INSPIRE

2011 Annual Performance Report
Administered by: Oklahoma State University
Type of Agreement: Cooperative Agreement
Project Manager: Steve Chance
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INSPIRE's PROJECT DESCRIPTION

The Interdisciplinary National Science Project Incorporating Research and Education Experience (INSPIRE) is a research based, multi-tiered student pipeline program designed for students in 9th to 12th grade. It provides a vital link between NASA's Elementary/Secondary projects and Higher Education projects. The scope and purpose of INSPIRE emphasizes the recruiting of underserved and underrepresented students to ensure a diverse pool of candidates from throughout the U.S.

INSPIRE
***v.* inspired, inspiring, inspires**
1. To affect, guide, or arouse by influence.
2. To fill with enlivening or exalting emotion.
3. To stimulate to action, motivate.
4. To draw forth; elicit or arouse.
5. To be the cause or source of; bring about
Source: The Free Online Dictionary

Students selected to participate:

- Learn about science, technology, engineering and mathematics (STEM) fields of study and careers;
- Participate in the INSPIRE Online Learning Community (OLC);
- And compete for unique, grade-appropriate summer experiences at a NASA facility.

NASA's unique mission provides the content for the OLC, the centerpiece of INSPIRE. It provides a virtual place for INSPIRE students to interact with their peers, NASA experts and education specialists. Through grade appropriate educational activities, chats and discussion boards, students and their families are exposed to the many careers and opportunities at NASA. The OLC also provides parents and caregivers resources designed to help them champion their student's education and career goals.

An online learning community is a public or private destination on the Internet that addresses the learning needs of its members by facilitating peer-to-peer learning. Through social networking and computer-mediated communication, people work as a community to achieve a shared learning objective. Learning objectives may be proposed by the community owner or may arise out of discussions between participants that reflect personal interests. In an online learning community, people share knowledge via textual discussion (synchronous or asynchronous), audio, video, or other Internet-supported mediums. Blogs blend personal journaling with social networking to create environments with opportunities for reflection. (Source: Wikipedia)

The Splash Page of INSPIRE's 2010-2011 Online Learning Community

To provide students from families experiencing financial difficulties, bridge the "digital divide" and ensure all students have an opportunity to participate in the OLC; those who qualify for the National School Lunch Program are eligible to be awarded a laptop computer.

Once selected into the OLC, students are then eligible to compete for the following grade-appropriate Summer STEM Experiences:

- **Explorer:** Rising 10th-grade students and their legal guardian compete to be awarded a summer visit to a NASA facility for a one-day VIP Tour, workshops, and briefings.

INSPIRE Explorer participants at the Marshall Space Flight Center

- **Collegiate:** Rising 11th-grade students compete to participate in a two-week, on-campus residential experience during the summer at a college or university selected by NASA. This exposure to college students and faculty is designed to encourage improved study skills and the pursuit of higher education and careers in STEM areas. The college or university provides lodging, meals, supervision, and educational activities.

INSPIRE Collegiate students at the South Dakota School of Mines and Technology learned about the art of blacksmithing

A few of the INSPIRE Collegiate students at the University of Puerto Rico

- **Residential Internship:** Rising 12th-grade students who will be at least 16 years of age at the start of the internship compete to participate in a paid 8-week research experience at a NASA facility. Students gain valuable on-the-job experience by working directly with NASA scientists and engineers during the work day and will participate in enriching after-work educational and cultural activities. During the internship, students receive:
    - A stipend based on minimum wage for the state in which the NASA facility is located and lunch allowance to cover the workweek;
    - Meals and housing at a location within commuting distance from the NASA facility;
    - Transportation to and from work and any after-work project activities;
    - On-site supervision by experience educators and structured enrichment activities after work hours;
    - Mentoring by scientists and engineers at the NASA Centers during work hours.

INSPIRE Interns at the Dryden Flight Research Center with their group project

- **Pre-College Internship:** Graduating high school students who are at least 16 years of age at the start of the internship compete for this paid 8-week research experience at a NASA facility. Application must be accepted to a college or university and declared a STEM major. This experience provides valuable on-the-job training and introduces students to other education and employment opportunities. Lodging, meals, transportation and after work activities are the student's responsibility. Students are paid a $5,000 stipend in three installments, providing all requirements have been met.

INSPIRE's PROJECT GOALS

Goal 1: Serve as a nationwide project to develop emerging adolescent and parental awareness and understanding of STEM-related education and careers.

Goal 2: Engage students and families with grade-appropriate resources and activities/educational modules and provide the capability for them to interact, ask questions, and share knowledge with their peers through participation in the OLC.

Goal 3: Provide unique NASA/STEM experiences to students and their families to further inspire and reinforce student's aspirations to pursue STEM education and families to support their student's pursuits.

INSPIRE's BENEFIT TO OUTCOME 2: Attract and retain students in STEM disciplines through a progression of educational opportunities for students, teachers and faculty.

INSPIRE attracted 1,923 students into STEM disciplines by providing NASA resources and grade appropriate experiences through their participation in the OLC and unique Summer STEM Experiences. These activities and experiences nurture and support student interest while helping them understand the skills necessary for a NASA and STEM career. As a result of OLC participation, 91% of students report they wanted to take more STEM courses, and between 90% and 98% of students participating in a Summer STEM Experience reported they were inspired to learn more about STEM and were building their experiences for future NASA and STEM careers.

INSPIRE is a critical link in NASA's student pipeline, drawing students from the middle grades and high schools, other Elementary and Secondary Education and outreach Projects such as NASA Explorer Schools (NES), NASA Foundations of

Influence, Relationships, Success and Teamwork (FIRST) Robotics, Science Engineering Mathematics and Aerospace Academy (SEMAA), the Aerospace Education Services Project (AESP) and center-unique projects like the High School Aerospace Scholars Program (HAS) at the Johnson Space Center (JSC) to engage them early in high school with NASA in STEM-related fields.

As students exit INSPIRE, they are provided information and encouraged to expand their education and employment activity in Higher Education NASA projects such as Motivating Undergraduates in Science & Technology (MUST), Undergraduate Students Research Program (USRP) and Human Capital-sponsored programs such as the Student Temporary Employment Programs (STEP), the Student Career Experience Program (SCEP) and other internship programs.

Without INSPIRE many NASA Field Centers are not be able to offer high school internships due to funding limitations. Feedback from centers confirm they are committed to maintaining a high school to college student pipeline for NASA and their center-unique projects as a means to expose students to additional internships and Cooperative (Co-op) Education opportunities. Since INSPIRE recruits nationally, students from throughout the U.S. have the opportunity to participate in a NASA experience. Considering the age group of high school students and concern for their safety, centers typically recruit only within commuting distance. INSPIRE offers additional diversity not only in terms of underserved and underrepresented, but also national representation. The centers also provide feedback about the enthusiasm, initiative, and high quality performance INSPIRE interns provide.

INSPIRE's 2011 ACCOMPLISHMENTS

The OLC:

- 1,923 students were selected to participate in the OLC, compared to 1,782 in 2010, an increase of 138 students (8%) from 2010. The students represent 47 states, the District of Columbia, Puerto Rico and the U.S. Virgin Islands.
- During the OLC application process, students were asked to volunteer the identity of their race, ethnicity, and gender. 22% volunteered their information:

Gender, Race, and Ethnicity	%	Grade Level	
Male	59		
Female	41	9th	314
Caucasian	55	10th	464
Asian	23	11th	643
African American	19	12th	502
Other[1]	12		
Hispanic	14		

1. Use of OEPM demographic questionnaire does not allow students to provide comments or clarification.

- 186 students (13% of the OLC population) who qualified for the National School Lunch Program and provided appropriate documentation were awarded a laptop computer.

"Having my own laptop will allow me greater freedom in my schedule. I will be able to do more without library computer time restraints."
"It would mean having greater time to work on assignments within my time period. I have 6 in my family and it'd hard to get PC time at times."
"Having my own laptop would mean not having to wait in line to use the library computers."

The effects of student participation in the OLC indicate it is a powerful tool as a means to connect students from throughout the U.S. to NASA and STEM:

- 83% report participation was a good investment in their time
- 91% report they want to take more STEM courses
- 91% report they have a better understanding of NASA
- 87% report they enjoy learning with NASA resources

- **INSPIRE is the only national K-12 project that has a sustained online learning community designed for students in the 9th through 12th grades**
- **INSPIRE directly supports President Obama's STEM education agenda through the new MacArthur Foundation and Mozilla initiative on "Digital Badges". INSPIRE is considered a prime K-12 project to incorporate this initiative because of its existing online learning community and infrastructure.**
- **INSPIRE's Summer STEM Experiences link directly to the Education Design Team's recommendation 1.2: "The Office of Education should refocus its high school and higher education offerings on providing experiential opportunities (e.g., hands-on activities, hardware design and data analysis), internships and scholarships for students..."**

The Summer STEM Experiences:
Funding allowed for 289 students to participate in the various grade appropriate Summer STEM Experiences. Students selected to participate in the experiences represented 40 states, the District of Columbia and Puerto Rico.

Below is a comparison of the number of students participating in the Summer STEM Experiences from 2009. INSPIRE funding in 2009 allowed for 386 students participate in a Summer STEM Experience. In 2010, INSPIRE was not fully funded, resulting in fewer students participating. In 2011, the primary reasons for fewer students being selected (particularly interns) was a consequence of the Shuttle Program's retirement, layoffs in the contractor workforce, and uncertainty about the future of NASA's human space program. These factors gave concern for the number and quality of research projects available to interns during the summer, resulting in fewer interns selected.

	Number of Participants		
Summer STEM Experience	**2009**	**2010**	**2011**
Explorer	84	9	65
Collegiate	105	60	83
Residential Internship	105	52	77
Pre College Internship	92	59	64
TOTAL PARTICIPANTS	**386**	**180**	**289**

INSPIRE Interns at the Stennis Space Center

The following is diversity of students who participated in the Summer STEM Experiences:

Summer STEM Experience Diversity	
Awarded laptop computer (National School Lunch Program)	15%
Male	62%
Female	38%
Disability	5%
Hispanic	11%
By Race:	
Caucasian	56%
Asian	36%
African American	9%
American Indian	2%
Pacific Islander	1%
Other[1]	10%

1. Use of OEPM demographic questionnaire does not allow students to provide comments or clarification.

Pre and post surveys from students and parents indicate overwhelmingly participation in the Summer STEM Experiences is beneficial:

- Explorer Experience: 65 students (and parents) participated in this experience and reported:
  - 92% they learned what it is like to work for NASA
  - 88% what it is like to work in a STEM career
  - 78% learned science content, 57% science skills
  - 90% were building their experience for a future NASA or STEM career
- Collegiate Experience: 83 students participated in this experience and reported:
  - 92% it was a good investment of their time

- 81% their learning objectives were met
- 85% they have a better understanding of NASA's mission
- 98% their experience inspired them to learn more about STEM

- Residential Internship: 77 students participated in this experience and reported:
  - 96% were interested in future NASA experiences such as internships/work
  - 100% learned more about NASA career opportunities
  - 95% of parents rated the overall experience as above average or excellent
  - 96% of parents would recommend this experience to another family
- Pre College Internship: 64 students participated in this experience and reported:
  - 97% their experience inspired them to learn more about STEM
  - 97% of parents believe their student learned what it is like to work for NASA
  - 97% of parents believe their student's participation was a good investment time
  - 100% of parents rated the overall experience as above average or excellent
  - 100% of parents would recommend this experience to another family

INSPIRE Interns at the Langley Research Center

Quote from a mentor:

"This was my first INSPIRE intern. I may have just gotten lucky, but he is exceptionally talented and productive, and exceeded my expectations of a high school graduate."

Quotes from INSPIRE students:

"My summer STEM experience was so much more than I was expecting. I not only got an amazing amount of lab experience but I also met some amazing people and got to experience so many great things. Everything about the experience was more than I could have hoped!"

"This was one of the best experiences of my life. Not only did I meet some amazing people and have a great time but I also learned important lessons that I can apply to school, college and my future career. Thank you INSPIRE for this fantastic opportunity."

"Thank you for this incredible experience; I've learned so much that I can't even begin to recount it all! I think INSPIRE is an excellent program and I hope that I will be able to participate again next year."

INSPIRE Publicity and Recruitment:
Diversity and inclusion are core values of NASA and INSPIRE. The National Project Manager, Oklahoma State University, and the centers emphasize these values in the publicity, recruitment and selection of students to participate in the OLC and Summer STEM Experiences.

NASA continually strives to ensure underrepresented and underserved students participate in INSPIRE and encourages them to pursue STEM careers. INSPIRE is fairly representative of high school student demographics in the U.S. and recruitment will continue to focus on those groups that are underrepresented. Participation in both the OLC and in the Summer STEM Experiences students are exposed to an atmosphere of equity, balance and inclusiveness. INSPIRE, through its Collegiate Experience, plans to focus future solicitations to enhance the capabilities of Minority Serving Institutions (MSI's) to contribute to the needs of the Agency.

Publicity and recruitment efforts are a shared responsibility of both the National Project Manager and the Centers.

- In 2011, the National Project Office publicized INSPIRE through national press releases, NASA's Education's webpage "Current Opportunities" feature, the efforts of other National Projects such as NES, TFS, AESP, SEMMA, FIRST Robotics, BEST, the 2010 Minority Student Education Forum grantees, and the National Space Grant Consortium.
- INSPIRE representatives attended the following national conferences and in many cases presented at workshops
  - National teachers Association (NSTA)
  - The International Technology and Engineering Education Association (ITEEA)
- Information was sent to national organizations involved in STEM outreach. Most notable are:
  - High schools with high enrollments of military dependents
  - The 4H Club
  - Boys and Girls Clubs of America
  - Girl Scouts
  - American Indian Science and Engineering Society (AISES)
  - Project ACCESS (Achieving Competence in Computing, Engineering and Space Science) reaching students with disabilities
  - American School Counselor Association
  - National Association of Black School Administrators
  - National Society of Black Engineers (NSBE)
  - Project Lead the Way
- INSPIRE purchased an advertising banner on the "Math Counts" website as well as their student and teacher listserve.

INSPIRE's CONTRIBUTIONS TO PART MEASURES

Performance Goal 5: 600,000 elementary and secondary students participate in NASA instructional and enrichment activities.

- 1,923 students were selected to participate in the OLC during FY11, an increase of 135 students (8%) from FY10 and an increase of 46% from FY09. 289 students participated in hand-on Summer STEM Experiences.

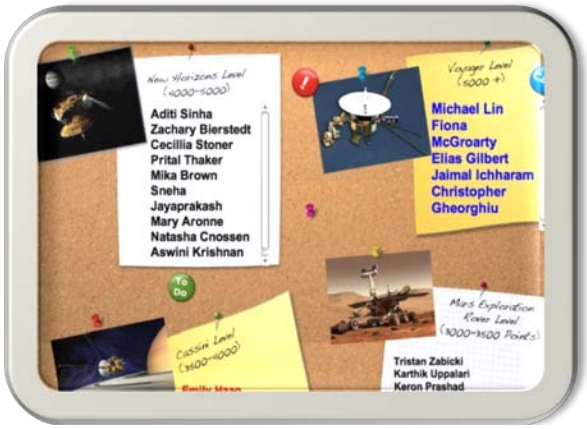
Performance Goal 6: 75 percent of elementary and secondary students express interest in STEM careers following their involvement in NASA education programs.

- Following participation in the OLC, 91% of students reported they had gained a better understanding of NASA's mission, were inspired to learn more about STEM, and wanted to take more STEM courses; and
- 90% of students reported being interested in a career at NASA following participation in the OLC.
- Following their involvement in the Summer STEM Experiences, 94% of students reported they are "interested" or "very interested" in STEM careers

IMPROVEMENTS MADE IN 2011

The OLC was enhanced and improved to incorporate research, best practices, and evaluation data from students, parents, project specialists and staff.

Additional short term activities were added and promoted to encourage INSPIRE students' participation and broaden their exposure to NASA and STEM activities.



A "Point Leader Board" was prominently posted on the OLC resulting in competition and a significant increase in the number of points earned by students compared to 2010

Numerous new activities were developed in 2011 for students to complete individually and as virtual team members. The following is a sample for students to complete individually:

- Earth on Fire: Students investigate the evidence of global warming, learn how the Carbon Cycle is affected, and determine future carbon dioxide concentrations.
- Having a Hot Time on Mars: Students use algebra and problem-solving skills to calculate the dosages of radiation an explorer on Mars would receive.
- Magnetic Storms and Aurora: Students compare the amount of energy dissipated by an aurora in the northern hemisphere with the recorded Kp index of magnetic storm severity.
- Earth on Fire: Students investigate the evidence of global warming, learn how the Carbon Cycle is affected, and determine future carbon dioxide concentrations.

- Having a Hot Time on Mars: Students use algebra and problem-solving skills to calculate the dosages of radiation an explorer on Mars would receive.
- Magnetic Storms and Aurora: Students compare the amount of energy dissipated by an aurora in the northern hemisphere with the recorded Kp index of magnetic storm severity.
- No Boundaries Contest: Students participating in this USA Today/NASA project research NASA careers and develop presentations to market them to younger students. Three students won "Honorable Mention".
- Planetary Geology Module: A new module was developed for students to explore specific topics as well as introduce new areas within STEM.

A design competition was held to provide students an opportunity to create an INSPIRE Team Patch in the tradition of patches designed for each Space Shuttle mission. Students voted for the winning design. It was made into cloth patches and decals and distributed to all OLC members. The winning patch was also utilized throughout the OLC and other venues (e.g. OLC site, newsletters) representing the INSPIRE project.
Above is the winning 2010-2011 INSPIRE Team Patch designed by a 12th grade student from Pennsylvania.

Samples of new activities developed in 2011 for students to complete in virtual teams:

A Website Design Challenge was held in the summer for teams to develop informational websites covering NASA and STEM related topics. 51 students participated. The following are hot links to a few of the sites developed:

- Astrophysics Language
- Astrotechnetium;
- NASA Past, Present, and Future
- NASA Technology
- International Space Station

The Real World/In World James Webb Telescope Engineering Design Competition provided the opportunity for students to learn the engineering design process to solve a problem related to the James Webb Space Telescope.

- One of 5 INSPIRE teams who made it to the final round of selection was awarded 2nd place.
- The 1st place team included an INSPIRE student who participated as a member of her school's team.

RealWorld/InWorld is a joint education initiative of NASA, the National Institute of Aerospace (NIA), USA TODAY Education, and LearniT-TeachiT.

Mars Desert Research Station Proposals: An INSPIRE alumnus attending Georgia Tech invited students participate in planning research and activities that would be conducted inside the station. 26 team proposals were submitted and 4 were selected for actual research. An online chat was also held to share results of the research conducted on the station, answer questions and discuss exploration of Mars.

The Mars Desert Research Station is sponsored by the Mars Society

Weekly Online Chats allow students to connect with NASA subject matter experts (SME's). Employees share information about their career paths and current work. Over 4,000 students attended the live events featuring 30 unique presentations.

All Centers Provided SMEs			
ARC	3	JSC	5
DFRC	1	KSC	6
GRC	1	LRC	3
GSFC	5	MSFC	1
JPL	5	SSC	1

Sample chats include:

- Jose Flores, Systems Engineer and former USRP intern discussed about his career and JSC.
- Steve Zornetzer, Associate Administrator at ARC, discussed NASA's effort to "Go Green".
- David Alexander, DLN coordinator at DFRC discussed aeronautical research.
- Dr. Don Neill, JPL member of NASA's Galaxy Evolution Explorer team (GALEX) spoke about discoveries made from the GALEX mission.
- Dr. Stan Odenwald, GSFC Astronomer discussed Solar Storms.

- Daniel Lokney, NASA Spinoffs Magazine editor spoke about technology spinoffs.
- Antja Chambers JSC Engineer and student pipeline success story discussed microgravity research.
- Rachel Zimmerman-Brachman Solar System and Technology Educator at JPL discussed the Cassini Mission
- Dr. Tony Colaprete LCROSS principal investigator at ARC discussed the LRO/LCROSS mission.
- Curtis Frodge, JSC Design Engineer spoke about Robotics.

Blogs: Over the eight-week experience, Residential and Pre College Interns amassed a great deal of blog entries with accounts of their work, their play, and their growth. Often times, other students commented on blog posts.

From an intern's blog:

Wow! It's week two already! Last week went by so fast! Since I wrote the last blog, I continued working with my assistant mentor for the rest of the week. I quickly finished my work with the ISS experiment and activities for a local NASA outreach activity. I may or may not be able to build a rocket for that. After I am done with that, I will be working on some really cool drop tower and ISS experiments.

From a 12th grade student in Puerto Rico:

It was AWSOME!
I can't believe the OLC it is about to end. I can't believe I learned so many things and met so many people. This was the best experience I've ever had in my entire life. I regret I didn't know about this community earlier. But I'm super exited because this year has been beyond my expectations. I really loved the live chats and learned everything I could. I kept a notebook with the important facts and things to research. I participated in some of the challenges which I enjoyed to the last day. I worked with different students and had fun just exchanging ideas with them. It was interesting how the live presenters were willing to answer questions and make sure the students participating in the live chat, had all the concepts right! I really appreciate the time and effort of everybody that works in this OLC to make this a huge success!
Thank You really this has been the best experience!

INSPIRE's PROJECT PARTNERS AND ROLE IN EXECUTION

As the primary project partner, Oklahoma State University (OSU) provides a professional staff of education and technology specialists to design and implement the OLC, providing student educational activities, challenges, weekly live video chats with NASA subject matter experts, daily news posts, blogs, discussion boards and polls. OSU also administrative support for project implementation such as: logistical support, chaperones and student advisors who provide supervision during off work hours for students participating in the Residential Internship, coordination and payment of transportation expenses and stipends, national recruitment efforts, and the OLC capability.

To broaden the underrepresented and underserved student participation, OSU partnered with the National Science Foundation's Louis Stokes Alliances for Minority

Participation (LSAMP), the American Indian Science and Engineering Society (AISES), and is working with Hispanic Serving Institutions.

Third party, independent project evaluation is accomplished through the Technology for Learning Consortium, Inc.

Three academic institutions that are part of the Space Grant Consortium provided INSPIRE's 2-week on campus Collegiate Experience in 2011. The original 3-year cooperative agreement was awarded in 2008 and ended this year.

- The University of Puerto Rico (Hosted at the Inter-American University campus)
- Virginia Polytechnic Institute and State University (Virginia Tech)
- South Dakota School of Mines and Technology

INSPIRE Intern at the Johnson Space Center

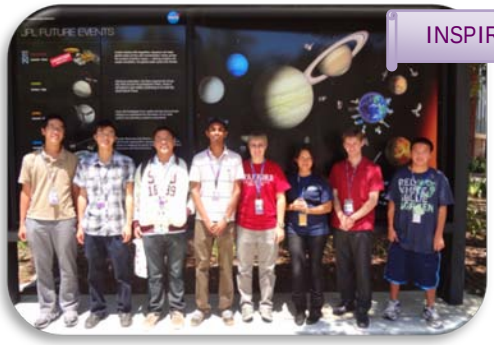
INSPIRE Interns in the Ames Research Center wind tunnel

Goddard Space Flight Center INSPIRE Residential Interns

INSPIRE Interns at the Glenn Research Center

INSPIRE Interns at the Johnson Space Center

INSPIRE Intern students at the Jet Propulsion Laboratory



Quotes from INSPIRE students about their internship experiences:

- *My summer STEM experience was so much more than I was expecting. I not only got an amazing amount of lab experience but I also met some amazing people and got to experience so many great things. Everything about the experience was more than I could have hoped!*
- *This was one of the best experiences of my life. Not only did I meet some amazing people and have a great time but I also learned important lessons that I can apply to school, college and my future career. Thank you INSPIRE for this fantastic opportunity.*
- *Thank you for this incredible experience; I've learned so much that I can't even begin to recount it all! I think INSPIRE is an excellent program and I hope that I will be able to participate again next year.*

INSPIRE Interns at the Kennedy Space Center