Evaluation Framework for NASA's Educational Outreach Programs

Rick Berg
Angela Booker
Charlotte Linde
Connie Preston

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Charlotte Linde, Rick Berg and Angela Booker

INTRODUCTION

The objective of the proposed work is to develop an evaluation framework for NASA's educational outreach efforts. We focus on public (rather than technical or scientific) dissemination efforts, specifically on Internet-based outreach sites for children. The outcome of this work is to propose both methods and criteria for evaluation, which would enable NASA to do a more analytic evaluation of its outreach efforts. The proposed framework is based on IRL's ethnographic and video-based observational methods, which allow us to analyze how these sites are actually used.

NASA's Existing Evaluation Framework

NASA already has in place an evaluation framework for educational programs: EDCATS (Education Computer Aided Tracking System). This system primarily provides external evaluation of face-to-face programs, such as classes, site visits, etc. It also has provisions for tracking hits and links for web sites. By external evaluation, we mean that the on-line questionnaires of the system capture basic demographic information and participant feedback. For example, the student evaluation form includes:

- ☐ Name
- ☐ Address and contact information
- ☐ Characteristics, including
- ☐ Gender
- ☐ Nationality
- ☐ Disabilities
- ☐ Race
- ☐ Career goals
- ☐ Grade level
- ☐ School address
- ☐ Type of school
- ☐ Participation in past NASA activities
- ☐ Program content
- ☐ Type of teaching techniques/tools used in the program
- ☐ Program value

- ❒ Evaluation of presentation
- ❒ Program resources and tools used or distributed
- ❒ Other program benefits
- ❒ Process for announcing program, applying to program, running program
- ❒ Overall rating for program and program staff
- ❒ Additional comments

Similar forms are available for teacher feedback.

There are feedback forms for participants and for observers of NASA's staged opportunities to chat with NASA experts. These forms ask participants to identify:

- ❒ Name and email address
- ❒ Teacher, student or other
- ❒ Number of people participating in chat from your location
- ❒ Number of computers used
- ❒ Featured NASA expert
- ❒ NASA project hosting the chat
- ❒ Date and time of chat
- ❒ Rate chat on scale of 5
- ❒ How did you decide which questions you would ask?
- ❒ Did the response answer your question. If not, explain
- ❒ Was the chat a valuable educational experience for you? Explain.
- ❒ General comments.

In addition, there are forms available for evaluation of NASA web sites, which track:

- ❒ Number of WWW hits
- ❒ Data transfer volume
- ❒ Unique internet addresses accessing site in previous month
- ❒ Number of redirections to other NASA web sites
- ❒ Number of search queries

Our Evaluation Goals

These are all necessary and important statistics to track. In addition, though it would be valuable to go beyond this to show more: how recipients use a site or a program, what physical and human resources a site requires to make it effective, how it could be made more appealing and useful to its users. At the same time, we share the caution of the EDCATS program in avoiding any attempt to measure direct effects on math or science test scores of NASA's outreach programs. In any student's education, there are so many other variables that it would be impossible to demonstrate a direct relation.

Further, NASA's mission to communicate knowledge is not to directly improve math and science performance, but to develop an informed citizenry, who are knowledgeable and enthusiastic about NASA's exploratory and scientific missions. The NASA education vision, as set forth in the NASA Strategic Plan of 1996 is:

> To promote the pursuit of educational excellence by involving the educational community in our endeavors to inspire America's students, create learning opportunities, and enlighten inquisitive minds.[1]

Therefore, we are attempting to evaluate the design of outreach sites and programs rather than their direct effects on test scores or other measures of student progress. Our efforts are directed at formative evaluation—evaluation designed to improve design, rather than at summative evaluation—evaluation measuring how recipients performed.

Use of Video for Analysis of Design

The major method for this project has been the analysis of videotapes of actual use of the outreach sites studied. Video analysis is the in-depth micro analysis of how people interact with one another, their physical environment and the documents, artifacts and technologies in that environment. *(For information on the history, technology and application of this method, see Goodwin and Heritage 1990, Jordan and Henderson 1995, McDermott et al 1978, Roschelle 1994, Roschelle et al 1990.)* Use of video provides a complete record that can be viewed over and over again and which permits the asking of new questions that may be completely different from those with which an investigation began. Video is also a powerful tool for designers, enabling them to see people actually trying to learn and use their designs. It provides information that is available in no other way. Thus, in this project, we are able to discover what web sites, activities and parts of an activity kids engage with. We are also able to see what kids do with the activities, how they shape or change them for their own interests. This provides important information for designers, since it allows them to see how their designs are used, ignored, or misused-all valuable information for the design cycle.

Comparison of Evaluation Methods

Below is a table summarizing the strengths and weaknesses of the methods discussed above. Note that EDCATS includes elements of several methods: collection of demographic statistics, survey questionnaire, and interview methods, although its open-ended questions do not include the interactivity of face-to-face interviews, in which an interviewer may ask clarifying questions.

[1] NASA Strategic Plan, January 1, 1996, Page 1.