



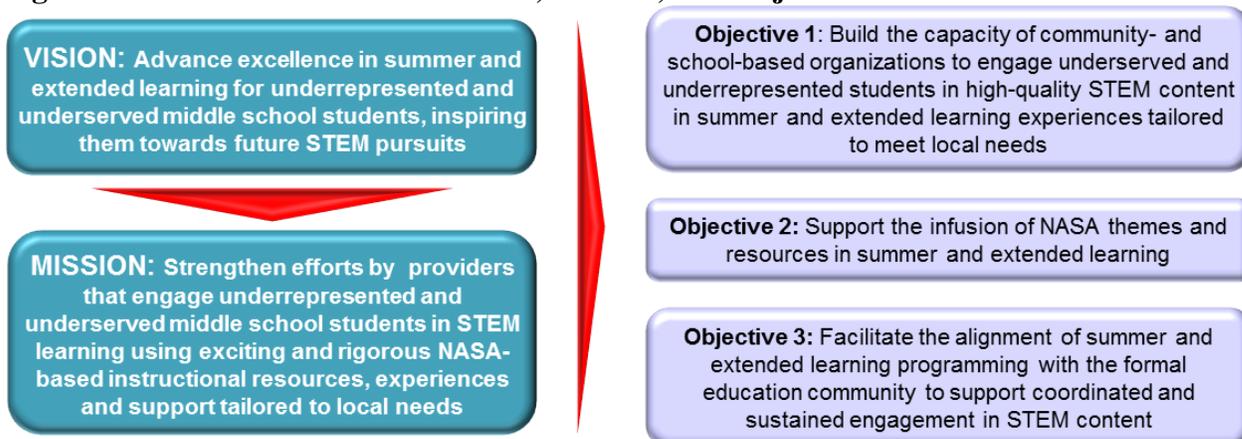
## Preliminary 2013 Annual Performance Report Summer of Innovation (SoI)

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### **PROJECT DESCRIPTION**

In 2009, President Obama announced the “Educate to Innovate” campaign to foster a renewed commitment to strengthen Science, Technology, Engineering, and Math (STEM) education. In January 2010, the National Aeronautics and Space Administration (NASA) launched the Summer of Innovation (SoI) project in response to the President’s call to action. As can be seen in the Figure I, SoI’s clearly articulated Vision, Mission and Objectives are centered on building local educational capacity for supporting STEM education for underserved and underrepresented middle school students.

**Figure I: Summer of Innovation Vision, Mission, and Objectives**



Summer and after-school programs present a prime venue for fostering student interest in STEM because of their informal atmosphere and their unique ability to inspire and excite children through enrichment experiences and hands-on, project-based group activities.<sup>1</sup>

<sup>1</sup> Robelen, E. (April 2011). Awareness Grows of Importance of Learning Science Beyond School. *Education Week: Science Learning Outside the Classroom*, 30 (27), S2-S5.

Out-of-school time (OST) activities allow students to connect with STEM on a personal level, which is especially important for students who are underrepresented in these fields and may not have previously felt encouraged to pursue STEM.<sup>2</sup> SoI was designed to give students an opportunity to engage in OST learning at an early age and during a critical period in the education cycle: summer. As a recent study has shown, 75% of Nobel Prize winners in science attribute their interest in science to an out-of-school experience,<sup>3</sup> and many students who originally underachieved in STEM before successfully pursuing STEM careers discovered their passion during OST programs.<sup>4</sup> A meta-analysis of 93 summer program evaluations showed that summer programs designed to improve students' academic abilities tend to increase skills and knowledge by the end of the summer.<sup>5</sup> In fact, not attending summer programs can have negative impacts on student performance. While students are on summer break, many forget what they learned in the previous year and enter the next grade at a disadvantage. Because of this "summer slide," the average student loses around two months of math skills by the end of the summer.<sup>6</sup>

SoI strategically partners with summer, school, and community-based organizations to strengthen summer programming, and to increase STEM education capabilities with NASA support and tailored content. SoI is geared specifically towards underserved and underrepresented students in grades 4-9 and leverages a multi-faceted, partnership-based implementation approach to maximize the project's scale and reach while allowing for local flexibility and innovation. These collaborations leverage evidence-based practices of SoI including its strong inquiry-based content and supports for qualified educators (professional development resources) accessible through the SoI website ([www.nasa.gov/soi](http://www.nasa.gov/soi)). Additionally, these collaborative opportunities linked formal and informal education partners and involved families in SoI. Currently, Summer of Innovation is implemented across five different approach models described below.

**2010 National Awards:** Four Space Grant Consortiums supported major efforts to mitigate the effects of the "summer slide" on student academic achievement and to increase student interest in STEM education. The five objectives of the pilot, as explicitly stated, were as follows: (1) Professional development and training opportunities for educators; (2) An intensive and interactive middle school education experience; (3) Strategic infusion of NASA content; (4) A STEM community of learning for sustained engagement over the 36-month performance period; and (5) Assessment of efficacy in implementation (evaluation).

**2011 National Awards:** Eight National Awards support major efforts to build the capacity of high quality or promising educational organizations targeting underserved and underrepresented populations. These National Awards are intended to broaden the scale of successful STEM efforts and/or to deepen the educational content value for

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<sup>2</sup> President's Council of Advisors on Science and Technology, 2010

<sup>3</sup> Friedman, L. & Quinn, J. (February 2006). Science by Stealth: How After-School Programs Can Nurture Young Scientists and Boost the Country's Scientific Literacy. *Education Week*, 25 (24).

<sup>4</sup> President's Council of Advisors on Science and Technology, 2010

<sup>5</sup> Cooper, H., Charlton, K., Valentine, J. C., & Muhlenbruck, L. (2000). Making the Most of Summer School: A Meta-Analytical and Narrative Review. *Monographs of the Society for Research in Child Development*, 65 (1), 1-127.

<sup>6</sup> Afterschool Alliance. (2008b). Summer: A Season When Learning is Essential. *Afterschool Alert* (33)

organizations that already have a broad student reach by providing them with rich NASA-based STEM curriculum and professional development.

**Center Awards:** Nine NASA Field Centers and the Jet Propulsion Laboratory have extensive experience engaging local community partners in summer programming for students across the country. These Ten Center Awards enhanced SoI's ability to support NASA STEM programming through Centers' collaborations with individual organizations or consortiums that benefited from the use of Centers' resources, facilities, and personnel. The participation of Centers is integral not only to expanding the geographic reach of SoI, but to ensuring that NASA resources are available and accessible to program implementers with a history of successful collaborations with NASA.

**Mini-Awards:** During the pilot of the SoI project in 2010, numerous organizations expressed interest in partnering with NASA in Summer Learning. Many of the organizations that provide opportunities to the SoI target audience are community based, and do not have substantial experience in government partnerships. NASA used the mini-grant opportunity to focus on these smaller organizations across the country to introduce them to Summer of Innovation content and themes. Administered through the Education Support Services (ES2) Contract at NASA Glenn Research Center, SoI granted mini-awards with a maximum value of \$2,500 to various sites across the country.

**General Public:** Organizations that are not awarded financial support or could not meet the project funding or sustained engagement requirements still had full access to the project's educational content through the SoI website (<http://www.nasa.gov/soi>). Through the Summer of Innovation website, visitors have access to NASA content modules, individual student lessons for grades 4-9, educator training modules, and information regarding alignment to National Standards.

In FY 2013, the SoI Project contributed to Outcome 2 and its objectives with the following accomplishments:

## **PROJECT ACCOMPLISHMENTS**

### ***General***

- Engaged 46,549 middle school students in grades 4-9 and 4,736 educators in approximately 900 SoI camps/activities across the United States
- Reached targeted audience (underserved and underrepresented students):
  - 72% minority
  - 48% female
  - 77% received free/reduced lunch
- Conducted Implementation and Outcomes Evaluation Studies based on SoI project design and evaluation plan recommendations from nationally recognized evaluation experts which:

- Focused on stand-alone camp model for middle school students in grades 6-8
  - Adopted Harvard University’s Program in Education, Afterschool, and Resiliency (PEAR) Dimensions of Success (DoS) observation tool which provides evidence-based criteria for out-of-school time STEM program quality to inform both program design and implementation
- The U.S. Department of Education (ED) and NASA entered into an interagency agreement to launch an innovative pilot in 3 states (MI, CO, VA) with 22 sites participating to expand high quality STEM programming in afterschool programs through the 21st Century Community Learning Centers (21CCLC). The 21CCLC program provides grants to states to support academic enrichment opportunities during non-school hours for students and their families, particularly students who attend schools in under-resourced communities. Through this pilot, NASA provided 3 STEM Challenges designed to increase learners’ involvement and interest in STEM, educate them on the value of STEM in their lives, and positively influence the perception of their ability to participate in STEM by connecting them to NASA-unique content resources.

***NASA Centers and the Jet Propulsion Laboratory (JPL)***

- NASA Centers and the Jet Propulsion Laboratory develop collaborations with schools, school districts, education institutions, science centers/museums and youth organizations including Boys and Girls Clubs, 21<sup>st</sup> Century Community Learning Centers (21<sup>st</sup> CCLC), 4-H, Boy and Girl Scouts of America, Girls Inc.
- NASA Center and Jet Propulsion Laboratory Success Stories highlighted the SoI camps/activities collaborators implemented throughout the summer including but not limited to the following examples:
  - SoI Rocketry & Mars Exploration Camp - During our 2<sup>nd</sup> camp we were visited by a 10 year old student who had participated in the first camp held the week prior. She informed us that she had a great deal of trouble with Science in school and that she was tired of failing that subject. She noted that she had a lot of fun at the SoI Rocketry & Mars Exploration camp in Ohio last week and was wondering if we would consider letting her also attend this camp. She said she was starting to “get it” and thought that if she could go through it again she would be “more ready” when school started in September. The staff was impressed with her presentation and allowed her to stay (although she was only counted once during the summer). At the conclusion of the second week of camp she came to us and proudly displayed the satellite she had built and how her satellite components were well within “weight specifications”. During her presentation she smiled with pride to her mother and stated that she was glad to have had an extra week to test, redesign, retest and finalize her satellites, planetary distance model “to scale” and that she was sure that the rocket she had built would not only fly “right” but would fall back to earth with a perfect parachute open. Her mom told us that she had never

once talked this way about anything to do with science until she came to this camp sponsored by Glenn Research Center (GRC). The staff was not surprised when the child showed up to the next 3 weeklong camps and not only finished her work but insisted on helping those who did not seem to “get it” the first time.

- 21<sup>st</sup> CCLC NASA SoI STEM Camp - Windy summer days make for a great summer experiment! The young commanders of the Academy of Fine Minds 21<sup>st</sup> Century Community Learning Center at Hiawassee Elementary had a high-flying adventure when they constructed and flew their very own kites! Hiawassee Elementary is an Orange County Public School located in the Pine Hills community of Orlando, Florida. While exploring the NASA SoI Robotics Unplugged Camp, students were given materials to create a kite using paper, pencils, straws, string, and tissue paper. One of the highlights of this NASA Kennedy Space Center (KSC) collaborative camp was the revelation that students had of the “trial and error” experimentation process. While some kites took flight on the first try, others crashed. Students had to reevaluate their design to determine what needed to change. Through hypothesis, testing, and experimenting, students concluded that the length of the tail and the length of the string made all the difference between a crash and a successful kite flight!
- Clear Creek Independent School District (CCISD) - More than 300 students got a unique jump start to the school year during the Summer of Innovation camps held a few weeks before the bells rang to signify the new year. NASA Johnson Space Center (JSC) provided professional development to CCISD teachers who lead the camp activities. Students learned to apply math and science skills in group activities also developed by NASA JSC. Camp participants had the opportunity to experience hands-on, engaging lessons that provided an academic preview of the new school year. Astronaut Ricky Arnold made a surprise appearance at the Summer of Innovation 2013 inspiring camp goers and bringing science to life with stories of his trip to the International Space Station. The camps culminated in the Voyage Back to School event at Space Center Houston which provided a forum for the students to showcase their summer projects and celebrate the return to school.

### ***2011 National Awards***

- 2011 National Awardees accomplished several milestones including:
  - Sustainability grant awards in the amount of \$35,000 from various foundations and education stakeholders
  - Winning Student Spaceflight Experiments Program Mission 4 proposal (1 out of 755 student team applications) from two SoI students (Pharr-San Juan-Alamo Independent School District). Student experiment on “How does microgravity affect mold growth?” was selected for flight to the International Space Station (ISS) on the next SpaceX mission
  - Engaged in pre-service teacher collaborations with university education programs including:

- ▶ Marian University train-the-trainer pilot program with 15 pre-service teachers in SoI STEM content who provided instruction in SoI camps in Indiana
- ▶ Sinte Gleska University Rising Star Educator Program (RSEP) designed to increase the number of educators who can effectively teach STEM in schools on South Dakota American Indian reservations provide educators the opportunity to teach in NASA Summer of Innovation summer camps and access NASA STEM resources.
- Indiana Celebrate Science! Event hosted over 7,000 attendees to promote a shared vision among industry, education and the public of the importance of STEM-related skills in our economy, environment, health systems, and social systems while creating interest among students early in their careers to explore, pursue, and persist towards a STEM-based education and career field
- SoI students on 27 teams from Puerto Rico participated in the FIRST Robotics World Championship where 15 teams made it to the quarterfinals and 12 of those captured awards

***2010 National Awards***

- 2010 National Awards continued to engage students and educators in STEM Learning Community activities including the Massachusetts Institute of Technology (MIT) Summer LEGO Engineering Institute for Educators; Educator Best Practices Conferences and SoI camps around the country
- New Mexico Space Grant Consortium successfully completed their second SoI “Launch and Learn” space flight with students’ experiments aboard a SpaceLoft-5 rocket from Spaceport America near Las Cruces, NM on June 21, 2013. The rocket reached an altitude of approximately 73 miles and experienced 17 Gs of force at a speed of Mach 5 (five times the speed of sound at approximately 3,800 mph). Within two hours of their journey to space, the experiments were returned to students and teachers for analysis back on earth.

***SoI Mini-Awards***

- The SoI Mini-Award program received 412 applications. Of those applications, 172 organizations were funded. The geographic distribution of the awards covered 43 states, the District of Columbia, and Puerto Rico

**Table I: FY2013 Summer of Innovation Project Participant Data**

Participants	Students	Educators (Certified Teachers & Informal Educators)
<b>2011 National Awardees (8) – Summer Implementation</b>	14,037	1,175

<b>Center Awards (10) – Summer Implementation</b>	25,186	3,232
<b>*STEM Learning Community Activities</b>	6,379	237
<b>**Mini-Awards</b>	947	92
<b>Totals</b>	<b>46,549</b>	<b>***4,736</b>

\* Participants served by FY2010 national awardees in FY2013

\*\* Preliminary Mini-Award 2013 participant data (reports submitted by 15 out of 172 awards to Education Support Services Contract)

\*\*\* Total Educators (1,937 Certified Teachers and 2,799 Informal Educators)

**Table II: FY2010-FY2012 Summer of Innovation Project Participant Data**

Participants	FY2010		FY2011		FY2012	
	Students	Educators (Certified Teachers & Informal Educators)	Students	Educators (Certified Teachers & Informal Educators)	Students	Educators (Certified Teachers & Informal Educators)
<b>2011 National Awardees (8) – Summer Implementation</b>	---	---	8,901	1,112	11,991	1,592
<b>Center Awards (10) – Summer Implementation</b>	14,035	3,359	17,434	1,474	26,958	1,617
<b>*STEM Learning Community Activities</b>	8738	724	5,533	613	2,800	405
<b>**Mini-Grant Awardees</b>	---	---	15,544	2,583	16,540	2,627
<b>Totals</b>	<b>22,773</b>	<b>4,083</b>	<b>47,412</b>	<b>5,782</b>	<b>58,289</b>	<b>6,241</b>

\* Participants served by FY2010 national awardees and FY2010 contract award in FY2010 - FY2012

\*\* Total Mini-Grant Awardees' 2011 - 2012 participant data (reports submitted by 382 out of 386 awards to Nat'l Space Grant Foundation)

In each year of implementation, SoI continues to engage its target participants in STEM inquiry-based experiential content, resulting in a four-year total of over 175,000 students and over 20,000 educators.

## **PROJECT CONTRIBUTIONS TO ANNUAL PERFORMANCE GOALS (APGs)**

The Summer of Innovation Project contributed to the following Fiscal Year 2013 Annual Performance Goals (APGs):

**Table III: NASA Office of Education APGs Contributed by SoI**

<b>APG #</b>	<b>APG Description</b>	<b>SoI Contribution</b>
<b>6.1.1.1</b>	Maintain no fewer than 1,000 online STEM-based teaching tools for K-12 and informal educators and higher education faculty.	SoI provides an interactive website which provides our partners, collaborators, educators and the general public access to STEM content and professional development resources online.
<b>6.1.2.1</b>	Conduct no fewer than 200 interactive K-12 student activities that leverage the unique assets of NASA's missions.	SoI collaborated with formal and informal education organizations to conduct over 600 camps this summer engaging 46,549 middle school students in grades 4-9 and 4,736 educators (certified teachers and informal educators) in STEM content
<b>6.2.1.1</b>	Participate in no fewer than 20 STEM education advisory boards, STEM-related committees, or other events or activities related to national STEM education policy.	NASA STEM Challenges pilot collaboration with Department of Education 21st Century Community Learning Centers (21 <sup>st</sup> CCLC)

## **IMPROVEMENTS MADE IN THE PAST YEAR**

Since its inception in 2010, SoI has continually refined its approach to maximize the scale and effectiveness of the project's resources, and through the review of lessons learned and adoption of best practices, SoI has strengthened its model of implementation and added rigor to its performance monitoring and evaluation activities. Based on recommendations made by a panel of evaluation experts, SoI conducted Implementation and Outcomes Studies focused on a stand-alone camp model for middle school students in grades 6-8. Members of the evaluation team along with SoI Project staff were trained in the use of Harvard University's Program in Education, Afterschool, and Resiliency (PEAR) Dimensions of Success (DoS) observation tool which provides evidence-based criteria for out-of-school time STEM program quality. To better prepare SoI Collaborators participating in the evaluation, an evaluation handbook was developed and webinar training was provided to the evaluation leads. SoI continued to strengthen its use of evidence-based practices by enhancing 2013 implementation requirements to include the following:

- Requirement to engage parents/caregivers through planned events
- Specified a student to teacher ratio of no more than 20 to 1 to ensure a high-quality student experience

- Specified the use of NASA SoI curricula to ensure consistency of inquiry-based NASA SoI STEM experiences in all camps

Any new partners will be required to propose and implement evidence-based plans for:

- Recruitment, registration and retention during the SoI camp experience of students
- Recruitment, retention and professional development of SoI educators
- Presentation of high-quality STEM student engagement activities

## **PROJECT PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION**

**Table IV: Summer of Innovation 2013 Collaborative Camps/Activities**

	NASA Centers/JPL	2011 National Awards	2010 National Awards	Mini-Awards
<b>#Collaborators/Activities</b>	362	328	14	172
<b>Grand Total</b>	<b>877</b>			

The project’s flexibility and adaptability has allowed a diverse base of community organizations from across the nation to find ways to work collaboratively in order to serve underserved and underrepresented populations. To support STEM Learning Community activities engaging students during the summer of 2013, all four Space Grant Consortia were given no-cost extensions.

In addition to working with external partners, NASA staff at Glenn Research Center (GRC), Kennedy Space Center (KSC), Langley Research Center (LaRC), Marshall Space Flight Center (MSFC) and Headquarters (HQ) worked in partnership to conduct FY2014 planning for SoI. Office of Education Infrastructure Division (OEID) team members collaborated with GRC project staff, HQ leaders and the SoI Evaluation Contractor to plan and execute both the Implementation and Outcomes Studies.

### **CHANGE LOG**

**Document changes to the Annual Performance Report.**

<b>Date</b>	<b>Version</b>	<b>Author</b>	<b>Comments</b>
11/25/2013	Ver.01	R. Gilmore	Initial Draft/Preliminary Report (participant data reported for 2013 National Awards, NASA Centers and preliminary Mini-Awards)