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Summer Science Snapshot: A Developing Partnership Model to Spark Interest in STEM Among Rural Learners

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Abstract

As pressures grow to increase the number of scientists and engineers cultivated in the United States, the nation is ramping up its focus on science, technology, engineering, and mathematics (STEM) education. National and international organizations are calling on higher education institutions to rethink how STEM has been portrayed in society and create new methods to teach and learn science—and particularly engineering—in K-12 classrooms. We perceive this focus as an opportunity to build on the foundations children have developed by bridging the gap between what students have learned in their local environment and the required curricula.

We contend children in every community possess the knowledge and tenacity to succeed in STEM. A child’s innate curiosity about how the world works and their place in it can be nurtured through intentional learning opportunities. These opportunities, steeped in creativity and design processes, build skills and encourage the exploration and application of their own knowledge. Affirming the value of what a child already knows allows her to generate a vision of herself as an innovator, a scientist, or an engineer.

Recognizing that traditional methods of teaching science in the U.S. merits a reworking, and that students’ local knowledge is largely untapped, a team of educators—a collaboration among higher education institutions, local resources, and a rural elementary school—used out-of-school time to explore place-based learning techniques and engineering-design tasks. This paper describes this collaborative model and shares findings related to the potential impact this place-based summer program has on student interest in STEM.
Introduction

The world is changing rapidly—technology is developing at an unprecedented rate. Children currently enrolled in primary school will be asked to tackle and solve problems of the future that have not been conceived of today. According to Dr. Christine Cunningham, founder and director of the internationally recognized Engineering is Elementary Curriculum at the Boston Museum of Science (as cited in Hu, 2010, p. 1), “[Children] are born engineers — they naturally want to solve problems — and we tend to educate it out of them.” To prevent this regression, tomorrow’s educators will need to serve as facilitators, recognizing and cultivating students’ existing knowledge while simultaneously challenging them to adopt new mental models through self-initiated investigation. The freedom to design, create and experiment is now becoming an integral component of 21st century instruction, for the innovative thinking necessary to solve complex problems can only flourish in such an environment (Wagner, 2010). Teachers can lead the way by providing the framework necessary for students to explore and discover, while connecting students to resources and opportunities beyond the confines of the traditional classroom. This practice, along with the natural enthusiasm and innate skill set that children possess, the required STEM content, and rich local context, will allow for meaningful learning to take place in any school.

This article focuses on the efforts of a team of elementary school teachers from Tully, a rural community in central New York, working in concert with caregivers, community members, science educators and Cornell STEM professionals to make science accessible and inspirational to upper elementary students. Three overarching positions are explored:

• Affirming the value of what a child already knows allows her to generate a vision of herself as an innovator, a scientist, or an engineer
• Integrating creativity and the design process into learning opportunities is an effective way to engage students and encourage the application of knowledge
• Mentoring and role modeling are valuable methods of spurring rural students’ interest in pursuing higher education in STEM

This article begins with a literature review of relevant rural science education research and the role motivation and engagement play in STEM learning, this is followed by description of the program, and ends with a discussion regarding the impacts our place-based program has on student interest in STEM.

Theoretical Framework

Rural Science Education

Recent research shows that "Rural education is becoming a bigger and even more complex part of our national educational landscape. Over 20 percent of all public school students in the United States are rural. Roughly 47 percent of these rural students live in poverty, more than 25 percent of these children is a child of color, almost 13 percent of these rural children qualify for special education services, and approximately 13 percent of these rural children has changed residence in the previous year...It is becoming impossible to ignore the national
relevance of these students, families, schools and communities" (Johnson, Showalter, & Klein, 2014, p. 28). Rural places are spatially delimited natural environments that include demographic and ecological, economic, institutional and sociocultural dimensions where people live, work, and visit (Brown & Schafft, 2011).

Rural schools consistently receive lower school funding than their urban counterparts (Sipple & Brent, 2008). In addition, exposure and access to educational opportunities offered by science organizations, museums, colleges, and corporations are limited in rural areas. The number and types of STEM-related professional and vocational jobs are low in less populated and technologically connected areas. Thus, many rural children are not exposed to the diverse ways in which STEM is practiced in the world and they may not envision STEM-related educational or career pathways (Avery, 2013).

Despite these barriers, local community resources can provide teachers and students with opportunities for valuable learning experiences in rural environments to offset these trends. As with many rural communities in the United States and abroad, the school campus serves not only as the educational center for the region, but the cultural, social, and recreation hub of this community. Therefore, rather than taking a deficit model approach, we explore the ways in which rural environments can be rich places for learning (Corbett, 2010; Howley & Howley, 2010; Theobald & Wood, 2010). Educators can specifically develop their abilities to leverage available contextual or local knowledge seeded and grown in the local communities and the surrounding ecology (Kassam & Avery, 2013). This involves taking advantage of local resources and providing authentic hands-on experiences that purposefully connect children’s local knowledge to school STEM and national content standards (Avery & Kassam, 2011).

**STEM and Educational Standards**

With the advent of the Common Core Learning Standards (CCLS), now more than ever before, students, teachers and administrators in the public education system are being held under a lens of intense scrutiny, subjected to a series of high-stakes tests and performance evaluations under the auspices of accountability. The content and evaluation focus of the CCLS is Literacy and Mathematics. Thus, other disciplines, such as science for example, are for the most part, becoming extinct in the elementary school classroom. Furthermore, although some of the CCLS and Common Core Modules mention science, the limited science content is often overshadowed by the demands and expectations to focus teaching on literacy exclusively. We do not subscribe to this practice. Rather, as we demonstrate in our programmatic model that follows, higher order thinking skills and 21st century problem-solving skills, valuing what learners bring to the classroom (local knowledge), capitalizing on student motivation in science, and implementing teaching and learning strategies that include differentiated instruction and differentiated assessments found in the CCLS and the Next Generation Science Standards (NGSS), can be attended to in parallel with place-based strategies to enhance teaching and learning for more learners. This synergest approach addresses what teachers are required to do while simultaneously harnessing and enhancing the science and engineering local knowledge and motivation rural children possess.

**Student Motivation and STEM**

Motivational constructs, such as student engagement in science class, enrollment in science courses, and interest towards science learning, are promoters of learning and are good
predictors of long-term growth and academic achievement (Vedder-Weiss & Fortus, 2013). Research shows that “student motivation is dramatically influenced by their interactions with teachers, the context and culture of the school and community, and personal experience in and out of the classroom” (Harde, Sullivan & Roberts, 2008, p. 9). Villegas and Lucas (2002) call for preparing culturally responsive teachers that “have affirming views of students from diverse backgrounds...understand how learners construct knowledge and are capable of promoting knowledge construction, know about the lives of their students, and design instruction that builds on what their students already know while stretching them beyond the familiar” (p. 20).

Innovative instructional strategies can increase student motivation in increasingly diverse student populations (Sopovitz & Turner, 2000). Value, the learner’s tendency to assign worth to presented knowledge and skills, influences student engagement and investment in a task. Valuing is linked to breadth of past experiences, and to current and future opportunities (Stern, 1994 as cited in Hardre’ & Sullivan, 2008). Cultivating a sense of value/legitimacy in rural students’ academic understanding of science and engineering and its relevance to their daily lives is an important component of education. Students in courses that connect STEM to their everyday lives are able to connect the STEM they learn inside and outside school--enhancing student success in science (Avery & Kassam, 2011).

Influencing children’s attitudes towards and interest in STEM is a powerful way to impact immediate and life-long learning. Early childhood interest in science, not performance in science, has been shown to be a greater predictor of choosing to concentrate in STEM as a career (Maltese & Tai, 2011). Open-ended engineering design projects are outlets for creativity and ways for students to uniquely convey their knowledge and understanding (Cejka, Rogers & Portsmore, 2006). For example, recent research has shown that the implementation of Engineering is Elementary (EiE), an engineering design curriculum for elementary schools, increases student interest in science, engagement in learning activities, and performance (Cunningham & Lachapelle, 2011).

In order to provide programming to serve and inspire students in rural communities, educators and families can benefit from forming partnerships with both public and private institutions. Such partnerships can be genuinely beneficial to all parties involved when rooted in local knowledge, local community and local ecology. This counters the often traditional approach that historically has created a pipeline that funnels students away from their foundational roots and local knowledge, rather than embracing and enhancing it (Corbett, 2007; Carr & Kafelas, 2009). When local resources are valued, constructive, mutualistic relationships between higher education institutions, educators and community members synergistically serve to bridge the resource gap and provide exposure to experiential learning opportunities that positively influence student motivation and long-term achievement (Wheland, Donovan, Duke, Qammar, Smith & Williams, 2013).

Methods

To document and evaluate programmatic impact on participating youth, we draw upon qualitative data collected through programmatic observations, surveys and interviews with participating rural school children and their parents and caregivers (Hine, 2010). Data collection took place throughout the program implementation. The data was analyzed using Content Analysis (Patton, 1990). The data were then organized in the emergent and thematic rural science framework of place-based education and rural teacher development (Avery, Bischoff, French & Siegrist, 2014). Institutional Review Board approval has been given for this research.
Programmatic Structure and Pedagogy

The program that we describe has spanned a decade in evolution and began as a collaboration funded by a National Science Foundation (NSF) Career Grant between high need high resource capacity rural schools within a 100 mile radius of Cornell University, science teacher educators (faculty, pre and in-service teachers) from the SUNY Oneonta region, and faculty and outreach educators from the Cornell University Department of Physics. One school in particular has had a strong and consistent presence in this program, the Tully Central School District. In 2009, a small team of Tully teachers reached out to science education staff and associated faculty at Cornell University to enhance STEM opportunities for their students. The Summer Science Snapshot Program (SSSP) for grades 4 through 8 students emerged as a result of these efforts. Prior to this, the program focused exclusively on teacher professional development.

For the purpose of this paper and to highlight our efforts, we discuss the 2012 SSSP as an illustrative case that encapsulates how the program has evolved into a rich place-based opportunity for participating teachers and students.

During the summer of 2012, the Tully team of teachers attended the Summer Science Snapshot Program (SSSP) for Educators in July. Through consultation with science experts in the field and STEM educators, the group developed a place-based curriculum unit emphasizing engineering design skills that would be valuable to their students’ understanding of water and sustainability.

The mission of the SSSP for Educators program is to model engaging, place-based instruction and design-based experiences focused on STEM curriculum both in and outside of the school settings. The program provides teams of teachers with time for collaborative lesson preparation along with the opportunity to try out learning activities, gathering authentic feedback from students and community members.

Context

This program takes place at annually Cornell University during the summer months and includes both a teacher and student component. During years of summer programming, we have identified two strategies that are key to providing meaningful learning opportunities by legitimizing students’ values, enhancing student motivation and fostering engagement in STEM activities in rural students: Place-based Education and Engineering Design-based experiences. A third aspect of our program involves connecting students to the STEM pipeline, accomplished by hosting summer learning experiences on the campus of a major research university where STEM role models and artifacts are made available to these youth. Collectively, these three programmatic strategies draw explicit connections between local knowledge, motivational and attitudinal constructs, and student agency in STEM.

Place-based Education Pedagogy

The SSSP team of educators set out to develop an interdisciplinary STEM unit supporting concepts associated with water and sustainability. The small rural community of Tully is nestled among the rolling hills of central New York State. It is located in south central NY, providing
learners with rich, place-based contextual knowledge of hydrologic systems. Residents have relied upon glacial features; rolling hills, kettle holes, and lakes, for work and recreation for decades and the children have grown up experiencing a connection to the ecology. The Tully teachers expressed their desire to link Tully’s local natural resources to meaningful science activities for students both in and outside of their classrooms.

To ensure effective pedagogical practices and connecting children’s local rural knowledge with global science, we utilize place-based education (PBE), which focuses on structuring learning around local history, culture, economy and environment (Gruenewald & Smith, 2008). PBE uses the local environment as a starting point to teach numerous subjects. Emphasizing hands-on, real-world learning experiences, this approach increases academic achievement, strengthens students’ ties to their community, enhances students’ appreciation for the natural world, and creates a heightened commitment to serving as contributing citizens (Sobel, 2005). PBE connects students with the community by involving them in decision-making and real-world problem solving, reflecting a much wider-ranging learning paradigm than simply learning to take a test (Smith, 2002).

Engineering Design-Based

Design-based learning opportunities build on students’ existing science knowledge; giving them opportunities for hands-on learning, and the development of higher-order thinking and skills (Cejka et al., 2006). We consider design as the activity of proposing and creating plans for a product that will solve an open-ended problem. This experience allows students to envision themselves in the future STEM workforce because they are authentically engaging in the work of scientists and engineers; they experience being scientists and engineers. Students work collaboratively, using shared skills and strengths to generate tangible, testable objects that are modified and improved over time. Design-challenges have been shown to motivate students to solve problems in order to learn engineering, science, and mathematics content (Klein & Sherwood, 2005). Fostering an understanding of the nature of science and engineering as a collaborative, social and iterative process and not just a final product, guides this approach.

Connection to STEM Pipeline

On-campus learning experiences enable students to envision themselves in the context of a higher education institution. Many rural students do not view themselves as contenders for a post-secondary education in STEM. Visiting a campus library, field trips to such places as research laboratories or engineering machine shops provide students with a context for learning, relevancy to their own lives, and insight into solving real world problems. Mentoring and role modeling by STEM undergraduate and graduate students where they share their stories of how they came to study in their area of interest and passion at Cornell University and elsewhere, has been shown to be extremely effective in spurring both rural and urban students interest in pursuing higher education in STEM fields (Avery, Trautmann, & Krasny, 2003; Baumgartner, Duncan, & Handler, 2006; Gilmer, Granger, & Butler, 2005; Trautmann, Avery, Krasny, & Cunningham, 2002).

The annual timeline for the Summer Science Snapshot Program (SSSP), the major components of the program, and the participants involved in its planning and execution, are outlined in Appendix A. This outside-of-school-time educational model, adjusted and improved over time, contributes to youth developing a sustained interest in science. The program is
interactive and social, with activities being self-driven and relevant to students’ lives and future. This SSSP model supports students’ sense of agency or personal awareness of their potential impact on the world (Basu, Barton, Clairmont & Locke, 2007; Shamah & MacTavish, 2009).

Findings

On the first day of the summer program for youth, facilitators introduced the book *A Long Walk to Water* by Linda Sue Parks to the students. This book is one of the informational texts included in the Common Core Learning Standards and is also one that offers interdisciplinary teaching opportunities for connecting local contexts to global contexts. Tully students were able to relate this experience to their knowledge of the story of the Lost Boys of the Sudan and their Tully hometown hero Lopez Lemung, who resettled in the U.S. in 2001 and attended Tully High School. The students are also familiar with fresh water resources in the region through everyday engagement with their environment via fishing, living in homes that rely on well water, by being involved with recreational activities on the local lakes, and through exploring the outdoors during play. This story also highlights the life a South Sudanese village girl who walks each day to get water from a distant well. To help students make connections to the daily lives of the characters in the story, we began with a hands-on math exercise where students determined the amount of weight the girl carried and the distance she walked each day to provide her family with drinking water. To physically simulate Sudanese roles and responsibilities, the boys in the group were asked to sit down and read portions of *A Long Walk to Water* (going to school) while the girls in the group were asked to carry five-gallon jugs of water around the classroom for several minutes (doing the chores). A discussion about gender roles, water quality and water scarcity followed the activity.

To continue making connections between local place and the global, for homework, students were asked to take photos of how they observed water being used at home and in their community. We shared their findings and photos the next day and discussed the availability and quality of water in different communities. While most of the participants have well water and filtration systems at home, many communities in other countries have very little access to drinkable water, and the water that is available might lead to sickness or death due to a lack of adequate wells and/or filtration. The group discussed the role of engineers in designing the technologies that have made drinking water easily accessible in the U.S. These same technologies have been modified and implemented in other countries with assistance from engineers and other experts from our country. A parent, responding to a survey question responded, “What did your child discuss with you regarding the Snapshot experience?” provided the following quote; “Participation in the Snapshot program taught him and other students from rural areas that opportunities are found all around the world and we are not enclosed to just living in one area.”

To connect students with opportunities in higher education and with experts in the field that work globally, representatives from the AguaClara Project at Cornell came to speak to the children about access to fresh water in areas throughout the world. The AguaClara Project takes teams of engineers and undergraduate students from Cornell to developing countries to design sustainable water filtration treatment systems for villages. Students learned about water filtration chemistry, mechanics, and community collaboration from the AguaClara student engineers. The student engineers from AguaClara then interacted with the Tully children as they worked through the engineering design challenge posed in the Engineering is Elementary curriculum unit, *Water, Water, Everywhere: Designing Water Filters* (EiE, 2015)
curriculum unit, situated in India, introduces students to the problem of water pollution—and to some solutions. It parallels nicely with what the students just learned from the AguaClara engineers' experiences in Honduras. As part of the engineering design process, students investigate the properties of filter materials, apply their knowledge of water, and think like environmental engineers as they plan, construct, test and improve their own water filters. Students further explored filtration on a larger scale and in a real life situation by going on a field trip to the Cornell water filtration plant where they met the engineers who run the plant and saw the filtration treatment process in action. Also while at the site, using iPad technologies, students engaged in a scavenger hunt where they looked for examples of engineering in action, capturing images of different technologies at the filtration plant. The photos demonstrated student understanding of the relationship between societal needs, science knowledge, engineering practices and resulting technological advancements. A quote from a parent survey affirms the importance of connecting a student to the educational role models and engineering experiences; “They (both children) actually started talking about being engineers and where they would go to college. They learned about trying something and adjusting their ideas to make things work better.”

Figure 1. Engineering students from Cornell’s AguaClara project work closely with SSSP students to add flocculent to water samples to clump suspended particles and to measure the clarity of filtered

During the engineering-design challenge portion of SSSP, students were asked to build a water filter and a water pump. A flurry of activity was sustained throughout the time allowed; a willingness to take risks in pursuit of answers indicated deep engagement. To insure that the activity invited disparate approaches and that it welcomed application of what students know from experience at home, facilitators circulated the room primarily as passive observers. As students worked through the problem, noteworthy elements of discussion included: explanations of prior knowledge, verbal, written, and sketched articulation of design ideas, dialogue/debate about what will and will not work, and lots of trial-and-error. Clear water began to emerge from the bottom of their homemade filter, demonstrating an obvious harnessing of underlying physics concepts, and affective utterances like “wow” and “cool” demonstrated enthusiasm toward the design project. Student survey feedback revealed a strong interest in engineering-design challenges. One student providing the following quote, “Doing these activities made me want
to be an engineer.” Other students expressed similar desires and an interest in participating in subsequent programming: “Yes! I definitely would love to participate in this program again. I love creating things and this is exactly what I love to do – create things and start from scratch!”

To further explore the topic of water and sustainability, we hosted a field trip to the Cayuga Lake Floating Classroom on a nearby glacier-formed lake, where the crew demonstrated their work monitoring the “health” of the lake and the effect of factors such as watershed run off, human use, and invasive species have on the lake environment. Children learned how to conduct water tests and monitor factors that can damage an aquatic environment. One participant provided us with the following feedback, “Taking a trip to the floating classroom sparked an interest in marine biology as I loved to take samples of the lake.”

Following their field experience, oceanographer Dr. Bruce Monger met with the children and shared with them his journey that ultimately led him to a career at Cornell University as an educator and researcher. Dr. Monger, who also grew up in a rural area, explained how studying ocean data, like the data students had collected on the lake, helps scientist monitor the health of the planet. He described his collaborations with other scientists; exemplifying how teams of specialists work together to solve environmental issues. Students concluded this learning by visiting a local stream and collecting shoreline trash to experience how they can be vital stewards of aquatic ecosystems even on this small scale. A parent offered the following reflection of the summer program; “She has always loved science but taking it out of the classroom into a hands-on environment has raised the bar in both comprehension and interest. This program allows her to connect a lesson to the real world.”

In addition to these experiences students were able to explore other offerings on the Cornell campus such as a guided tour of the Wilson Laboratory particle accelerator facility, visit to the campus bookstore and dining facilities, and walking tour(s) of the campus and its artifacts and attractions. All of these experiences added to the students’ overall understanding of the

Figure 2. Small teams of students work together to build water pumps using inexpensive, accessible materials. Creative problem-solving and ingenuity are exhibited as testing and redesigning occurs. Student observations and data collection are recorded.
opportunities that being a member of a campus community could offer them in higher education; developing their sense of self–efficacy and fostering motivation for learning.

On the evening of the final day of the SSSP program, students exhibit their projects as part of a formal program presented to families, friends, other invited guests such as scientists and school administrators. This capstone event allows students to showcase their work, share what they have learned, and describe their experiences during the two-day program. A quote from a student interviewed said; “…I would really love to go to Cornell...and get a degree in engineering...With engineering you can do so many things. I really liked when we were in the particle accelerator. That was my favorite part because it’s just so amazing to think how fast those things can go...It’s hard for me to even think how humans could have like achieved all this! I mean think about it, we’ve got to be smart to do all this and discover something we can’t even see. It’s really cool…”

Invited guest are encouraged to visit each team of students and listen to how their devices work, what challenges the team had in implementing the design, and any other information the students wish to share.

Figure 3. Aboard the Floating Classroom, SSSP students work with scientists to collect water quality samples and measure turbidity levels at different locations around Cayuga Lake.

Figure 4. SSSP students demonstrate the use of their water pump to a visiting Tully parent. Participants each receive their own certificate following the Showcase event.
Following the project showcase, guests attend a narrated slideshow with photos from the program chronologically assembled by facilitators – capturing some of the defining moments of the shared experience. Each student is awarded a certificate with their name on it, publicly acknowledging their participation in the Summer Science Snapshot program. Immediately following the capstone event, paper surveys are distributed to parents/caregivers with emphasis placed solely on improving the Snapshot youth program. Parents completing the survey can opt to self-identify or could remain anonymous. Overall, results from the surveys are overwhelmingly positive. A compilation of student quotes from the surveys can be found in Appendix B.

Implications

The data provided in this informal study indicates that the objectives of the Summer Science Snapshot Program (SSSP) are being met; students are engaged in the experiential learning being facilitated by teachers trained in effective pedagogy in science education. Preliminary data indicates that this program model has impacted student motivation for STEM learning. Teachers, pre-service teacher candidates, and university professionals have been able to come together in partnership to reflect upon and assess the strengths and needs of students in rural communities and work in concert towards a sustainable model for learning. In addition, student participants are able to interact with undergraduate and graduate students, educators and professional role models in STEM, which helps children to envision themselves as future scientists and engineers.

Part of the mission of the SSSP is to prepare educators to teach engaging, place-based instruction and design-based experiences focused on STEM curriculum in the school setting. Using a place-based, team approach allows for collaboration and partnerships for lesson planning and preparation. The SSSP provides teachers with the opportunity to try out curriculum units and engagement lessons to get authentic feedback from learners as well as collaborate with fellow educators and professionals in the field.

Teachers who attended the Science Summer Snapshot Program and co-facilitated the 2012 SSSP for Youth program described in this paper have replicated the water and sustainability unit as an interdisciplinary lesson in their own classrooms. By implementing engineering design lessons in their classrooms and extending the learning into their surrounding community, they have leveraged local resources, affirmed students’ knowledge and value of place, and earned the support of rural families, administrators and community members. We strongly encourage other rural schools and communities to replicate our model as it provides much needed support and opportunity for rural schoolteachers and learners.

Partnerships can play a critical role in supporting rural communities as they identify and use contextual resources to foster interest and relevance in learning for their youth. The greatest asset of any community is the character of its people, and the future of any community lies in the attitudes and aspirations of their children. We have responded to the needs of our rural youth by providing transformative learning environments that ignite in them a desire to learn, grow and succeed. The youth of today will need to respond to the global needs of tomorrow. Programs like ours provide students with an accessible toolkit of STEM knowledge, skills and self-assurance to make the difference both in their own rural community and abroad.
Acknowledgements

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Appendix A

Cornell Summer Science Snapshot Annual Timeline

• Planning Meeting (1 day, spring)
  o Organizers meet to agree on:
    ▪ Theme, Objectives
      ▪ Field trips/tours of facilities
      ▪ Presentations by engineers/researchers
      ▪ Engineering Design Challenge
      ▪ Showcase Venue/Highlight
    ▪ Logistics planning for Summer Snapshot for Educators program

• Summer Science Snapshot for Educators program (3 Days, July)
  o Organizers host Participant Teachers at the Host Institution to:
    ▪ Test run the field trips/tours, presentations, and engineering design challenge
    ▪ Discussion of intended outcomes and strategy for execution of Summer Snapshot for Youth program
    ▪ Facilitator selection and logistics planning for Youth program

• Summer Science Snapshot for Youth (2 Day, August)
  o Organizers, Participant Teachers, and Students at Host Institution to experience:
    ▪ Field trips/tours of facilities
    ▪ Presentations by researchers
    ▪ Engineering Design Challenge
    ▪ Showcase

• Reflection meeting (1 day, August)
  o Team meeting and discussion
    ▪ Reflection
    ▪ Analysis of Student artifacts
    ▪ Adaptations, alterations or extension of activities
    ▪ Implementation logistics/scheduling for year

• On-site Implementation, (school-year)
  ▪ Ongoing
  ▪ University resources
  ▪ Classroom support
### Appendix B

**Sample Responses as Quotes Provided by Students From 2012 Surveys**

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<thead>
<tr>
<th>Question</th>
<th>Sample Response</th>
<th>Sample Response</th>
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<tr>
<td>Did this program help you better understand what scientists and engineers do? How?</td>
<td>“Yes, it helped me better understand because we actually got to do hands-on projects and meet real scientists and engineers.”</td>
<td>“Yes. Doing these activities made me want to be an engineer.”</td>
<td>“Yes, because it was like we were scientists and engineers for a couple of days.”</td>
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<tr>
<td>Would you like to have similar science and engineering lessons or activities offered at your school?</td>
<td>“Yes, I think it would be fun to bring the hands-on experiments to school.”</td>
<td>“Yes...it was fun to create things while I was learning.”</td>
<td>“Yes, at school we don’t build things. I would like to build things.”</td>
</tr>
<tr>
<td>Would you be interested in participating in the Snapshot program again if it were offered in the future?</td>
<td>“Yes! I definitely would love to participate in this program again. I love creating things and this is exactly what I love to do – create things and start from scratch!”</td>
<td>“Of course! I actually got to spend time with scientists and do what they do.”</td>
<td>“Yes. I would be interested to do it again because I got to learn new things and it was very fun.”</td>
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<tr>
<td>Is there anything else you would like to share with us about your experience this summer?</td>
<td>“Yes, I loved it. It was like I had an adventure through science and I want to come back every single year!”</td>
<td>“Do not stop this program!”</td>
<td>“The teachers were so nice and kind.”</td>
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<tr>
<td></td>
<td></td>
<td>“Every day after camp I would come home and tell my mom all that I did in camp.”</td>
<td>“It was very fun and awesome.”</td>
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