

SCIENCE AERONAUTICS AND TECHNOLOGY

FISCAL YEAR 2001 ESTIMATES

BUDGET SUMMARY

ACADEMIC PROGRAMS

EDUCATION PROGRAM

SUMMARY OF RESOURCES REQUIREMENTS

	<u>FY 1999</u> <u>OPLAN</u> <u>12/23/99</u>	<u>FY 2000</u> <u>OPLAN</u> <u>REVISED</u>	<u>FY 2001</u> <u>PRES</u> <u>BUDGET</u>	<u>Page</u> <u>Number</u>
		(Thousands of Dollars)		
Student support programs	8,600	10,200	7,300	SAT 7.1-6
Teacher/faculty preparation and enhancement programs	12,800	8,700	9,100	SAT 7.1-9
Support for systemic improvement of education	35,300	35,800	30,400	SAT 7.1-11
Educational technology.....	14,200	28,839	5,800	SAT 7.1-16
Evaluation.....	<u>700</u>	<u>1,500</u>	<u>1,500</u>	SAT 7.1-19
 Total.....	 <u>71,600</u>	 <u>85,039</u>	 <u>54,100</u>	
Enterprise Program Funding			<u>[7,500]</u>	
Total Program Funding	<u>71,600</u>	<u>85,039</u>	<u>61,600</u>	
 <u>Distribution of Program Amount by Installation</u>				
Johnson Space Center.....	1,300	1,000	1,000	
Kennedy Space Center.....	600	600	600	
Marshall Space Flight Center.....	1,600	2,000	2,000	
Stennis Space Center.....	1,000	1,000	1,000	
Ames Research Center.....	3,200	2,700	2,700	
Dryden Flight Research Center.....	400	500	500	
Glenn Research Center.....	2,100	1,000	1,000	
Langley Research Center.....	1,300	1,200	1,200	
Goddard Space Flight Center.....	50,900	62,539	31,600	
Jet Propulsion Laboratory.....	400	500	500	
Headquarters.....	<u>8,800</u>	<u>12,000</u>	<u>12,000</u>	
 Total.....	 <u>71,600</u>	 <u>85,039</u>	 <u>54,100</u>	

PROGRAM GOALS

NASA's direction for education is set forth in the NASA Strategic Plan as one of the Agency's five contributions to the Nation's science and technology goals and priorities:

Educational Excellence. *We involve the educational community in our endeavors to inspire America's students, create learning opportunities, and enlighten inquisitive minds.*

This contribution is accomplished through implementation of a full range of NASA education programs and activities that contribute to the various efforts and activities of those involved with and in the education community, and benefit the participants as well as advance the mission of the Agency. Progress towards this goal is measured in two ways:

- **Excellence:** NASA seeks to be judged by its customer, the education community, as providing excellent and valuable educational programs and services. Therefore we will attempt to maintain an "Excellence" rating ranging between 4.3 and 5.0 (on a 5.0 scale) as rated by our customers.
- **Involvement:** NASA strives to involve the educational community in our endeavors. Therefore, at the proposed funding level, we seek to maintain a current level of participant involvement of approximately 3 million with the education community, including teachers, faculty, and students.

STRATEGY FOR ACHIEVING GOALS

In carrying out its Education Program, NASA is particularly cognizant of the powerful attraction the NASA mission holds for students and educators. The unique character of NASA's exploration, scientific, and technical activities has the ability to captivate the imagination and excitement of students, teachers, and faculty, and channel this into education endeavors which support local, state, and national educational priorities. In fulfilling its role to support excellence in education as set forth in the NASA Strategic Plan, the NASA Education Program brings students and educators into its missions and its research as participants and partners. NASA provides the opportunity for a diverse group of educators and students to experience first hand involvement with NASA's scientists and engineers, facilities, and research and development activities. The participants benefit from the opportunity to become involved in research and development endeavors, gain an understanding of the breadth of NASA's activities, and return to the classroom with enhanced knowledge and skills to share with the education community.

NASA Implementation Plan for Education

The NASA Implementation Plan for Education provides general guidance for the implementation and continual improvement of the NASA Education Program for fiscal years 1999-2003. Specifically, the plan

- Identifies three leadership strategies to improve and guide the NASA Education Program: (1) contribute to educational excellence; (2) develop alliances; and (3) involve the education community.
- Outlines the education agenda for the next five years through seven improvement initiatives: (1) focus and coordinate state-based efforts; (2) enhance instructional products and dissemination; (3) improve education program integration and coordination; (4) facilitate NASA research in the higher education community; (5) support preservice education; (6) target informal education; and (7) implement NASA's comprehensive data collection and evaluation system.
- Delineates the operating principles integral to the conduct of all NASA education activities: customer focus; collaboration; diversity; and evaluation.
- Defines the NASA Education Program and Evaluation Framework, the basis from which our agency-wide and center-based programs are organized, implemented, and evaluated.
- Describes the roles and responsibilities of the various organizational entities that carry out the NASA Education Program.

This plan provides guidance for agency-wide education programs as well as programs and activities carried out by the NASA Enterprise Offices, the Office of Equal Opportunity Programs, and the NASA field centers.

SCHEDULE & OUTPUTS

The NASA Education Program and Evaluation Framework was established to serve as a model to guide the implementation and evaluation of NASA's Education Program. During FY 1999, NASA has further refined and implemented the framework and the evaluation system that was pilot tested in FY 1996. Three levels of performance measures have been developed. At the top level, all programs have measures that relate to the Program's primary metrics: excellence and involvement. Data showing progress towards these metrics are provided below. At the second level, each implementation approach has specific measures that all programs in that particular category are measured against such as career goals, program value, curriculum integration/use, standards awareness and utilization, overall quality, partnerships/alliances, service quality, and usage. At the third level, each program, in addition to the applicable second level measures, has program specific measures that show progress as well as participant written feedback that provides qualitative evaluation data.

ACCOMPLISHMENTS AND PROPOSED RESULTS

FY 99 Achievements

In FY 1999, the NASA evaluation system was able to collect data on most of the agency wide education programs, and many center-specific programs and activities. The data summary below is a roll up of top level measures that relate to the Education Program's two metrics - - excellence and involvement. The data is for FY 1999, as of 12/15/99. This is still considered preliminary as data roll up continues through January 2000.

Excellence

Progress towards this metric is measured by a quality rating by the educational customer of NASA's performance. The following data were collected:

Participant ratings of excellence (score: 5=excellent to 1=very poor; total participants reporting: 30,071 participants responding; not all participants are asked all 4 questions; 62-82 programs reporting)

- 4.70 Recommend to others
- 4.69 Rate staff
- 4.58 Expect to apply what was learned
- 4.68 Valuable experience
- Overall average for excellence: 4.66

Based on this information, the NASA Education Program is meeting its metric of excellence, as defined by the satisfaction expressed by our customers. As the FY 1999 data collection is completed, it is anticipated that additional participants will report, but we do not expect the ratings to change significantly.

Involvement

Progress towards this metric is measured in two ways: (1) total number of participants, including students/teachers/faculty/Administrators, etc., involved in NASA education programs; and (2) number of partnerships/collaborations. The following data were collected:

- Total in-person involvement in NASA Education activities: 3,702,645.
- Total involvement in NASA Education activities: 37,360,885 (189 programs reporting)
 - In-person: 3,702,645; electronic: 9,020,044; general public: 24,638,196
 - 42% students; 6% teachers/faculty; 10% Administrators, Civic, Parents, etc. ; 51% other
 - Students: 1,557,561; 33% K-4; 42% 5-8; 24% 9-12; 3% under grad; 0.5% grad
 - K-12 Teachers and Higher Education Faculty: 228,003. K-12 Teachers: 201,074; 35% K-4; 39% 5-8; 26% 9-12; Higher Educators/faculty:= 26,929; 6% Community College; 11% Undergraduate Faculty; 82% Graduate Faculty. Total Teachers and Faculty: 228,003. The K-12 numbers represent teachers teaching each grade group, not the total number of teachers – one teacher can teach more than one grade so these numbers can't "add up." These percentages are calculated as a ratio based on the 201,074. The breakdown of K-12 teachers is not used to come up with the total – only the total number of K-12 teachers given to us by the program managers, and in some cases, they do not provide any grade at all. We thus have 201,074 K-12 teacher people.
 - However, this is not the case in calculating the percentages for higher education teachers which is 228,003. 27% K-4; 30% 5-8; 20% 9-12; 1% community college; 1% undergraduate; 10%
 - Types of K-12 schools represented (5,294 participants reporting)
 - 30% urban; 37% suburban; 33% rural

- NASA programs and external alliances
 - 6,096 instances of alliances
 - higher education institutions; industry; contractors; other NASA facilities; Educator Resource Center Network; non-profits; local community; school districts

It is clear from the number above the NASA Education Program is meeting the metric of involving 3 million participants in our programs and we anticipate continuing to do so in FY 2000.

BASIS OF FY 2001 FUNDING REQUIREMENT

STUDENT SUPPORT PROGRAMS

	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>
		(Thousands of Dollars)	
Elementary and secondary.....	2,200	3,800	3,800
Higher education.....	<u>6,400</u>	<u>6,400</u>	<u>3,500</u>
Total.....	<u>8,600</u>	<u>10,200</u>	<u>7,300</u>

PROGRAM GOALS

The goal of the Student Support Program is to use the NASA mission, facilities, human resources, and programs to provide information, experiences, and research opportunities for students at all levels to support the enhancement of knowledge and skills in the areas of science, mathematics, engineering, and technology.

STRATEGY FOR ACHIEVING GOALS

Student support activities: (1) provide NASA mission experiences and information that are designed to promote students' interest and achievement in science, mathematics, technology, and geography; (2) provide exposure to NASA research and/or research experiences and activities to promote science, mathematics, technology, engineering, and geography career awareness; (3) provide support to the science and technology workforce pipeline by including greater participation of individuals who are under represented in science, mathematics, technology, and geography in NASA student programs; and (4) increase the number of NASA student support opportunities through partnerships and interagency cooperation and collaboration.

Activities such as the NASA Student Involvement Program (NSIP) and the Shuttle Amateur Radio Experiment (SAREX) provide general exposure to NASA's mission and stimulate interest in mathematics, science, and technology subject matter. Additional activities such as the Summer High School Apprenticeship Research Program (SHARP and SHARP-PLUS), demonstrate the applications of mathematics, science and technology by providing research experiences for students who traditionally have not been represented in mathematics, science and engineering fields. At the higher education level, activities such as the Graduate Student Researchers Program (GSRP) provide support to train students in NASA-related disciplines at both the master's and doctoral levels.

SCHEDULE & OUTPUTS

In FY 99, 1,533,469 students participated in NASA education activities. Elementary/secondary students comprised almost 97% of that number, in a variety of programs, projects, and activities.

In addition to collecting “excellence” and “involvement” data, second level metrics are also collected for student support programs. These include data on applicant/award ratio; gender, ethnicity, demographics; college major; career goals; interest change; and program value.

For example, 506 students participated in the Summer High School Apprentice Research Program (SHARP/SHARP Plus). This program involves under represented minority high school students in intensive research apprenticeships with NASA, industry, and university scientists and engineers. SHARP students live within commuting distance of a NASA installation; SHARP PLUS students have residential research experiences at a participating Historically Black College or University or a Predominately Minority Institution. The goal of both programs is to involve students from groups traditionally under represented in science, mathematics, engineering, and technology in research environment. The program is very competitive as only 22% of those who apply are accepted into the program. Seventy-four percent of these students are juniors in high school when they enter the program; 52% of the participants are female; approximately 32% are African American and 20% are Hispanic. Participants rate the program as being a valuable experience (4.8) and would recommend to others (4.7) (Score: 5=excellent; 1=very poor). At the conclusion of their experience, 50% indicated a career goal of engineer (level of interest in this discipline area changed for a 3.5 to 4.2 over the course of the experience).

ACCOMPLISHMENTS AND PROPOSED RESULTS

General plans for Student Support Programs in FY 2000 and FY 2001 include the development and maintenance of electronically disseminated communication of NASA-sponsored student opportunities and career information to our customers, and better coordination of student program efforts across the NASA system to ensure the progression of students from one program to another.

In FY 2000, SHARP and SHARP Plus, will be combined under one procurement vehicle, which will create greater efficiencies in the management of these programs. However, both the residential and center based components will be maintained.

Other agency-wide student programs include the NASA Student Involvement Program, Shuttle Amateur Radio Experiment, and the Graduate Student Researchers Program. The NASA Student Involvement Program continues to promote literacy in science, mathematics, and technology among students in grades 3-12. More than 3,211 students continued to participate in the program. The program insures linkages with the NASA Enterprises and provides standards-based, hands-on, inquiry-oriented learning experiences, including an opportunity for high school students to fly experiments on the space shuttle or a sounding rocket.

The Shuttle Amateur Radio Experiment continued in FY 1999 to provide students the opportunity to participate directly in the Shuttle program by communicating directly with astronauts via amateur radio. Again, more than 10,000 students, administrators, teachers, parents, community members, ham radio operators and the media, participated in this overall program. Also, other schools planned to listen to the audios and do distance learning-type projects. In FY 2000/FY 2001, work will continue to integrate SAREX on the International Space Station.

The Graduate Student Researchers Program continued in FY 1999 to provide graduate fellowships to U.S. citizens conducting thesis research in NASA related areas. Approximately 300 students were supported full time, and a similar number is expected in FY 2000.

In FY 2000, development will begin on a coordinated, agency-wide, undergraduate internship program. This program will be developed as a student research opportunity, designed to increase diversity in the pipeline for NASA, and to fill a gap in programs at the undergraduate level. Plans are to implement the program in FY 2001.

In FY 2001, Student Programs will be maintained at the same funding and general participation levels as in FY 2000. However, \$2.5 M in funding for the GSRP and the internship program will be provided by the Enterprise Offices.

BASIS OF FY 2001 FUNDING REQUIREMENT

TEACHER/FACULTY PREPARATION AND ENHANCEMENT PROGRAMS

	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>
		(Thousands of Dollars)	
Elementary and secondary.....	4,200	3,700	3,700
Higher education.....	<u>8,600</u>	<u>5,000</u>	<u>5,400</u>
Total.....	<u>12,800</u>	<u>8,700</u>	<u>9,100</u>

PROGRAM GOALS

The goal of the Teacher/Faculty Preparation and Enhancement Programs is to use the NASA mission, facilities, human resources, and programs to provide exposure and experiences to educators and faculty, to support the enhancement of knowledge and skills, and to provide access to NASA information in science, mathematics, technology, engineering, and geography.

STRATEGY FOR ACHIEVING GOALS

At the elementary and secondary level, preparation and enhancement activities are designed to (1) provide NASA mission-based programs that introduce the application of science, mathematics, geography, engineering, and technology for use in student learning activities; (2) provide educators with a wider range of alternatives using scientific inquiry, based on the NASA mission; (3) encourage a “multiplier” effect to expand the benefits of the in service program beyond participants to include additional educators; (4) provide access to and promote utilization of NASA related materials and information resources; (5) increase the participation of under served and under utilized individuals and groups; and (6) facilitate collaborations between the faculty of teacher preparation departments and the faculty of scientific and technical departments to develop innovative approaches to teacher preparation. Pre-service programs such as Project NOVA, and in-service programs such as the NASA Education Workshops (NEW) and the Urban Community Enrichment Program (UCEP) are designed to enhance and improve the teaching of mathematics, science, and technology by demonstrating their applications in aeronautics and space through workshops around the country. The Teaching From Space Program continues to provide instructional products that help support these preparation and enhancement workshops.

At the higher education level, activities are designed to enhance faculty research skills and content knowledge; balance participation so that a cross-section of colleges and universities is represented (i.e., community colleges, four year institutions, institutions that serve significant numbers of under represented groups, under funded institutions); and provide opportunities for curriculum expansion/revision that aligns with the mission needs of NASA and universities. Activities such as the Summer Faculty Fellowship Program (SFFP) provide research experiences for faculty at NASA field centers to further their professional knowledge in the engineering and science disciplines, and to ultimately enhance the undergraduate/graduate curriculum.

SCHEDULE & OUTPUTS

In FY 1999, 488,744 educators and faculty participated in NASA education activities. K-12 educators comprised approximately 98% of that number. For example, 376 453 educators participated in the NASA Education Workshops (NEW). These workshops, held at NASA centers during the summer, provide an opportunity for practicing teachers to update their background and skills in science, mathematics, and technology. Twenty-two percent of participants represent suburban schools, 27% urban, and 37 rural. On a rating scale of 5 (5-excellent; 1=very poor), participants rated “expected to apply what learned” at 4.8 and “valuable experience” at 4.8.

ACCOMPLISHMENTS AND PROPOSED RESULTS

General plans for teacher/faculty preparation/enhancement programs in FY 2000 and FY 2001 include plans to model inquiry-based science investigations or meaningful mathematics problem solving by engaging educators in the kinds of learning they are expected to practice with their students; expand follow-up and networking opportunities for the alumni of NASA’s teacher enhancement programs; expand the scope of educator enhancement programs to include workshops at each center for institutions in their region that serve informal education and urban/rural systemic efforts; provide education experiences for educators in the effective application of educational technologies; and define and execute activities that target preservice education programs.

FY 1999 accomplishments for NEW are cited above. In FY 2000, partnerships between NASA and rural and urban education systems will continue to be strengthened through center based workshops. Other agency-wide programs included:

Teacher preparation programs such as Project NOVA disseminate nationally an undergraduate pre-service model based on standards and benchmarks for science, mathematics, and technology. NOVA links higher education faculty across several disciplines to create these models. To date, more than 81 colleges and universities have participated. The Urban Community Enrichment Program (UCEP) provides more than 1,572 urban teachers greater exposure to new NASA knowledge. The Teaching from Space Program continues to develop products that are incorporated into enhancement activities, providing tools that can be applied in the classroom and disseminated through the Educator Resource Center Network.

At the higher education level, the Summer Faculty Fellowship Program provides highly beneficial opportunities for U. S. citizen engineering and science faculty throughout the Nation to participate in NASA research. This program has contributed significantly to the improvement of both undergraduate and graduate education, and directly benefits NASA, universities, faculty, students and the Nation. Approximately 179 university faculty continue to be supported annually for ten weeks. This program provides opportunities for college and university faculty to come to NASA centers to work with NASA data and to enhance research and teaching capabilities. There are currently approximately 100 academic institutions participating, most of who had little previous contact with the agency.

The impact of slightly reduced funding levels in FY 2000 will be evidenced by slightly lower participation rates in workshops or in a reduced number of workshop opportunities at both the precollege and higher education levels. In FY 2001, the proposed increase in funding at the higher education level will result in increased opportunities for participation by faculty and higher stipend levels.

BASIS OF FY 2001 FUNDING REQUIREMENT

SUPPORT FOR SYSTEMIC IMPROVEMENT OF EDUCATION

	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>
		(Thousands of Dollars)	
Aerospace Education Services Program (AESP).....	5,600	6,200	6,200
National Space Grant College and Fellowship Program.....	19,100	19,100	19,100
Experimental Program to Stimulate Competitive Research.....	10,000	10,000	4,600
Innovative Reform Initiatives.....	<u>600</u>	<u>500</u>	<u>500</u>
 Total	 <u>35,300</u>	 <u>35,800</u>	 <u>30,400</u>

PROGRAM GOALS

The goal of the Support for Systemic Improvement of Education Program is to use NASA’s unique assets to support local, state, regional, and national science, mathematics, technology, engineering, and geography education change efforts through collaboration with internal and external stakeholders.

Systemic improvement encompasses the process whereby an entire system is re-engineered toward achieving a new goal. NASA is committed to supporting systemic initiatives in the areas of science and mathematics education, and its activities vary depending on the needs of the institution, school system, and/or state. Thus, the activities supported by programs included in this category seek to provide a range of support in response to the needs of the customer community.

STRATEGY FOR ACHIEVING GOALS

Systemic improvement activities are designed to: (1) coordinate planning among NASA education initiatives to ensure alignment with and support of standards-led systemic improvement initiatives of the states; (2) redirect existing education programs, and ensure new initiatives address state needs and tie unique education and economic development efforts; (3) support standards-based science, mathematics, technology, and geography education change by aligning NASA educational programs and products with the national/state standards; and (4) expand interactions with external stakeholders in the systemic improvement of education change.

A major program at the elementary and secondary education level is the Aerospace Education Services Program (AESP). The AESP’s primary focus is teacher enhancement with emphasis on and support for local, state, regional and national mathematics, science, and technology education efforts through collaboration of internal and external stakeholders in high impact reform activities.

Systemic Improvement activities at the higher education level use partnerships, linkages, and collaborations to provide activities and experiences designed to enhance research and educational capabilities, and enhance the collaborative capabilities of a diverse

set of academic institutions. Programs such as Space Grant and EPSCoR play a major role in NASA's contribution toward the Nation's systemic educational reform efforts.

The Space Grant Program, authorized by Congress in 1987, increases the understanding, assessment, development, and use of aeronautics and space resources. All 50 states, Puerto Rico, and the District of Columbia have Space Grant Consortium programs in which 729 affiliates participate. These consortia form a network of colleges and universities, industry, state/local governments, and nonprofit organizations with interests in aerospace research, training, and education.

The NASA EPSCoR Program provides seed funding that will enable eligible states to develop an academic research enterprise directed toward long-term, self-sustaining, nationally competitive capabilities in space science and applications, aeronautical research and technology, and space research and technology programs. This capability will, in turn, contribute to the state's economic viability.

Systemic improvement at both elementary and higher education levels is captured in NASA's Innovative Reform Initiatives program which is supportive of standards-based systemic improvement efforts, and focuses on science, mathematics and technology education. A means of supporting systemic improvement is through partnerships with professional education associations, national aerospace education associations, industries, other Federal agencies, and state and local groups. When NASA becomes a partner with these groups, its role may be one of leadership, being a participant, or acting as a facilitator to empower and enable wide reaching educational reform that is systemic in nature. An example of these partnerships is NASA's work with the National Alliance of State Science and Math Coalitions (NASSMC).

SCHEDULE & OUTPUTS

Performance in this area is measured in a variety of ways, including partnerships/alliances, supplemental funding, and standards. In FY 1999, NASA education instances of partnerships and collaborations activities documented 28,754 alliances with a variety of partners (note, a program may be involved in multiple alliances).

2% NASA Contractors; 3% Other Industry; 35% Local Community; 1 % Museums/Planetariums; 3% Non Profit; 1% Federal Agencies; 9% higher Education Institutions; 1% Other NASA; 34% K-12 Schools; 2% K-12 School Districts; 5% NASA HQ Program Office; 2% State Government; 2% Education Resource Centers. Partners included schools (K-12 and higher education), industry, and non-profit organizations.

More than \$67M was secured in supplemental funding, of which 26% came from other Federal agencies, 6% from state agencies, 11% from Educational Organizations and Institutions; 11% from industry/business, and local organizations.

Other measures of performance are indicated below:

Aerospace Education Services Program

- 3,210 school visits; 4,625 student programs conducted; 145,085 students involved
- 1,706 teacher workshops conducted; 17,803 teachers participated
- Program was a valuable experience – 4.7 (on a scale of 5, 5=excellent; 1=very poor)
- Workshop content matched education objectives – 4.4
- Program demonstrated the interdisciplinary nature of NASA’s research and development – 4.6

Space Grant (FY 1998 data)

- 52 University-based Consortia
- Space Grant involves 729 affiliates which include:
 - 518 colleges and universities
 - 52 business/industry
 - 34 State and local government agencies
 - 125 other affiliates (science museums, not for profits, etc.)
- \$42.8M in matching funds (36% university; 22% other Federal, 10% industry; 23% other; 9% local/state government)
- 2,270 fellowships and scholarships (75% undergraduate; 22% under represented groups; 44% women)
- 932 education programs/projects/activities
- 373 public service programs/projects/activities

EPSCoR

Awards to twenty states:

- Alabama, Arkansas, Kentucky, Louisiana, Montana, Puerto Rico, Kansas, Nebraska, Oklahoma, South Carolina – original grants and prep grants
- Idaho, Kentucky, Louisiana, Maine, Mississippi, Nebraska, Nevada, South Dakota, Vermont, West Virginia – prep grants
- Participants: **(FY 1997 data)**
 - Institutions: 68
 - Research clusters: 47
 - Faculty: 244
 - Post doctoral fellowships: 38
 - Graduate students: 219
 - Undergraduates: 154
- \$25.6M proposals funded
- 152 publications, refereed papers
- 2 patents; 5 patent applications; 1 invention disclosure

ACCOMPLISHMENTS AND PROPOSED RESULTS

General plans for Systemic Improvement activities in FY 1999 and FY 2000 include providing professional development on standards-based education initiatives to NASA's internal education community; reviewing existing NASA education initiatives to ensure their alignment with the vision and philosophy for state-based systemic reform; designing new programs or redesigning existing programs to ensure that all NASA efforts align with the science, mathematics, technology, and geography education standards and supporting the needs of those engaged in the implementation of standards-based education at the state and local levels; leveraging the use of NASA programs and resources by expanding NASA interactions and cooperation with all stakeholders involved in national and state systemic initiatives; and implementing a plan through the field centers that supports the needs of individual states.

The AESP specialists are directly involved in supporting state systemic improvement by providing technical linkages to NASA research and development and education programs and services. The AESP delivers educational services on a state-by-state basis. Each education specialist is assigned one or two states so they might become familiar with their states' science, mathematics, and technology education agenda and the education leaders within these states. This enables them to customize or tailor-make their teacher workshops to fit that particular state's framework. The funding in FY 2000 will continue operation of this program and allow the contract to be re-competed in FY 2000/FY 2001 timeframe.

In FY 1999 and FY 2000, funding for Space Grant was increased pursuant to Congressional direction. This funding increase provides for increased basic awards for all Space Grant consortia and supports the award of designation status to up to four additional state consortia. The FY 2001 budget maintains the FY 1999 and FY 2000 funding level for the Space Grant Program.

FY 1999 marked the sixth year of the NASA EPSCoR program with reduced funding for the original six awardees. These six states have been very successful in a short period of time, as evidenced by the metrics previously cited. In addition, four new states were chosen in the second round of awards in late FY 1996 (Kansas, Nebraska, Oklahoma, and South Carolina). They are completing their third year of work, and are expected to be as successful as the first group. Congressional direction in FY 1999 increased the funding for this program to \$10.0 million. This enabled all eligible NASA EPSCoR states to receive planning grant funding for all twenty states. These awards will help these programs prepare for the next round of awards, scheduled for FY 2001.

NASA's Innovative Reform Initiatives program supports standards-based systemic improvement efforts and priorities, and focuses on science, mathematics, technology, and geography education. To prevent duplication and to strengthen the impact of systemic reform initiatives, NASA confers with other federal agencies and national organizations that are also working with educational systemic reform, including the National Science Foundation, U.S Department of Education, National Research Council, Council of Chief State School Officers, and professional education organizations such as the National Science Teachers Association, National Council for the Teaching of Mathematics, and the International Technology Education Association. Systemic reform initiatives are accomplished through partnerships with local, state, and national stakeholders including professional education associations, national aerospace education associations, industries, education agencies, and other interest groups. When NASA becomes a partner with these groups, its role varies between providing supportive leadership, being a complementary participant, or acting as a facilitator to empower and enable wide reaching educational reform that is systemic in nature. Examples of these partnerships are the National Alliance of State Science and Math Coalitions (NASSMC), the Council of State Science Supervisors (CS3), the NASA Industry Education Initiative (NIEI). These partnerships are each mutually beneficial in creating systemic change by increasing the customer and support bases for both NASA and the partnering stakeholder. Similar opportunities will be explored in FY 2000 and FY 2001.

BASIS OF FY 2001 FUNDING REQUIREMENT

EDUCATIONAL TECHNOLOGY

	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>
		(Thousands of Dollars)	
Learning tools.....	1,700	3,800	3,800
Demonstrations.....	2,000	2,000	2,000
Learning Technologies Project.....	4,000	4,000	--
Franklin Institute.....	--	1,373	--
JPL.....	--	2,105	--
Sagan Discovery.....	--	915	--
Texas Learning.....	--	3,661	--
Space Science Museum.....	--	3,661	--
Ohio View.....	--	1,831	--
Completion of Science Learning Center in Kenai, AK	--	915	--
Lewis & Clark – Re-discover Web Tech.....	--	1,831	--
Univ. of San Diego for Sci & Ed Tech.....	--	458	--
City of Ontario CA for Sci & Ed Tech.....	--	458	--
Univ. of Maryland, Advanced Info Tech Center.....	2,000	--	--
Univ. of Redlands, Academic Infrastructure.....	3,500	1,831	--
Residential Aerospace Education Center.....	1,000	--	--
Total	<u>14,200</u>	<u>28,839</u>	<u>5,800</u>

PROGRAM GOALS

The goal of the Educational Technology program is to research and develop products and services that facilitate the application of technology to enhance the educational process for formal and informal education and lifelong learning.

STRATEGY FOR ACHIEVING GOALS

The Educational Technology program (1) produces technology-based teaching tools and strategies that are grounded in or derived from the NASA mission; (2) uses emerging technologies for, and applies existing technologies to, educational programs; (3) utilizes technology to facilitate communication within the educational community; (4) involves educators in NASA missions through innovative uses of technologies; and (5) conducts research into new teaching and learning practices that are made possible through NASA mission-derived technology.

The NASA Classroom of the Future (COTF) continues to be a major component of the educational technology program. The role of the COTF is to translate NASA technologies and research results into learning tools, demonstrations, and teacher enhancement programs that support standards-based education reform.

The NASA CONNECT program, an instructional television and web-based series, demonstrates work place math, science, and technology as collaborative processes. The teaching protocol is through reflective discussion, video engagement, dialogue notes, journal writing, and on-line engagement. The program is designed to raise student awareness of careers requiring math, science, and technology. This awareness will allow the students to overcome stereotyped beliefs regarding females and minorities in math, science and technology.

The Learning Technologies Project provides demonstration projects and on-line systems dedicated to bringing NASA science to teachers and students in the classroom using examples from NASA's unique missions. The goal of this program is to accelerate the implementation of a national information infrastructure through NASA science, engineering, and technology contributions and to facilitate the use of technologies within the K-12 education systems.

NASA Spacelink is an electronic resource specifically developed for the educational community. Spacelink is a "virtual library" in which electronic versions of NASA's educational products and hundreds of NASA World Wide Web links are arranged for educators. Educators can search this virtual library to find information regardless of its location within NASA.

SCHEDULE & OUTPUTS

Performance in this area is measured in a variety of ways, including overall quality, type/number of users; standards application; internet hits; data transferred; searchable pages; and unique IP addresses.

- **NASA CONNECT:** 75 PBS member affiliated stations; 5 state-wide educational networks; 11 district-wide educational stations; 147 community/cable access stations; Registrants: 73,000 educators, 4.7 million students; Channel One: 230,000 educators, 5 million students.
- **NASA Spacelink, and Learning Technologies Project:** 123,247,600 internet hits; 18,865 GB data transferred; 7,686,381 unique IP addresses.
- **Classroom of the Future** Research and Development: Two major instructional CD-ROMS, BioBlast and Astronomy Village, were developed and dissemination begun; one web-based Earth science curriculum supplement; one on-line course for Earth science teachers; 25,000 materials disseminated; 15,000 students and 7,000 teachers served.

ACCOMPLISHMENTS AND PROPOSED RESULTS

General plans for this program area include providing technology training and support for the persons involved in the operation of the Educator Resource Center Network and the Space Grant program; implementation of a coordinated electronic dissemination system that ensures that all NASA education activities and products are available through appropriate networking technologies; demonstrate NASA's educational technology resources at professional development conferences; develop innovative learning tools and technologies that are integrated with curriculum support and teacher enhancement activities ; develop, implement, and evaluate distance education and virtual mentoring projects; and support distribution of excess NASA equipment to schools and institutions of higher education.

Educational Technology activities support the development of high quality, affordable learning tools and environments (e.g., CD-ROM databases, DVD-ROM, live or taped video, computer software, multimedia systems, virtual reality) and supplementary instructional materials. These tools use existing technology as well as emerging technologies to facilitate education programs. Demonstrations of innovative, efficient, and effective technology and networking applications are also supported. Classroom of the Future continues to be NASA's primary educational technology research and development site.

NASA's Educational Technology program includes the center-based components of the Learning Technologies Project (LTP). One of the goals of this program is to demonstrate how newly emerging communication technologies can be used to bring NASA's science and engineering data to schools and the public. The ten center-based projects have made extensive amounts of earth, space, and aeronautics information available on the Internet in educational formats. Through this program, collaborations are maintained with and support provided to schools across the country. In FY 2000 LTP will initiate a follow-on grant program funding the use of information technology in educational outreach efforts. In FY 2001, funding for this program will be provided by the Enterprise offices.

Educational Technology activities in FY 1999 included funding for the following activities directed by Congress in the Conference Report accompanying the VA-HUD-Independent Agencies Appropriation Act: the University of Maryland Advanced Information Technology Center, University of Redlands Academic Infrastructure, and Residential Aerospace Education Center at the Glenn Research Center.

Educational Technology activities in FY 2000 include funding for the following activities directed by Congress in the Conference Report accompanying the VA-HUD-Independent Agencies Appropriation Act: the Franklin Institute, Jason XI, Sagan Discovery, Texas Learning, Space Science Museum, Ohio View, Completion of Science Learning Center in Kenai, AK, Lewis & Clark , University of San Diego for Science & Education Center, City of Ontario California for Science & Education Center, University of Maryland Advanced Information Technology Center, University of Redlands Academic Infrastructure, and Residential Aerospace Education Center at the Glenn Research Center.

In FY 2001, funding for Educational Technology programs reduces, however, the funding for the LTP will be provided by the Enterprise Offices.

BASIS OF FY 2001 FUNDING REQUIREMENT

EVALUATION

	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>
		(Thousands of Dollars)	
Evaluation.....	700	1,500	1,500

PROGRAM GOALS

The goal of the evaluation program is: to provide a substantive accounting and evaluation of the performance of NASA's educational program, with its associated projects and activities, in the implementation of its goals by developing and maintaining a systematic strategy for collecting, aggregating, and reporting evaluation indicator data.

STRATEGY FOR ACHIEVING GOALS

NASA has undertaken a comprehensive effort to evaluate its education programs in order to demonstrate the accomplishment of achievable and measurable goals and objectives. A set of standard, agency wide indicators, metrics, and evaluation instruments has been developed for agency wide use. The data are collected on-line in a single database capable of providing correlation and report generation capability. External, third-party education evaluation experts provide additional guidelines and criteria for the analysis of qualitative and quantitative data facilitating in-depth evaluations of various programs.

SCHEDULE & OUTPUTS

NASA continues to refine a comprehensive system to evaluate its Education Program in order to demonstrate the accomplishment of achievable and measurable goals and objectives. Based on recommendations provided by a study of the NASA Education Program by the National Research Council (NRC), NASA established program goals and defined a comprehensive Education Framework that captures the elements of NASA's Education Program. This framework is detailed in NASA's *Implementation Plan for Education*, and supported by implementation plans developed by the Enterprises and NASA field installations between FY 1995 and the present. NASA utilizes an Internet-based system, for the collection, analysis, evaluation and reporting of standard and program unique data and program outcomes for all NASA education programs.

ACCOMPLISHMENTS AND PROPOSED RESULTS

NASA's Education Data Collection and Evaluation System (EDCATS), continues to add programs incrementally until all NASA education programs are included. As programs compile a firm set of baseline data, selected annual program targets will be established, as needed or required. By FY 2002 the system will be fully operational track data and evaluation metrics for the entire NASA Education Program.