

National Aeronautics and Space Administration



Science Mission Directorate Education & Public Outreach

Help Guide

Version 1.0
December 2011

The most current version of this document can be downloaded at
<http://nasascience.nasa.gov/researchers/education-public-outreach/explanatory-guide-to-smd-e-po-evaluation-factors>

If you have comments or questions, please send email to
HQ-SMD-ROSES-EPO@mail.nasa.gov

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Change History

<p>December 2011 Version 1.0</p>	<p>Initial Release of <i>SMD E/PO Help Guide</i></p> <p>It is based on updates of the <i>SMD EPOESS Guide v1.2, Explanatory Guide to the Proposal Evaluation Factors for ROSES Program Element: Opportunities in Education and Public Outreach for Earth and Space Science (EPOESS)</i> (Nov. 2010)</p>
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Preface

NASA's founding legislation, the Space Act of 1958, directs the Agency to expand human knowledge of Earth and space phenomena and to preserve the role of the United States as a leader in aeronautics, space science, and technology. High achievement in STEM education is essential to the accomplishment of NASA's mission. The NASA Science Mission Directorate is a major contributor to the overall NASA education and outreach effort through a portfolio of investments in Higher Education, Elementary and Secondary Education, Informal Education, and Outreach.

NASA continues the Agency's tradition of investing in the Nation's education 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 Nation's laboratories and research centers of tomorrow.

In 2006 and beyond, NASA will pursue three major education goals:

- Strengthen NASA and the Nation's future workforce—NASA will identify and develop the critical skills and capabilities needed to ensure achievement of the Vision for Space Exploration. To help meet this demand, NASA will continue contributing to the development of the Nation's science, technology, engineering, and mathematics (STEM) workforce of the future through a diverse portfolio of education initiatives that target America's students at all levels, especially those in traditionally underserved and underrepresented communities.
- Attract and retain students in STEM disciplines—NASA will focus on engaging and retaining students in STEM education programs to encourage their pursuit of educational disciplines and careers critical to NASA's future engineering, scientific, and technical missions.
- Engage Americans in NASA's mission—NASA will build strategic partnerships and linkages between STEM formal and informal education providers. Through hands-on, interactive educational activities, NASA will engage students, educators, families, the general public, and all Agency stakeholders to increase Americans' science and technology literacy.

NASA delivers a comprehensive education portfolio implemented by the Office of Education, the Mission Directorates, and the NASA Centers. Through the portfolio, NASA contributes to our Nation's efforts in achieving excellence in STEM education. Three Outcomes serve to align all Agency education activities:

Outcome 1: Contribute to the development of the STEM workforce in disciplines needed to achieve NASA's strategic goals through a portfolio of investments.

Outcome 2: Attract and retain students in STEM disciplines through a progression of educational opportunities for students, teachers, and faculty.

Outcome 3: Build strategic partnerships and linkages between STEM formal and informal education providers that promote STEM literacy and awareness of NASA's mission.

The Education Strategic Framework depicted in Figure 1 provides a conceptual basis for examining, guiding, and coordinating the NASA education portfolio.

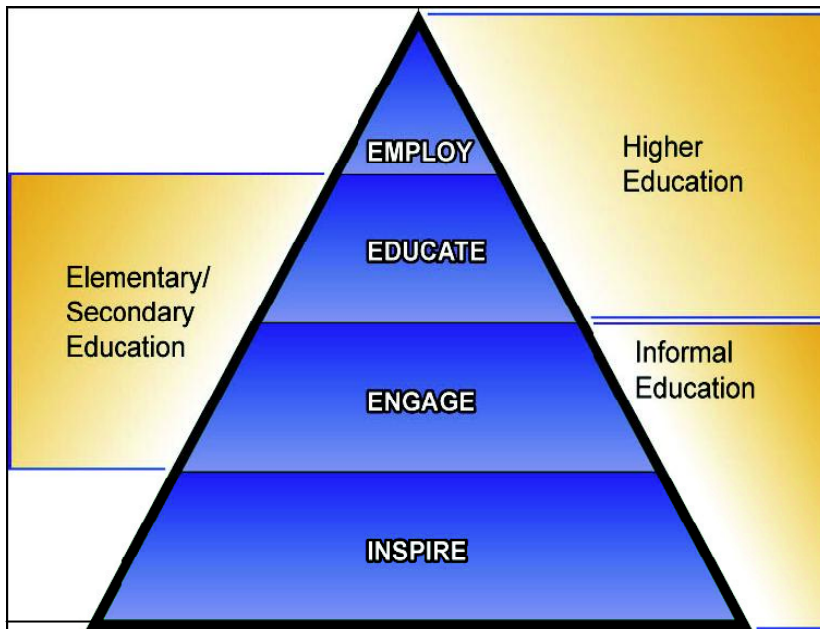


Figure 1

The Education Strategic Framework is a strategic management tool that allows the Agency to monitor participant movement through education activities, with each category leading to the next. Education programs and projects draw from the category below them – as a key source for participants – and they connect participants to the category above them – providing a more experienced and

focused group and creating a measurable pipeline. If a participant’s imagination is captured by an inspirational activity, it will be far easier to interest that individual in more interactive engagement activities. As that individual becomes more engaged, he or she may search for opportunities to learn and eventually become employed in the aerospace industry - either in the private or public sector (e.g., NASA). Student opportunities at NASA include internships, scholarship programs, and student education employment programs (e.g., cooperative education). No matter where the individual decides to pursue their career, the goal is to direct a subset of the original audience through the pipeline to pursue a career in science, technology, engineering, or mathematics while drawing in new participants along the way.

Outreach is also an essential aspect of the SMD program. It directly connects to many aspects of NASA Public Affairs and NASA education efforts. It often provides an inspirational spark for participants to seek out education opportunities. The SMD Outreach Goal is to stimulate interest in science, engineering, and technology relevant to NASA SMD. There are four objectives:

1. Increase interest in careers that use science, engineering, and/or technology relevant to NASA SMD
2. Increase understanding by the general public of SMD science, engineering, and technologies
3. Increase participation of citizen scientists in SMD education opportunities
4. Increase public engagement in improving science, mathematics, engineering, and technology education in the United States.

Outreach can be directed at any audience including students, teachers, citizen scientists, and the general public.

The information contained in this document is intended to give a flavor of what exemplary Education and Public Outreach projects can be rather than a prescription for what to do. It is based on experience to date and thus the contents of the Guide will evolve over time with regular updates. For the latest version, please link to

<http://nasascience.nasa.gov/researchers/education-public-outreach/explanatory-guide-to-smd-e-po-evaluation-factors>

For assistance in aligning proposals with the goals and objectives of NASA and SMD education, see the *Explanatory Guides* for ROSES Education and Public Outreach offerings. These Guides provide an elaboration of each of the SMD E/PO proposal factors, and include “Indicators” that may be used by both proposers and reviewers to assess how well a proposal meets the evaluation factors. These guides are available at

<http://nasascience.nasa.gov/researchers/education-public-outreach/explanatory-guide-to-smd-e-po-evaluation-factors>

If you have comments or questions, please send E-mail to HQ-SMD-ROSES-EPO@hq.nasa.gov

I. SMD E/PO Policies

NASA's Science Mission Directorate (SMD) commitment to Education and Public Outreach (E/PO)

Historically NASA has placed a premium on training the next generation of scientists via the support of graduates and postgraduates in their usual scientific roles on research proposals. Such support for future scientists is important and ongoing. The SMD E/PO program expands the SMD role in education to meet national needs for improving pre-college science education and enhancing general literacy in science, mathematics and technology. This means supporting the involvement of the science community in partnership with the education community to enhance science, technology, engineering, and mathematics (STEM) education and the public understanding of science. SMD devotes a substantial level of resources toward its E/PO program. Every NASA Science Mission Directorate (SMD) flight project proposal (AO) is *required* to include a meaningful segment on E/PO.

SMD E/PO Program and the broader NASA Education Program

The SMD E/PO program operates within the NASA Education program, which is coordinated by the NASA Office of Education. Management of various programs is vested in several organizations including the Office of Education, NASA Directorates (such as the Science Mission Directorate), and the NASA Field Centers. The SMD E/PO portfolio reflects ongoing contributions to the NASA Education Program.

The SMD E/PO portfolio encompasses projects in higher education, elementary and secondary education, informal education, and outreach. The beneficiaries of these projects are:

Higher Education: college college/university faculty, undergraduate, graduate students, or postdoctoral researchers.

Elementary & Secondary Education projects – beneficiaries are educators and/or Kindergarten through grade 12 students.

Informal Education projects – beneficiaries may be of any age.

Outreach: beneficiaries may be of any age.

The Science Mission Directorate has identified specific outcomes for these projects which align with the broad Agency Education Outcomes (described in the Preface)

The four SMD Higher Education Outcomes are:

- (1) Early Career Scientists & Pre-Service Faculty Development
- (2) Research Experiences for Students Underrepresented in Earth and Space Science
- (3) Student Collaborations
- (4) Resources for Higher Education

The three SMD Elementary and Secondary Education Outcomes are:

- (1) Building Elementary and Secondary Teacher Skills
- (2) Elementary and Secondary Resources
- (3) Elementary and Secondary Student Opportunities

The three SMD Informal Education Outcomes are:

- (1) Informal Education Resources
- (2) Building Informal Educator Skills
- (3) Informal Education Opportunities

SMD also contributes to Outreach through *four Outreach Outcomes:*

- (1) STEM Careers Opportunities for SMD
- (2) Public Understanding of SMD STEM
- (3) SMD Opportunities for Citizens Scientists
- (4) Public Engagement in STEM Education

For further descriptions of these outcomes, see the Glossary (Appendix A).

NASA's Science Mission Directorate (SMD) Commitment to Education and Public Outreach (E/PO)

The NASA science research and development community has earned an international reputation for outstanding scientific achievement. Discoveries are abundant as scientists probe into the depths of a familiar night sky or our own home planet. This discovery-rich quality also makes Earth and space science an inspirational context for science education and public outreach (E/PO). The SMD E/PO strategy reflects the conviction that with key partnerships and cleverly leveraged efforts, the Earth and space science community can take greater advantage of its inspirational assets to have a powerful, positive impact on education in America.

Successful science education produces a science literate public who appreciates the nature of science; science literate educators, journalists, artists, politicians and business leaders who can recognize and articulate the value of science in society; and a diverse, high-quality technical work force. It is clearly in the enlightened self-interest of the space science community to bring the power of its inspirational endeavors more deliberately to bear in support of these outcomes.

SMD's Emphasis on E/PO to Underserved and/or Underutilized groups

Profound changes in the composition of the population of the United States are now taking place. According to projections by the Bureau of the Census:

- By 2030, the total elementary school age population of the United States will be equally divided between non-Hispanic whites and all other racial/ethnic groups combined.

- From 2030 to 2050, Native Americans, Asian/Pacific Islanders, Hispanics, and African Americans will together far outnumber non-Hispanic whites in elementary schools, high schools, and new entrants into college and the workforce.
- By 2050, non-Hispanic whites will decline to 53 percent of the total US population (all ages).

Thus, meeting the future needs of a society based on science and technology will require the involvement of individuals from groups who, at the current time, are not as effectively utilized as they should be in science and technology. In addition, these underserved and/or underutilized groups are significantly more underrepresented in space science than they are in science and technology as a whole. SMD is committed to playing a substantive role in addressing the need for outreach to these underrepresented groups to help ensure the future supply of scientists and engineers, and educate all people about the important role that science and technology plays in their lives).

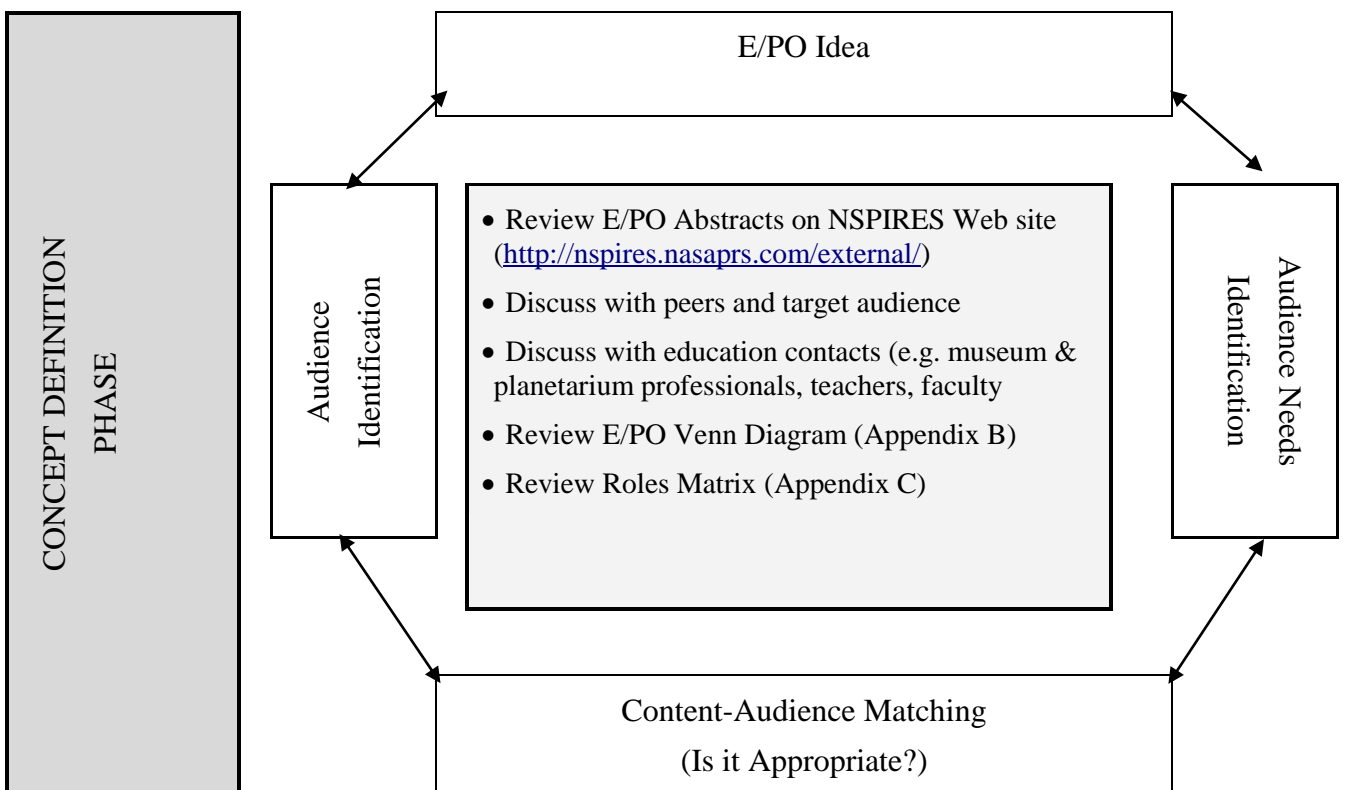
II. SMD E/PO Proposal Quick Start Guide

Developing a Science Mission Directorate (SMD) Education And Public Outreach (E/PO) proposal is a significant but rewarding undertaking. Getting started in E/PO is fairly straight forward – you need an E/PO idea that the SMD E/PO program can fund, you need a team of people with the expertise to carry the idea out, and you need to write it all down in a concise proposal.

SMD recognizes that many researchers are not experts in education and public outreach and has prepared both *Explanatory Guides* and this *Help Guide* to help them understand what SMD is looking for in a proposal, suggest roles and ideas that they might consider, and resources they can consult.

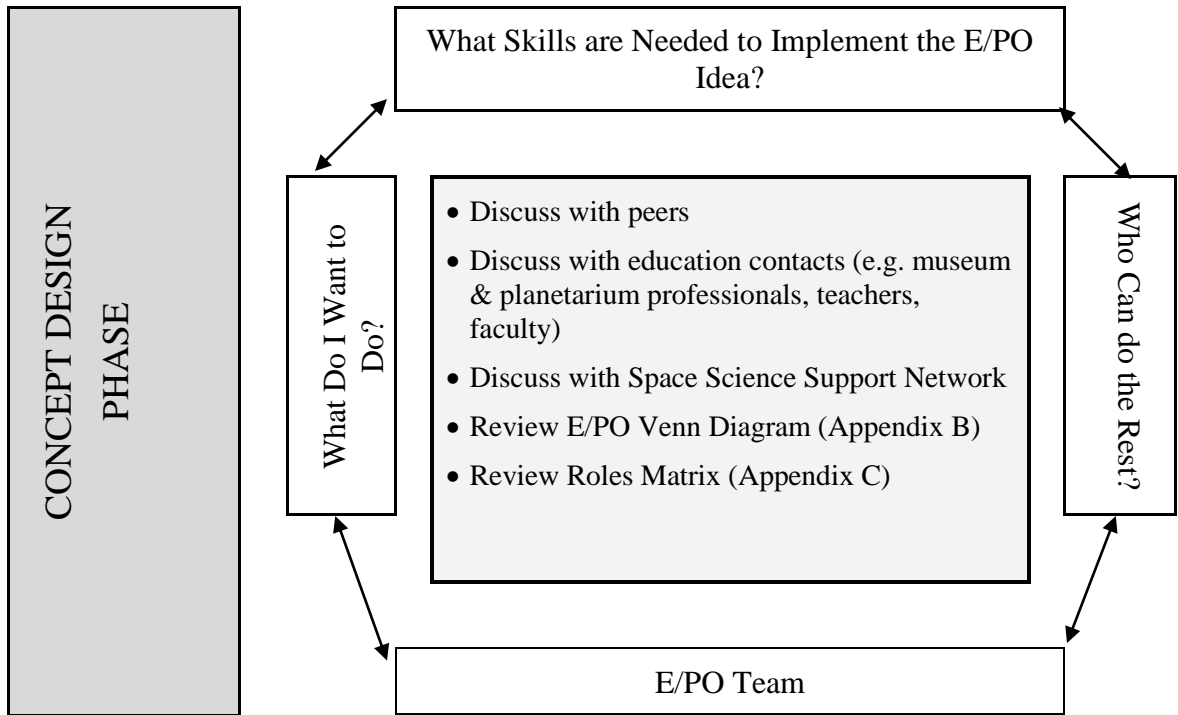
Step 1: Review the SMD E/PO Evaluation Factors discussed in the *Explanatory Guides*. Understand what types of E/PO ideas can be funded by the SMD E/PO program.

Step 2: Generate an E/PO idea—this is usually an iterative process of identifying potential audiences and their needs and matching them against the SMD STEM content you are considering.



Step 3: Review the SMD E/PO Indicators of Alignment described in the *Explanatory Guides*. Understand the details of SMD E/PO activities and what the review panel will be looking for.

Step 4: Put Together Your E/PO Team—this is usually an iterative process to evaluate the skills needed for the project and then to identify who has them. Budget considerations can come into play. If you are developing a comprehensive E/PO program for a Mission, see Appendix D for the desired qualities of a Mission E/PO Lead.



DO NOT OVERLOOK PROGRAM EVALUATION—If there are several different elements within the effort, each of them needs to be evaluated, in addition to the overall effort. Evaluation should be geared to the scale and type of the proposed efforts. Some might use simple, informal approaches, while others very specific evaluation methods like pre- and post-tests, questionnaires, or a focus group. The person doing the evaluation should be knowledgeable in the use of the selected evaluation approach.

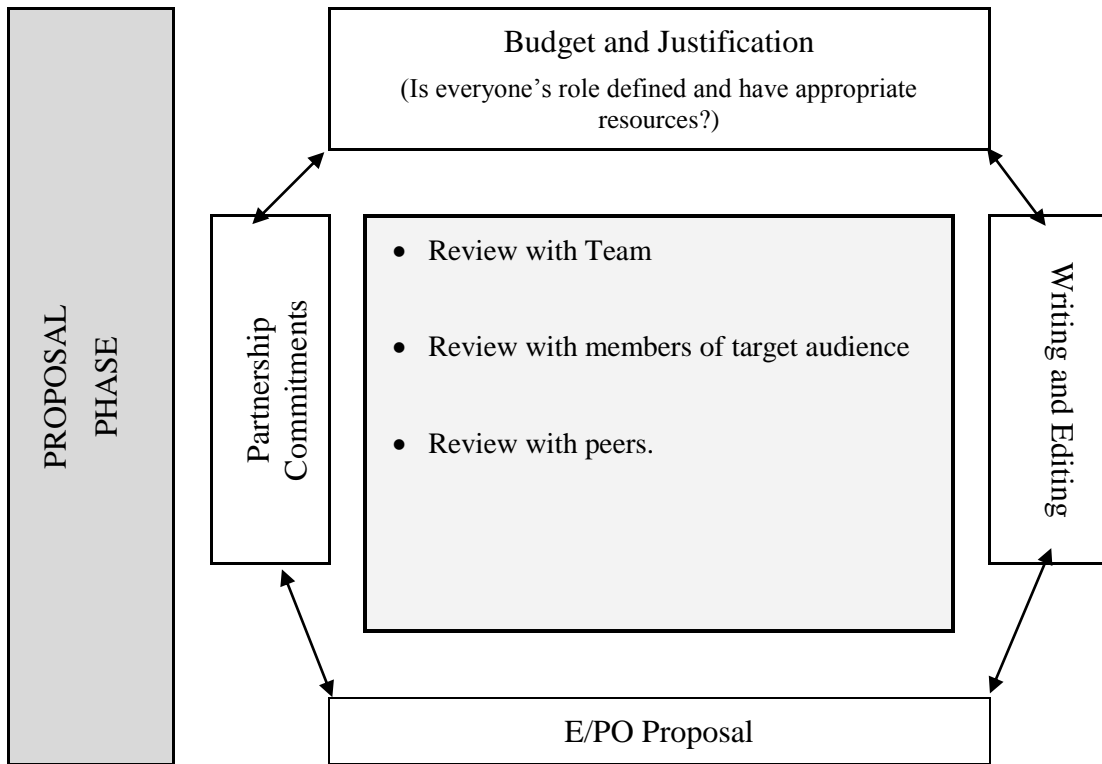
The Space Telescope Science Institute IDEAS program provides an excellent primer on evaluation that is relevant to NASA SMD E/PO programs. The URL is:

<http://ideas.stsci.edu/Evaluation.shtml>

Step 5: “Sanity Check” – discuss your E/PO Idea and Partners with a representative of the target audience and/or your peers.

Step 6: Prepare Your Proposal—this is usually an iterative process between the team members. Reviews by the target audience and an evaluator can help clarify goals and objectives. They can also help ensure that sufficient detail is provided for reviewers who may

be unfamiliar with the science or particular approach to implementing the E/PO Project Activity.



Step 7: The Review Process

To ensure quality and consistency in the review process, review panels for the E/PO segment include both educators and researchers.

The process of handling E/PO proposal segments follows the known best and fair practices for proposal review in current use throughout SMD. (See the *Guidebook for Proposers Responding to NASA Research Announcements*, Appendix C, which is available at <http://www.hq.nasa.gov/office/procurement/nraguidebook/>.)

The panel reviews are conveyed to proposers along with the funding decision.

FAQ: What kind of E/PO should I emphasize in my Project Activity proposal?

There is no single answer to this question as there are a wide spectrum of acceptable products and activities (see Appendix B), some of which may be of greater value for a particular locale or region. There may also be geographically convenient partnership opportunities—such as with a nearby science museum or planetarium that can serve to motivate particular types of education activities. The SMD E/PO effort recognizes that various audiences have different needs, and that impact manifests itself differently within each group of users. (See OSS E/PO Evaluation Report (2007), Lesley

University, <http://nasascience.nasa.gov/educators/program-evaluation/NASA%202007%20Summative%20report.pdf>)

There are two primary sources for information on SMD sponsored programs and products. The first is the 2006 NASA Education Portfolio Data Call Report [<http://www.strategies.org/Portfolio/FinalReport.html>]. The second source is the SMD E/PO report [<http://ossim.hq.nasa.gov/ossepo/index.html>].

FAQ: How can I expand the scope of my Project Activity in order to get the most out of proposed funding?

There are many strategies for enhancing the value or cost-effectiveness of a project including the creative use of existing Earth and space science community resources (e.g., scientists and engineers, observatories, mission operations facilities, computers, science imagery and other data). Some general strategies to expand the scope of a project are listed with examples below:

- Having a substantive impact beyond the direct beneficiaries (e.g. having a "waterfall effect" where a program trains master teachers e.g. Solar System and Astrophysics Educator projects.)
- Capitalizing on dissemination techniques and infrastructures that can reach relatively large audiences (e.g. science museums, planetariums, radio, television, Internet, traveling exhibits – see “FAQ: How can I disseminate products developed by our Project Activity?” below)
- Drawing on (or leveraging) resources beyond those directly requested (e.g. partners provide cost sharing, in-kind contributions, or existing capability and infrastructure that would be cost ineffective to recreate from scratch)

FAQ: What attributes should I look for in a Project Activity partner?

Desirable qualities to look for include:

- substantial experience in managing the development of Earth/space science-related E/PO products and activities.
- significant experience in presenting SMD science effectively to a large and diverse public audience.
- a history of positive professional association with both the science and education communities.
- credible expertise relevant to the assigned project element, openness and ability to engage scientists in meaningful and efficient ways in outreach efforts.
- geographical or institutional desirability in terms of access to scientists and/or to underserved or underrepresented populations.
- willingness to contribute the use of existing infrastructures, capabilities, or programs that could be leveraged for dissemination or evaluation of products and events (e.g., museum and planetarium programs, an ongoing series of educator workshops, a distance learning infrastructure, a national network of outlets for educational resources, or a radio/television/Internet broadcast capability).
- willingness to provide matching funds or in-kind contributions.

FAQ: How can I disseminate products developed by our Project Activity?

All NASA-sponsored awardees are required to submit their Earth and space science education products and resources for review and potential broader dissemination. This review does not take the place of formative evaluation of education materials and it is expected that products have been reviewed for scientific accuracy and educational value, as well as field-tested by teachers and/or students as appropriate. Earth and Space Science products should be submitted to <http://www.strategies.org/nasareviews>. After a product or resource has passed the review, it may be disseminated broadly through NASA assets such as the NASA Space Grant Consortia, NASA CORE, and NASA Aerospace Education Specialists. In addition materials may be posted online at the NASA Education portal Web site, the SMD education Web site, or the SMD Science Education Resource Directory (<http://teachspacescience.stsci.edu/>).

III. SMD Science Education and Public Outreach Forums

A. The SMD Science E/PO Forums

Each SMD Science Division has its own Forum: Astrophysics, Earth Science, Heliophysics, and Planetary Science. The four Forums are teams of scientists and educators that work closely with SMD to support and coordinate the activities of the SMD E/PO community. The SMD E/PO community includes the missions, programs, contractors, and grantees funded to conduct E/PO activities using SMD content, expertise, and facilities, as well as those interested in these efforts. The Forums:

- Facilitate communication and collaboration among current and potential SMD-funded E/PO programs and providers
- Identify a range of opportunities and various strategies for scientists and others to participate in SMD E/PO programs
- Support community members in enhancing their skills and knowledge as E/PO practitioners
- Help community members respond to SMD and NASA E/PO requirements
- Identify and leverage partnerships that enhance and broaden program impact
- Analyze the portfolio of SMD E/PO products and activities
- Develop thematic approaches that place E/PO activities in the context of SMD science
- Help SMD place E/PO products and activities into an online one-stop portal
- Integrate Division E/PO activities into SMD- and NASA-wide initiatives

Through these coordinated efforts, SMD is working to increase coherence within its E/PO portfolio and to create more effective, sustainable, and efficient utilization of SMD science discoveries and learning experiences.

If you are interested becoming involved in SMD E/PO and wish to learn more, please contact the lead of the Forum that most closely aligns with the scientific theme of your research or educational program. The Forum Leads are:

Astrophysics

Space Telescope Science Institute
Point of Contact: Denise Smith

E-Mail: dsmith@stsci.org
Phone Number: (410) 338-4434

Earth Science

The Institute for Global Environmental Strategies
Point of Contact: Theresa Schwerin

E-Mail: theresa_schwerin@strategies.org
Phone Number: (703) 312-0825

Heliophysics

University of California, Berkeley
Point of Contact: Laura Peticolas
E-Mail: laura@sunearth.ssl.berkeley.edu
Phone Number: (510) 643-6295

Planetary Science

Lunar & Planetary Institute
Point of Contact: Stephanie Shipp
E-Mail: ship@lpi.usra.edu
Phone Number: (281) 486-2109

B. Forum Support of a PI's Proposal Efforts.

The Forums can help you understand the elements in the EPOESS and Supplements guides so that you can create strong programs and competitive proposals. They can offer insights into ways that a project activity can be strengthened, based on an understanding of audience needs, gaps in the SMD E/PO portfolio, best educational practices, and evaluation methodologies. They can make recommendations for contacting similar programs that could serve as models for your efforts, and suggest partners to contact to discuss synergies. They can also point to resources pertaining to effective evaluation tools and metrics.

The Forums cannot fund, write, or review proposals, nor can a Forum serve as a proposal team-member (e.g., co-investigator, collaborator, partner, advisory panel member). The integrity of the proposal process is at the heart of SMD's approach to E/PO. The Forums have adopted a set of Operating Principles to ensure that they provide fair and equitable services to the entire SMD E/PO community (see Section D, below). Forums cannot provide letters of support. All proposers are eligible for these services (and those discussed below for grantees and mission E/PO programs) without a letter of support.

Before consulting a Forum, it is helpful for you to prepare answers to the following questions as a way to focus the discussions.

- What is the name of the solicitation to which you are responding?
- When is the proposal due date?
- Who are the Co-Is and primary contractors (if any) on your proposal and where are they located?
- What is the basic science content of your proposal, and to which SMD Division(s) is it linked: Astrophysics, Earth Science, Heliophysics, or Planetary Science?

In addition to the questions above, the Forum will discuss the following with you:

- What are the science, education, and outreach experiences and interests of your proposal team members?
- Does the target audience "fit" with the experiences and interests of your team? What are the audience needs with respect to your proposal idea? How do you intend to meet those needs?
- Are you aware of any particular partners or networks with whom you want to collaborate (e.g. school districts, university or community college, science museum,

planetarium, observatory, minority focused organization, educational TV, SMD networks, National Parks, etc.)?

- How much funding will your proposal devote to education and public outreach?
- Over what time period will E/PO funds be spent?

This set of questions does not constitute an exhaustive list but is intended to stimulate dialogue and the flow of fruitful ideas.

C. Forum Support for Grant Awardees and Mission E/PO programs.

Once selected, you will be invited to join the Forum activities through the Forum with which your project most closely aligns. The Forums provide a variety of opportunities for you to get to know your colleagues and the programs they represent, including monthly online tag-ups that share news pertinent to the community, professional development opportunities, and annual community meetings. All of these activities are intended to help community members collaborate, enhance their professional skills, leverage each other's activities, and extend their reach through partnerships. In addition, Forums can continue to offer insights and advice that can help you to strengthen your program as it develops.

The Forums work with community members to develop thematic educational approaches that place your activities in the context of SMD science, thus increasing the reach, impact, and "shelf-life" of your efforts. They assist in the coordination of SMD's presence at selected science and education conferences and placement of programs within SMD's web presence, helping to showcase SMD E/PO programs and products. They will help you respond to SMD and NASA E/PO requirements, such as reporting through the Office of Education Performance Measurement system, the NASA education product review, and sharing of E/PO highlights with SMD.

All selected E/PO programs are strongly encouraged to become contributing members of the SMD E/PO community. Doing so will enhance your E/PO efforts and those of other community members and will help SMD to maintain a coordinated, high impact, sustained, national E/PO program.

D. Operating Principles of the Science Education and Public Outreach Forums

1. The Science Education and Public Outreach Forums (Forums) will provide fair and equitable services to all customers of the NASA Science Mission Directorate (SMD) Forums. Such services include advice on Education and Public Outreach (E/PO) project design and implementation and proposal preparation, and information on partnership and networking opportunities with a wide variety of E/PO institutions and programs within and outside of NASA.

2. Forums will not write or review all or part of SMD Announcement of Opportunity (AO) or NASA Research Announcement (NRA) proposals. In all cases, the responsibility for formulating the E/PO program and preparing a proposal is that of the proposer.

3. Forums will treat E/PO proposals prepared by customers who respond to SMD AOs and

NRAs as proprietary information.

4. Forums are, in some cases, embedded in larger host organizations that have ongoing E/PO programs. To ensure fair and equitable services, Forum team members and their host organizations will follow existing best and fair business practices and good faith measures used by NASA and the Earth and space science research community regarding pre-proposal information dissemination, proposal creation, peer review, and proposal selection.

5. Forums will provide information to customers about options for partnerships that feature competing possibilities and capabilities other than those of their host organization.

6. Forum team members will not participate in the review of E/PO proposals for which they have directly rendered services, or in which they or their host institutions are listed as partners.

IV. "Informal Education" vs. "Public Outreach"

Both informal education and public outreach are essential elements in engaging and inspiring the public and each plays a critical role in increasing their understanding of NASA. The following is intended to define informal education's role and distinguish it from public outreach.

The First Criteria is the Intent

In trying to distinguish whether something is informal education or public outreach the first consideration is – what is the primary intent or goal of the activity?

Outreach:

The **intent of outreach** is to raise awareness of, or interest in, NASA, its goals, missions and/or programs, and to develop an appreciation for and exposure to science, technology, research and exploration.

Education:

The **intent of education** is to increase learning, to educate students, educators and the general public on specific science, technology, engineering or math (STEM) content areas, and to expand the nation's future STEM workforce.

Additional Criteria

Having an educational 'intent' is not a sufficient condition to be an informal education effort. In order to qualify as 'Informal Education', as opposed to 'Public Outreach', a project has to additionally meet at least two of the following criteria:

1. **Supplemental Materials/Handouts:** Standards based education materials are used to supplement and enrich the experience, visual, or activity. (This includes adaptation of standards-based materials that were developed for formal education. See [Recasting Content in a New Light: A Guide for Adapting Formal Education Materials for Informal Settings](https://nasascience.nasa.gov/educators/space-science-education-resource-directory-sserd/RecastingContent_508.pdf) [https://nasascience.nasa.gov/educators/space-science-education-resource-directory-sserd/RecastingContent_508.pdf])
2. **Staffing:** Staff/facilitators, trained or qualified in STEM/education fields, actively work with participants to further enhance their understanding and increase the educational value of the experience, visual, or activity.
3. **Content:** Educational standards and/or learning objectives play a key role in developing content and/or design and explore topics in-depth

Depending on their design, many products and services, such as Web sites, videos, and CD-ROMS, may be structured as informal education, or tailored more toward formal education or toward public outreach. For example, a CD-ROM might contain an interactive, standards-based curriculum for use in the classroom (formal education), or it might be an archive of captioned images for use on home computers (public outreach), or it might serve an interactive kiosk in a science museum exhibit (informal education). A website may also be

cast across the E/PO spectrum. A Web site can be used to deliver a standards-based distance learning course (Formal Education), or to provide the public with a description of the latest images from another planet (Public Outreach).

Note that there are other classes of Public Affairs or Public Relations products and services that do not generally fall into the domain of E/PO. These include press releases, press conferences, video clips, mission-related brochures, posters, lithographs, and toys. While such activities are important avenues for reaching the public, they are outside the scope of the SMD E/PO program. In addition, SMD resources for E/PO should not be used for “give-away” items such as coffee mugs, lapel pins, T-shirts, mouse pads and other items of limited E/PO value.

V. Aligning E/PO Efforts and Products with the Education Standards

This section focuses on the National Academy of Science's National Research Council science education standards. There are also educational standards in science, technology, mathematics, and geography that have been developed by a variety of scientific and educational organizations such as the AAAS Project 2061 Benchmarks. Prospective proposers and their partners should also be aware of these other disciplinary standards, as well as State Education Standards (that may be relevant when focusing on a particular geographic region) that may be pertinent to their proposed E/PO activities (see Appendix E).

The National Academy of Science's National Research Council published the National Science Education Standards (NSES) in 1995. This document is based on a nationwide collaboration of educators and scientists and is an important ingredient in modern science education reform efforts. It offers a coherent vision of what it means to be scientifically literate and how best to achieve such literacy.

The NSES content standards describe what all students – regardless of background or circumstance --should understand and be able to do at different grade levels from kindergarten through high school. The content standards are differentiated by grade level (K-4, 5-8, and 9-12) in concert with the best research on what is developmentally appropriate for students at various ages. The content standards are organized under the following headings: Unifying Concepts and Processes in Science, Science as Inquiry, Physical Science, Life Science, Earth and Space Science, Science and Technology, Science in Personal and Social Perspective, and History and Nature of Science. The way science works and evolves is at least as heavily emphasized as the actual facts and specific ideas in science, and thus scientists can offer perspective on this as well as content knowledge. For Earth and space scientists, a good place to begin gaining familiarity is with the content standards in Unifying Concepts and Processes and in Earth and Space Science (see Appendix E for links to Standards).

A common misconception is that Standards involve content only, as if they were solely a list of facts students should know in science. It is *essential to recognize* that alignment with Standards involves much more than curricular content. There are also standards that articulate best practices in how to teach and assess student learning, how to train and professionally develop teachers, and how school districts and states can support implementation of exemplary curricular materials in an ongoing manner. Thus, aligning an educational product or activity with the *national science education standards* is a challenging prospect that is often underestimated. This points to the value of and need for effective partnering with institutions and/or personnel in the field of education who have studied the Standards carefully and who are knowledgeable and experienced in developing and implementing standards-based instructional materials and practices. Almost any scientific research project can be intellectually linked to the fundamental science concepts and processes articulated in the Standards, but *linking is not the same as aligning.*

A commonly proposed element of an education project is a curriculum or educator guide. An educator guide that is aligned with Standards has several important attributes: 1) the lesson's content is suitably fundamental and age-appropriate, 2) best instructional practices are built

into the lessons, and 3) adequate teacher training is available to support the implementation of the Guide's lessons. These attributes are discussed further below.

The focus of a standards-based lesson or educational experience is on a fundamental concept rather than on details associated with a mission or research project. However, missions and research projects may be used as real-world, inspirational *contexts* for teaching fundamental concepts, say about gravity, or energy, or how scientific inquiry is done. For example, NASA's Cassini mission focuses on the study of the Saturn system. There are no science education standards that say students should learn all about the research conducted by the Cassini mission. However, there *are* Earth and space science education standards that call for the study of the Solar System in general, and the planets in particular. Standards also say students should learn about Systems, Order, and Organization, about Science as a Human Endeavor, and about the relationship between technology and scientific discovery. Cassini's exploration of the Saturn system can provide a motivational context for such standards-based learning.

Another aspect of alignment with Standards is age-appropriateness. It is not realistic to propose producing a standards-based lesson or educator guide that serves *all* grade levels *unless* special consideration is given to how the needs and expected cognitive capabilities of students at different grade levels would be addressed. A standards-based lesson will readily fit into or enhance the existing curriculum of a school devoted to science education reform.

A standards-based lesson also offers the educator/user a sound approach to instruction based on the best available research about how students learn and what teaching practices facilitate that learning. This often involves the use of what is commonly called "hands-on" activities, but this in itself is insufficient to make the lesson pedagogically sound. Sound, standards-based lessons are very similar in structure to the way scientists do science: 1) they raise a fundamental question of interest; 2) they identify what they already know or think they know about the question; 3) they plan and implement an experiment ("hands-on activity") to address the question; 4) they examine what they learned from the experiment and reflect on how it relates to what they thought they knew; and 5) others test them out on what they have learned.

Educator guides are best disseminated in conjunction with educator workshops that include appropriately tailored background on the pertinent science and instructional practices, as well as direct hands-on experience with the standards-based lessons of the guide. Workshops aligned with standards model standards-based instruction and explicitly address both science and best teaching practices. Scientists can be effective contributors in workshop settings, both because of their depth of understanding of basic science and their experience in applying this knowledge to inspirational, real-world explorations.

VI. Project Activity Evaluation

Evaluation of project efforts is required. The evaluation is primarily designed to determine if the objectives of the project have been achieved. Clear definition of project objectives will point to the way to determining what needs to be measured. Discussions with experienced evaluators can assist in the clarification of the project objectives and can be valuable even in the proposal development phase.

Methods of evaluation include focus groups, surveys, observations, follow-up interviews, pre- and post-testing, and many other techniques.

Evaluation should be geared to the scale and type of a proposed effort. The proposed evaluation should be appropriate for the scale and type of the activity; for instance, a small education effort might use pre-test/post-tests at a workshop or web surveys; a larger effort might include an educator survey conducted by education students at a local university to determine longer-term impact. It is useful to follow standard methods or consult an individual trained in research and evaluation methods when designing an evaluation procedure, even when the evaluation is to be done informally by the proposer(s).

There are generally three stages of evaluation. "Front End" evaluation, done very early in the planning stages, can help determine where there is need, interest, or potential confusion regarding an envisioned product or activity and its intended audience. "Formative" evaluation improves the effort while it is being developed: pilot testing is a good example of formative evaluation. "Summative" evaluation looks at the results of an effort: how effective it was, whether it met the stated intentions, whether it had other unanticipated effects, and so on. Summative evaluation tends to be the most formal and is often done to publish the lessons learned so they can be used for future projects.

You should include evaluation results from other related efforts as appropriate with attribution to the evaluator. Include a brief discussion of the applicability of the methods used and lesson learned to the proposed effort.

Appendix A:

Glossary

A. STEM – The disciplines associated with Science, Technology, Engineering, and Mathematics.

B. Science Mission Directorate Outcomes –

The Science Mission Directorate E/PO Outcomes are aligned with the NASA Education Outcomes and Objectives (see <http://education.nasa.gov/about/strategy/>)

The four SMD Higher Education Outcomes are:

1. Early Career Scientist & Pre-Service Faculty Development – This SMD project provides summer research experiences, short workshops, and seminars to early career scientists and pre-service education faculty. The purpose is to deepen their understanding of SMD science and technology so they are better prepared to contribute to the STEM workforce and training of future educators. The project is carried out through SMD missions and competitively selected awardees working in partnership with higher education institutions. (Aligns with Objective 1.1)
2. Research Experiences for Students Under-represented in Earth and Space Science – This SMD project provides summer research experiences, short workshops, and seminars to students underrepresented in Earth and Space Science so they are better prepared to contribute to the STEM workforce. The purpose is to deepen their understanding of SMD science and technology. The project is carried out through SMD missions and competitively selected awardees working in partnership with higher education institutions. (Aligns with Objective 1.2)
3. Student Collaborations – This SMD project provides higher education student teams with the opportunity to work directly with NASA science and technology data and mission teams on development of an instrument, investigation of scientific questions, data analysis or modeling, development of supporting hardware or software, and/or other aspects of the mission. The activities may involve flight or ground systems. The purpose is to contribute to their learning and appreciation of scientific exploration of space and the development of their work skills relevant to NASA SMD missions. The project is carried out through SMD missions and competitively selected awardees working in partnership with higher education institutions. (Aligns with Objective 1.3)
4. Resources for Higher Education – This SMD project develops curriculum resources for higher education. The purpose of the project is to make SMD science and technology discoveries available, provide opportunities for higher education students to work with NASA science and technology data. The project is carried out through SMD missions and competitively selected awardees working in partnership with higher education institutions. (Aligns with Objective 1.4)

The three SMD Elementary and Secondary Education Outcomes are:

1. Building Elementary & Secondary Teachers Skills - This SMD project provides training for formal educators on SMD formal education resources. The purpose of

the project is to deepen their understanding of SMD science and technology so they can more effectively convey information to their student and engage them in participative science. The project is carried out through SMD missions and competitively selected awardees working in partnership with educators and formal education institutions. (Aligns with Objectives 2.1 and 2.2)

2. Elementary and Secondary Resources - This SMD project develops resources for elementary and secondary formal education. The purpose of the project is to make SMD science and technology discoveries available in formal education venues. The project is carried out through SMD missions and competitively selected awardees working in partnership with educators and formal education institutions. (Aligns with Objective 2.3)
3. Elementary and Secondary Student Opportunities - This SMD project provides elementary and secondary education students with the opportunity to work directly with NASA science and technology data. Family involvement is encouraged. The purpose of the project is to stimulate interest in STEM disciplines and careers through engagement with SMD science and technology discoveries. The project is carried out through SMD missions and competitively selected awardees working in partnership with educators and formal education institutions. (Aligns with Objective 2.4)

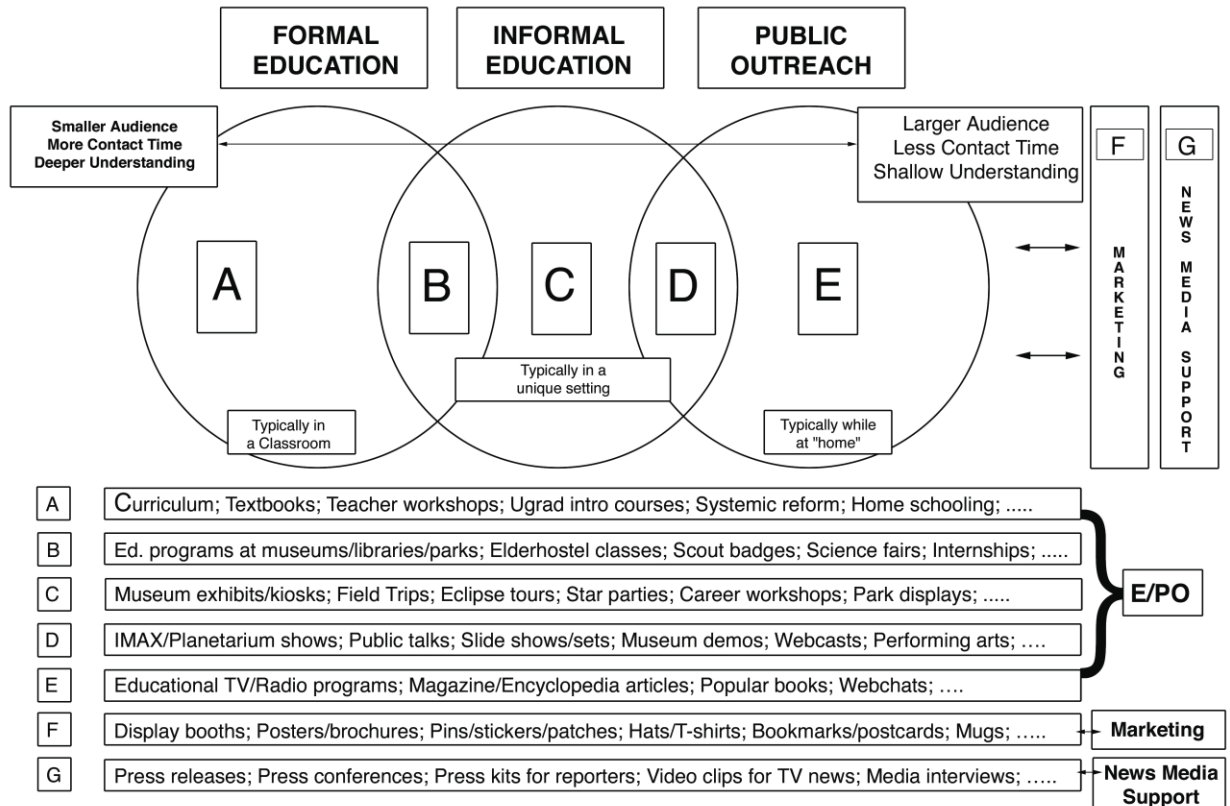
Please note that in Outcome 2, testing elementary and secondary resources (e.g. resources that have not passed SMD Education Product review or equivalent) in educator workshops should be counted under Elementary and Secondary Resources (product development) and not in Building Elementary and Secondary Teachers Skills.

The three SMD Informal Education Outcomes are:

1. Informal Education Resources - This SMD project develops resources for informal education. The purpose of the project is to make SMD science and technology discoveries available in informal education venues such as science centers and planetariums. The project is carried out through SMD missions and competitively selected awardees working in partnership with informal education institutions. (Aligns with Objective 3.1)
2. Building Informal Educator Skills - This SMD project provides training for informal educators on SMD informal education resources. The purpose of the project is to deepen their understanding of SMD science and technology so they can more effectively convey information to their audiences. The project is carried out through SMD missions and competitively selected awardees working in partnership with informal education institutions. (Aligns with Objective 3.2)
3. Informal Education Opportunities – This SMD project engages informal science education partners in proposal reviews, programmatic reviews, and Working Groups. The purpose is to strengthen the understanding of the informal education community of SMD science and technology opportunities and enhance SMD project activities through informal education expertise. The project is carried out through SMD. (Aligns with Objective 3.3)

- C. NASA Research Announcement (NRA) – An NRA is used to announce research interests in support of NASA's programs, and, after peer or scientific review using factors in the NRA, select proposals for funding. Unlike an RFP containing a statement of work or specification to which offerors are to respond, an NRA provides for the submission of competitive project ideas, conceived by the offerors, in one or more program areas of interest. NRAs may result in grants, contracts or cooperative agreements.
- D. Announcement of Opportunity (AO) - This is generally used to solicit proposals for unique, high cost research investigation opportunities that typically involve flying experimental hardware provided by the proposer on one of NASA's Earth-orbiting or free-flying space flight missions. Selections through AO's can be for periods of many years, involve budgets of many millions of dollars for the largest programs, and usually are awarded through contracts, even for non-profit organizations, although occasionally grants are also used.

APPENDIX B: Education and Public Outreach Venn Diagram



A two page white paper entitled, "A Framework for Planning Education and Public Outreach Programs Associated with Scientific Research Programs" (C.A. Morrow, 2000) offers a more complete description of this diagram. It is available online from http://www.spacescience.org/education/extra/resources_scientists_cd/Source/Venn.pdf

APPENDIX C:
A SAMPLE of ROLES for Scientists, Technologists, Engineers, and Mathematicians in
EDUCATION and PUBLIC OUTREACH (E/PO)(adapted from C. A. Morrow, 2000)

		Nature of E/PO Involvement		
		ADVOCATE	RESOURCE	PARTNER
E n t r y P o i n t	K-12 STUDENTS	<ul style="list-style-type: none"> • Participate in PTA 	<ul style="list-style-type: none"> • Judge a science/technology fair • Answer student E-mail • Give tour of a research facility 	<ul style="list-style-type: none"> • Mentor a student • Tutor a student
	IN-SERVICE K-12 TEACHERS	<ul style="list-style-type: none"> • Speak out in support of appropriate professional development opportunities for teachers. 	<ul style="list-style-type: none"> • Answer teacher email • Present in teacher workshop 	<ul style="list-style-type: none"> • Work with a teacher to implement curriculum. • Hire a teacher intern.
	INTRO UNDERGRADUATE SCIENCE TEACHING	<ul style="list-style-type: none"> • Speak out in a faculty meeting in favor of attention to educational research that supports the reform of undergraduate STEM teaching. • Support the teaching profession in your classroom. 	<ul style="list-style-type: none"> • Teach a segment of a STEM or STEM methods course for preservice teachers. 	<ul style="list-style-type: none"> • Teach an intro science course that applies innovative inquiry-based methods • Develop a STEM course or curriculum in your department for teachers-to-be.
	SCHOOLS OF EDUCATION (Science Courses for Preservice Teachers, Graduate Students, Faculty Members)	<ul style="list-style-type: none"> • Speak out in your department or organization in favor of closer ties with Colleges of Education • Support the teaching profession in your classroom 	<ul style="list-style-type: none"> • Teach a segment of a STEM course or science methods course for preservice teachers. • Collaborate with education faculty to improve courses on teaching science 	<ul style="list-style-type: none"> • Hire a graduate in education as evaluator of an education project • Work with an Education professor to develop a new “STEM methods” course for teachers-to-be.
	SYSTEMIC CHANGE (District, State, National)	<ul style="list-style-type: none"> • Speak out at professional meetings about the importance and value of involvement in systemic change. 	<ul style="list-style-type: none"> • Review STEM standards for accuracy. 	<ul style="list-style-type: none"> • Collaborate on writing or adapting STEM standards.
	EDUCATION MATERIALS DEV. (NSRC, EDC, Lawrence Hall)	<ul style="list-style-type: none"> • Speak out at a school board meeting for adopting exemplary educational materials. 	<ul style="list-style-type: none"> • Review STEM educational materials for science accuracy. 	<ul style="list-style-type: none"> • Collaborate to create exemplary STEM education materials.
	INFORMAL EDUCATION (e.g., Science Centers, Scouts, After-school Programs, Planetaria, Elderhostels, Amateur Astronomy Groups)	<ul style="list-style-type: none"> • Participate on the board of a science center or planetarium. 	<ul style="list-style-type: none"> • Review scripts for science exhibit or planetarium show. • Serve as a science advisor for an exhibit or program. 	<ul style="list-style-type: none"> • Create content for a museum science exhibit or planetarium show. • Serve as science coordinator for a scout troop
	PUBLIC OUTREACH (e.g., NPR, PBS, popular magazines/ books/ encyclopedias, lectures, public Web sites)	<ul style="list-style-type: none"> • Advocate that quality science and technology news be covered by your local newspapers and television stations 	<ul style="list-style-type: none"> • Give a public lecture • Review an article or Web site on science for accuracy and currency 	<ul style="list-style-type: none"> • Collaborate in the production of a PBS television show • Write an article for a popular science magazine

APPENDIX D:

Mission E/PO Lead Sample Position Description

The E/PO manager will be responsible for the overall planning, management and coordination of all formal and informal education activities.

Position duties and requirements:

1. In collaboration with the science and technology team members design and develop a suite of formal education materials/products and resources aligned with the Mission science objectives. (15%)
2. Alignment and coordination of formal and informal education activities. Develop and coordinate a series of informal education activities, products and events aligned with key Mission milestones. (15%)
3. Assume overall responsibility for the management and reporting of the Mission E/PO budget expenditures and assume all NASA HQ reporting requirements. Develop an end-to-end schedule of activities, events and deliverables appropriately aligned with the Mission E/PO budget. (10%)
4. Insure all partner institutions/organizations, and co-investigators (museums, universities, and all other sub-contracting organizations) are compliant with NASA Guidelines and have formal institutional authorization for participation. Insure adherence to SMD E/PO policies and guidelines as they pertain to various partner/collaborative organizations as well as all other general legal requirements for federally funded research activities. (5%)
5. Function as representative for the Mission E/PO Program at appropriate professional society meetings and various NASA education events. (5%)
6. Responsible for insuring all educational products developed for the Mission E/PO program (including curricular materials, and all on-line activities and products) align with Mission science objectives as well as appropriate national education standards, are independently evaluated and are made available to the education community in accordance with NASA SMD policies and requirements. (15%)
7. Coordinate participation of Mission Scientific and technical team members for various Mission Public Events. (15%)
8. Participate in other programs, and activities such as workshops, events, and Public Presentations as required. Various other duties relevant to Mission E/PO effort as required. (20%)

Educational Requirements, Skills and Experience:

1. Understanding of SMD Education and Public Outreach and the current Exploration Programmatic goals.
2. Terminal degree in relevant area of scientific expertise or in science, mathematics, or technology education with a minimum of five years of relevant experience leading large, preferably national scale education programs that focus on content relevant to NASA Science Mission Directorate content areas. A minimum of 10 years of relevant experience in a Formal Science/Mathematic/Technological Education setting with increasing duties that demonstrate successful progression into a leadership/managerial role may be considered in lieu of a terminal degree.
3. Candidates without terminal degree in science/math/technology must demonstrate experience and understanding of relevant science, math, and technical content areas and ability to communicate and work effectively with scientific and technical staff.
4. Candidates without significant K-12 educational expertise must demonstrate experience and ability to interact effectively with formal/informal education community and address current National Science, Mathematics and Technology Education requirements.
5. Significant experience working effectively with underserved communities and awareness of the unique educational needs of these communities.
6. Excellent oral and written communication skills and formal presentation skills. Ability to work effectively as a team member and diverse national audiences with a wide range experience, interests and abilities.
7. Flexibility and ability to adapt and function effectively in a fast-paced working environment.

APPENDIX E:

Links to Science, Math and Technology Education Standards

Academic content standards describe what every student should know and be able to do in the core academic content areas (e.g., mathematics, science, geography). Content standards should apply equally to students of all races and ethnicities, from all linguistic and cultural backgrounds, both with and without special learning needs.

Science Standards

NRC National Science Education Standards

<http://www.nap.edu/books/0309053269/html/index.html>)

Describes the science standards created by the National Research Council.

AAAS Project 2061 Benchmarks

<http://project2061.aaas.org/tools/>

Describes the science standards created by the American Association for the Advancement of Science.

Science Literacy Maps

<http://strandmaps.nsdli.org>

A tool for teachers and students to find resources that relate to specific science and math concepts. The maps illustrate connections between concepts as well as how concepts build upon one another across grade levels. Clicking on a concept within the maps will show National Science Digital Library resources relevant to the concept, as well as information about related AAAS Project 2061 Benchmarks and National Science Education Standards.

Mathematics Standards

<http://standards.nctm.org/>

Describes the mathematics standards created by the National Council of Teachers of Mathematics.

Technology Standards

<http://cnets.iste.org/>

Describes the technology standards created by the International Society for Technology in Education.

State Standards

<http://www.academicbenchmarks.com/search/>

APPENDIX F: Links to Organizations Serving Underserved/Underutilized Populations

NASA Minority University Research and Education Programs

http://www.nasa.gov/audience/foreducators/postsecondary/features/F_MUREP.html

American Indian Higher Education Consortium (AIHEC)

<http://www.aihec.org/>

American Indian Science and Engineering Society (AISES)

<http://www.aises.org>

National Organization for the Professional Advancement of Black Chemists and Chemical Engineers (NOBCChE)

<http://www.nobcche.org>

National Society of Hispanic Physicists (NSHP)

<http://www.hispanicphysicists.org/>

National Society of Black Physicists (NSBP)

<http://www.nsbp.org>

Society for the Advancement of Chicanos and Native Americans in Science (SACNAS)

<http://www.sacnas.org>

Coalition to Diversify Computing (CDC)

<http://www.cdc-computing.org/>

National Federation of the Blind (NFB)

<http://www.nfb.org/nfb/Default.asp>

Association for Women in Science

<http://www.awis.org/>

APPENDIX G: Key NASA Links

NASA Strategy and E/PO Implementation Documents

- (1) NASA Office of Education Strategy
<http://education.nasa.gov/about/strategy/index.html>
- (2) 2006 NASA Strategic Plan
http://www.nasa.gov/pdf/142302main_2006_NASA_Strategic_Plan.pdf

NASA Information

- (1) NASA Science Mission Directorate
<http://nasascience.nasa.gov/>
- (2) NASA Office of Education
<http://www.nasa.gov/offices/education/about/index.html>

Resources for Researchers and Educators

- (1) SMD E/PO information for researchers
<http://nasascience.nasa.gov/researchers/education-public-outreach>
- (2) Overviews of SMD Missions and their E/PO projects
<http://nasascience.nasa.gov/missions>
- (3) Earth Science Education Catalog
<http://nasascience.nasa.gov/educators/earth-science-education-catalog>
- (4) NASA Space Science Education Resource Directory
The Education Resource Directory provides Internet access to top-quality educational resources produced by NASA's Space Science Education and Public Outreach programs
<http://teachspacescience.stsci.edu>
- (5) NASA Reviewed Collection
The NASA Science Reviewed Collection provides educators and students with a direct line of access to quality products reviewed through the NASA product review. The resources have been rigorously reviewed by an independent peer review of teachers, curriculum and design specialists, teacher trainers, and Earth system scientists. The review of the learning resources is based on their scientific accuracy, educational value, documentation, ease of use, their power to engage or motivate students, their robustness/sustainability as a digital resource, and ability to foster mastery of significant understandings or skills. Resources in the collection support the NASA Science Mission Directorate: Earth and Space Science education missions.
<http://www.dlese.org/dds/histogram.do?group=subject&key=eserev>

- (6) Educators' Resources for Earth and Space Science: Teacher's guides, education programs, and learning resources
<http://nasascience.nasa.gov/educators>
- (7) Space Science Is for Everyone: Creating and Using Accessible Resources in Educational Settings
The brochure is offered as a tool for science, technology, engineering and mathematics educators who are working with students with disabilities. Some activity descriptions are supplemented with case study examples addressing a particular disability. In addition, contributing educator-authors have provided a variety of lessons learned from formal education (Pre-K through 12th-grade), home school education, and informal or "free-choice" education learning venues, such as science centers, museums and planetariums.
http://www.nasa.gov/pdf/259240main_Space_Science_Is_for_Everyone.pdf
- (8) Recasting Content in a New Light: A Guide for Adapting Formal Education Materials for Informal Settings
Recasting Content in a New Light: A Guide for Adapting Formal Education Materials for Informal Settings is a field-tested "how-to" guide for adapting formal education materials to meet the unique needs of the informal education community.
https://nasascience.nasa.gov/educators/space-science-education-resource-directory-sserd/RecastingContent_508.pdf
- (9) NASA Science Mission Directorate Education and Public Outreach Annual Reports (last report done was in 2005)
<http://ossim.hq.nasa.gov/ossepo/>
- (10) *Voyages in Education and Public Outreach*: A NASA Space Science Newsletter
Voyages served as a vehicle for sharing the NASA Space Science's latest events and accomplishments in Education and Public Outreach. Past issues (2001-2005) are available here.
<http://nasascience.nasa.gov/researchers/education-public-outreach/voyages-in-education-and-public-outreach>
- (11) Abstracts of SMD proposals selected for Education and Public Outreach Opportunities in Earth and Space Science (2006-2009)
NASA lists the titles and abstracts of all proposals and associated Principal Investigators that were selected for funding in response to these opportunities on the NSPIRES Web site, which is located at: <http://nspires.nasaprs.com/>. At this site, click on the link to "Selected Proposals" then select the year, such as "2008", to view the posting of the Education & Public Outreach for Earth & Space Science Program proposals selected.
- (12) Resources for Scientists in Education and Public Outreach
These resources include several papers and presentations by authors who have significant experience at the interface between the realms of scientific research and K-12 education and public outreach (E/PO). The resources fall into six categories: 1. Making the Case for Scientist Involvement in Education and Public Outreach 2. The Roles of Scientists in Education and Public Outreach 3. Guidance for E/PO Program and Proposal Planning 4. Guidance for E/PO Product Development 5. Professional Development Opportunities for Scientists and E/PO Leaders in Education 6. Access to the E/PO Community
http://www.space-science.org/education/extra/resources_scientists_cd/

- (13) Roles Matrix for Scientists in Education and Public Outreach
http://www.spacescience.org/education/extra/resources_scientists_cd/Source/Roles.pdf
 The Roles Matrix is designed to raise awareness about the great diversity of education and public outreach roles scientists can play. The Matrix offers a framework that describes the different levels of involvement in a variety of activities that contribute to improving science education in both formal and informal settings.
- (14) Space Science Media Needs of Science Center Professionals
<http://cse.ssl.berkeley.edu/spacescience.pdf>
 The Sun-Earth Connection Education Forum interviewed twenty-nine science center professionals to explore ways to better meet their media needs. (“Media” refers to images, animations, simulations, and videos, etc.) Key recommendations are discussed.
- (15) NASA Education Resources in Other Languages
<http://flbrain.org/NASALanguageMaterials1.htm>
 A comprehensive list of over 50 NASA programs and resources in Spanish and many other languages.
- (16) Trends in International Mathematics and Science Study (TIMSS)
<http://nces.ed.gov/TIMSS/>
 TIMSS responds to the need for reliable and timely data on the mathematics and science achievement of our students compared to that of students in other countries. The TIMSS provides trend data on students' mathematics and science achievement from an international perspective.

Archives

- (1) History of OSS E/PO Program
http://nasascience.nasa.gov/researchers/education-public-outreach/strategy/Cospar_Manuscript.pdf
- (2) "Partners in Education: A Strategy for Integrating Education and Public Outreach into NASA's Space Science Programs"
<http://spacescience.nasa.gov/admin/pubs/edu/educov.htm>
- (3) "Implementing the Office of Space Education & Public Outreach Strategy"
http://spacescience.nasa.gov/admin/pubs/edu/imp_plan.htm
- (4) “Implementing the Office of Space Science Education/Public Outreach Strategy: A Critical Evaluation at the Six-Year Mark”
http://nasascience.nasa.gov/educators/program-evaluation/OSS_EPO_Task_Force_Report.pdf
- (5) NASA Space Science E/PO Summative Evaluation Report (2007), Lesley University
http://nasascience.nasa.gov/educators/program-evaluation/NASA_2007_Summative_report.pdf
- (6) Earth Science Outreach and Communication Plan 2005
<http://nasascience.nasa.gov/about-us/science-strategy/past-strategy-documents/OutreachPlan.pdf>

APPENDIX H: OMB Approval Process for Data Collection Instruments

