NASA Explorer Schools (NES)

National Science Teachers Association (NSTA)
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PROGRAM DESCRIPTION
The NASA Explorer Schools (NES) Project establishes three-year partnership between NASA and school teams, consisting of teachers and education administrators from diverse communities across the country. Focusing on underserved populations, 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 science, technology, engineering, and math through significant structural techniques such as professional development, stipends, grants, the innovative use of technology and curricular supports based on NASA's resources. NES provides a comprehensive middle-level project to students and teachers at the critical age of decision-making for NASA's education pipeline.

PROGRAM RELEVANCE TO NASA
The NASA Explorer Schools project is applicable to NASA's Office of Education in the Elementary and Secondary Education Division.

PROGRAM BENEFITS TO SOCIETY
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 part in impacting individual students and entire school communities. NES connects NASA to communities at a personal level that allows students, teachers, parents, administrators and the local community to experience and interact with NASA outside the newspaper headlines.

PROGRAM GOALS
The goals for NASA Explorer Schools are as follows:

- 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.
- 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.
- Increase family involvement in children's learning.

PROGRAM ACCOMPLISHMENTS
NSTA provides project implementation, administrative oversight, and professional development

expertise for the project elements as follows:

- Participant Support – Stipend checks were paid for the fall and spring semesters to qualified NES team members. In the summer, participants received a stipend upon completion of all workshop requirements. During FY07 NASA provided professional development conference support funds opportunities to 277 NES educators to attend one of 11 approved educational conferences and NSTA handled all logistics. NSTA provided logistical support for 70 NES teachers that attended the Reduced Gravity Flight Opportunity workshop. NSTA maintained the primary database of NES team member information and provided the primary communication support for NASA to all active and alumni NES teams.
- Marketing and Promotions – On behalf of NASA, NSTA coordinated print advertising and recruitment efforts for NES. Print ads were placed in selected educational journals and magazines. Face-to-face promotion was accomplished through an NES exhibit presence at 14 educational conferences. Packets containing assorted NASA and NES-related promotional materials were sent to active NES teams at the beginning of the school year.
- Online Support and Tracking Systems – NSTA maintained the annual project application and provided data reports to NASA. A total of 175 completed applications were received from schools in FY07. The NES Tracking System was used to track documentation required for technology grant check processing. The NES Help Desk allowed NES users to seek answers to questions not listed in the Frequently Asked Questions section. An online application was created by NSTA for NES educators to seek professional development conference support funds.
- Team Selection and Notification – The NES national selection board met in March to finalize the NASA Center team selections. The selection board meeting was coordinated by NSTA and held at its facility. For the 2007 cohort, 25 teams were selected. NSTA sent acceptance package forms to selected teams and coordinated the return of those required documents. Non-selected teams were encouraged to apply again in the future.
- NSTA Professional Development Projects – NSTA provided professional development opportunities in partnership with NASA NES leadership on mission critical and standards-aligned topics through symposia at its conferences, web seminars, an online short course, and SciGuides. During FY07, 269 educators attended six NES-sponsored dynamic symposia at three NSTA conferences and 436 educators participated in 11 web seminars delivered through the NSTA Learning Center as follow-up, synchronous events to these symposia. A short course on the topic of “Force and Motion” was delivered in early 2007 for 20 NES educators. The development of two NES-funded SciGuides was completed on the topics of energy and space habitats. With the launch of the NSTA Learning Center, NES sponsored e-PD resources and opportunities such as free science objects and web seminars. Archives are visible to more than 30,000 teachers who view and access these resources daily.

STUDENT ACCOMPLISHMENTS

NSTA increases student interest and content knowledge in STEM by enhancing and supporting NES teachers’ science teaching. Through high quality professional development experiences and grants for technology purchases, student interest in and ability to apply STEM content has increased, as well as student knowledge about STEM careers.

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PROGRAM DESCRIPTION

The NASA Explorer Schools (NES) Project establishes a three-year partnership between NASA and school teams, consisting of teachers and education administrators from diverse communities across the country. Focusing on underserved populations, 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 science, technology, engineering, and mathematics through significant structural techniques such as professional development, stipends, grants, curricular support based on NASA's resources, and the innovative use of 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.

PROGRAM RELEVANCE TO NASA

NASA is committed to investing in the Nation's educational programs and supporting the country's educators who play a key role in preparing, inspiring, exciting, encouraging, and nurturing the young minds of today who will manage and lead the Nations' laboratories and research Center's of tomorrow. In achieving this goal, the Agency has created NES a project working primarily with groups of students who are underrepresented in Science, Technology, Engineering and Mathematics (STEM) professions or who are traditionally underserved by NASA in rural or urban parts of the country. The DLN provides a direct connection between NES and NASA 's unique content, facilities, and personnel through interactive instructional technologies (videoconferencing, Web casting).

PROGRAM BENEFITS TO SOCIETY

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PROGRAM GOALS

The goal of NES aligns to Outcome 2 of the 2006 NASA 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. The 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. NES primary reaches students by engaging teams of teachers and administrators in partner schools. NES provides teachers with unprecedented access to NASA unique mission content, resources, and technology. NES creates partnerships with schools which provide technology grants, sustained professional

development through workshops at NASA centers and in schools, the engagement of families and the community, special student opportunities and content delivery through the DLN via videoconferencing.

The goals for NES are as follows:

- 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.
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PROGRAM ACCOMPLISHMENTS

25 new NES partnerships, serving a total of 30 schools, were established in 2007, bringing the total number of NES partnerships to 200, representing a total of 249 schools. 87% of these schools are considered high poverty and 77% serve high minority student populations.

NES kick-off events were conducted at the 25 new 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.

Professional development was provided to educators during one-week STEM workshops, follow-up educational advisory sessions with NES staff, and on-site training at schools. 7955 educators participated in NES activities and professional development. 473 educators participated in 19 long-duration (one week) NES STEM workshops. 94% of the educators that participated in these workshops used the NASA resources in their classroom. (Data collected using six month follow-up survey completed by workshop participants)

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. (Data collected using end of workshop participant surveys) Statistically significant increases in participants' confidence in their ability to use NASA as a context for teaching STEM concepts were also observed.

The DLN increased it customer based by 151% between 2005 and 2007. In FY07, 113,872 students and educators participated in 2570 DLN events; 796 of these events were provided to NES. These numbers show an increase of 178% from the number of

events provided in 2005 and a 285% increase in the number of events provided to NES in 2005. (Data collected using DLN automated, online scheduling and reporting system)

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 using the NASA mission as a context to enhance a school's curricula by adding real world applications and relevance.

Highlights from FY07 student accomplishments:

- 153,840 students participated in NES activities during FY07.
- 344 students attended shuttle launches at Kennedy Space Center, FL.
- Students from 33 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.
- 92,896 students participated in DLN events.
- Student interest surveys completed in spring 2007, showed 84% of the 9699 NES students who responded to the survey, stated that they would "Like" or "Like a lot" a career in STEM.

NES Evaluation
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EVALUATION PROCESS

The evaluation process for 2008-09 was designed based on the PART requirements and the needs of the project for formative and summative data. Specifically, the following evaluation data were collected (note new or revised measures are indicated).

Effect on Teachers

Our evaluation examines three variables for the effect of NES on educators: 1) Learning experiences offered; 2) The quality of these learning experiences; 3) The effect of these experiences on teachers' use of NASA resources with students. We use multiple methods to examine each variable.

Learning Experiences Offered

The schedule, attendance and objectives of each learning experience for educators is tracked and reported. DLN data on participation by teachers and students provides data on digital participation.

Quality of the Learning Experience

For each learning experience, teachers complete a questionnaire immediately following. From this measure, we are able to evaluate the perceived effectiveness of the learning experience and the educators' intent to use what he or she has learned. We are using a short event questionnaire from the program-wide evaluation analysis for webinars, and a longer questionnaire for longer learning experiences (Garet et al xxxx). Learning experience plans are also analyzed based on best practices research. NES coordinators complete an agenda analysis indicating the degree to which a workshop engages educators with appropriate and relevant content. Participants do daily ratings on the same variables to provide formative feedback to NES coordinators and other NASA staff facilitating the workshop. This process has been developed and refined over the last four years.

Use of NASA resources

A follow up questionnaire was developed this year to be completed four to six months after a learning experience (depending on the time of year) to evaluate the actual use as a result of the educators' learning experience. In addition, teachers in NES schools, the NES team lead and the administrator complete end

of year questionnaires that ask about their use of NASA resources. During the year, each NES team maintains an eFolio of their NASA related activities. In this eFolio they describe the learning experiences they have as faculty and administrators in an NES school, as well as the activities they do with students. We have revised the eFolio this year to ask the teams to indicate if activities they do with students are influenced by learning experiences they have had. A newly developed site status report (completed twice a year by NES coordinators on each school) provides additional data on the use of NASA resources in the school.

Effect on Students

Our evaluation examines the effect on students in three areas: 1) Participation in STEM activities; 2) Interest in STEM topics; 3) Interest in STEM careers. To evaluate these effects, we gather data from students, and from their teachers.

- Students are asked questions about their activities and interests in an end of the year questionnaire. Over the past three years, we have developed and tested questions that provide data on the activities students participate in, such as after school clubs, outside of school STEM experiences, and family activities. We also ask them about their interest levels at the beginning and end of the year.
- Educators provide their observations of the effect of the NES activities on students in several different ways. For eFolio activities, educators complete an evaluation that asks about the effect on students. In the end of the year surveys, teachers, administrators and NES team leads indicate the level of effect participation as an NES school has had on students.

EVALUATION UPDATE AND ITS RELEVANCE TO NASA

Originally in 2003, the evaluation was designed to evaluate the NES goals and objectives within the overall NASA education goals. The formative and summative design components were designed based on best practices in evaluation. The NES project embraced these evaluation efforts and used the formative data to continuously refine the project implementation. The data were reported by PART and OMB requirements. The current evaluation plan builds on these earlier efforts with the goal of providing additional data to guide implementation, to involve NES schools in reflecting and refining their own goals and objectives, and to provide NES coordinators and other NASA staff information to support the schools in using NASA resources. A detailed table of specifications is available in the evaluation plan that shows how each evaluation tool and its fields or questions contribute to the evaluation of progress toward the PART measures. Briefly, the PART measures are reported on in the following ways.

Percentage of elementary and secondary educators using NASA content-based STEM resources in the classroom

Teachers are directly asked about their use of NASA content-based STEM resources in the classroom and in other school activities in a yearly

questionnaire, and in follow-up questionnaires after workshops of more than two days. They also indicate use of NASA resources in their eFolio entries.

Percentage of elementary and secondary educators who participate in training programs who use NASA resources in their classroom instruction

Teachers who attend training programs are directly asked if they intend to implement what they learned in an end of workshop questionnaire. They are asked what they actually implemented in a follow-up questionnaire four-six months later. They indicate the effect of training on activities in the eFolio. In the end of the year questionnaire they indicate how much they have used NASA resources during the previous year.

Percentage increase in number of elementary and secondary student participants in NASA instructional and enrichment activities

The site status report tracks NASA related activities in schools. Additional data on participation is collected in the eFolio.

Level of student interest in science and technology careers resulting from elementary and secondary NASA education programs

Students are asked directly in an end of the year questionnaire about their level of interest in STEM careers.