

**Formative and Summative Evaluation Efforts for the
Teacher Enhancement Institute conducted at
NASA Langley Research Center, Summer 1994**

by

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Introduction

During the 1980s, a period of intense concern over educational quality in the United States, few indicators of U.S. student achievement garnered the interest of policy makers and pundits as successfully as the results of international testing in mathematics and science. This concern was so great that a task force was established to generate goals for the nation. This move became known as Goals 2000. As a part of the Goals 2000 initiative, President George Bush indicated that "By the year 2000, U.S. students should be first in the world in mathematics and science."

Background

The Teacher Enhancement Institute (TEI) at NASA Langley Research Center was developed in response to Executive Order 12821 which mandates national laboratories to "assist in the mathematics and science education of our Nation's students, teachers, parents, and the public by establishing programs at their agency to provide for training elementary and secondary school teachers to improve their knowledge of mathematics and science. Such programs, to the maximum extent possible, shall involve partnerships with universities, state and local elementary and secondary school authorities, corporations and community based organizations."

To those ends, the TEI faculty planned a program using the general guidance given in Executive Order 12821, implementing NASA directives, and local guidance. The unifying theme of aeronautics was arrived at, allowing the institute to capitalize on Langley's unique strengths in that area. Six specific program objectives were developed. After completing TEI, the program participants should be able to:

- develop an aviation and space instructional module in mathematics, science and technology appropriate for the teacher's class. This module should be based on experiences in research accomplished at the Teacher Enhancement Institute and utilize the Problem Based Learning model.
- demonstrate knowledge of resources available through NASA and the education technology that will support current mathematics, science and technology instruction.
- disseminate to students, peer teachers, administrators and parents information acquired through Teacher Enhancement Institute on integrating this material in mathematics, science and technology.
- create learning communities and an electronic network of human resources that will enable teachers to discuss curricular, scientific, and technological issues discussed in the Teacher Enhancement Institute.
- use computers as a tool to enhance classroom learning.
- recognize America's role in aeronautics.

From the TEI objectives, the lesson blocks were formed. Four general categories of activities utilized to implement the objectives and the approximate amount of time spent on each one were:

pedagogical issues	15%
educational technology	30%
application of NASA research and aeronautics to the classroom	40%
co-operative learning - sharing applications	15%

Formative Evaluation

The faculty worked closely with one another and the invited speakers to insure that the sessions supported the objectives. Speakers were informed of the objectives and given guidance concerning form and function for the session. Faculty members monitored sessions to assist speakers and to provide a quality control function. Faculty provided feedback to speakers concerning general objective accomplishment. Participant comments were also provided when applicable. Post TEI surveys asked for specific comments about each TEI session. During the second of the two, two week institutes, daily critiques were provided to the participants for their reflection. This seemed to provide much improved feedback to speakers and faculty because the sessions were fresh in each participant's mind.

Between sessions one and two, some changes were made to the program as a result of the formative evaluation process. Those changes, though, were minor in nature and comprised what may be called "fine tuning" a well conceived and implemented program.

Summative Evaluation

After the objectives were written, an assessment instrument was developed to test the accomplishment of the objectives. This instrument was actually two surveys, one given before the TEI and one given after the TEI. In using such a series, it was expected that changes in the participants induced by attendance at TEI may be discovered. Because the institute was limited in time and depth of exposure, attitudinal changes (self-assessment of ability and confidence) were chosen to be surveyed. On the pre-survey, seven general categories of questions were asked. The post-survey repeated three of these categories, providing a pre and post evaluation of the same questions and added a fourth category which asked the participant to self-assess objective accomplishment.

Results and Conclusions

The assessment process for TEI was valuable when one looks at the final accomplishments of the TEI. A number of aspects stand out:

- Formative evaluation during project development allowed the goals and objectives to guide the development of the institute.
- Formative evaluation provided positive guidance to presenters in developing and implementing their session.
- Formative evaluation helped presenters to improve or focus their sessions.
- Summative evaluation provided managers a way to gauge the success of the institute.
- Summative evaluation provided a benchmark for future programs to be measured against.

Copies of the surveys and critiques are included in the Final Report of the Teacher Enhancement Institute, available from the Office of Education, 17 Langley Boulevard, Mail Stop 400, Langley Research Center, Hampton, VA 23681-0001