Girls Building Information Technology Fluency Through Design

Year 2 Report

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PARTNERS, COLLABORATORS, AND RESOURCES

Partners

SRI International's Center for Technology and Learning (SRI)
Girls Incorporated of Alameda County (Girls Inc.)
Hatchuel, Tabernik, and Associates (HTA) as the external evaluator

Collaborators & Resources

The Build IT team has consulted the following resources to develop Units 1, 2, 3, 4, 5, and 6:

- Techbridge (NSF-HRD 0080386)
- Imagination Place! (NSF-HRD 9714749)
- The New Way Things Work (Macaulay, 1998)
- The ACM's report A Model Curriculum for K-12 Computer Science (Tucker et al., 2003).
- CyberSmart's Communication Inventions Activity. By the CyberSmart Education Company
- Learn the Net http://www.learnthenet.com
- Intel's The Journey Inside http://www.intel.com/education/journey/
- Internet Safety National Center for Missing and Exploited Children, www.missingkids.com.
- New Games Foundation's New Games Book, More New Games, and Best New Games.
- *Introduction to Computing*. Bermuda Information Technology Course Track. (2000) By Stanford University Computer Science Department. Bermuda Computing Curricula Project
- GroupScribbles (NSF-ITR #0427783) In Unit 4, we are using GroupScribbles to teach computing concepts.
- StageCast Creator http://www.stagecast.com/ In Unit 5, we are using this game creation software designed for middle and high school students as an introduction to object-oriented programming.
- Tapped In (NSF-REC #0106926) is part of Unit 2.
- Oracle's Think.com is used as blogging software since many schools block other common blogging application sites.

To develop the summative surveys (*IT Attitudes Survey* and the *Fundamental IT Concepts Survey*), the evaluation team consulted

- Michigan Study of Life Transitions Questionnaire (MSALTQ) (Teasdale & Lupart, 2001)
- Barron, B. (2004). Learning ecologies for technological fluency: Gender and experience differences. *Journal of Educational Computing Research*, *31*(1), 1-36

Collaborators include other ITEST projects focused on girls and IT. We have submitted a panel to AERA 2008 with Jill Denner, PI for *Girl Game Company: Engaging Latinas in Information Technology*; Karen Peterson, PI for *TechREACH: Technology and Research Experiences through After-School Clubs for High-Risk Students*; and Rosanna Guerrero, PI for *Project IT Girl: An Interdisciplinary Approach to Solving Real World Problems Using 3D Modeling and Information Visualization*; and Deborah Muscella, PI for *Technology at the Crossroads*.

ACTIVITIES

SRI International and Girls Incorporated of Alameda County (Girls Inc.) are collaborating to create and implement Build IT, an after school and summer youth-based curriculum for low-income middle school girls (sixth, seventh, and eighth grades) to develop IT fluency, interest in mathematics, and knowledge of IT careers. Build IT, a cornerstone of the Girls Inc. middle school program, is a problem-based curriculum that capitalizes on girls' interest in design and communication technologies and incorporates performance tasks for IT fluency assessment. The curricular, professional development, and assessment materials developed during this NSF-funded 3 year project will reach 150 girls initially and be portable to 1,500 Girls Inc. program sites that reach more than 600,000 girls annually.

The Build IT team is developing a coherent portable program for girls to learn about, design, and use information technologies in IT activities that includes

- Curriculum
  - Problem-based activities that use the design process as a means for girls to learn to define problems and then test and critique solutions.
  - Scaffolds for participation in design as design partners with computer science students and as designers, identifying and solving design problems.
  - Integrated performance assessments that provide formative assessment information to the girls, youth leaders, teachers, parents/guardians, and evaluators. Many of the girls' performances will occur at Family Tech Nights, involving the community in reflecting on what the girls are learning.
  - Structured interactions with IT professionals that provide scaffolds for the professionals to share their career paths, education, and the interests they had as a middle school student, and to co-lead an activity with the youth leader.
- Professional development and supports for the youth leader staff to develop the staff capacity, as well as the organization's knowledge and resources, to run a technology program beyond the 3 years of the grant.

Build IT's programmatic goals are to:

- Encourage middle school girls to pursue IT careers.
- Motivate middle school girls to use technology and to strengthen and build their technology fluency.
- Increase middle school girls' interest in and desire to take high school algebra and geometry courses in preparation for postsecondary STEM education and/or IT careers.
- Increase Girls Inc. staff capacity, as well as the organization's knowledge and resources, to run a technology program beyond the three years of the grant.

Year 2 Goals and Achievements

The goals for the second year of the Build IT project were to refine and re-implement Units 1-3 of the curriculum reaching a total of 50 new girls (Cohort 2) in sixth and seventh grade and provide new curriculum (Units 4-6) to 15 returning girls (Cohort 1) in order to achieve the above three programmatic goals. During its second year of funding the Build IT team has:

- Refined and implemented full versions of the first three units (two semesters during the school year and the summer) for a total of 126 contact hours. Fifty girls in Cohort 2 at Muir, EXPLORE, and ASCEND received the 78 contact hours during the school year.

Ten of these girls who participated in the summer program (48 hours) received the total 126 hours by participating in all three units.

- Pilot tested portions of Units 4 and 5 with 15 girls in Cohort 1 at Muir and implemented the full version of Unit 6 with 4 of these girls during the summer program. The 15 girls during the school year received approximately 30 contact hours by participating in the pilots and IT professional interactions. The 4 girls who participated in the summer program received an additional 48 hours of contact hours; 78 hours total.
- Implemented the program at four schools sites during the school year, reaching initially 83 girls and retaining 65 girls.
- Enabled girls' interactions with more than 40 IT professional women.
- Developed and distributed IT professional resource guides to support IT professionals and youth leaders in leading sessions focused on IT professions.
- The PI, Girls Inc.'s ALL STARS program manager, and a program coordinator co-led three of the five professional development sessions for the 6 youth leader staff and provided ongoing professional development for these youth leaders through Girls Inc.'s curriculum planning time. The program manager and coordinator lead two of the five sessions without assistance from the PI.
- Hosted six Family Tech Nights and a Summer Celebration.

Year 2 Measurable Impacts

In Year 2, the impact of Build IT on participants and staff continues in a positive direction. Preliminary findings from a quasi-experimental study show girls to have more realistic images of IT careers, interest in pursuing these careers, interest in taking mathematics and computer science courses, and the skills to use IT tools as informed users and designers of technologies. In addition, in contrast to Year 1, girls conceptual knowledge of information technology is increasing. We attribute this change to refinements made to the curriculum and its implementation.

Girls Inc. staff are also continuing to demonstrate their IT knowledge and skills over the course of the project and are able to encourage and enhance girls' interest and engagement in a number of the Build IT activities. Areas for growth for the Build IT project include continuing to refine the curriculum and local staff supports so that youth leaders feel comfortable and confident in teaching the curriculum. While the Build IT program is achieving its goals, there is still room for additional growth across all of the goals. The curriculum is challenging; continuing to focus on developing staff capacity is key to Build IT's sustainability and scalability.

FINDINGS

Major Achievements and Progress

The Build IT team has developed and implemented the following curricular resources as planned:

- Refined and implemented for a second year Units 1-3 (two semesters and the summer) for a total of 126 contact hours.
  - Unit 1 focused on the design process and design concepts that the girls will use throughout Build IT. The enduring understandings for Unit 1 include: Design is a process, composed of specific stages and elements: brainstorming, planning, gathering user data, scenario development, storyboarding, requirements and documentation,

prototyping, user testing, and revising; Design is used to address users' needs; Design has to satisfy constraints; Design is iterative; and Design is a collaborative endeavor.
  - Unit 2 focused on making connections between what the user sees and does and how the Internet works. The enduring understandings for Unit 2 include: Designs have both form (how it is designed, what it looks like) and function (what it is designed to do); Engineering conventions (i.e. shared standards) create opportunities and constraints for design; The Internet is a large global network comprised of thousands of smaller networks.
  - Unit 3 focused on having girls apply their design knowledge and skills to the development of their own Web pages and Web-based communication tools. The enduring understandings for Unit 3 include: Designs have both form (how it is designed, what it looks like) and function (what it is designed to do); Engineering conventions (i.e. shared standards) create opportunities and constraints for design; IT professionals work with others to solve problems – colleagues and users. There are a variety of IT careers.
- Developed and pilot tested portions of Units 4 and 5, and implemented the full version of Unit 6. The total hours for these units will be 120 or greater.
  - Unit 4 focuses on current networked applications and technologies, such as GroupScribbles (NSF-ITR #0427783), that enable girls to work with algorithms and other computer science concepts. Girls explore the hardware design of networked technologies, including telephones, computers, and PDAs. The enduring understandings for Unit 4 include: Networks include a variety of human and technology components that can be mapped and analyzed to troubleshoot problems and improve the system; computers, in a variety of sizes, can be used independent of networks and as part of networks; and an algorithm is a detailed, step-by-step description of a solution to a problem. Computer programming is used to implement algorithms on computers to address problems.
  - Unit 5 enables girls to collaborate on design teams to create a game for real users—younger girls in the Girls Inc program. Using Stagecast Creator, the middle school girls in Build IT are in design teams of 2-3 girls each with the roles of leadership. The enduring understandings for Unit 5 include: collaboration involves a strategy for dividing tasks associated with a solution into pieces that can be worked on individually and reassembling the work products into a cohesive whole to form the solution; leadership involves communicating ideas to justify a position and convince others; and how to troubleshoot a problem in an information technology system.
  - Unit 6 focuses on fostering girls participation in collaborative teams to apply their design skills to the development of Web pages for a specific client. Program leaders (possible along side the client) facilitate Web development and guided practice in the girl-led problem-based activities. The enduring understandings of collaboration and leadership are continued in this unit.
- Increased the number of school sites and girls reached: In Year 2, the Build IT team implemented the program at four schools sites during the 2006-2007 school year: Muir Middle School in San Leandro; Ascend, Urban Promise, and EXPLORE in Oakland, reaching initially 83 girls and retaining 65 girls.
- Established ongoing relationships with IT professionals and organization who either visited the school sites or hosted field trips for a second year.

- Continued to expand the IT professional network by adding new individuals and organizations. Girls interacted with more than 40 IT professionals.
- Developed and distributed IT professional resource guides to support IT professionals and youth leaders in leading interactive sessions for middle school girls that focus on IT professions. These guides support IT professionals who may visit a Girls Inc. site or host a fieldtrip to their organization.
- Implemented five professional development sessions, including materials, for youth leader staff and provided ongoing professional development for the youth leaders through Girls Inc. curriculum planning time. ALL STARS staff (one Program Manager, two Program Coordinators, and two Program Leaders) attended these sessions. For the program leaders, who work directly with the girls, these sessions were their first introduction to the unit. Additional curriculum meetings followed with the ALL STARS staff.
- The program manager and coordinator lead two of the five sessions without assistance from the PI.
- Connected with middle school mathematics and technology teachers in the ALL STARS schools to check on the connection between girls' experiences in Build IT and in school. Surveyed these teachers about important mathematics concepts and technology skills related to Build IT in order to guide curriculum improvements.
- Hosted six Family Tech Nights and a Summer Celebration. These events provided an opportunity for girls to demonstrate their IT skills and knowledge to themselves, their peers, parents, program leaders, and teachers.

Impact on Girls and Girls Inc. Staff
Together, these major achievements and our program's goals have enabled us to have the following impacts on the girls who participated in Build IT and the Girls Inc. staff members and organization.

Encourage middle school girls to pursue IT careers.

Summative Evaluation Findings. In Year 1, girls' image of IT careers as solitary and boring changed significantly to collaborative, fun, and intellectually stimulating. These changes in perception about careers and their own experiences using information technologies are fostering girls' interests in pursuing IT careers. The summative data shows that girls have demonstrated positive changes in IT career attitudes. Notably, they demonstrated a 10 percent increase in sentiments that IT careers would be fun, a 10 percent decline in feelings that IT careers would be boring, and a statistically significant 13 percent decline in feelings that they would not enter IT careers because they do not like computers. The comparison group did not exhibit changes of this scale. Thus, Build IT participation has had a positive effect on career interests and attitudes.

In Year 2, girls maintained positive views of IT careers. On a scale of 1 to 10, the average Build IT participant maintained a score of 7 with respect to positive attitudes about IT careers. Build IT participants demonstrated comparatively large (8 to13 percentage point) declines in negative attitudes toward IT careers such as not liking computers, perceptions of male-dominance in the field, and perceptions of the jobs being boring. The Build IT participants had slightly more interest in IT careers than the comparison group.

Formative Evaluation Findings. Observations and interviews conducted by the formative evaluation support the findings of the summative evaluation: Build IT is influencing girls to consider IT careers, but these careers are not necessarily their first choices. In interviews with the girls during the school year, many girls—though not all—said they might like an IT job some day. One girl said, "I might be able to do that," and another said, "You could do amazing things." One said, "I thought [the jobs] were hard but seemed kind of fun." In contrast, during the summer program where girls had more time to participate in three IT fieldtrips for three to four hours each and to reflect on these IT careers, the formative evaluation team saw more enthusiasm for IT careers.

Toward the end of the two week summer program, girls brainstormed a list of jobs they had learned about and came up with a total of 17 careers, including engineer, producer, "computer fixer," interpreter, and accessibility tester. They went through the list as a group, explaining (with a fair degree of accuracy) what each job entailed, and then said what kind of job they would like to have. Only one girl said that the jobs on the list did not interest her. Others said they would like to be:

- Engineer (3)
- Program manager (1)
- Graphic designer (1)
- Web designer (1)
- Producer (1)
- Tester (4)
- Marketer (1)
- Programmer (1) (This girl said she wanted to use the HTML codes that she had memorized during the unit.)
- Kid tester (2) (Girls were referring to the person who manages user testing with children.)
- Software designer (1)
- Program manager (1)

This reflection on IT careers indicates a marked difference from girls' responses about careers in earlier units, when they have typically said that although the IT jobs they learned about sound "okay" or "interesting," they wanted jobs such as doctor, lawyer, etc. It is important to note that in this case the question to the girls was phrased differently: they were asked about the list of jobs they had just created. The fact that one girl indicated that she was not interested in those jobs shows that girls did not necessarily feel they were required to choose only from the list, and their enthusiasm as they spoke about the careers that interested them is another testament to the shift that has occurred in how these girls look at their future.

This information reinforces the need to have girls participating in a minimum of three IT professional experiences per unit—visits or better yet, field trips—and providing girls with opportunities to reflect on these IT careers. The contrast between the summer and the school year, in which there were fewer IT professional field trips, shows the importance of these experiences.

Motivate middle school girls to use technology and to strengthen and build their technology fluency.

Build IT aims to address the core aspects of fluency with information technology as defined by the National Research Council (NRC) (1999). It aims to teach fundamental concepts of IT, so that youth have a foundation in some of the big ideas that organize computer science as a field. It also aims to develop contemporary skills by providing practice with today's design and communication technologies. And it aims to build youth's intellectual capabilities for posing and solving problems with technology through design.

Summative Evaluation Findings. In Year 1, girls demonstrated their technology skills to themselves as well as program leaders, parents, and formative evaluators. In the summative evaluation, girls showed substantial growth in perceived IT skills as well. This growth was particularly true with respect to perceived ability to learn new programs, using the computer to communicate, using the design process to solve problems, and describing how information travels through the Internet.

In Year 2, girls continue to demonstrate that Build IT has an impact on their technology skills. Build IT participants demonstrated a significant 11% increase in overall computer use and were 20% to 23% more likely to teach others about computers and technology than their non-Build IT counterparts in the comparison group. Build IT participants were also 6% to 10% more likely to share computer and technology information with parents and siblings than their counterparts. From self-reports, girls in Build IT reported a significant 5% greater growth in perceived IT competency as well.

Most notably in Year 2, Build IT participants increased their knowledge of IT concepts. This finding is in sharp contrast to Year 1 in which the summative evaluation found little growth in girls' conceptual knowledge of IT, an important factor in IT fluency. In contrast to girls who did not engage in the project in Year 2, Build IT participants demonstrated as 17-percentage point increase in understanding design, computers, networks and technology concepts. ALL STARS staff also highlighted that participants applied their increased knowledge of the design process to everyday concepts and to their schoolwork. In addition, according to Girls Inc. staff, girls' competencies in leadership, teamwork, and problem solving, which are all aspects of technology fluency, are also increasing due to their participation in Build IT.

Formative Evaluation Findings. The formative evaluation and performance tasks highlight areas of the curriculum that successfully enabled girls to develop IT skills and conceptual understanding. For example, in Unit 1, girls demonstrated the ability to make changes to their designs based on input from intended users. In Unit 2, girls were able to use a blogging tool to create their own blogs. During the summer, girls in Unit 3 were able to use HTML code to create their own web pages and the girls completing Unit 6 worked successfully with a client to create an ALL STARS web resources for the Girls Inc. website. In Unit 4, girls demonstrated their understanding of networks by using different types of tools (computers, handhelds) to send messages via different types of networks (wireless, infrared). The girls also commented when they didn't understand how the information was being shared and asked questions, indicating a self-awareness of their own knowledge. In Unit 5, girls demonstrated their increasing understanding of the effort it takes to create software or other technologies. After using Stagecast

software to program a game, one girl commented "Whoa, so it takes a long time to make a videogame—that's why they are so expensive."

At Family Tech Nights girls gave presentations to attendees on the design process, how the Internet works, and their technology creations, demonstrating to themselves, peers, parents, and program leaders that they understood these concepts and that they have the technology skills to do the work.

Increase middle school girls' interest in and desire to take high school algebra and geometry courses in preparation for postsecondary STEM education and/or IT careers.

While we have made some progress in connecting the mathematics in Build IT to the overall Build IT curriculum and mathematics in school, the results from the summative and formative evaluations mirror last year's results: there is considerable room for growth in influencing girls interest in mathematics and plans for taking mathematics courses in high school.

Summative Evaluation Findings. While the girls expressed more interest in taking mathematics and computer science courses (20 percent gain from pretest to posttest), they are still not certain what courses they plan to take. The summative evaluation suggests that the Build IT program make this course information more explicit in the curriculum.

Formative Evaluation Findings. The formative evaluation supports the findings of the summative evaluation, but also highlights that the mathematics activities in Units 3 and 5 were particularly successful this year. In Unit 3, the math activity, revised and led by SRI mathematics education researcher Teresa Lara-Meloy, was more successfully integrated into the flow of curriculum than math activities in earlier units, according to one program leader. Girls were engaged during the activity. Another leader said that the way the math was explained in the curriculum was better than how math activities in earlier units are explained. She also noted that in facilitating the activity waiting to explain the concept of combinatorics until the end of the lesson worked very well for the girls: they did not become bogged down with overwhelming terminology until they were already comfortable with the underlying concepts. The girls were challenged by the math but overall did a good job.

This mathematics researcher and educator also led the Unit 5 mathematics activity on slope. While girls did come up with the concept of slope on their own and it was, according to staff, very connected to the Stagecast activities, it was not clear that girls understood the concept of slope.

Although identifying interesting and relevant mathematics to IT and providing the necessary supports for Girls Inc. staff to successfully facilitate these mathematics activities has been a challenge for the Build IT team, we feel it is an important aspect of Build IT and a contribution to the field to meet this challenge. Specifically, math self-efficacy is a significant predictor of the likelihood of young women's persistence in STEM (Farmer, Wardrop et al. 1999). In Year 3, the Build IT team plans to continue to refine the mathematics throughout Build IT, drawing on SRI staff expertise, the advisory board meeting in August 2007, and information from the teachers at the schools to make connections between school mathematics and the mathematics found in

Build IT. The team will also embed more mathematical supports in the curriculum for Girls Inc staff.

Increase Girls Inc.'s staff capacity, as well as the organization's knowledge and resources, to run a technology program beyond the 3 years of the grant.

From interviews by the *summative evaluation* team as well as interviews and observations by the *formative evaluation* team, like Year 1, in Year 2 staff have developed greater IT knowledge and skills over the course of the project. They are able to troubleshoot technical problems; and they can encourage participant interest and engagement in a number of the Build IT activities. The staff also expressed strong support for and interest in continuing the Build IT program.

However, in Year 2 we have found that program leaders are not comfortable with the technology conceptual knowledge and mathematical understanding. Program Coordinators and leaders felt that the network-related activities and mathematics activities in the curriculum were confusing and difficult for staff members to understand, which made it even harder to translate and teach to participants. Ironically, the girls showed gains in both mathematics interest and conceptual understanding of networks.

In Year 3, the Build IT team plans to provide more in-depth training to Girls Inc. staff on challenging Build IT activities, embed more supports into the curriculum, and work with Girls Inc. leadership to find ways to promote and sustain program leaders interest in technology and computers.

Processes Used in Materials Development

The SRI team and the Girls Inc. leadership (ALL STARS program manager and two program coordinators) collaborate to develop the curriculum. Using an *Understanding by Design* (Wiggins & McTighe, 1998) approach, the SRI team develops the enduring understandings, evidence of learning, and ideas for the activities, including the mathematics-related activities, performance tasks, and existing activities from sources noted. The PI and co-PI from Girls Inc. (ALL STARS program manager) discuss these initial ideas and begin to define the activities. The co-PI drafts the schedule, while the SRI team completes a draft of the unit.

The draft of the unit is reviewed by the Girls Inc. leadership. Feedback is given to the SRI team and changes are agreed to in a design meeting. Changes are incorporated into the curriculum documentation by SRI and, in some cases, Girls Inc. leadership. Advisors are consulted individually by e-mail to review the curriculum as well. In addition, at the end of Year 2 (August 16 and 17) advisors and the Build IT team will attend an advisory board meeting at SRI focused on integrating mathematics into the Build IT curriculum, a project challenge the team is working to address (See Project Challenges.) Feedback is also given in professional development sessions and changes are made to the curriculum prior to implementation as necessary.

The formative evaluation team uses observations of the implementation and interviews with staff and the girls to provide feedback to the curriculum developers in a formative evaluation report for each unit. Details on the formative evaluation process are in the Evaluation Activities section.

The team met in August 2006 and made the necessary changes to the curriculum for Units 1 through 3 as noted in the Year 1 Annual Report for Build IT. In August and September 2007, the team will meet to address the following changes, based on the data from the formative and summative evaluations, for Units 1 through 6:

General Curriculum Changes

- Provide a technical guide so that program leaders prepare well for issues such as school firewalls.
- Continue to refine the mathematics throughout Build IT, drawing on SRI staff expertise, the advisory board meeting in August 2007, and information from the teachers at the schools to make connections between school mathematics and the mathematics found in Build IT.
- Embed more supports in the curriculum for Girls Inc staff on network technologies and mathematics so that they can learn these concepts at their level and be prepared to facilitate conversations with the girls.
- Indicate in the curriculum where IT professional interactions should happen and emphasize reflection time on these interactions.
- Provide additional pointers in the curriculum to basic skills for technology and mathematics activities.
- Provide suggestions on how to teach vocabulary in authentic contexts rather than worksheets or games that are disconnected from the concepts.

Unit 1 Changes

- Add more technology components to Unit 1 as an option for sites that are ready. We initially removed technology options, such as creating the Perfect Hangout online rather than with physical objects. Include this technology piece and others as an option.
- Add more prompts about the design process for leaders to ask the girls and to reflect on themselves.

Unit 2 Changes

- Make design process more specific in Unit 2.
- Make distinction between blogs and groups more apparent.
- Revisit performance tasks and connect them more to the activities as well as to the concepts.
- Divide the unit into two parts.

Unit 3 Changes

- Reduce the writing and increase the HTML in the performance task.
- Make it explicit that program leaders must have girls critique each other's websites as part of the performance task.

Unit 4 Changes

- Focus on creating networking activities that engage girls and provide tangible experiences with networks.

Unit 5 Changes

- Provide background information on slope so that program leaders can facilitate these conversations effectively.

Unit 6 Changes

- Add curriculum for girls to learn to manipulate images prior to the mathematics activity.

Suggestions for Program Staff

- Continue to spend time teaching the design process to program leaders.
- Connect the goals of Build IT to the larger youth development goals of ALL STARS so that program leaders understand the expected outcomes of the program and why these goals are important.
- Explain the *Understanding by Design* curriculum development process and show what enduring understandings and associated activities are key to the curriculum.
- Make sure leaders understand that girls need to participate in a minimum of three IT professional experiences per unit—visits or better yet, field trips—and provide girls with opportunities to reflect on these IT careers.
- Provide more in-depth training to Girls Inc. staff on challenging Build IT activities, such as networks and mathematics.

Recruitment and Retention of Girls

Recruitment

Build IT is part of ALL STARS, Girls Inc.'s middle school program. Build IT participants are recruited through and also participate in the ALL STARS program. The recruiting for the Build IT project benefits from the well-established relationships that Girls Inc. has with the schools and community, and their experience working with parents and girls from these communities. Two of the schools, ASCEND and Muir combined have worked with Girls Inc. for more than 25 years, with regular communication among teachers, administrators, and program staff. Teachers and administrators from these schools have recommended that the girls attend the Girls Inc. middle school program called ALL STARS, parents may encourage their daughters to attend, or the girls themselves have asked to participate after previous involvement with Girls Inc. Build IT is part of the ALL STARS program.

In Year 1, to implement the first three units of the Build IT project two schools, the Muir and EXPLORE sites, included Build IT in their ALL STARS program. Girls Inc. implemented Build IT for 76 girls, 42 at Muir and 34 at EXPLORE. Of these 76 girls, 46 girls completed the entire school year program, which included Units 1 and 2 for a total of 72 service hours. Of those girls who completed Units 1 and 2, 12 girls completed Unit 3, an additional 48 hours of programming, totaling 120 service hours.

In Year 2, Girls Inc. added two more sites: ASCEND and Urban Promise Academy (UPA) to the ALL STARS sites offering Build IT. Girls Inc. implemented Build IT for 67 Cohort 2 girls receiving Units 1 and 2; they included: 16 girls at Muir, 17 girls at EXPLORE, 22 girls at ASCEND, and 12 girls at UPA. (See Table 1.) Of these 67 girls, 50 girls completed the entire school year program, which included Units 1 and 2 for a total of 78 hours. Of those girls who completed Units 1 and 2, 10 girls completed Unit 3 during the summer, an additional 48 hours of

programming, totaling 126 service hours.

In addition, 16 girls in Cohort 1 at Muir participated in approximately 30 hours of piloting Units 4 and 5 plus interactions with IT professionals during the school year. Four of these girls participated in Build IT's summer program (Unit 6) for an additional 48 hours of programming, totaling 78 service hours. Staff resources at Girls Inc. and an available Cohort 1 limited the piloting and full implementation of Units 4 and 5 in Year 2. Both units will be implemented in full in Year 3 and will provide the total 120 service hours.

In Year 3, the Build IT team anticipates serving 40 new girls and 26 returning girls at three school sites: Muir, EXPLORE, and ASCEND. (See Table 1.) At Muir girls served in Year 3 will be returning girls only for two reasons: (1) there is not enough staff to serve both groups; and (2) all the girls that would go into Unit 1 are in sixth grade so they will have the opportunity to do two years of Build IT beginning in the 2008-2009 school year. At EXPLORE, there are no returning girls because the school does not offer after school programming for their eighth graders. EXPLORE will recruit 6th graders only in the 2007-2008 school year so that they can progress through two years of Build IT. At ASCEND, 10 girls will return to participate in an adaptation of the curriculum to be planned by the site coordinator. These 10 girls were introduced to Build IT during another Girls Inc. summer program, EUREKA, that incorporated parts of Build IT into their program. The formative evaluation team will be looking at these adaptations in Year 3.

Table 1. Number of Girls Participating in Build IT

ALL STARS Schools	Muir	ASCEND	EXPLORE	UPA	Total Girls Reached
Year 1	42 new recruits	—	34 new recruits	—	76 new recruits
Year 2	16 new recruits 16 returnees	22 new recruits	17 new recruits 0 returnees	12 new recruits	67 new recruits (16 returnees)
Year 3 (estimated)	0 new recruits 16 returnees	24 new recruits 10 returnees	16 new recruits 0 returnees	—	40 new recruits (26 returnees)
Total number of Build IT participants over 3 years					183 new recruits (42 returnees)

Retention

Retention in the ALL STARS program and subsequently the Build IT project during the Year 1 school year was 65% at Muir and 59% at EXPLORE. In Year 2, with the exception of the Urban Promise Academy, retention rates were high: 94% at Muir, 90% at ASCEND, 88% at EXPLORE, and 33% at UPA stayed in the program throughout the school year. At the end of the first semester in Year 2, Girls Inc. decided to end ALL STARS programming at UPA because they were not receiving the support they needed from the school and parents to retain the girls in the overall ALL STARS program.

For both Years 1 and 2, the retention rate during Build IT Summer Camp (Unit 3 and Unit 6) was

100%. Overall, Girls Inc. notes girls participating in site-based summer programming tend to show greater retention and attendance rates than those girls participating in school-based, after-school programming. Likely reasons for this include a lack of alternative activities to participate in and fewer commitments during summer vacation, including homework; enrollment in summer programming requires more initiative and effort, as participants must submit an application and access daily transportation to the Girls Inc. site, which results in a greater sense of accountability and investment; and more parent/guardian buy-in, due to need for summer day care and activities for girls while the parent/guardian attends work.

Evaluation Activities

Formative evaluation

SRI's Torie Gorges and Reina Fujii lead the formative evaluation for Build IT, with advice from Vera Michalchek, Senior Social Scientist at SRI. The purpose of the formative evaluation is to (1) identify the challenges and successes the group leaders experienced in implementing the curriculum. This work focuses on the research question, "Which of the intended task situations in the curriculum do staff find easy or challenging to enact, and how do they adapt them to changing program conditions?" (2) investigate how girls are participating in Build IT and the kinds of practices they are developing through their participation, working to answer the questions, "Which of the intended roles as designers are the girls able to take up, and at what point during the curriculum experience are they able to take them up?" "How do girls in the program perceive the relationship between their participation in Build IT and other Girls Inc. activities, and between Build IT and school?" and "What evidence is there that girls are thinking about and revising their thinking about computer science subject matter, as well as planning and revising plans for course taking?"

The formative evaluators conducted structured observations at the Build IT program sites (Muir, Ascend, EXPLORE, and Urban Promise) during the school year, and Girls Inc. during the summer, pre- and post interviews with key stakeholders (i.e., program manager, program coordinators, and group leaders), weekly group leader feedback via email, interviews with girls, and review of the curriculum and artifacts produced by the girls and group leaders. The formative evaluators prepared a report of their findings for each of the six units. This report is in the Addenda.

Summative evaluation

Hatchuel Tabernik and Associates (HTA) lead the summative evaluation. The purpose of the Build IT summative evaluation is to examine the effect of the intervention on girls' technology-related development and explore the outcomes of the program for staff and sites. HTA, in collaboration with SRI International, developed a pair of surveys: the *IT Attitudes Survey* and the *Fundamental IT Concepts Survey*. The *IT Attitudes Survey* covered the topics of academic plans, interest in and attitudes regarding IT careers, and the perceived skills of respondents. The *Fundamental IT Concepts Survey* asked respondents to read a series of brief vignettes regarding issues and problems that arise in the design process or everyday technology usage and choose the correct response from a multiple choice selection.

HTA and SRI revised several of the items in these surveys between the summer and fall of 2006.

Some of these revisions were refinements to the text to make them easier for middle school girls to understand. The team also added five items to the *Concept Survey* on network and computer understanding based on the Build IT curriculum and four items to the *Attitudes Survey* to illicit whether or not girls felt comfortable helping others on the computer and what they thought a computer scientist looked like. These additional items for the *Attitudes Survey* came from Brigid Barron's work (Barron, 2004).

HTA administered the revised surveys as a pretest in the fall of 2006 (or when the girls entered the Build IT program) and as posttests in the spring of 2007 and at the end of the summer camp 2007. The girls in the summer camp had received the pre-test during the school year. HTA also analyzed the data and prepared the Build IT Summative Report (see Addenda).

Support from Sources Other than NSF

The funds for field trip transportation, the 32 laptops, and their technology support were provided by The PSB Fund.

Received Wells Fargo 2007 Pioneer Award for $2,500. See the Awards and Innovations section for details.

Received $7000 in April 2007 from an anonymous donor to Girls Inc. for Build IT endeavors.

An important component of the Build IT project is its volunteer IT professionals. These individuals donate their time and expertise to support the Build IT program. Many individuals and organizations have participated in both years of Build IT, unless otherwise marked. The IT professionals who have participated in Build IT to date include:

IDEO

- Emily Ma, Mechanical Engineer
- Kara Krumpe, Product Designer
- Besty Fields, Interaction Designer

SFMOMA

- Dana Mitroff, Head of Online Services
- Tana Johnson, Producer and Instructional Designer for Interactive Educational Technologies

The Tech Museum

- Christina O'Guinn, Museum Programs Developer (Year 1)
- Melissa Book McAlexander, Ph.D., Interim Director of Education (Year 2)
- Sima Westwood, Programs Specialist (Year 2)

Children's Discovery Museum

- Tina Cosby, Exhibit Developer/Designer
- Peggy Monahan, Manager of Exhibit Design and Development

Exploratorium

- Vivian Altmann, Children's Educational Outreach Program

- Website Designers

Stanford University
- Jen Burney, Astrophysics Ph.D. candidate at Stanford and Ultimate Frisbee Player

BUMP Records, a youth program at Bay Area Video Coalition (BAVC)
- Femi Andredes, Production Engineer
- Felice Smith, Production Engineer

Interaction Designers
- Janette Cullinan, Director of Instructional Design at Ninth House
- Debbie Stephen-Stauffer, Co-owner/Inventor of Double U Products Inc. of the product DaysAgo digital day counter (http://www.howmanydaysago.com)
- Nikki Reynolds, Director of Design at Fresh Perspectives, a company currently translating a face-to-face parenting curriculum into an interactive CD-ROM

SRI International's Center for Technology in Learning
- Patti Schank, Cognitive Scientist and Software Engineer
- Zaz Harris, Software Engineer (Year 1)
- Krista Davis, Software Engineer (Year 1)
- Melissa Koch, Educational Technology and Program Developer (Year 1)
- Jasmine Lopez, Software Engineer (Year 2)
- Sarah Nowlin, Engineering Systems Engineer (Year 2)

Google
- Stephanie Williams, Operations Manager
- Ellen Spertus, Software Engineer
- Katie Stanton, Product Management
- Robin Jeffries, User Interface
- Jessica Gray, iGoogle Designer
- Sophia Brueckner, iGoogle Designer
- Additional Google IT professionals served as Lunch Buddies and Tour Guides. These professionals included Maricia Scott, Sarah Moussa, Michelle Levesque, Kim Ngo, Natasha Wyatt, Ellen Spertus, Julie Chin, Clara Lee, and Natasha Mohanty.
- In Year 2, girls met Danielle Van Dyke, Carole Dulong, Champika Fernando, Ellen Spertus, Sunita Verma, Kendra Carattini, Kathy Walrath, Susie Renner, Eynat Rafalin, Jyotsna Kaki, Stephanie Williams, Gaby Aguilar, and Shannon Madison.

Leapfrog (Year 2)
- Diana Silva, Website Designer
- Dave Stauffer, Website Designer
- Ariel Katz, Web Design Intern
- Dean Burris, Product Designer
- Emily Treat, Online Game Design
- Elizabeth Young, Producer
- Hilda West, Human Resources VP
- Madhura Deshpande, Game Design

- Colleen Lewis, Game Design
- Yun Zhang, Game Design

Project Schedule and Status

The Build IT project is on schedule for developing six units that span two school years and two two-week summer sessions totaling 240 contact hours. Our staff capacity-building efforts are also on schedule as Girls Inc. leadership takes over more of the professional development and begins adapting the curricula in ways that meet their programming needs.

The Build IT team did change its development approach for logistical reasons. In Year 1, we started with a smaller number of schools (two rather than four) and piloted the first three of six units with the two schools. In Year 2, we were in the four schools as planned, but had to drop one school because of issues with commitment to the ALL STARS program. We piloted Units 4 and 5 with these schools, and Unit 6 during the summer. We will do full implementations of all six units in Year 3. We are on track for reaching more than 150 girls; we will reach more than 180 girls and retain close to 150 girls.

Project Challenges

While we have made significant progress on last year's challenge of conceptual knowledge of IT and found that involving graduate students is not a sustainable part of the Build IT program, the mathematics component of the curriculum continues to be a challenge.

Mathematics component

The mathematics goal in Build IT is to increase middle school girls' interest in and desire to take high school algebra and geometry courses in preparation for postsecondary STEM education and/or IT careers. To achieve this goal, the mathematics in Build IT needs to connect to (1) the information technology activities and work of IT professionals in the curriculum; (2) middle school or elementary mathematics so that girls can do the mathematics and feel successful; and (3) mathematics courses that girls can take in high school.

We have successfully connected some mathematics activities to the information technology content and IT professionals careers (See Table 2), but not all. Identifying these mathematics that connect well to information technology and have relevance to middle school youth has proved challenging. The Build IT team will host an advisory board meeting on August 16 and 17, 2007, at SRI International to address these issues: identifying mathematical concepts that relate to information technology and rethinking the approach to mathematics activities that we currently have in the Build IT curriculum.

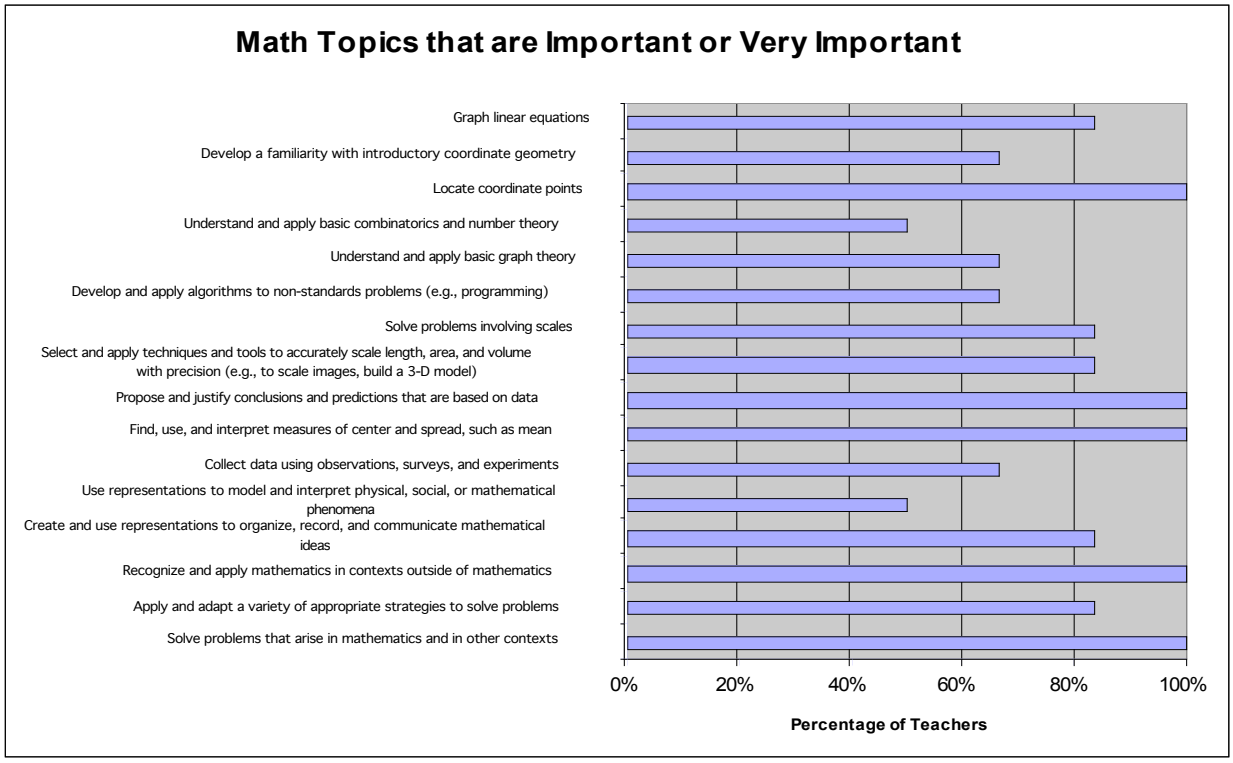
Table 2. Mathematics in Build IT

	Averages	Scale	Algorithms	Coordinate geometry	Ratios	Status
Unit 1						
Things That Fly	X					Good
Perfect Hangout		X				OK/Revise
Unit 2						
Getting to Your Blog			X			Good
Graphs in Math			X			Revise/Replace
Unit 3						
Color Your World			X			Good
Unit 4						
Distributed computing			X			Revise/Replace
Cryptography (TBD)						TBD
Unit 5						
Screen Real Estate				X		Good/Revise
TBD						TBD
Unit 6						
Sizing an Image					X	Good/Revise

We have also made efforts to connect with girls' mathematics teachers to be sure that we are addressing mathematics that they feel are also important for girls to understand. While we wanted to have a focus group, due to teachers' time we surveyed these teachers about important mathematics concepts and technology skills related to Build IT in order to guide curriculum improvements. (See Table 3 for a summary of the survey data.)

The Build IT Team will continue to provide staff with an understanding of course taking requirements for middle school and high school at all of the schools involved in the Build IT program so we can make connections to what courses are available to the girls in school so that they can talk with girls directly about the courses to take in conjunction with the mathematics activities.

Table 3. Importance of the Math Topics Covered in Build IT
Eight teachers responded to the teacher survey: six math teachers, one technology teacher, and one teacher did not identify his/her subject taught. The teachers rated by importance a number of math skills and concepts covered in Build IT.



Two teachers wrote in responses to an open-ended question asking for suggestions about what math skills and concepts they would like covered in Build IT. One said that number patterns, fractions, and scale were important. Both said that students need basic math skills in order to succeed.

Training and Development

For staff

The professional development in the Build IT program is a cornerstone of the staff capacity building work. The PI and the ALL STARS program manager (and Build IT co-PI) planned the professional development and determined which parts or whole workshops could be led by Girls Inc. staff. This team uses a train-the-trainer approach and builds on the experience of the program manager and a program coordinator who had a year of experience leading Build IT's Units 1, 2, and 3 going into Year 2.

In Year 2, The PI, Girls Inc.'s ALL STARS program manager, and a program coordinator co-led three of the five professional development sessions for the 6 youth leader staff and provided ongoing professional development for these youth leaders through Girls Inc.'s curriculum planning time. The program manager and coordinator lead two of the five sessions without assistance from the PI.

The youth leader staff participated in this professional development for each unit a few weeks prior to implementation. Build IT program leaders and program coordinators then met during weekly curriculum development meetings to prepare the activities throughout the school year. For the two-week summer camp, the Girls Inc. team met a couple of times prior to the two-week session to prepare.

In the professional development, the professional development facilitators use the curriculum to teach the concepts and run through the activities with the youth leaders. The sessions included discussions and hands-on activities with the leaders participating as youth. During the school year, the professional development is split into two sessions. In Year 1, the Build IT team learned from conducting the professional development for Unit 1 over two consecutive afternoons, that it is better to split the curriculum in half and do the first professional development session prior to implementation and the second professional development session prior to the implementation of the second half of the curriculum.

For youth

During the school year, girls at Muir, EXPLORE, and ASCEND had Build IT twice a week for a total of 2.5 hours each week. During the summer, girls attended Build IT Summer Camp 2006 for two weeks for 4 hours Mondays, Wednesdays, and Fridays, and 6 hours on Tuesdays and Thursdays for field trips.

Unit 1 (October 2006 through December 2006)

Unit 1 focused on the design process and design concepts that the girls will use throughout Build IT. Girls go on 2 to 3 fieldtrips or 2-3 IT professionals visit them during the unit.

Week 1 introduces girls to the fact that design is all around them, that they can and do design, and that they can influence the world around them. The Design Process is introduced.

Week 2 gives girls the chance to explore the design of familiar objects and to learn one of the first two steps in the design process: defining the problem and brainstorming.

Week 3 provides girls with opportunity to explore simple machines and to sketch the process that they see and one they design. Girls focus on sketching, specifically storyboarding and developing a design.

Week 4 gives girls a chance to explore the design (materials and structure) of flying toys such as Frisbees, Aerobies, and Boomerangs in order to propose and then construct the best design. Girls engage in researching, prototyping, and building their designs. Girls use mathematics to compare the flight patterns of different flying toys.

Week 5 begins a four-week project in which girls design an ideal hangout for others. They are now using all aspects of the Design Process.

In Week 6, girls learn how to investigate the needs of different users and include technologies in their room designs. Girls present and iterate on their designs.

In Week 7, girls refine their designs again to take into account more users' needs.

Week 8 is a performance task in which girls present their designs and design process demonstrating that they understand that the goal of design is to satisfy multiple users' needs and that iteration is necessary in design.

In Week 9, girls prepare for Family Tech Night.

In Week 10, girls present all their designs and demonstrate their understanding of the Design Process at Family Tech Night.

Unit 2 (January 2007 through May 2007)
Unit 2 focused on making connections between what the user sees and does using Internet-based communication tools, such as blogs and groups, and how the Internet works. Girls go on 2 to 3 fieldtrips or 2-3 IT professionals visit them during the unit.

Week 1 introduces girls to the Internet as a communication technology and investigate the general design of Web pages. What is designed on the Internet is discussed.

In Week 2, girls explore the structure of the Internet, Internet elements, such as URLs, and how information travels on the Internet.

In Week 3, girls learn safety guidelines for using the Internet and create email accounts to use with their blogs.

Week 4 introduces girls to communication tools and strategies for comparing their features.

Week 5 continues girls exploration of communication tools, including giving girls time to use these tools and share tools they use (e.g. YouTube).

In Week 6, girls learn what blogs are, how they work, and begin creating their own blogs. Girls revisit the design process and design requirements in order to plan the design of their blogs.

Week 7 gives girls time to create their own blogs.

In Week 8, girls use algorithmic thinking to determine the best plan for using a series of blogs as communication tools and comment on each others' blogs.

In Week 9, girls develop a strategy for encouraging others to post to their blog and give each

other feedback on their blog designs.

In Week 10, girls explore a community space in depth to learn how to customize the space for a specific purpose. Girls address design requirements for communication and group collaboration.

In Week 11, girls use graphs to describe and plan connections among their Clubhouses. Girls reflect on the role of mathematics in technology and their lives.

In Week 12, girls develop a strategy for fostering communication and give each other feedback on their community spaces.

In Week 13, girls are presented with a functions that requires them to choose to use blogs or Tapped In, and then justify the decision. They continue their exploration of communication tools.

In Week 14, girls prepare for Family Tech Night.

In Week 15, girls present the blogs and Tapped In spaces that they have created, and demonstrate their understanding of how the Internet and communication tools work.

Unit 3 (July 16, 2007 through July 27, 2007)
Unit 3 focused on girls apply their design knowledge and skills to the development of their own Web pages and Web-based communication tools.

Day 1 introduces girls to the summer camp and the design requirements for the websites they'll created. Girls choose a theme and begin to plan their websites based on the design requirements.

Day 2 is a fieldtrip to LeapFrog with presentations and activities.

Day 3 introduces girls to HTML coding. Girls learn to set up their website using a folder and file structure, and implement basic tags to create a web page and include title, spacing, and formatting codes.

Day 4 is a fieldtrip to Google with presentations and activities.

Day 5 continues girls' learning of HTML. Girls learn how to add internal and external hyperlinks, images, and image links to their websites.

Day 6 continues girls learning of HTML. Girls learn how to add color to the text, background, and image borders of their websites. The mathematics activity provides girls with an opportunity to reason through possible web page combinations if 16 colors are available for the text, background, and image borders.

Day 7 is a fieldtrip to SRI International with IT professional presentations and activities using GroupScribbles and a digital character creator.

Day 8 is a performance task that checks girls understanding of HTML and provides time for girls to add the chat feature to their pages.

Day 9 is a day for girls to work on their websites and help each other learn HTML codes.

Day 10 is the Web Publishing Celebration where girls present their websites to each other, parents, and Girls Inc. staff.

Outreach Activities

The Build IT team's outreach activities to date include:

- NSF Highlights. Girls Build IT. Highlight ID: 14562.
- Recruiting IT professionals from industry to participate as role models. (For a list of IT professionals, see the "Additional support from sources other than NSF" section).
- Workshop presentation, Designing for Design Learners, at CHI April 2007.
- Submission of a professional development workshop to Girls Inc.'s East coast regional conference October 2007. [accepted]
- Submission of a panel session for AERA 2008 in collaboration with other ITEST grantees focused on girls and IT. [waiting to hear]
- Submission of poster session for AERA 2007 in collaboration with ITEST's LRC and grantee colleagues [not accepted]
- Submission of a workshop session to 21st Century Learning Centers 2007 [not accepted]
- Inclusion in the peer-reviewed *Consumer Guide to Afterschool Science Resources* at http://www.sedl.org/afterschool/guide/science/index.html
- Participation in a panel on *Developing Girls' Technology Fluency* organized by the BayCHI Kids organization (http://www.baychi.org/bof/kids/).

Publications and Products

The Build IT website is a accessible through SRI and Girls Inc.'s websites at http://ctl.sri.com/projects/displayProject.jsp?Nick=buildit and http://www.girlsinc-alameda.org/programs/oakland/oakland_middleSchool.htm respectively. Details on the Build IT program are available to the public, specifically for parents at http://www.girlsinc-alameda.org/programs/sanleandro/allstars_buildit.htm

Build IT publications to date include:

Bryan, M., Nemes, O., & Koch, M. (2007). Girls in Build IT. In Reaching & Teaching the New Learner. NSF's ITEST PI Meeting. Washington, DC.

Koch, M. & Penuel, W. (2007). Designing for Design Learning. In CHI 2007 Conference Proceedings. Workshop on Converging on a Science of Design through the Synthesis of Design Methodologies. San Jose, CA.

Courneya, J. & Koch, M. (2007). Sharing Best Practices in Youth Development. NSF's ITEST PI Meeting. Washington, DC.

Koch, M. (2007). "Build IT Year 1 Data Summary." NSF's ITEST PI Meeting. Washington, DC.

Koch, M. (2007). "Build IT Year 2." ITEST Poster Session. NSF's ITEST PI Meeting. Washington, DC.

Koch, M. (2006). "Build IT Year 1." ITEST Poster Session. NSF's ITEST PI Meeting. Washington, DC.

Koch, M. (2006) Build IT curriculum. Featured in Consumers Guide to After School Science Resources at http://www.sedl.org/cgi-bin/mysql/afterschool/science.cgi?location=search&show_resource_id=45

Koch, M. (April, 2006). Build IT: Girls Building Information Technology Fluency Through Design In M. Koch, J. Denner, D. Emery, & R. London (presenters) BayCHI-Kids Event: Developing girls' technology fluency. Menlo Park, CA: SRI International

Koch, M. (October, 2006) Infusing IT/STEM skill standards in informal ITEST learning. ITEST Webcast

Koch, M. et al. (August, 2006). Build IT: Girls Developing Information Technology Fluency through Design. Annual Report. Menlo Park, CA: SRI International.

Awards and Innovations

Recognized at Wells Fargo's 2007 Pioneer Awards event. The Wells Fargo African American Team Member Resource Group, CheckPoint Bay Area, hosts this event in honor of Black History Month. Awardees were selected for contributing to "Black Innovation: Paving the Way for Generations To Come." Specifically, the Build IT team in the Girls Inc. ALL STARS program at EXPLORE middle school was honored for their work to encourage African American girls in science, technology, engineering, and math (STEM) and connect these young women with role models in STEM careers. The award included $2,500 funds for the Build IT program.

Selected to appear in the peer-reviewed Consumer's Guide to Afterschool Science Resources. The developers of the Consumer's Guide to Afterschool Science Resources from the Lawrence Hall of Science and the Southwest Educational Development Lab contacted the PI in November 2005 about submitting materials to be reviewed for possible inclusion in the Consumer's Guide. The PI sent the completed draft of Unit 1 and an outline with sample activities for Unit 2 for review. The description of Build IT and the reviews are available at http://www.sedl.org/cgi-bin/mysql/afterschool/science.cgi?location=search&show_resource_id=45

Developed graphical design process reference. After reviewing design resources for youth as well as materials for adults for a simple representation of the design process, the SRI team

created a graphic of the design process that is used in the Build IT curriculum and was made available to the ITEST community. The image can be made into a poster. See Addenda for the graphic.

Developed simple chat feature that girls included on their websites. In Unit 3, we enabled girls to create their own context for online communication (their websites) and add a tool to their site (chat feature) to communicate with other girls who participated in the Build IT Summer Camp 2006. The chat feature and directions for enabling it were created by SRI software engineer, Zaz Harris, in PHP which comes with Linux, an open-source operating system, and can be easily added to a server at no cost if it is not already installed. The girls added the PHP code to their websites to make the chat feature work. This simple feature will be bundled with the Build IT curriculum. Instructions and the working chat feature are available at http://butterfly.ctl.sri.com/buildit/async_chat/creating_client.html

ADDENDA

Advisory Board

The advisory board for the project includes

- William Penuel, Senior Education Researcher at SRI, an expert in assessment, evaluation, and after-school learning
- Judy Brown, Vice President of Programs at Miami Museum of Science and Director of the NSF-funded GREAT! Curriculum
- Pat Loomes, Executive Director of Girls Incorporated of Alameda County
- Brenda Stegall (formerly Jan Stanton who left Girls Inc. in 2006), Director of Girls Inc.'s National Programs and Professional Development
- Allen Tucker, Professor of Computer Science at Bowdoin College and Editor of the ACM's *A Model Curriculum for K-12 Computer Science*
- Allison Druin, Assistant Professor of Computer Studies at the University of Maryland Charles Patton, Senior Researcher at SRI, mathematician and technologist, expert in mobile networking
- Linda Kekelis, Techbridge Director
- Lynn Johnson, Youth Development Specialist at the Community Network for Youth Development.

In Year 1, the advisory board was first e-mailed an outline of the planned curriculum for the first year for comment. Specific e-mails were then sent to Judy Brown, Allen Tucker, Allison Druin, Charles Patton, Lynn Johnson, and Linda Kekelis with questions pertinent to their areas of expertise. Most of their suggestions were incorporated into the curriculum with the exception of suggestions that were not aligned with the ALL STAR context. For example, Lynn Johnson suggested that every Build IT activity needed to begin with an ice breaker for the girls. The larger ALL STARS program had the ice breakers for the day; a separate one was not necessary for Build IT specifically.

In addition, William Penuel has advised on the development of the performance tasks for each unit and the evaluation efforts for the project.

In Year 2, we worked with several of the advisors individually. Charles Patton consulted with us on the development of Unit 4. He provided guidance on incorporating GroupScribbles for understanding computer science concepts, activities with mobile networking technologies, and suggestions on how to integrate mathematics into Build IT in general.

We also worked frequently with Pat Loomes, Judy Glenn, associate director of Girls Incorporated of Alameda County, and Brenda Stegall to explore approaches to sustaining and scaling Build IT across different Girls Inc. sites. Stegall has helped us identify the Girls Inc. affiliates most likely to adopt Build IT and thus, the regional conference where the Build IT PI and middle school coordinator from Girls Inc of Alameda County will provide a professional development workshop on October 19, 2007, to reach these affiliates.

We are also exploring funding for sustainability and scalability efforts with Girls Incorporated of Alameda County and Girls Inc.'s national office.

On August 16 and 17, 2007, the SRI Build IT team will host an advisory board meeting at SRI to further develop the mathematics component of the Build IT curriculum.

Summative and Formative Evaluation Reports

The following evaluation reports are included as separate pdf documents with this annual report:

- Build IT Summative Report, Year 2
- Formative Evaluations of Units 1 through 6, Year 2

Awards and Major News Items

In Year 1, SRI and Girls Inc. issued a joint press release on October 27, 2005, available at http://www.sri.com/news/releases/10-27-05.html Several publications printed the release, including:

- Tri-Valley Herald
- The Oakland Tribune
- The Daily Review
- Palo Alto Daily News
- Education Week
- TMCnet.com
- T.H.E. Journal in *T.H.E Newsletter*

Build IT Program to Strengthen Technology Fluency in Middle School Girls

Menlo Park and San Leandro, California – October 27, 2005 – SRI International and Girls Incorporated of Alameda County (Girls Inc.), today announced an $875,195 three-year grant from the National Science Foundation's Information Technology Experiences for Students and Teachers (ITEST) program (http://www.nsf.gov/). The Build IT grant supports Information Technology (IT) fluency and knowledge of IT careers through problem-based design curricula in after-school and summer programs for middle school girls in typically under-served communities. Additionally, program participants will collaborate as design partners with IT professionals and graduate students in the software engineering process.

The SRI and Girls Inc. collaboration draws on the combined strengths of both organizations in youth development, gender equity, technology fluency, technology design, and evaluation research. The Build IT curriculum will capitalize on middle school age girls' interest in design and communication technologies to motivate them to use technology, build their technology fluency, and foster their interest in pursuing IT careers.

"We are excited to work collaboratively with SRI designers and engineers to significantly expand the depth of IT experiences that we are able to offer Girls Inc. participants," says Pat Loomes, executive director, Girls Inc. "While our expertise focuses on girls' needs with the intent of making a difference in girls' lives, working with SRI will stimulate a new level of technological innovation and creativity that allows girls to confront and counteract the societal messages about their value and potential."

"Developing and implementing Build IT with Girls Inc. gives us the opportunity to inspire middle school girls not only to use information technology, but to learn that they can design information technologies that solve human problems," says Melissa Koch, SRI Build IT principal investigator and director. "Working with a youth development organization that strives to improve girls' learning will draw on SRI's expertise in assessment and evaluation. Together, we will develop youth development-friendly instruments and practices to identify girls' technology fluency."

During the three-year grant period , Build IT will be offered at Girls Inc. middle school programs in Alameda County and will reach more than 150 girls. Beyond the grant period, Build IT will be disseminated through the national Girls Inc. network, which reaches more than 600,000 girls annually through 1,500 program sites. More information about Build IT is available at http://www.ctl.sri.com/projects/displayProject.jsp?Nick=buildit

About ITEST
ITEST is a program within the Division of Elementary, Secondary, and Informal Education (ESIE), a branch of the National Science Foundation's (NSF) Directorate for Education and Human Resources. ITEST is designed to increase the opportunities for students and teachers to learn about, experience, and use information technologies within the context of science, technology, engineering, and mathematics (STEM), including Information Technology (IT) courses. It is in direct response to the concern about shortages of information technology workers in the United States. Supported projects are intended to provide opportunities for both school-age children and for teachers to build the skills and knowledge needed to advance their study, and to function and contribute in a technologically rich society. ITEST is comprised of youth-based projects with strong emphases on career and educational paths and comprehensive projects for students and teachers.

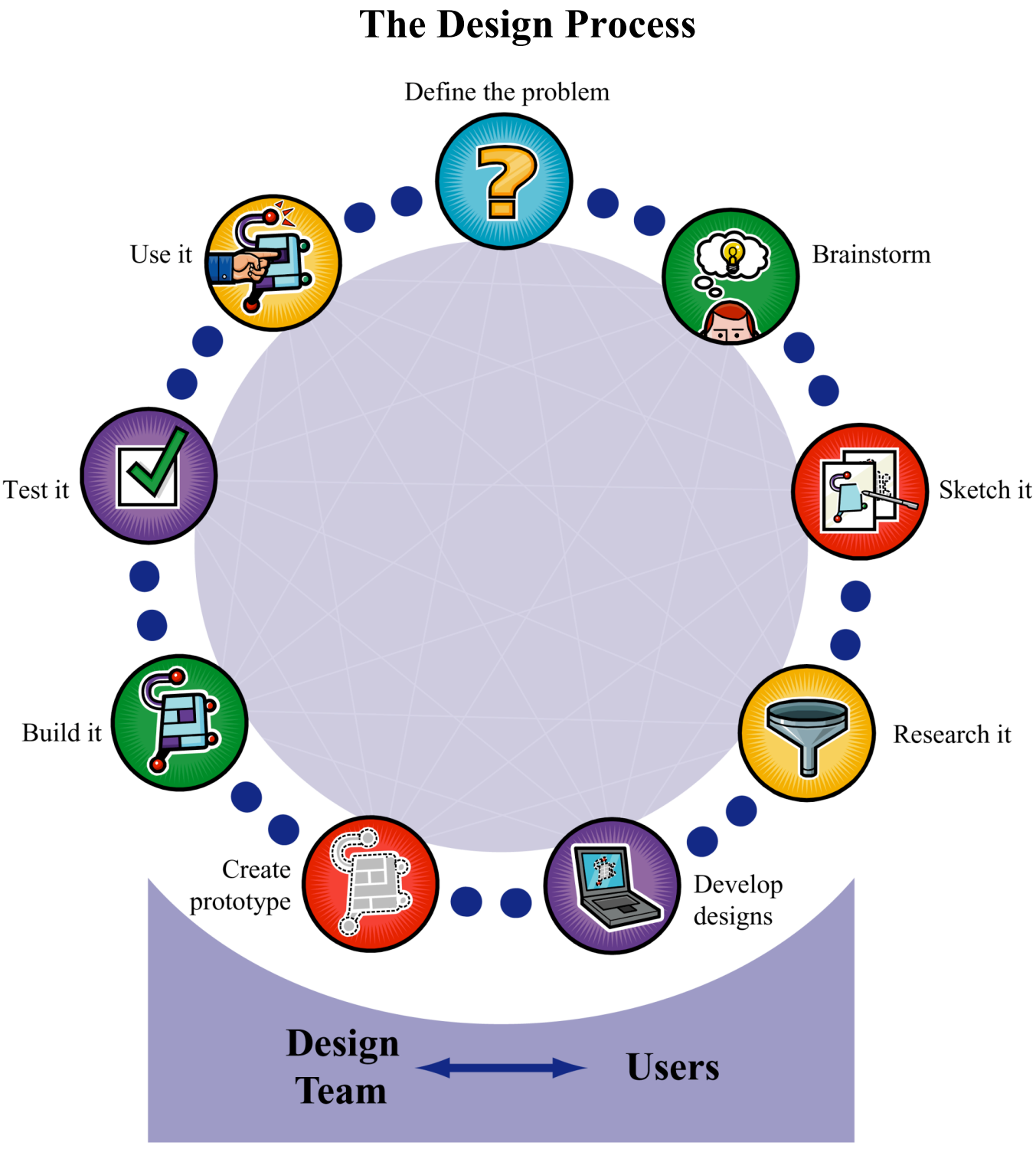
About Girls Inc.
Girls Incorporated of Alameda County is a local affiliate of the national Girls Inc. a nonprofit organization dedicated to inspiring all girls to be strong, smart and bold . Currently serving over 7,000 girls annually, Girls Inc. of Alameda County offers year round academic, enrichment and skill building programs, as well as counseling services to youth, and their families, from low-income communities. Girls Inc. challenges girls to explore their potential, attend college, build careers, and expand their sense of what is possible.

About SRI International
SRI's Center for Technology in Learning (CTL), which will lead the Build IT program, focuses on significant issues in learning and teaching, and on the use of innovative technologies to address those issues. To maximize its impact, CTL (http://ctl.sri.com) works in cooperation with education organizations, school systems, and technology companies.

SRI, located in Silicon Valley, is one of the world's leading independent research and technology development organizations. Founded as Stanford Research Institute in 1946, SRI has been meeting the strategic needs of clients for more than 55 years. The nonprofit research institute performs contract research and development for government agencies, commercial businesses,

and private foundations. In addition to conducting contract R&D, SRI licenses its technologies, forms strategic partnerships, and creates spin-off companies.

Innovation: Design Process Graphic



Build IT, a collaboration between SRI International and Girls Incorporated of Alameda County, is supported by the National Science Foundation's Information Technology Experiences for Students and Teachers (ITEST) program under Grant No. ESI-0524762

Build IT Curriculum and Professional Development Resources

The following Build IT curricular and professional development resources are available to NSF through this password protected site at https://www.sri.com:1800/display/builditinfo/Home Others interested in these materials, please contact the principal investigator at melissa.koch@sri.com.

Build IT

Curriculum Documents for Units 1 through 6

The Build IT curriculum is still in development. Activities and some artifacts from units that have been implemented are located here.

Units 1 was updated September 2006. Unit 2 was updated January, 2007. Unit 3 was updated June 5, 2007. Unit 4 draft November 2007. Unit 5 draft April 23, 2007. Unit 6 was created June 14, 2007.

- Unit 1 2006
- Unit 2 2007
- Unit 3 Summer 2007
- Unit 4 Pilot 2007
- Unit 5 Pilot 2007
- Unit 6 2007

BigIdeas.doc Document used to develop enduring understandings for each unit.

Working with IT Professionals

The following documents are guides and examples provided by the Build IT team to IT professionals who share their careers, interests, and education experiences with the girls.

- ITPacketFieldtripfin.doc
- ITPacketVisitfin.doc
- MelsITProfessionalpres.ppt
- PattisIntroduction.ppt
- ITProfPresentationExample.pdf
- IDEO IT Professional Brainstorming Session.pdf

Professional Development for Girls Inc.

Year 2

The following documents capture the process and activities of the professional development provided to Girls Inc. group leaders, with Girls Inc. leadership providing much of the professional development during Year 2.

- PD_Y2_unit1_Part1.doc
- PD_Y2_Unit1_Part 2_GirlsInc.doc
- PD_Y2_Unit 2_Part1.doc
- PD_Y2_Unit 2_Part2.doc
- PD_Y2_unit3_girlsinc.doc

Year 1

The following documents capture the process and activities of the professional development provided to Girls Inc. staff during Year 1.

- PD_Unit1.doc
- PD_Unit 2_Part1.doc
- PD_Unit2_Part2.doc
- PD_for_Unit3.doc
- URLs_PD_Build_IT_Unit3.doc

Evaluation Documents

Year 2

The following documents are the formative evaluation that covers each unit, the summative evaluation report, and the surveys for Year 2.

- FormativeEvalAllUnitsY2.pdf
- Build IT_Summative_ReportY2.pdf
- Build IT Attitudes Survey_Yr2_fin.pdf
- Build IT Concepts Survey_Yr2_fin.pdf

Year 1

The following documents are the formative evaluation reports for each unit and the summative evaluation report and surveys for Year 1.

- FormativeEvalUnit1.pdf
- FormativeEvalUnit2.pdf
- FormativeEvalUnit3.pdf
- Summative_BuildIT_FnlRptY1.pdf
- Build IT Concepts Survey.pdf
- Build IT Attitudes Survey.pdf

Reports to NSF

Year 2

- BuildIT_nugget.pdf NSF Highlight, accepted April 2007

Year 1

- Y1BuildITAnnualReport_2006FIN.pdf Year 1 Annual Report

Presentations and Selected Pictures

Year 2

The following are presentations by the Build IT team and selected pictures from the implementation of Units 1, 2, and 3, 4, 5, and 6 in Year 2.

- BuildIT_Summary_FIN.pdf
- BuildITposter-2007-FIN.pdf
- DesigningforDesignLearningFIN.pdf
- TeachingDesignWorkshopFIN.pdf
- BuildIT_TeachingDesignWorkshop.doc
- SelectedPictures_Y2.doc

Year 1

The following are presentations by the Build IT team and selected pictures from the implementation of Units 1, 2, and 3 in Year 1.

- buildit_poster_fin.pdf
- BuildITBayCHIEvent.ppt
- SelectedPictures_BuildIT_Y1.doc

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