org/)

• The YouthLearn Initiative (http://www.youthlearn.org/)

• The Fun Works (http://www.thefunworks.org/)

• Serious Games (http://seriousgamessource.com/)

• Girl Scouts STEM resources (http://www.girlscouts.org/program/program_opportunities/science/)

Resources, continued

- Gender, Diversities, and Technology Institute links to resources ([http://www2.edc.org/gdi/links.htm](http://www2.edc.org/gdi/links.htm))
- Shampoos, etc! ([http://bingweb.binghamton.edu/~annatan/shampoo/](http://bingweb.binghamton.edu/~annatan/shampoo/))
Contact Information

Suzanne Reynolds-Alpert, Technical Assistance & Research Associate
ITEST LEARNING RESOURCE CENTER
sreynoldsalpert@edc.org
617-618-2764
BUILD IT

NSF ESI-0624709

Using Underwater Robotic Vehicles to Build IT and Pre-Engineering Skills

Jason Sayres
Curriculum and Professional Development Specialist
Science and Engineering Education
NSF *ITEST* Project 2006-09

- Increase engineering, science, IT achievement and career interest
- 36 diverse middle and high schools in NJ (one in NYC)
- 72 teachers involved for 3 years
- >2,600 students over 3 years
Why Underwater Robotics?

• Presents unique, complex design challenges (e.g., buoyancy, control in 3-D)
• LEGO enables rapid prototyping, testing, redesign
• Exposure to concepts like propulsion, drag, buoyancy and stability, gearing, torque, speed, and thrust
Why LEGO®s?

- Familiarity
- Ease of use and durability
- Variety of pieces
- Rapid construction and redesign – “Tweak friendly”
- Fewer components required to create start-up kit
Project Challenge

• Using LEGO and related components, create an underwater ROV (remotely operated vehicle) that will be able to pick up weighted wiffle balls and deposit them in a bin.
Task 1 – Straight Line Challenge

• Use a single motor to build a vehicle that can travel the diameter of the pool on the surface as quickly as possible; optimize gearing to achieve best propeller speed.
Task 2 – Figure Eight Challenge

• Use a second motor to enable steering; maneuver on surface to complete a slalom course around two buoys in shortest time.
Task 3 – Submerge Challenge

- Use a third motor and other materials to control the vehicle's buoyancy in order to descend and rise vertically in water.
Task 4 – Grabber Challenge

• Design a motorized mechanical manipulator which can grasp specified objects; build an electrical control system which uses 4 switches to control 4 motors; each switch must have 3 positions (forward, backward, off).
Task 5 – Final Challenge

• Produce a vehicle which can retrieve the greatest number of objects from the bottom of the pool within a specified period.

• Objects must be deposited in bins at various depths in the water to score points.
Girls’ Participation in BUILD IT

• Comprehensive project; data not collected specifically on girls

• Observations from school and summer institutes:
  – LEGO provides low project entry threshold—engineering design less intimidating
  – Girls less wedded to poor designs than boys; more willing to adopt/adapt designs and learn from others what works well
  – Girls’ attention to detail in the design, programming
Girls and STEM
Where Are They?

Wendy Green
NJTEA 2006-7 Past President
Technology Teacher
TSA Advisor
What’s wrong with this picture?

In 2004, only 18.5 per cent of undergraduate engineering students are women, as demonstrated in the foreground of this picture. (Jeff Prevett - left)
Same Question?

Here’s a more recent photo showing the females being outnumbered.
Not an Elective Class

- Require courses in Technology Education or Pre-engineering for all females (and student)
- Give females a chance to experience the design process
- Expose females to the thought of being an engineer
Attitude in Classes/Clubs

- I can do it, you can do it
- Confident demonstrations
- Equal treatment for male and female
- Avoid gender bias
Group Work

♦ Female groups encourage them to take on leadership roles and gain confidence
♦ Groups with more females than males allows for leadership to take place also
Gender Friendly Activities

♦ Space Simulation
♦ Cat Recreation Furniture
♦ Fishing Lures
♦ Underwater Robotics
♦ Cardboard Armada
Fishing Lure
STEM Programs at The Girl Scouts of Central Texas

An overview

http://www.gsctx.org
Who & Where

- Serve over 4000 girls in STEM Programs each year
- Membership of over 20,000 Girl Scouts across 46 Counties

http://www.gsctx.org

Girl Scouts of Central Texas
Program Types

- Workshops
- Collaborative Events
- Special Interest Groups
- Camps
- Resource Kits
- Outreach Programs

Girl Scouts of Central Texas

http://www.gsctx.org
Program Evolution
Program Evolution

- Established in 2000
- First ever computer lab for Girl Scouts in the USA
- Served about 100 girls/year
- Basic computer skills curriculum presented to participants
Program Evolution

• Workshops introduced in 2005

• Traditional GS badge and patch programs modified to include new technology like Google Earth

• Each workshop designed to teach a specific skill in a non-traditional manner

• Served about 1500 girls/year

http://www.gsctx.org

Girl Scouts of Central Texas
Program Evolution

• Camps, collaborative events, outreach programs increased

• Focus on all STEM areas, with sold-out science summer camps based on popular books like Lightning Thief and Harry Potter

• Curriculum updated to incorporate research data from the Girl Scout research Institute.

• Served about 3500 girls/year
Program Evolution

• Programs expanded to all 46 Counties in Central Texas

• Traveling program initiated with trained staff and equipment traveling to remote locations

• Outreach program expanded to include regular after-school clubs

• Served over 5000 girls this year

http://www.gsctx.org

Girl Scouts of Central Texas
What Works

• Schedule groups at their convenience

• Have pre-set curriculum with broad appeal

• Train multiple teachers/volunteers to deliver programs after school and on weekends

• Incorporate STEM into programs in non-traditional ways

• Build successful collaborations with other organizations

• Provide older girls with an opportunity to work with younger girls

Girl Scouts of Central Texas

http://www.gsctx.org
Girl Scout Best Practices

Program Design Keys
Discover
Connect
Take Action

Program Delivery Processes
Girl Led
Learning by Doing
Cooperative Learning

Girl-led is just what it sounds like—girls play an active part in figuring out the what, where, when, how, and why of their activities.

Learning by doing is a hands-on learning process that engages girls in continuous cycles of action and reflection that result in deeper understanding of concepts and mastery of practical skills.

Through cooperative learning, girls work together toward shared goals in an atmosphere of respect and collaboration that encourages the sharing of skills, knowledge, and learning.

http://www.gsctx.org

Girl Scouts of Central Texas
Funding and Marketing

- Programs fully funded by grants and revenue
- Marketing through traditional GS methods and through other channels like the Texas Girls’ Collaborative Project
- Collaborative events like EYH, Maker Faire, Design Squad
- FLL, Café Click, Program Aide Training

Possibilities:
- A bi-annual catalog of activities
- Fliers, Email blasts, eNewsletters

http://www.gsctx.org
STEM Program Faces

http://www.gsctx.org

Girl Scouts of Central Texas
Questions, comments, feedback - savitar@gsctx.org
Time for Questions

Please use the Chat section of your screen and type any questions you have for the presenters. We will answer as many as time allows.

In case we can’t get to all of your questions, presenter contact information will be available in the archived webcast materials available at:

www.ngcproject.org/events/webcastarchive.cfm
More NGCP Information

Program Directory
www.ngcproject.org/directory

Mini-Grant Application
www.ngcproject.org/mini-grant

Join the NGCP listserv
www.ngcproject.org/resources/newsletter.html

Upcoming Webcast
Wednesday, October 8, 2008, 11:00-12:00 (Pacific time)
Creating collaborations with NGCP mini-grants
www.ngcproject.org/events/webcasts.cfm