LEADERSHIP REMARKS

NASA SEMAA: A NATIONAL LEADER IN K-12 STEM EDUCATION

To inspire, engage, educate, and employ the “explorers and innovators of the next millennium,” NASA has designed its educational investments to strengthen NASA’s and the Nation’s future workforce; attract and retain students in science, technology, engineering, and mathematics (STEM) disciplines through a progression of educational opportunities for students, teachers, and faculty; and engage Americans in NASA’s mission.

Recognized as one of the top 18 programs in the 2007 Innovations in the American Government Awards competition by the Ash Institute for Democratic Governance and Innovation at Harvard University’s John F. Kennedy School of Government, the Science, Engineering, Mathematics and Aerospace Academy (SEMAA) serves as evidence of NASA’s ability to ignite the desire to learn in a unique and powerful way.

This year was an extraordinary one for SEMAA and education across the Agency; its momentum will propel us into a promising 2008 and beyond.

Dr. Joyce L. Winterton
NASA Assistant Administrator for Education

The Glenn Research Center is pleased to have been awarded responsibility for managing the Agency’s Science, Engineering, Mathematics, and Aerospace Academy (SEMAA) Project. Activities within the SEMAA Project inspire students across the Nation to pursue careers in Science, Technology, Engineering, and Mathematics (STEM) and fuel the NASA pipeline as the Agency pioneers the future in space exploration, scientific discovery, and aeronautics research. Congratulations on being recognized by Congress as “one of the Nation’s premier K-12 STEM educational programs.”

Woodrow Whitlow Jr.
Center Director, NASA Glenn Research Center

SEMAA is an emerging national leader in K-12 Science, Technology, Engineering, and Mathematics (STEM) education. During fiscal year 2007, SEMAA was recognized by Harvard University as one of the top 18 most innovative government programs/projects in the nation; and the 110th U.S. Congress wrote SEMAA into history via a congressional record, honoring and congratulating SEMAA as “one of the nation’s premier K-12 STEM educational programs.”

SEMAA possesses an established infrastructure for K-12 STEM education services and a presence in underserved communities that should not be overlooked. As the nation continues to increase its efforts in K-12 STEM education, SEMAA will utilize its infrastructure to help strengthen collaborations amongst STEM stakeholders in an effort to maximize the benefits to students and families and increase the nation’s overall return on investment in K-12 STEM education.

Gail Dolman-Smith
President & CEO, Paragon TEC, Inc.
NASA Contractor
SEMAA AT-A-GLANCE

NASA has a unique capacity to revitalize STEM education in America; utilizing its awe-inspiring subject matter, cutting-edge research opportunities, and world class facilities. NASA is currently investing in a portfolio of educational programs/projects focused on (1) Strengthening NASA and the nation’s future workforce, (2) Attracting and retaining students in STEM disciplines, and (3) Engaging American’s in NASA’s mission. NASA SEMAA is aligned to NASA Education Outcome 2: Attracting and retaining students in STEM disciplines.

MISSION

SEMAA is an innovative, national project designed to increase the participation and retention of historically underserved and underrepresented K-12 youth in the areas of Science, Technology, Engineering, and Mathematics (STEM).

GOALS

Inspire a more diverse student population to pursue careers in STEM-related fields.
Engage students, parents/adult family members and teachers by incorporating emerging technologies.
Educate students utilizing rigorous STEM curricula, designed and implemented as only NASA can.

NASA SEMAA IS...

Hands-On, Inquiry Based K-12 STEM Curricula

• Aligned to National Math, Science, and Technology Standards
• Encompass the research and technology of NASA’s four Mission Directorates
• Provide NASA SEMAA graduates with up to 441 hours of advanced studies in STEM prior to enrollment in a post-secondary institution

Aerospace Education Laboratory (AEL)

• Places cutting-edge technology at the fingertips of NASA SEMAA middle and high school students
• Engages students in real world challenges relative to both an aeronautics and reduced gravity research scenario
• Houses real aerospace hardware/software including an Advanced Flight Simulator (AFS); a laboratory-grade, research wind tunnel; and a working, short-wave receiver and handheld Global Positioning System (GPS) for aviation

Family Café

• Promotes sustained family involvement at NASA SEMAA sites nationwide
• Provides parents/caregivers with relevant parenting and STEM education information
• Researches and presents information to parents/caregivers on other STEM-related programs available for their child’s participation in an effort to maximize student exposure and interest in STEM
SIGNIFICANCE OF THE UNDERREPRESENTED

African Americans, Hispanics, Native Americans, and persons with disabilities make up 24% of the general population, but only 7% of the science and engineering workforce; representing the biggest gap in the U.S. STEM workforce. (National Science Board. Science and Engineering Indicators, 2000).

STEM education research supports that if women and minorities participated in the science and engineering workforce proportional to their presence in the general population, there would be no U.S. talent gap.

SEMAA’S FOCUS ON THE UNDERREPRESENTED

NASA SEMAA harnesses the collective resources of NASA, institutions of higher education, science centers, museums and primary and secondary schools to bridge the education gap for historically underrepresented K-12 youth in STEM. SEMAA’s focus on the underrepresented is evident in the demographical statistics highlighted below.

2007 SEMAA STUDENT PARTICIPANT DEMOGRAPHICS

- Ethnic Minorities – 86%
- Low Income Students (below the national poverty level) – 53%
- Students with Special Needs – 495
- Females – 49%

TRANSCENDING BARRIERS

NASA SEMAA is committed to transcending barriers that stand between historically underrepresented students and the STEM classroom.

- Commitment to Critically Ill Children - Conducted a one-week summer session for critically-ill children at Egleston Children’s Hospital (Atlanta, GA) for the third consecutive year. SEMAA teachers underwent immunization shots and worked closely with hospital staff to ensure the sterilization of all hands-on materials prior to admittance to the hospital classroom.
- Commitment to Students with Special Needs - Partnered with the Special Education Department at the University of the District of Columbia (Washington, D.C.) to provide the expertise necessary to maximize SEMAA learning opportunities for students with special needs.
OUTCOMES BY DESIGN

NASA SEMAA is a national project, operating from 17 sites located throughout 13 states and the District of Columbia. Site locations include Historically Black Colleges and Universities (HBCU), Hispanic Serving Institutions (HSI), Tribal Colleges and Universities (TCU), science centers, museums, and elementary/secondary schools. During fiscal year 2007, NASA SEMAA sites inspired, engaged and educated 64,296 students, parents/caregivers and teachers.

INCREASING K-12 STUDENT EXPOSURE & INTEREST IN STEM

• Increased 3rd-12th grade exposure by 36 classroom hours annually, and K-2nd grade by 27 classroom hours annually
• Average student increase in STEM interests:
  Science – 33%
  Technology – 30%
  Engineering – 40%
  Mathematics – 30%

STRENGTHENING THE NATIONAL STEM PIPELINE

• Fostered the participation of NASA SEMAA students in 50+ other STEM programs/projects, thus maximizing student exposure and interest in STEM and strengthening the national K-12 STEM pipeline

INCREASING FAMILY INVOLVEMENT

• Provided parents/caregivers with up to 21 hours of STEM education and parenting workshops/focus groups annually
• Created exciting, hands-on, inquiry based, STEM-focused learning opportunities for students and parents/caregivers to work together

ENSURING PROJECT GROWTH THROUGH INNOVATION

• Developed Space Medicine, Geo-Robotics, and Astrobiology High School Curriculum Modules
• Created a Mars Flight e-simulation for the SEMAA AEL
• Transformed AELs in select locations to state-of-the-art, distance learning laboratories
• Implemented Parent Centers in public schools as satellite operations to the SEMAA Family Café
• Developed a STEM Partnership Manual documenting a systems approach to partnership development and project sustainability

BUILDING PROJECT SUSTAINABILITY

• Collaborated with a network of 200+ partners
• Leveraged an annual record number $3.8 Million in sustaining funds, representing over a 100% match to the budget provided by NASA
Harvard Recognizes NASA SEMAA as a Top Government Innovator

On September 24, 2007, the Harvard University John F. Kennedy School of Government’s Ash Institute for Democratic Governance and Innovation presented NASA SEMAA with a Finalist Award for the 2007 Innovations in American Government Award Competition. With this award, NASA SEMAA was recognized as 1 of the 18 most innovative government programs in the nation; placing SEMAA in the highest 2% of applicants from the federal, state and local governments.

As a finalist, NASA SEMAA has received national press attention (appearing in a USA Today article entitled “The Best and the Brightest”) and a $10,000 grant to be directed towards the dissemination and replication of project innovations.

Of special significance is the fact that NASA SEMAA was the only educational initiative to be recognized as a 2007 Innovations in American Government Award finalist. NASA SEMAA’s success in elevating the education of America’s youth to this platform is profound; a platform that addressed such critical issues as fostering renewable energy, improving health care access, promoting affordable housing, and 14 other extraordinary and deserving innovations.

"These finalists offer tangible results that innovative leaders can improve public services to their citizens. When government officials focus on achieving results through innovative thinking, they show that government has the capacity to successfully tackle serious problems while creating efficiencies.”

Dr. Stephen Goldsmith
Director of the Innovations in American Government Program, Harvard University
NASA SEMAA sites at Tennessee State University (HBCU), New Mexico State University (HSI), and the Miami-Dade County Public Schools (the fourth largest school district in the nation) are collaborating on a Discovery Research K-12 (DRK12) grant from NSF totaling $300,000. These SEMAA sites are working together to advance STEM education by pilot-testing an exciting NASA based high school curriculum in astrobiology, and conducting educational research on the project and its impacts on underrepresented students (to be led by researchers from TSU).

The web-based curriculum, known as the Astrobiology in the Secondary Classroom (ASC) curriculum, includes hands-on science activities, computer simulations, and analysis of real NASA data sets. SEMAA students currently participating in the project are practicing authentic science inquiry while pondering the “big questions” of life on earth. Once the pilot-testing and research phase is complete, the curriculum will be replicated at NASA SEMAA sites nationwide.

The ASC curriculum was developed through a collaboration of the Minority Institution Astrobiology Collaborative, the NASA Astrobiology Institute, and educators and curriculum developers from TSU. Additionally, scientists from the Goddard Center for Astrobiology, the Carnegie Institute of Washington, and the Indiana-Princeton-Tennessee Astrobiology Initiative supported the curriculum development team.

“The NASA SEMAA Project has a foundation for K-12 STEM education and a presence in underserved communities that is valuable to NSF’s mission”.

Dr. Julia V. Clark
Program Director, Division of Research on Learning (DRL)
National Science Foundation
2007 SEMAA SUCCESS STORY

NASA SEMAA Students Pursue STEM Degrees/Impact STEM Workforce

Three SEMAA graduates received the 2007 NASA SEMAA Next Generation Pioneer Award. This prestigious national award is presented annually to leading NASA SEMAA graduates for their long term participation in SEMAA and subsequent accomplishments related to the study of STEM.

**Tamela Jones** participated in SEMAA at Wayne State University (Detroit, MI) for 8 years, and has since graduated from Wilberforce University with a Bachelor’s of Science in Computer Science. Tamela is currently working on her Masters in Management Systems/Information System Management at the Keller Graduate School of Management. In addition to her graduate studies, Tamela is employed by the Corporate Internet Group of JP Morgan Chase; where she works as a Researcher for the Safety and Evacuation Team.

**Liam Rattray** participated in SEMAA at Fernbank Science Center (Atlanta, GA) for 6 years, during which time he began the SEMAA LINKS Engineering Team and developed an 8-week curriculum module for SEMAA high school students that resulted in the conversion of a commercial truck to run on pure waste vegetable oil. Liam is currently a sophomore and honors student at the Georgia Institute of Technology, majoring in Public Policy.

**Manuel Sosa** participated in SEMAA at New Mexico State University (NMSU) (Las Cruces, NM) for 4 years; during which time he was an honors student and began the Gadsden High School SEMAA Club. Under Manuel’s leadership, the SEMAA Club took on two major engineering design challenges; in which they built a 15’ microgravity droptower that they presented during the 2006 X-Prize Cup, and designed a Moon Buggy that they drove in the 14th Annual Great Moon Buggy Race Competition. Manuel is currently a freshman at NMSU majoring in Aerospace Engineering.

“SEMAA inspired me to pursue a career as an aerospace engineer. My dream is to one day work for NASA!”

-Manuel Sosa, NASA SEMAA Graduate/ Aerospace Engineering Major, New Mexico State University
THE POWER OF PARTNERSHIPS

NASA SEMAA PARTNERSHIP VISION

“\textit{To foster formal partnerships and collaborations amongst global STEM stakeholders to maximize student exposure and interest in STEM and increase America’s overall return on investment in K-12 STEM education.”}

\textbf{SEMAA National Sustainability Committee (NSC)}

NASA SEMAA sites are required to develop partnerships annually that will both enhance and sustain project services beyond NASA funding. During fiscal year 2007, the SEMAA sites leveraged over $3.8 Million in partnership funds (including both financial and in-kind support), constituting more than a 100% match to the total project budget provided by NASA.

Below are just a few examples of local SEMAA partnerships developed during the 2007 fiscal year:

- **National Science Foundation (NSF)** – Provided $300,000 for the adaptation of a NASA Astrobiology curriculum for historically underrepresented K-12 students; bringing NSF’s year-to-date contributions to SEMAA to just over one-half million dollars.

- **Institute for Museum and Library Services (IMLS)** – Provided $150,000 to SEMAA at Fernbank Science Center (Atlanta, GA) for the creation of Parent Centers in the public schools. The Parent Centers are being established in response to requests from school administrators to support their efforts to increase family involvement within the schools.

- **New Mexico State Legislature** – Passed a State House Bill to make funding of the NASA SEMAA Project at New Mexico State University (Las Cruces, NM) a recurring line item in the state’s budget. The $80,000 in annual funding from the state will support the continued expansion of the project throughout the southern half of New Mexico.

- **American Honda Foundation** – Provided $40,000 for SEMAA at Cuyahoga Community College (Cleveland, OH) to support the expansion of the project to additional inner city youth.

To supplement local partnership efforts and ensure SEMAA’s long term sustainability, the newly formed SEMAA NSC will begin developing the first ever national partnerships for SEMAA during the 2008 fiscal year.

\textit{A partial list of 2007 NASA SEMAA partners is included on page 9.}
LEADERSHIP AND FINANCIAL STATEMENT

“With increasing demands on our economy, workforce, and national security, STEM education is more important than ever.”

Senators Richard Durbin (D-IL) & Norm Coleman (R-MN),
Co-Founders - Bipartisan Science/Math Education Caucus, U.S. Senate

ORGANIZATIONAL CHART

NASA Headquarters
Office of Education

NASA Headquarters
Elementary & Secondary Education Program

NASA Glenn Research Center
Educational Programs Office

NASA Glenn Research Center
NASA SEMAA Project Manager

Aerospace Education Laboratory
Contractor:
Lockheed Martin

National SEMAA Office (NSO)
Contractor:
Paragon TEC, Inc.

17 NASA SEMAA SITES

2007 NASA SEMAA BUDGET

NASA SEMAA Site Operations (17 sites) ......................... $1,843,750

National SEMAA Office Operations* - Contractor .......... $1,025,000

Aerospace Education Laboratory** - Contractor .............. $100,000

NASA Glenn In-House Costs ........................................ $312,250

Grand Total ................................................................. $3,281,000

* The National SEMAA Office and Aerospace Education Laboratory contracts were combined at the beginning of 2nd quarter FY07.

** The Aerospace Education Laboratory contract was in operation for 1st quarter FY07 only as a separate contract.

For more information on the NASA SEMAA Project, contact Paragon TEC, Inc. at (216) 361-5555, or visit the website at www.semaa.net.
NASA SEMAA PARTNERS

“After my first year doing SEMAA, I knew I wanted to become an aeronautical engineer. I had never even considered becoming an engineer before SEMAA.”

Shalini Chudasama

ADC Foundation
Air Force Association (AFA)
Albany State University
Alcoa Foundation
American Honda Foundation
Arizona State University
Baltimore Metropolitan Housing Authority
Berry’s Catering
Best Buy
Boy Scouts of America
Boys and Girls Club
Children & Charity Foundation
Chums, Inc.
Citibank
Citigroup Community Fund
City of Detroit Mayor’s Office
Civil Air Patrol
ConEd
Cuyahoga Community College
D.C. Employment Services
DC Council of Engineering and Architectural Society
Domino’s
Dougherty School System
DTE Energy Foundation
Experience Aviation
Fernbank Science Center
First Book
Fisher Scientific
Florida Department of Education
Florida Memorial University
Food Bank of Southwest Georgia
Gadsden Public School District
Girl Scouts of America
Glenn Research Center
Goddard Space Flight Center
Grace Church Societies
Holmes Elementary School
Institute of Electrical and Electronics Engineers (IEEE)
Institute of Museum and Library Services (IMLS)
Intel Corporation
International Women’s Air and Space Museum
Intrepid Sea, Air, and Space Museum
J & J Southeast
Jet Propulsion Laboratory
John F. Kennedy Middle School
Johnson Space Center
JWIRE Enterprises
Kennedy Space Center
Kiwanis Club of Cleveland
Langley Research Center
Las Cruces Public Schools
Livingstone College
Lockheed Martin
Lucy Sale Foundation
Marshall Space Flight Center
Martha Holden Jennings Foundation
Martinsville City Schools
Mathematics Matters Every Day (M²ED)
Miami Central Senior High
Miami Dade County Police Department
Miami-Dade County Public Schools
Michael Jordan Foundation
Morgan State University
NASA Headquarters
National Foundation for Teaching Entrepreneurship
National Science Foundation
Nat’s Catering
New Mexico State Legislature
New Mexico State Senate
New Mexico State University
North Miami Beach Senior High School
Oglala Lakota College
Paragon TEC
Pine Ridge Indian Reservation Schools
Project Academics Related to Success (A.R.T.S.)
Qwest Foundation
RGK Foundation
Richland County School District One
SECME, Inc.
Success Institute
Tennessee Space Grant Consortium
Tennessee State University
The Parent Academy
Thomas H. White Foundation

Tommy Hilfiger Foundation
Tuskegee Airman
U.S. Immigration and Customs Enforcement
United Black Fund
United States Department of Education
University of the District of Columbia
Vanderbilt University
Verizon Wireless
Virginia Department of Aviation
Wal-Mart
Warren County Office of the City Manager
Warren County School System
Wayne State University
Wilberforce University
Wiley College
Windsor Hills Elementary School
X-Prize Corporation
York College, CUNY
Young Eagles
Youth Positive Direction Center
“It is vital that as technology advances, so do the minds of our future workforce. By offering exciting STEM education courses to thousands of students nationwide, NASA SEMAA is playing a critical role in making this happen.”

Barrington Irving (First person of African descent and the youngest person to fly solo around the globe - 2007)

“All student photos in this report feature actual SEMAA participants.

“Resolved that we celebrate and honor SEMAA as one of the nation’s premier K-12 STEM educational programs.”

110th United States Congress
NASA SEMAA Congressional Record

“SEMAA has brought a world of opportunities to our students at Skyway Elementary.”

Velma Arnold,
NASA SEMAA Teacher (Miami, FL)

“The committee commends SEMAA for its focus on underserved and underrepresented populations of students and on inspiring their interest in science and engineering…SEMAA is an excellent project for reaching the intended participants.”

National Research Council,
National Academies

For more information, visit www.semaa.net

Prepared by Paragon TEC, Inc.
### SEMAA Data for the Office of Management and Budget (OMB)

The Office of Management and Budget (OMB) has assessed Federal Government programs using a standard questionnaire called the Program Assessment Rating Tool (PART). The questions relate to a program’s performance and management, and Federal agencies provide detailed explanations and evidence to support their answers on the questionnaire. The program ratings range from Effective at the highest to Ineffective or Results Not Demonstrated at the lowest end of the scale. All PART evaluations contain follow-up actions and improvement plans. OMB has assessed 1,004 Federal programs, or 98 percent, of all Federal programs. The results are available to the public at [www.expectmore.gov](http://www.expectmore.gov).

NASA Education participated in the PART in 2007. SEMAA data submitted to NASA’s Office of Education in support of the 2007 PART is outlined below.

### PART Measures

**Percentage increase in number of elementary and secondary student participants in NASA instructional and enrichment activities**

FY07 Baseline (17,773 Direct Student Participants)

Although an official baseline was not established in FY06, SEMAA served 15,760 Direct Student Participants that year. In FY-2007 SEMAA served 2,013 more Direct Student Participants resulting in an 12.77% increase over FY-2006.

**Level of student interest in science and technology careers resulting from elementary and secondary NASA education programs**

50% of respondents representing Direct Student Participants in grades 4-12 indicated plans to work in a STEM career after completing their studies.

33.5% was the overall average increase in student interest in STEM

33.3% average increase in Science

30.3% average increase in Technology

40.0% average increase in Engineering

30.3% average increase in Mathematics

Note: Feedback collected from Direct Student Participants in grades 4-12.

More than 86% of respondents either “Agreed” or “Strongly Agreed” that they learned more about careers in STEM, resulting in a 4.4 average rating on a 5.0 rating scale.
Output Measures

Percentage increase in number of elementary and secondary student participants in NASA instructional and enrichment activities

17,773 Direct Student Participants (86% ethnic minorities, 49% female)

Ethnic Breakdown
American Indian/Alaska Native = 484
Asian = 444
Black/African-American = 12,021
Hispanic/Latino(a) = 2,917
Native Hawaiian/Pacific Islander = 1
Multi-Racial (Two or More Races) = 45
White (Non-Hispanic) = 1,586
Other = 275

Gender Breakdown
Males = 9,104
Females = 8,669

Grade
Grades K-4 = 8,702
Grades 5-8 = 6,985
Grades 9-12 = 2,086

Students with Special Needs
Direct Student Participants with Special Needs = 495

Students Living Below the Poverty Line
Percentage of Direct Student Participants Living Below the Poverty Line = 53%

Number of elementary and secondary student participants in NASA-sponsored extended learning opportunities

24,917 Total Outreach Participants (K-12 Students)

Breakdown of Outreach Numbers
AEL Student Outreach Participants = 11,034
- American Indian/Alaska Native = 18
- Asian = 491
- Black/African-American = 7,560
- Hispanic/Latino(a) = 1,092
- Native Hawaiian/Pacific Islander = 0
- Multi-Racial (Two or More Races) = 9
- White (Non-Hispanic) = 1,857
- Other = 7
- Males = 5,288
- Females = 5,746

Other Student Outreach Participants = 13,883
- Other Outreach Students with Special Needs = 77
Number of opportunities for family involvement

SEMAA provided a total of 270 opportunities for family involvement during FY-2007.

SEMAA also engaged 5,393 parents/caregivers with 736 hours of structured, STEM focused content.

Outcome Measures

Activities and investigations result in increased student interest in STEM

33.5% was the overall average increase in student interest in STEM
33.3% average increase in Science
30.3% average increase in Technology
40.0% average increase in Engineering
30.3% average increase in Mathematics

Note: Feedback collected from Direct Student Participants in grades 4-12.

Activities and investigations result in increased student knowledge about careers in STEM

More than 86% of respondents either “Agreed” or “Strongly Agreed” that they learned more about careers in STEM, resulting in a 4.4 average rating on a 5.0 rating scale.

Note: Feedback collected from Direct Student Participants in grades 4-12

Family participants will show an increased interest in their student’s STEM coursework

464 Family Café participants from 12 SEMAA sites participated in a survey which yielded a 45.42% increase in their overall interest in their student’s STEM coursework as a result of their participation in SEMAA.

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<tr>
<th>Family Café Participant Data</th>
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<tr>
<td>Science Interest Increase</td>
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<td>Technology Interest Increase</td>
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<td>Engineering Interest Increase</td>
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<td>Mathematics Interest Increase</td>
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<td>Overall STEM Interest Increase</td>
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Efficiency Measures

Percentage of programs that operate through Digital Learning Network (DLN) structures

Data source: Survey Instrument (see data question below)
Thirteen (13) out of fourteen (14) SEMAA sites participated in the survey.

During FY-2007, this NASA SEMAA site accessed NASA Content via the following: (Check all that Apply)

- NASA DLN (Digital Learning Network) = 38%
- NASA Webcast (Live/Archived) = 85%
- NASA Podcast = 15%
- NASA Videoconference = 23%
- e-Simulations = 23%

Global Efficiency Measures

Ratio of funds leveraged by NASA funding support

In FY-2007, SEMAA sites leveraged $3.8M (Financial and In-Kind Contributions) supported by a network of 200+ partners nationwide.

Total Financial Contributions: $1,474,928.29
Total In-Kind Contributions: $2,369,376.20
**Grand Total:** $3,844,304.49