



National Aeronautics and Space Administration

***NASA's success in engaging the public on
Earth and space science education***

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You have asked, "How has NASA been successful in engaging the public on space science?"

I ask, "Where were you when the 'Eagle Landed' and Neil Armstrong took a giant leap for mankind?" As that time and place rises in your emotional memory, notice how powerful the thought and feeling of that moment still is. While technology and raw courage allowed NASA to expand humankind's physical boundaries, what holds the event in our minds is the emotional and intellectual desires for adventure, going where no one has gone before, and seeing what has not been seen. This is the root of NASA's success in engaging the public on space science. We have exciting subject matter that stretches the imagination. We have heroes that have gone where few dare. We have expertise that draws on the best minds in the world. We have images and data that show us what no one has ever seen. It is a winning package that has inspired television programs, motion pictures, museums, and new realms of research. It is the subject matter that news media around the world leapt upon in the 1960s because their readers hungered for true adventure stories.

You have asked, "How has NASA been successful in education?" NASA has a finely tuned educational program that supports all citizens. Its success began with the images taken by astronauts of the Earth and the moon, and continues today with data images and movies about the universe and Earth's environment.

Remember your thoughts when you first saw the "Earth Rise" image taken by the Apollo 8 astronauts. For the first time, we saw how small Earth was in the void of outer space. We noticed that there were no political boundaries. We also saw that it was mostly blue. It is an ocean planet that has interconnected systems that affect every human being.

THE FOLLOWING SECTION NOT INTENDED FOR THE ORAL REMARKS

The power of the whole Earth images engaged the citizens of the United States and the world in a dialogue about globalism. NASA's role has been to continue gathering images and data and then disseminate them. The channels of dissemination have evolved into programs that encourage students and faculty in the study of our planet and space through faculty and graduate workshops, fellowships, and funding resources. We are also building partnerships with an array of informal learning organizations.

NASA has participated in a process of producing, organizing and evaluating the usefulness of our data and research content and then matching that content with the learning and teaching goals of education institutions. It is an ongoing process as the nature of education continues to redefine itself.

An effort to improve learning in science and technology, both in public literacy and in encouraging individuals pursuing careers, will require a sustained commitment, of 10 to 20 years. First, we must excite and engage a generation in the fields of science and technology, who will then communicate that excitement. There are daunting challenges particularly in the communities that are under-served and underrepresented in the fields of science and technology.

To further these goals we must make the latest and most exciting science and technology easily available to children and adults. Children must encounter it in their schoolwork, in youth group activities, in sporting and entertainment. Adults must be given opportunities for deeper and richer learning through existing channels such as the news media, the Internet, adult education centers, and museums.

NASA has learned how to effectively address public literacy and career development in the sciences. Both space science and Earth science have benefited from the other's experiences. It

is a challenge for the hard facts and ambiguities of science to compete with the glamour of a man walking on the moon. To be effective, education efforts of the science enterprises within NASA, must be creative, thoughtful and strategic.

You have asked NASA to relay our lessons-learned

Today we offer the following lessons-learned, which apply to both school children and to adults. These lessons are derived from: a clear understanding of the impact we would like to effect, an honest examination of both our strengths and shortcomings, a clear sense of the magnitude of the problem, and an analysis of the challenges facing the organizations on the front-line of education.

The most important lesson we have learned is to consider all of our efforts in the context of their ability to be scalable and sustainable. The sheer magnitude of the number of citizens we must impact and the length of time that we will need to sustain that impact makes it imperative that we consider only solutions that are sustainable and readily scalable to the nation as a whole. Just as we need a long-term 10 to 20 year development of an integrated and sustained ocean observing system, we need an integrated and sustained effort in education to make a significant impact in our Nation's understanding of the oceans and their role in the Earth's interrelated system.

Once we view the world through the lens of scalability and sustainability we focus in on issues related to meeting the needs of the education community. To do that, we need to be sure we know what we have to offer this community and that what we possess, is something that they truly need and cannot readily obtain from other sources. In NASA's case, we have research results, scientific data and dazzling imagery, expertise of our employees, and our space assets. Because NASA is an active research organization in its own right, results are current, timely and fresh. This is something that is in high demand by most education organizations. I speak broadly of schools, or school systems, science centers, youth groups, local and national parks. At the same time we have learned that most of these education organizations like to use learning materials which they have created for their own purposes. Yet they need and in many cases are actively seeking the scientific content. In response, we have begun to provide science learning resources in many small "pieces" rather than one comprehensive end-to-end educational learning program. This then allows education organizations to create their own unique story with the NASA resource "pieces." In this way, an individual NASA story may be "re-purposed" into many different educational venues at little to no additional NASA investment.

The oceans community will need to do a similar assessment of its "assets" and identification of those which are current, timely and fresh; all the while keeping in mind issues of scalability and sustainability. Unlike NASA, the oceans community has the advantage of the physical presence of the oceans in at least some citizen's front yards. Your most formidable challenge may be to "bring the oceans" to those who do not live near them. That's where informal learning opportunities can be of significant value to your community.

We have also learned that the most scalable and sustainable way for our assets to be used is for us to infuse them into existing and planned efforts in the education community. In essence, we try to work within the existing educational framework, rather than attempt to create a new one. To be effective at this "infusion" approach we identify educational organizations that are most interested in our assets and are already working with similar topics. We then try to target our learning resource "pieces" to these organizations by matching both the depth of content and the packaging of the learning resources to the professional practices of their organization such as may be planned around major astronomical events. You may even have a subscription to Sky and Telescope in your home and may be pointed to a NASA web site for further information.

The oceanographic community has an equally engaging opportunity waiting to be developed. It is the integrated and sustained ocean observing system that will be implemented over the next

several years as part of NOPP. The observing system and the science and technology associated with it present a range of opportunities to engage all citizens and educators, in particular, in many aspects of the ocean.

In conclusion, there are key parallels between the driving factors for NASA's success in the education arena and what the ocean community could do to enhance its education activities. These parallel factors include: exploration of the unknown, discovery, risk-taking, adventure, and the need for advanced technology development.

I have informally surveyed many oceanographers about the source of inspiration for their careers and others about how they developed lifelong interest in and passion for ocean issues. The most common responses are, reading about Thor Heyerdahl's Kon-Tiki Expedition - a balsa wood raft adventure, from South America to Polynesia or by watching the adventures and explorations of Jacques Cousteau on television. The dual concepts of exploration and education about the ocean are also deeply rooted in our education system by our almost universal exposure through historical and geographical readings, to the great explorers of our planet – Vasco De Gama, Ferdinand Magellan, James Cooke, and others.

A national ocean education strategy must draw on our reservoir of present day ocean science explorers and adventurers to inspire interest and excitement about the ocean. Many of the lessons learned at NASA are relevant in this context.

A national ocean education strategy must dovetail into the broader education context – earth system science, biological sciences, general science education, and geography. We believe that a holistic Earth System Science approach is essential. We link success intuitively and emotionally to the recognized isolation of our Planet Ocean in space, as depicted so gloriously in the first photo of Earth Rise.

A national ocean education strategy must work across government agencies, educational institutions, and the private sector. We think the Education Strategy being developed under the National Oceanographic Partnership Program is on the right track.

Finally, we, at NASA, stand ready to assist you in any way we can. Thank you.