



# NASA SUMMER OF INNOVATION (SOI)

FY2014 ANNUAL PERFORMANCE REPORT

**FUNDING SOURCE:**

OFFICE OF EDUCATION  
STEM EDUCATION AND ACCOUNTABILITY PROJECTS (SEAP)

**LINE OF BUSINESS:**

STEM ENGAGEMENT (SE)

**MANAGING ORGANIZATION:**

JOHN H. GLENN RESEARCH CENTER  
OFFICE OF EDUCATION

**ACTIVITY MANAGER:**

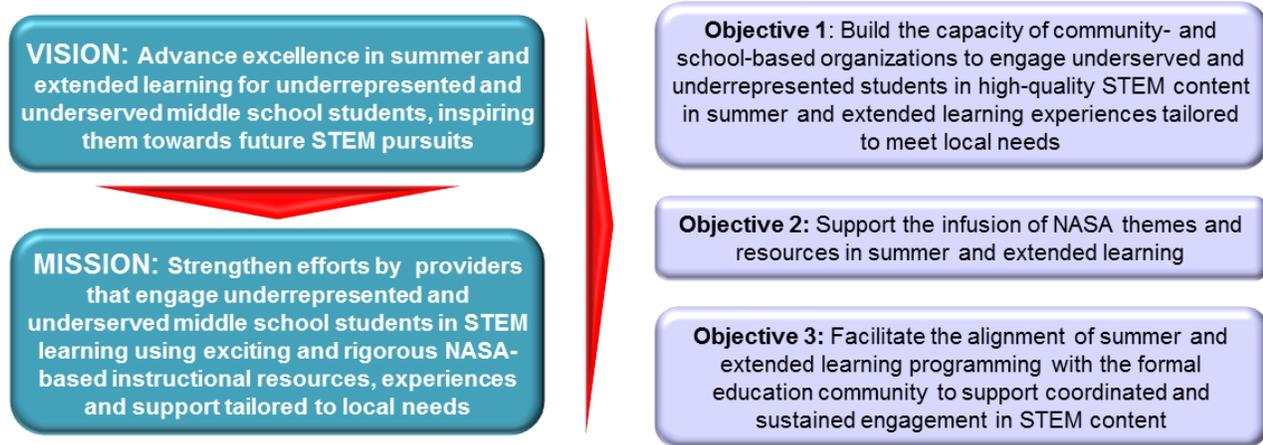
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## ACTIVITY DESCRIPTION

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 response to the President’s call to action in January 2010, the National Aeronautics and Space Administration (NASA) launched the Summer of Innovation (SoI) pilot project. Figure I, articulates SoI’s Vision, Mission and Objectives that centered on building local educational capacity for supporting STEM education for underserved and underrepresented middle school students.

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



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.

SoI aligned to National and Agency priorities. Specifically, SoI is strongly aligned to the NASA STEM Engagement Line of Business as it engages and supports external partners in the delivery of evidence-based summer learning opportunities to under-resourced youth from populations under-represented in STEM and educator professional development in STEM. This will contribute to long-term impacts of increased interest and participation in STEM, including increased numbers of high school graduates pursuing STEM majors and careers. SoI aligned to CoSTEM Goal #2: Increase and sustain youth and public engagement in STEM by providing inspiring, engaging and authentic STEM activities for youth.

In FY 2014, NASA established a STEM Education and Accountability Projects (SEAP) to align and restructure some Office of Education activities to meet the goals established by NASA’s and the Federal STEM Education 5-Year Strategic Plans and SoI competed for its final year of funding for Center implementations in an innovative internal-to-NASA competition directed by the STEM

Engagement Line of Business Director. Nine NASA Field Centers and the Jet Propulsion Laboratory (JPL) received \$50,000 for SoI implementation (\$500,000 total).

During a 5-year period of performance that concluded in January 2015, Summer of Innovation used the following five approaches:

**2010 National Awards:** Four cooperative agreements ranging from \$949,000 - \$2,000,000 (36-month performance period; 2010-2013) were awarded to Space Grant Consortiums in Idaho, Massachusetts, New Mexico and Wyoming to support major efforts to mitigate the effects of the “summer slide” on student academic achievement and to increase student interest in STEM education

(<https://nspires.nasaprs.com/external/solicitations/summary.do?method=init&solId={226FB106-9159-430E-C622-B273E17CB923}&path=closedPast>). The five objectives 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). Additionally, a single contract award in the amount of \$2,000,000 was made to Paragon TEC, Inc. in 2010 (30-month performance period) to support the same five objectives mentioned above.

**2011 National Awards:** NASA awarded cooperative agreements up to \$750,000 to eight national awards (48-month performance period; 2011-2014) which supported major efforts to build the capacity of high quality or promising educational organizations targeting underserved and underrepresented populations

(<https://nspires.nasaprs.com/external/solicitations/summary.do?method=init&solId={0747C4B3-F253-51A5-9A39-BA4A9F1AC1F3}&path=closedPast>). These National Awards were intended to broaden the scale of successful STEM efforts and/or to deepen the educational content value for 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 received funding ranging from \$50,000 - \$150,000 annually (2010-2014?). These ten internal-to-NASA recipients enhanced SoI’s ability to support NASA STEM programming through Centers’ collaborations with individual organizations or consortiums that use of Centers’ resources, facilities, and personnel. The participation of Centers expanded the geographic reach of SoI.

**Mini-Awards:** NASA used the mini-award opportunity to focus on smaller organizations across the country to introduce them to Summer of Innovation content and themes. From 2011 – 2013, SoI granted over 500 mini-awards with a maximum value of \$2,500 to various sites across the country.

**General Public:** Organizations that were not awarded financial support or could not meet the project funding or sustained engagement requirements had access educational content at <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. The website has information on the SoI project, its network of partners/collaborators, education resources and professional development.

**ACTIVITY GOALS**

The goal of Summer of Innovation is to engage and support external partners in the delivery of evidence-based summer engagement opportunities in STEM to youth from underserved/underrepresented populations with the intent of increasing interest and participation in STEM and contributing toward the national-level impact of increased numbers of high school graduates pursuing STEM majors and careers.

In FY2014, SoI focused implementation efforts on the following key priorities:

- Closeout 2010 and 2011 National Award cooperative agreement implementation
- Evaluation Contractor, ABT Associates, Inc. finalized SoI National Implementation and Outcomes Evaluation Reports
  - [http://www.nasa.gov/sites/default/files/soi\\_stand-alone\\_implementation2013.pdf](http://www.nasa.gov/sites/default/files/soi_stand-alone_implementation2013.pdf)
  - [http://www.nasa.gov/sites/default/files/soi\\_stand-alone\\_program\\_model\\_fy2013\\_outcome\\_report.pdf](http://www.nasa.gov/sites/default/files/soi_stand-alone_program_model_fy2013_outcome_report.pdf)
- Conducted SoI Capstone STEM Engagement Events in collaboration with NASA Center Awards
- Collaborated with the 4-H organizations and existing partners/collaborators
- Supported 4-H National Youth Science Day (NYSD) “Rockets to the Rescue” National Science Experiment Activities (<http://www.4-h.org/4-h-national-youth-science-day/>)

**ACTIVITY BENEFIT TO PERFORMANCE GOALS**

The Summer of Innovation contributed to the following Fiscal Year 2014 Annual Performance Goals (APGs) and Annual Performance Indicators (APIs) as reported in the table on the following page.

**Table I: NASA Office of Education APGs and APIs Contributed by SoI**

APG # / API #		Description	SoI Contribution
<b>APG</b>	<b>2.4.2</b>	Continue to support STEM educators through the delivery of NASA education content and engagement in educator professional development opportunities.	SoI collaborated with formal and informal education organizations to provide professional development and engagement opportunities to 5,045 educators (certified teachers and informal educators) in NASA STEM content.
<b>API</b>	<b>ED-14-6</b>	250,000 educators participate in NASA-supported professional development, research, and internships that use NASA-unique STEM content.	

APG # / API #		Description	SoI Contribution
APG	2.4.5	Continue to provide opportunities for learners to engage in STEM education engagement activities that capitalize on NASA-unique assets and content.	SoI collaborated with formal and informal education organizations to conduct over 400 camps/activities engaging 39,710 middle school students in grades 4-9 in NASA STEM content.
API	ED-14-8	One million elementary and secondary students participate in NASA STEM engagement activities.	

## **ACTIVITY ACCOMPLISHMENTS**

### ***Summary Overview***

- Engaged 39,710 middle school students in grades 4-9 and 5,045 educators in approximately 400 SoI camps/activities across the United States
- Reached targeted audience (underserved and underrepresented students):
  - 65% minority
  - 47% female
- SoI project successfully engages a large proportion of students from groups that are traditionally underrepresented in STEM
- Students in most of the observed camp classrooms experienced high quality out-of-school time (OST) STEM programming
- Providing teachers with ready-to-use materials and hands-on professional development was viewed as very helpful
- Teachers and students reported the hands-on activities as the most compelling aspect of SoI

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

- Engaged in NASA STEM content:
  - 26,857 students
  - 3,381 educators (756 certified teachers, 219 pre-service teachers and 650 informal educators)
- 112 collaborative camps/activities
- NASA Field Centers and JPL (Centers) focused on collaborations with 4-H and youth serving organizations to engage students and/or train educators in STEM content supporting the 4-H National Youth Science Day (NYSD) “Rockets to the Rescue” initiative (<http://www.4-h.org/4-h-national-youth-science-day/past-experiments-archives/>). Reported data indicated that nine Centers have collaborated with 21, 4-H organizations at 30 locations in 12 states to engage over 6,200 students and 790 educators in STEM content.
- Success Stories and Accomplishments highlighting the SoI camps/activities collaborators implemented throughout the summer include but not limited to the following examples:
  - Glenn Research Center (GRC) supported the City of Learning, national initiative and plans to continue collaborating with the MacArthur Foundation
  - Goddard Space Flight Center (GSFC) SoI maintained a quality program by ensuring among participants: leadership, collaborative planning, and extensive staff development before the beginning of camp

- The Jet Propulsion Laboratory (JPL) collaborated with ten organizations (i.e., 4-H, school district, science center, county office of education) to engage over 9400 students in STEM content in the state of California
- Texas 4-H Students Visit Johnson Space Center (JSC) for NYSD Activities – See feature story at <https://jscfeatures.jsc.nasa.gov/pages.ashx/155/Texas%204H%20students%20blast%20off%20at%20Johnson%20Space%20Center>
- JSC supported Oklahoma 4-H Students on a visit to Oklahoma State University for NYSD – See feature story at <http://sunup.okstate.edu/category/seg/2014-second-half/101814-4h>
- Langley Research Center (LaRC) supported a NYSD Event held at the Virginia Air and Space Center (VASC) was a huge success. The commitment of teachers, who gave up their Saturday to come and spend the day with their students was inspiring. The students and teachers embraced the competition and worked hard to design the best rockets. The conversations in the test launch area demonstrated that students of all ages were grasping the concepts of weight, lift, and angles. The enthusiasm of the students drew others to join in who were visiting the museum. Parents from at risk communities joined their children with cameras in hand to cheer them on during the competition. The event was a tremendous success for students, teachers, parents, and SOI.
- The LaRC Berkeley Middle School event was another tremendous success. The students were so excited to meet a real astronaut, and the group who had heard astronauts in space the year before were able to meet one in person. The students were very engaged, the astronaut was extremely effective in reaching his young, middle school audience, and the activities the day before the event provided background knowledge for the presentation at the same time that they supported 6th grade state standards. The school administration and teachers were extremely grateful for this opportunity.
- The Central Elementary School fourth grade three-part event was a huge success and reaffirmed the importance of multiple exposures to STEM for students. The students were inspired and excited. The initial response of the Education Director to bringing a group of 4th graders to the Center was one of great concern related to how much they would really get out of it and the risks to their safety if they were unruly. However, when the Education Director joined them for lunch she was swayed by their enthusiasm for what they were learning and their excitement about STEM. The instruction they had received earlier in the week and the opportunity to share with their parents some of what they had learned at the evening event had prepared them for what they saw and experienced at the Center. They clearly were inspired by their experience, and their experience helped LaRC to redefine its expectations of who should and should not be given access to our researchers.
- Marshall Space Flight Center (MSFC) supported an Alabama 4-H National Youth Science Day event in collaboration with the U.S. Space and Rocket Center for 300 attendees from around the southeast. Participants had the opportunity to speak to NASA and Lockheed Martin engineers after propulsion demonstrations and conducted the Rockets to the Rescue experiment with Lockheed Martin volunteers. Attendees not only experimented with rockets, but had the opportunity to view one of the world's largest collections of rockets and space memorabilia.
- MSFC also supported the Boys and Girls Clubs of North Alabama (BGCNAL) to engage over 700 students in at least 30 hours of NASA-unique STEM activity between

August-December, 2014. The clubs focused their time on the NASA's BEST Students set of activities. The BGCNAL is working to ensure STEM activities are a permanent fixture of the clubs' daily and weekly activities

[http://www.waaytv.com/space\\_alabama/marshall-grants-encourage-stem-education/article\\_d718818a-4830-11e4-8036-0017a43b2370.html](http://www.waaytv.com/space_alabama/marshall-grants-encourage-stem-education/article_d718818a-4830-11e4-8036-0017a43b2370.html)

- Stennis Space Center (SSC) supported the Saint Louis Science Center to engage over 500 students in NASA-unique activities by partnering with other youth-serving organizations in the Saint Louis, MO area through a train-the-trainer approach

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

- Engaged in NASA STEM content:
  - 12,680 students
  - 1,625 educators (756 certified teachers, 219 pre-service teachers and 650 informal educators)
- 288 collaborative camps/activities
- 2011 National Awardees accomplished several milestones including:
  - The Lead/Deadwood Art Center sponsored the Space School Musical (SSM) at Neutrino Days, held at the Sanford Underground Research Facility. They held two productions. An estimated 800 people attended Neutrino Days. The partnership with Dakota Players was a huge success this summer. They put on the SSM production in 15 different communities between May and September. Space School Musical also is in high demand for the school calendar year.
  - The United States Air Force visited 3 NASA SoI sites in central Pennsylvania. While there, the Air Force gave a brief introduction to the gyroscope and all students were able to learn the laws of motion. Students were able to learn flight control and what it takes to simulate shuttle and airplane launches.
  - An important strategy for growing and sustaining the Nebraska BLAST! Program was the commitment to provide ongoing professional development for teams of informal educators and certified teachers who work in buildings with 21st CCLC programs. During the summer of 2014, professional development workshops were offered in six Nebraska regions. A total of 60 certified teachers and 57 informal educators attended these trainings. Content offered included Robotics, Rocketry, Cosmic Connections to the Universe, High Altitude Ballooning, Aeronautics, Biomedical Engineering, and E-Textiles.
  - At the Laurel Elementary site, the Principal established an ongoing year-round STEM mentoring program for the students as a direct result of the TEWS-Space – NASA SoI summer camps and the progress made during the summer. This school is located in a predominantly Hispanic and low-income area with limited access to afterschool programs.
  - The NASA SoI program in Puerto Rico expanded to impact the following 9 cities: Manati, Vega Baja, Arecibo, Mayaguez, Ponce, San Juan, Carolina, Humacao and Morovis and 24 SoI students on 7 teams from Puerto Rico participated in the 2014 VEX Robotics Championship in Anaheim, CA capturing 7 of the top awards: Excellence Award (the highest Award of the competition); Best Autonomous Robot; Finalist Award (Alliance of 2 teams from Puerto Rico); Best Design Award; Mentor of the year; and Inspire Award

**2010 National Awards**

- Engaged in STEM Learning Communities:
  - 173 students
  - 39 educators (28 certified teachers and 11 informal educators)
- 3 collaborative camps/activities

**Table II: FY2014 Summer of Innovation Project Participant Data**

<b>Provider</b>	<b>Students</b>	<b>Educators (Certified Teachers, Pre- Service Teachers and Informal Educators)</b>	<b>Totals</b>
<b>2011 National Awards (8)</b>	12,680	1,625	14,305
<b>Center Awards (10)</b>	26,857	3,381	30,238
<b>2010 National Awards - Space Grants (4)</b>	173	39	212
<b>Totals</b>	39,710	5,045	44,755

**Table III: FY2010-FY2014 Summer of Innovation Project Student Participant Data**

<b>Provider</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>
<b>2011 National Awards (8)</b>	-N/A--	8,901	11,991	14,037	12,680
<b>Center Awards (10)</b>	14,035	17,434	26,958	25,186	26,857
<b>2010 National Awards - Space Grants (4) and Contract Award (1)</b>	8,738	5,533	2,800	6,406	173
<b>Mini-Grant Awards</b>	-N/A--	15,544	16,540	16,454	-N/A--
<b>Totals</b>	22,773	47,412	58,289	62,083	39,710

**Table IV: FY2010-FY2014 Summer of Innovation Project Educator Participant Data**

<b>Provider</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>
<b>2011 National Awards (8)</b>	<b>-NA--</b>	<b>1,112</b>	<b>1,592</b>	<b>1,175</b>	<b>1,625</b>
<b>Center Awards (10)</b>	<b>3,359</b>	<b>1,474</b>	<b>1,617</b>	<b>3,232</b>	<b>3,381</b>
<b>2010 National Awards - Space Grants (4) and Contract Award (1)</b>	<b>724</b>	<b>613</b>	<b>405</b>	<b>241</b>	<b>39</b>
<b>Mini-Grant Awards</b>	<b>-N/A--</b>	<b>2,583</b>	<b>2,627</b>	<b>1,618</b>	<b>-NA--</b>
<b>Totals</b>	<b>4,083</b>	<b>5,782</b>	<b>6,241</b>	<b>6,266</b>	<b>5,045</b>

In each year of implementation, SoI continued to reach its target population of participants (i.e., students underserved and underrepresented in STEM and females). Since inception, SoI engaged over 230,000 students and over 27,000 educators in over 3 million hours of NASA STEM inquiry-based experiential content.

**ACTIVITY IMPROVEMENTS MADE IN THE PAST YEAR**

Since its inception in 2010, SoI has continually refined its approach to maximize the scale and effectiveness through the review of lessons learned, adoption of best practices and third-party evaluation activities.

In closing out the SoI, external partners and staff at each NASA Center and the Jet Propulsion Laboratory (JPL) provided lessons learned including the following:

***Overarching Lessons:***

- Generating in-depth understanding of program implementation is essential to inform program improvement and understand what is effective
- Hands-on activities are important to engage both teachers and students
- Getting kids to camp is necessary but what happens during a camp makes the difference
- Well-articulated program requirements are necessary to create a replicable program model
- Continuous program improvement is driven by ongoing evaluation

Additionally, SoI received the final National Implementation and Outcomes Evaluation Reports from the evaluation contractor. The following information summarizes the keys findings/successes and recommendations noted in the reports:

*Findings/Success*

- SoI project successfully engages a large proportion of students from groups that are traditionally underrepresented in STEM
- Students in most of the observed camp classrooms experienced high quality out-of-school time STEM programming
- Self-reported student data suggested a statistically significant increase in both enthusiasm for science, and interest in out-of-school (OST) STEM activities following participation in SoI
- Teachers and students reported the hands-on activities as the most compelling aspect of SoI
- Providing teachers with ready-to-use materials and hands-on professional development was viewed as very helpful

*Recommendations*

- Continue to encourage parent and student engagement through **outreach events**
- Encourage camps to employ K-12 certified teachers and maintain educator-to-student ratios of 1:20 or higher
- Highlight **STEM content and opportunity to learn** about NASA, which are key reasons why students sign up for SoI
- Encourage camps to employ K-12 certified teachers and **maintain educator-to-student ratios of 1:20** or higher
- **Increase time and support** available for hands-on and problem solving activities in SoI
- Continue to provide educators with **access to hands-on curricula and materials** as these are key to student engagement
- Continue **use of the Dimensions of Success (DoS)** to assess camp quality

Both evaluation reports can be found on the NASA Education Performance Assessment website (<http://www.nasa.gov/offices/education/performance/index.html>) under the NASA Education Performance Related Reports section.

- Summer of Innovation Stand-Alone Program Model Outcomes Report (2013) - [http://www.nasa.gov/sites/default/files/soi\\_stand-alone\\_program\\_model\\_fy2013\\_outcome\\_report.pdf](http://www.nasa.gov/sites/default/files/soi_stand-alone_program_model_fy2013_outcome_report.pdf)
- Summer of Innovation Stand-Alone Implementation Report (2013) – [http://www.nasa.gov/sites/default/files/soi\\_stand-alone\\_implementation2013.pdf](http://www.nasa.gov/sites/default/files/soi_stand-alone_implementation2013.pdf)

**ACTIVITY PARTNERS AND ROLE OF PARTNERS IN ACTIVITY EXECUTION**

**Table V: Summer of Innovation 2014 Collaborative Camps/Activities**

	NASA Centers/JPL	2011 National Awards	2010 National Awards
#Collaborators/Activities	112	288	4
<b>Total</b>	<b>404</b>		

After completing the SEAP innovative internal-to-NASA competition for the final year of funding for SoI Center Award implementations, nine NASA Field Centers and the Jet Propulsion Laboratory (JPL) received \$50,000 (\$500,000 total). Center Awards leveraged partnerships and collaborations to

continue successful operations. In addition to working with external partners, staff at each NASA Center and the Jet Propulsion Laboratory (JPL) worked in partnership to execute the Summer of Innovation.

The 2010 National Awards (Four Space Grant Consortia) operated under no-cost extensions allowing them to continue engaging students during the summer and to complete final reporting requirements. Two Space Grant Consortia (Massachusetts and New Mexico) were granted a second no-cost extension which will conclude operations in 2015.

The 2011 National Awards Summer activities also contributed to SoI operations engaging students and educators. Two 2011 National Awards (Albany State University - NNX11AI09A) and South Dakota Discovery Center – NNX11AI08A) were granted no-cost extensions to continue operations through the end of the 2015 calendar year and June of 2016 respectively. The table below details the expiration dates of the cooperative agreements and contract award for SoI National Awards since 2010.

**Table VI: Cooperative Agreement Expiration Dates**

<b>Cooperative Agreement Expiration Dates</b>		
	<b>Cooperative Agreement #</b>	<b>Expiration Date</b>
<b>2010 Awardees</b>		
<b>Idaho Space Grant</b>	NNX10AJ85A	April 11, 2014
<b>Massachusetts Space Grant</b>	NNX10AJ90A	May 13, 2015
<b>New Mexico Space Grant</b>	NNX10AJ30A	May 4, 2015
<b>Wyoming Space Grant</b>	NNX10AJ89A	September 30, 2014
<b>2010 Contract Award</b>		
<b>Paragon TEC, Inc.</b>	NNC07CB33C	October 31, 2012
<b>2011 Awardees</b>		
<b>Albany State University</b>	NNX11AI09A	December 31, 2015
<b>Chester County Intermediate Unit 24</b>	NNX11AI34A	May 31, 2015
<b>Dorothy Jemison Foundation for Excellence</b>	NNX11AI04A	May 4, 2015
<b>Indiana Association of United Ways</b>	NNX11AI05A	May 3, 2015
<b>Nebraska Department of Education</b>	NNX11AI15A	May 31, 2015
<b>Puerto Rico Institute of Robotics Inc.</b>	NNX11AI18A	May 4, 2015
<b>Rio Grande Valley Science Association</b>	NNX11AI06A	May 14, 2015
<b>South Dakota Discovery Center</b>	NNX11AI08A	June 30, 2016