NASA EXPLORER SCHOOLS

Administered by the National Science Teachers Association (NSTA)
and Oklahoma State University (OSU)
Type of Agreement: Grant (NSTA) and Cooperative Agreement (OSU)

Rob LaSalvia, NES Project Manager
Glenn Research Center
(216) 433-8981

PROJECT DESCRIPTION

The NASA Explorer Schools (NES) Project establishes a 3-year partnership between NASA and school teams, consisting of teachers and education administrators from diverse communities across the country. NES project works primarily with educators who serve groups of students who are underrepresented in science, technology, engineering, and math (STEM) professions or who are traditionally underserved by NASA in rural or urban parts of the country. NES joins educators, students, and families in sustained involvement with NASA's research, discoveries, and missions. The project is designed for education communities at the 4-9 grade levels to help middle schools improve teaching and learning in STEM through significant structural techniques such as professional development, stipends, grants, curricular support based on NASA's resources, and the innovative use of instructional technology provided primary by the NASA Digital Learning Network (DLN). NES provides a comprehensive middle-level project to students and teachers at the critical age of decision-making for NASA's education pipeline.

PROJECT GOALS

NES expands horizons -- opening young minds to the possibilities of what the future holds. NES strives to make the resources, experiences, and tools necessary for effective science and mathematics education available to schools nationwide. The NES project links educators and students to resources and facilities that are normally beyond reach in the public school system. This direct contact plays an integral role in impacting individual students and entire school communities.

The goals for NES are as follows:

Project Goal 1: Provide educators with sustained professional development.

Project Performance Objectives:

- Increase the active participation and professional growth of educators in science.
- Increase the academic assistance for and technology use by educators in schools with high populations of under-served students.

Project Goal 2: Provide all students the opportunity to explore STEM topics in a variety of engaging and interactive NASA contexts.

Project Performance Objectives:

- Increase student interest and participation in mathematics, science, technology and geography.
- Increase student knowledge about careers in mathematics, science, engineering and technology.
- Increase student ability to apply mathematics, science, technology, and geography concepts and skills in meaningful ways.

Project Goal 3: Build strong family involvement within NES schools.

Project Performance Objectives:

- Increase family involvement in children's learning.

PROJECT BENEFITS TO OUTCOME 2

Attract and retain students in STEM disciplines through a progression of educational opportunities for students, teachers and faculty.

The goals of the NES Project align to Outcome 2 of the 2006 NASA Education Strategic Coordination Framework (http://education.nasa.gov/about/strategy/) which works to "attract and retain students in STEM disciplines." NES works to effectively compete for the minds, imaginations and career ambitions of America's young people.

NES primarily reaches students by engaging teams of teachers and administrators in partner schools. The project provides teachers with unprecedented access to NASA's unique mission content, resources, and technology. During 1-week professional development workshops at NASA Centers, educators gain first-hand knowledge of NASA research, facilities and educational resources. Customized professional development opportunities are offered throughout the 3-year partnership by NES Coordinators during on-site visits and through e-Professional Development opportunities that utilize on-line collaborative software and Web cast technologies.

In FY08, 1410 educators participated in NES STEM professional development opportunities. Among those who attended professional development, 86.9% used at least one NASA resource in their classrooms. (Paragon TEC, Inc., July 2008). More than half of NES teachers reported that they agree or strongly agree that their teaching is more effective when they use NASA STEM resources (52%), and agree or strongly agree that their students were more interested in STEM topics when they used NASA resources (53.7%); and nearly half (49.4%) reported that their students were more interested in STEM careers when they used NASA resources (Paragon TEC, Inc., July 2008).

The NES Project focuses its efforts on engaging and retaining students in STEM education and encourages them to pursue educational disciplines that are critical to NASA's future engineering, scientific, and technical missions. 105,598 students participated in NASA instructional and enrichment activities in FY08. Students in grades 4-12 reported statistically significant increases in interest in science and math following participation in NES. (Paragon TEC, Inc., August 2008)

As a result of participation in NES, students are exposed to career related activities throughout the K-12 pipeline. NES teachers reported introducing information about STEM careers more than 3732 times during the 2007-2008 school year. (Paragon TEC, Inc., August 2008) 73.4% of students in NES team members' classes reported that they were interested in a career that involves science, technology, engineering or mathematics. (Paragon TEC, Inc., July 2008) 77% of NES students reported that they would rather use NASA resources to learn STEM concepts and over 70% reported that it is easier to learn and they learn more using NASA resources. (Paragon TEC, Inc., July 2008)

PROJECT CONTRIBUTIONS TO PART MEASURES

PART measure 8: Percentage of elementary and secondary educators who participate in NASA training programs who use NASA resources in their classroom instruction.
465 teachers participated in NES long-duration (> two days) professional development opportunities in 2008. 93.7% (436/465) of the teachers who attended long-duration professional development used at least one NASA STEM resource in their classroom instruction. (Paragon TEC, Inc., July 2008)

PART measure 9: Percentage increase in number of elementary and secondary student participants in NASA instructional and enrichment activities.
NES student participation in NASA instructional and enrichment activities declined by 31.4%; decreasing from 153,840 students in 2007 to 105,598 students in 2008. 73.8% (124/168) of NES served high minority (>50% minority) student populations and 72.0% (121/168) of NES served high poverty (>50% of students received free or reduced price lunch)

PART measure 10: Percentage of students expressing interest in science and technology careers following their involvement in NASA elementary and secondary NASA education programs.
73.4% (6806/9269) of NES students reported that they were interested in a career that involves science, technology, engineering or mathematics. Students reported a statistically significant increase in their interest in STEM and NASA careers from last year to this year with 34% (3171/9269) of NES students in grades 4-12 indicating an increased interest in science careers and 32% (2968 students) indicating an increased interest in technology careers. (Paragon TEC, Inc., July 2008)

IMPROVEMENTS MADE IN THE PAST YEAR

In FY08, NES began an extensive internal and external review of the project goals, model, implementation and results. The process was initiated as a result of the recommendations received from The National Research Council of The National Academy of Science's external evaluation of NASA's Elementary and Secondary Education Program (Quinn, Schweingruber, and Feder, 2007). Focus groups consisting of nationally recognized education experts and NES teachers and administrators were conducted in June of 2008 to make recommendations for project enhancements. A restructuring working group was convened in Washington D.C., in September 2008 to refine and enhance the NES model.

This year, NES developed the NES Site Status Report System, an online database tool, to track each NES schools' progress toward achieving project goals and meeting school

needs. The system is used by NES staff to monitor project implementation and services provided to each NES. The system has provided an efficient mechanism to track metrics, status, and project data for individual schools, Center regions and the Agency.

PROJECT PARTNERS AND ROLE OF PARTNERS IN PROJECT

FY08 NES Partner School Accomplishments:

Since the inception of the project in 2003, NASA has established 200 NES partnerships, representing a total of 249 schools from diverse community located in all 50 States, Washington D.C., Puerto Rico and the Virgin Islands. In FY08, NASA maintained partnerships with 119 NES in their first through third year of the 3-year partnership with NASA. Additionally, 49 NES who had completed their initial 3-year partnership actively participated in NES professional development and student opportunities.
72.0% of these 168 NES schools served in FY08 are considered high poverty and 73.8% serve high minority student populations.

NES kick-off events were conducted at the 25 first-year NES, reaching 28,864 students, educators and community members. NASA senior officials, astronauts, engineers and education staff visited each school to engage members from all sectors of the community in the excitement and challenges of space exploration and recognize the schools' selection as a NES. NES kick-offs provided the public with a common message to develop a better understanding of NASA's mission and excited students and teachers about being in a partnership with NASA over the next three years. 105 elected officials, or their representative, attended NES kick-off events, including 12 Federal Legislators, or their representative. 169 community and business partners participated in NES kick-off events. The events received significant media coverage, including 31 newspaper articles, 9 radio interviews, and 26 television news stories.

FY08 NES Educator Accomplishments:

Professional development was provided to educators during STEM workshops, follow-up educational advisory sessions with NES staff, and on-site training at schools. 1410 educators participated in NES professional development. 227 educators participated in 11 long-duration (one week) STEM content workshops at NASA Centers, June-July 2008. 96.4% of participants reported that the workshops were valuable experiences. 94.2% of participants planned to apply the STEM concepts that they learned during the workshops and 96.4% reported that they planned to use NASA STEM resources learned during the workshops in their classrooms.

Participants were highly satisfied with their experiences at NES STEM workshops, as indicated by statistically significant changes in participants' knowledge of NASA's mission, their awareness of NASA resources and their understanding of NASA's support for education at all workshops. Statistically significant increases in participants' confidence in their ability to use NASA as a context for teaching STEM concepts were also observed. (Paragon TEC, Inc., July 2008)

NSTA provided professional development opportunities in partnership with NES on mission critical and standards-aligned topics through symposia at its conferences and Web seminars. During FY08, 67 educators attended two NES-sponsored symposia at two NSTA conferences and 233 educators participated in six web seminars delivered through the NSTA Learning Center as follow-up, synchronous events to these symposia. Through the online NSTA Learning Center, NES-sponsored e-PD resources and

opportunities, such as free science objects and web seminars, are available to the public. Archives are visible to more than 60,000 teachers who view and access these resources daily.

FY08 NES Student Accomplishments:
NES provided opportunities for active engagement of students in STEM content to increase their ability to apply STEM and to learn about career paths. Typically done with teacher support and training, these project elements offer direct uses of NASA mission data to solve investigative questions posed by students. Multiple efforts provided educators and students with content-specific activities that use NASA missions as a context to enhance a school's curricula by adding real world applications and relevance.

In FY08, 906 students from 23 NES participated in Virtual Student Symposia, during which they presented the results of their research projects and investigations, via the DLN to NASA personnel and other NES students. 1686 of the NES students participated in extended learning opportunities such as after-school science, math, robotics, or NASA clubs. (Paragon TEC, Inc., July 2008) 75% of NES students reported that after learning with NASA, they wanted to learn more about STEM and 73.4% expressed interest in STEM careers. (Paragon TEC, Inc., July 2008)

NES provided 255 family involvement events reaching 47,659 students and family members in FY08. NES demonstrated a 50% increase in the number of students attending family events focused on STEM from FY07 to FY08. 81% (6105/7493) of the students in grades 4-12 reported that they increased the amount of time that they talked about something they learned about NASA in class with their family members this year compared to last year. (Pargon TEC, Inc., July 2008)

REFERENCES

Paragon TEC, Inc. (2008, July). NASA Explorer Schools Summary of Fall Evaluation Activities (3rd Quarter Deliverable). Cleveland, OH: Dolman-Smith, G., Bondurant, R.L., Davis, D., Bettinger, E., Davey, B., and Ring, G.

Paragon TEC, Inc. (2008, August). NASA Explorer Schools Annual Report (4th Quarter Deliverable). Cleveland, OH: Dolman-Smith, G., Bondurant, R.L., Davis, D., Bettinger, E., Davey, B., and Ring, G.

Quinn, H. R., Schweingruber, H. A., and Feder, M. A. (Ed.). (2007) The National Academy of Science, National Research Council, Board on Science Education. NASA's Elementary and Secondary Education Program: Review and Critique (ISBN: 0-309-11552-3). Washington, D.C: National Academies Press.