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NATIONAL GIRLS COLLABORATIVE PROJECT

Idea Brief

Advancing the Agenda in Gender Equity for Science, Technology, Engineering and Mathematics

This Idea Brief is available online at www.ngcproject.org/

The National Girls Collaborative Project (NGCP) partners with Education Development Center, Inc. (EDC) to provide capacity-building topical webcasts that assist girl-serving organizations. We are pleased to join NGCP in our joint mission to inform and encourage girls to pursue careers in science, technology, engineering, and mathematics.

EDC assists NGCP by providing expertise on research-based strategies, co-hosting online events, and producing summary publications from joint EDC/NGCP events. This Idea Brief is the second in a series of publications that will summarize key points presented in topical webcasts.

This Idea Brief highlights key points from the November 14, 2007 webcast. Content experts were Sarita Nair-Pillai (co-PI at the National Science Foundation [NSF]-funded ITEST Learning Resource Center at EDC), Jill Denner (PI of the NSF-funded project Girl Game Company), and Zakiyyah Kareem (Program Manager at the NSF-funded project IT Girl.) Sarita reviewed relevant research and strategies, while her co-presenters discussed how these strategies have been implemented and proven successful in their projects.

Effective Strategies for Working with Girls in Science, Technology, Engineering, & Math

About the Presenter:
Sarita Nair-Pillai directs a number of projects funded by NSF. She is a co-PI on ITEST (Innovative Technology Experiences for Students and Teachers) which engages youth and teachers in STEM through intensive, hands-on learning experiences. Sarita's work focuses on engaging youth—particularly those underserved and underrepresented in STEM education and the STEM workforce. "This topic is close to my heart," said Sarita, "because of my past work as a software engineer and my own life's journey—I know first-hand how important these strategies are."

From Research to Practice

Sarita presented six strategies that both research and practice support as being effective to engage girls in STEM:

- MENTORING
- EXPERIENTIAL LEARNING
- STEM CAREER PERCEPTIONS
- IMPORTANCE OF 21st CENTURY SKILLS
- FOSTERING PERSISTENCE
- CREATING A CULTURE OF HIGH EXPECTATION

Mentoring. Current career development literature strongly supports the importance and influences of family, friends, educators, and professionals on young womens' career decision-making process. "Womens' relationships are highly relevant and are certainly an organizing factor in their career decisions—hence, the importance of mentors for young girls." Said Sarita.

Peer and near-peer mentoring is also impactful and offers two very important benefits to girls: 1) Insight into the STEM interests of their peers and the professional lives of women that are in STEM fields; and 2) Exposure that helps to combat some of the negative gender stereotypes that often dissuade girls from going into STEM. These include notions that the field is for 'boys only,' and that these occupations are solitary or dull. "The gender stereotypes are particularly insidious because gender ideas have already started to form by middle school." Noted Sarita.

There are challenges to recruiting mentors, but successful strategies include using local and community resources, obtaining assistance from older students pursuing STEM, and looking for volunteers from teacher and afterschool programs. Local chapters of professional societies, such as the Society of Women Engineers (SWE), are also good places to recruit. Corporations often desire to nurture local connections, and many have womens' initiatives or STEM-related employee groups.

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Experiential Learning. Research demonstrates that young people thrive in learning environments where they are exposed to experiential, contextual subject matter. Girls are engaged when they see the connections between subject matter and how technology can help solve pressing environmental issues, for example. "Embedding the learning into meaningful contexts is important; as are inquiry-based experiences that are linked to strong standard-based subject matter." Said Sarita.

STEM Career Perceptions. To combat negative perceptions of STEM careers, regularly integrate content into activities that positively promotes the field of STEM and the women who choose STEM-related careers. "There are a lot of stereotypes that exist, including perceptions that these fields are largely solitary occupations." Explained Sarita, "Misperceptions abound that these occupations are just not 'cool.' Research supports that girls really care about making a difference in the world—about having an impact on society. Enlightening about the ways that STEM does just that can be a very powerful tool for sparking interest in these fields."

21st Century Skill Development. There is some confusion about what is meant by '21st century skills'—what it is and why it's important. "At its core it's really about debunking some of the myths about what it takes to be successful in these fields." Explained Sarita. An example of this is helping girls understand that they don't have to be 'the best' student in math and science classes; and that there are many other skills they possess that are important and vital to the world and in the workplace. These skills include the ability to collaborate and adapt to novel situations, problem-solving, effective social skills, creativity, and leadership ability.

Fostering Persistence. A measure of success for any program is for participants to have developed an overall sense of self-efficacy. When designing your program and planning the activities, you will want to keep asking yourself, 'What happens to these girls once they leave the supportive and engaging environment of the program?' Do your best to ensure that the girls have fun and build their confidence up while they learn valuable skills. Affirm that their individual identities matter. Another key to persistence is **parental buy-in**. Make parents feel invested by including them in activities where possible, and showing them how important these skills are for their childrens' futures. Communicate to parents and caregivers how impactful their support is and encourage them to dispel myths and stereotypes whenever possible.

High Expectations. "Begin any program design with the assumption that girls **can** and **will** excel," Sarita counseled, "and find ways to reinforce this message continually with girls." Allow girls to make big and interesting mistakes in the supportive environment of your program. Provide a judgement-free environment where girls can take risks and be leaders.

About the Presenter:
Jill Denner is PI of the NSF-funded ITEST project Girl Game Company. The project is in its' second year of a three-year grant. Jill is a Senior Research Associate at ETR Associates.

The Girl Game Company hopes to reach a minimum of eighty girls over two cohorts. Girls typically engage in activities one day per week during the school year, and for a three-week intensive session during the summer. The activities are included as part of the participating schools' extended learning day enrichment programs. "Our goal is specifically to increase girls' interest, capacity, and motivation to pursue a career in STEM—particularly in the area of Information Technology." Explained Jill.

"Embedding the learning into meaningful contexts is important; as are inquiry-based experiences that are linked to strong standard-based subject matter."

The project participants are middle school girls from rural, central California. Most of the girls' families work in agriculture. The majority are Latina, with the highest proportion having roots in Mexico. The girls possess a range of computer experience, and have differing levels of access to computers at home. The project benefits from the learnings of a prior project, **Girls Creating Games**, which Jill also participated in. "We have made the lesson plans, program guides, girls' games, and publications available on our Web site." Said Jill. *(Note: please see Resources on page 4 for the link.)*

Sharing Strategies

Jill shared three strategies that have worked well in the Girl Game Company. These strategies illustrate several of the points made by Sarita.

Use instructional approaches that research and program staff say appeal to girls. A project-based, design-based learning approach has worked very well with the girls in the Girl Game Company. The girls make a product (a digital game) that others can play. The project activities take place in the context of a 'company'—the girls all have specific roles in the company, whose purpose is to make games for "clients." The games are placed in the online community of Whyville, which is a science-based online community for preteens. The company's first client was NSF. "It's meaningful to the girls that they're really making something for other people to use." Said Jill. Research has shown that girls want to use technology to improve the world—many of the Girl Game Company's games tackle issues like global warming or cultural tolerance. "The girls don't want to just 'play for fun.'" She noted.

In addition, the instructional approach of pair programming is used. Two girls share one computer and they work together. One is the driver controlling the mouse and keyboard, and the other is the navigator who also provides input; they then trade off positions. The project

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has developed many activities to support girls in working together. Jill said that an extensive strategy for pairing girls has been developed. It ensures that the girls can work together productively and have fun. Jill and her staff also believe that the female-only environment helps to foster a positive learning environment for the girls.

Expose girls to career paths in digital game design and the technology industry. In addition to becoming 'employees' at the Girl Game Company, project participants go on field trips to universities and local technology companies such as Google and Electronic Arts. Jill noted with pride that girls were asked by Google to come back and show their games to the employees there!

Exposing the girls to workers in the technology field allows opportunity to dispel stereotypes. Echoing Sarita's earlier comments, Jill noted that "In middle school, girls are exploring different identities, and we've found that it's very important to situate these within the context of the family—including family obligations and cultural traditions. So one of the things professionals talk to the girls about are their families and how a career in IT impacts that."

Increase girls' network of support to pursue IT careers and classes. Try to generate real networks of support around girls. Solicit help from college students pursuing technical careers. Recruit mentors from local businesses. Role models can assist either in-person or virtually. Jill has found that contact with tech-savvy peers in Whyville is helpful. "The girls love going on there, and we use it as an incentive to get them to do some of the harder technological tasks. They love to chat, go online, and create and change their avatars."

Family involvement is crucial. The Girl Game Co. hosts a series of 'family nights' where information is presented on internet safety, career options, what it takes to apply to college, and more. Child care is provided, and meals (not just snacks) are served to make it easy for families to attend. Simultaneous translation is also offered, and this has made the gatherings very successful.

June 8-11	WEPAN Conference (www.wepan.org)
June 11	Webcast: The Gender Chip Project: How Can We Use Media to Inspire Girls to Enter the Science & Technology Fields?
June 22	ASEE Annual Conference

About the Presenter:
Zakiyyah Kareem works on the NSF-funded ITEST Project IT Girl. She is a Program Manager at Girlstart, a non-profit in Austin, Texas.

The projects at Girlstart have been using methods that work to engage girls. Zakiyyah has observed first-hand that an all-girl environment is very effective. Many of Girlstart's programs employ college-level students with backgrounds in teaching. "This creates a really laid-back environment that removes a barrier and fosters trust and exploration." Zakiyyah said of the near-peer mentoring system. Confidence-building is also a key component. "We want to increase their confidence so that when they enter traditional learning environments, they know that they can succeed."

Zakiyyah explained that Girlstart offers different types of programs. An after school component (Club Girlstart) is for 6-8th grade and participants are nominated by their teachers. The girls engage in activities which cover science, career education, engineering and technology. There are also Saturday camps which are free and open to the community; and week-long summer camps for girls in grades 6-8 and 4-5. These camps pique girls' interest by including robotics, forensic science, and web design in activities. Like the Girl Game Company, Girlstart's programs integrate family and see this as a key to success. A girl's entire family is invited to participate in selected activities.

Making a Difference

Project IT Girl is for high school students, and was developed in direct response to issues of gender equity and the gender gap in the hi-tech fields. "Our goals," explained Zakiyyah, "were to provide really unique experiences for high school girls…we wanted to improve their confidence in pursuing technical education and careers, and we wanted to help them see how their technology use could make a difference in their communities."

The first cohort of girls are in their junior year of high school, and began the program as sophomores. Because of the three-year commitment, IT Girl staff wanted to recruit committed girls with supportive families. They used outreach and targeted school promotions to garner participants.

Although the girls have self-selected to be in the program, they come with differing levels of computer experience. Zakiyyah also emphasized that the girls are very socially motivated. The second year of the program focuses on computer programming, and the girls will be learning Python to create educational games. These games will be submitted to the One Laptop Per Child program for possible inclusion on the XO laptop. All games will be available for download

from the Project IT Girl Web site (http://www.girlstart.org/itgirl/games.html).

To keep the girls engaged, IT Girl employs the following strategies:

Career Exploration. The project has reached out to the surrounding community and the girls have had the opportunity to interview experts. As part of the summer academy, women from the technology community were invited to come and talk about their jobs, their lives, and the journeys that brought them into the technology field. In particular, the girls are interested to know how these professionals balance their lives and families with their careers. Girls are also taken to the University of Texas for open houses to explore different majors. At the university, they had the opportunity to see a supercomputer in action. "By exposing them to different things, the girls come up with some great ideas," said Zakiyyah. "One of these was creating an avatar to interact with the supercomputer—the scientist showing us around said it was a good idea and that he never would have thought of it himself!"

Modeling. Exposing the girls to college-aged women pursuing STEM studies helps foster a supportive and comfortable atmosphere for the girls. Recently, women professionals with backgrounds in programming were brought in to trouble-shoot and debug the girls' programs, and the girls have really welcomed their help. "We have lots of celebrations once we get the code errors fixed," said Zakiyyah.

Mentoring. As Sarita and Jill illustrated, mentoring is a key component to a successful program. IT Girl emphasizes a particular aspect of mentoring: "Our goal is to connect the middle school girls with the high school girls in ways that are meaningful for both of them." (High school-aged girls get college-aged mentors.) "This vision of multi-generational mentoring is something we're really excited about. We're finding great ways to connect the girls to the larger community; and the larger community to our program."

Selected Q & A

Q: How many staff work with the Girl Game Company?

A: (Jill Denner) We have a lead teacher and a program coordinator. They both work directly with the girls. We're also working with the school to involve some of the regular teachers who are on-site.

Q: Are the materials available in Spanish? Are they culturally relevant and accessible for the girls and their parents?

A: (Jill Denner) Some of our materials are translated, and done so that they are as culturally relevant as possible. We also pair girls that are considered ELL with girls who are English dominant. We are still trying to determine whether this is enough; or if we do need to translate all our materials. What we have is available on our Web site.

Q: How are your free Saturday programs funded?

A: (Zakiyyah Kareem) We are funded through different grants and have foundation support as well as support from various companies and individuals.

Q: How do you measure the change in girls' self-confidence?

A: (Zakiyyah Kareem) Each girl is given a pre-survey which asks attitudinal questions including their thoughts and feeling regarding science and technology. We also do a post-survey on those same questions, so we are able to look at what has shifted.

Q: What criteria do you use in pairing girls?

A: (Jill Denner) We ask the girls to tell us three people they would be willing to be paired with. Then we pair them based on level of confidence and experience with computing (trying to match levels.) We also spend some time watching them work together before the final matches are made.

Resources

The ITEST Learning Resource Center at EDC:
http://www2.edc.org/itestlrc/

Girl Game Company at ETR Associates:
http://programservices.etr.org/index.cfm?fuseaction=projects.summary&ProjectID=108

Girls Creating Games:
http://psweb.etr.org/gcgweb/public/games/index.html

Project IT Girl at Girlstart:
http://www.girlstart.org/itgirl/

About NGCP

The National Girls Collaborative Project brings together organizations throughout the United States and Puerto Rico that are committed to informing and encouraging girls to pursue careers in science, technology, engineering, and mathematics (STEM).

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