ASA STEM Proposal

Hank Lehrer
Embry-Riddle Aeronautical University Professor, retired, lehrerh@erau.edu

Brent D. Bowen
Embry-Riddle Aeronautical University, bowenb6@erau.edu

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Aerospace States Association
Mathematics, Science and Technology Education (MSTE) Grants
Proposal
8/10/2001

1. Membership Information:

   Kent Penney (ASA Delegate)   Brent D. Bowen (Alternate)
   Designee of the Lieutenant Governor Nebraska Space Grant and EPSCoR
   Nebraska Department of Aeronautics University of Nebraska at Omaha
   Lincoln, NE Omaha, NE 68182

2. Project Title: Families United (FUN) in the Discovery of Mathematics, Science,
   and Technology: Systemic Initiative to Improve MSTE Skills of Nebraska’s Native
   American Children

3. Affiliations: A NASA EPSCoR Initiative in partnership with the Langley Research
   Center, the NASA Nebraska Space Grant and EPSCoR Programs, Nebraska
   Department of Aeronautics, Nebraska Indian Community College (NICC), and
   the Santee Community Schools, NE

4. Contact:  Dr. Henry R. Lehrer
   422 Allwine Hall
   University of Nebraska at Omaha
   Omaha, NE 68182
   Phone: 402-554-3424
   Fax: 402-554-3781
   Email: hanklehrer@earthlink.net

5. Background

   The NASA Nebraska Space Grant has been engaged in minority outreach with
   the state’s Native American educational community since early 1997. The main thrust of
   the effort has been to assist in improving the mathematics, science, and technology
   skills of elementary, secondary, as well as collegiate students. Such an initiative finds its
   philosophical underpinnings in not only NASA’s desire to aid such indigenous
   populations but in the NASA Nebraska Space Grant’s efforts to serve the same
   population for the same reasons. To further this effort, the NASA Nebraska Space grant
   has funded faculty outreach grants, institutional enhancement grants, hosted workshops
   for teachers, sponsored field trips for students, as well as having engaged in numerous
   activities to enhance the viability of the program.

   However, one clearly identifiable barrier in completing future projects though is
that over the past several decades, the Nebraska Native American population on the state’s reservations has been plagued by un-employment (running as high as 75% on some reservations) and extremely dismal family situations. As a result, and as might be expected, school age children have be a difficulty in meeting minimum academic standards or even staying in school until graduation. Consequently, a very small number of students graduate from secondary schools and an even smaller number attends higher education.

6. Assistance Provided

The NASA Nebraska Space Grant and EPSCoR Programs have played a strong leadership role within the state in assisting the Native American reservations schools in Nebraska in improving science, mathematics, and technology skills. Specifically, the formation of the Nebraska Native American Working Group - the superintendents of the four reservation schools, the two presidents of the state’s tribal colleges, and Nebraska Space Grant educators - in 1997 was a critical element in the Nebraska Space Grant/Native American Outreach Initiative.

One recent activity was to send four elementary teachers of Native American children to a two-week workshop at NASA Ames this past summer; each of the four reservation schools in the state (Omaha Nation, Winnebago, Walthill, and Santee) were represented. Another successful endeavor has been the NASA Aeronautics Day at the Sioux City, IA Airport. Begun in 1997, the thrust is to familiarize students at the Nebraska reservations schools with aeronautics in general and specifically the application of scientific activities in an aviation setting. Since the program began, close to 500 5th grade students have spent a day at the airport viewing military and general aviation operations. One general theme that runs through the day’s activities is that it is critical to stay in school, do well in the sciences, and avoid any involvement in drugs or alcohol. These projects have been extremely successful but have been aimed solely at the schools, teachers, and students.

7. Innovation

**Family Science:** Family Science (which includes embedded mathematics and technology concepts as well) is a program designed to involve families working together on several different hands-on activities during evening meetings at school. Sometimes special demonstrations and guest speakers are included in the programs. Also, ideas are given to parents on how to do experiments and projects at home with their children. These activities can be done using materials readily available in most homes or are easily provided as part of an activities kit. Hopefully, as a result of the Family Science programs, parents and students will realize that science can be fun.

The purpose of this program is not to make parents into scientists or the primary teacher of their child, but to provide an opportunity for families to work together in an
interesting and enjoyable manner. Of course, by doing such activities, it will become more apparent that science is not only for school, but that it is related to the real, everyday lives of everyone. Doing such activities provides additional time for the learning of science and will enhance student learning.

**The Project:** The Families United in the Discovery (FUN) of Science project that is envisioned would involve selected students and their teachers. The initial target group though is upper elementary children approximately 11-12 years of age and the specific population will be students in the Santee Community Schools in Niobrara, NE. This school will serve as a demonstration stage. Additionally, the project will include the parents and family of those children; faculty of the NASA Nebraska Space Grant; and members of the NASA Langley Education Office. A successful first year program will then be duplicated with students in the Winnebago and Omaha Nation school districts.

**Timeline:** The planning and curriculum development phase will be completed during the summer of 2000. The demonstration project will occur during Fall 2000 and the Spring 2001. The educational summit, referred to below, will be called for Spring 2001.

**Activities:** Key activities will be the development of instructional discovery units (family science units) based possibly on weather and climate, aeronautics, space science, and other scientific units. These discovery units (DU) will be the subject of all the activities for the participants during each unit. The subject of the initial demonstration project will be selected from the following DUs:

$ DUASTS: Astronomical Science: Celestial observations and sky awareness.
$ DUWS: Weather Science - What about my climate; facts about weather observation, reporting, and forecasting.
$ DUAS2: Aeronautical Science 2: Construction and flight testing of either a kite or a model airplane. Computation of altitude, endurance, and other factors.
$ DURS: Rocket Science: The development and launching of a model rocket.

**The Teaching Paradigm:** The paradigm will be that students and teachers will cover several appropriate parts of the unit at school, the students would complete more of the unit after school hours with the family members, and there would be monthly Family Science Night at the school. The science night will include an evening meal plus a combination of science demonstrations by NICC and UNO faculty, directed group activities, visits by NASA Langley educators, and fellowship. The underlying goal is the continued improvement of mathematics and science skills among these Native American youngsters through involvement of the family unit.

**FUN Steering Committees:** The importance of integration of traditional science education into a Native American setting must be carefully orchestrated. Since there are
distinct ways to view science, it is imperative to seek counsel and advice of individuals
with both a scientific background and an awareness of the special tenants found in
Native American science. This local steering committee will be formed early in the
planning phase and will include such individuals as:

- Octa Keen (Winnebago) - Health Co-ordinator at University of Nebraska Medical
  Center
- Tommie Lee (Navajo) - American Indian Science Education Society Board
  Member
- Ed Zendejas (Omaha) - UNO Faculty Member
- Carolyn Fiscus (Winnebago) - UNO Native American Consultant
- Chuck Squirer - Superintendent: Santee Schools
- Dan Sullivan - UNO Chemistry Professor
- Ray Gunther - UNO Physics Professor
- Neil Grandganet - UNO Mathematics Education Professor
- Shelley Avery - Science Teacher: NICC

**Systemic Educational Change:** This endeavor will, in the long term, focus on
systemic change for the entire Nebraska Native American reservation school network
through the implementation of family science. Then programs will be exported to the
non-Native American schools in subsequent years. It would be extremely difficult to
make state-wide educational change in Nebraska due to the large area of the state and
the small population density but a more reachable short-term goal will be to focus on
change within a minority population that is in desperate need of NASA/ASA assistance.

A key item in the exporting of systemic change would be the calling of an
educational summit that involves the stakeholders identified above. This meeting will
focus on the integration of NASA’s Education Program Initiatives with state standards
using what has been learned with the family science program at Santee. However, an
unusual situation exists in Nebraska in that state standards for MSTE were adopted in
1999 but the Santee Community Schools adopted such standards in 1998. The Santee
standards meet or exceed all the Nebraska standards. With this dichotomy in mind
though, it would be appropriate to have a state educational summit focus on how
specifically the standards were developed and how NASA’s Improvement Initiatives
might be integrated into other Native American schools standards and then utilized in all
Nebraska schools.

The actual summit would be held during the late spring of 2001 and the location
would be at either Wayne State University in Wayne, Nebraska or at S. Sioux City, NE;
both locations would be convenient to all participants as well as officials from state
offices in Lincoln. The one-day event would focus on using NASA science to improve
educational programs and determining the most effective and efficient way to
accomplish such an endeavor. A state-wide advisory committee based on the FUNds
committee identified above plus key state officials will be formed at the educational
summit. This committee will serve as the guide for further activities in the state. Summative results of these activities will result in a systemic model for use of NASA science in other Native American school settings in other states.

**NASA Interface:** The following individuals are aware of and have been briefed on this project and will provide assistance:

- Dr. Samuel Massenburg  
  Director of NASA Langley Education Office
- Dr. Thomas Pinelli  
  Education Officer NASA Langley
- Kevin Krigsvold  
  Distance Learning Assistant NASA Langley
- Geoffrey S. Lee  
  University Program Manager NASA Ames
- Thomas Clausen  
  Education Officer NASA Ames
- Liza Coe  
  Educational Technology and Multimedia Manager NASA Ames
- Bonnie Samuelson  
  Education Outreach NASA Ames
- Dr. Brent Bowen  
  Director NASA Nebraska Space Grant
- Michaela Schaaf  
  Assistant Director NASA Nebraska Space Grant

8. **Benefit:**

A recent series of articles "Broken Promise: The Failures of Indian Education" in the *Omaha World Herald* indicated that of 867 students that entered Nebraska reservation high schools in 1993, 94, and 95, a total of 385 (55.6.4%) dropped out. Nationally, approximately 30.4% of all Native American Indian students never finish high school; the next closest minority was Hispanic with a 17.8% dropout rate. While it would be naïve to assume that just implementing a family science program would moderate these figures, the literature does indicate that such an initiative can begin to make a difference. Specifically, when parents are involved, children achieve more, regardless of socioeconomic status, ethnic/racial background, or the parents, education level. There is a direct correlation between parent involvement and student achievement. Some of the benefits of parent involvement include higher grades and test scores, better school attendance, and more consistently completed homework. In programs designed to involve parents in full partnerships, the children who are furthest behind often make the greatest gains. Children exhibit more positive attitudes and motivation toward school and have a more positive self-concept when parents are involved in their education.

The benefits of involving parents in education are not confined solely to the early school years. Significant gains at all ages and grade levels can be achieved when parents share in their children’s education. Junior high and high school students whose parents remain involved make better transitions, maintain the quality of their work, and develop more realistic plans for their future. Children from diverse cultural
backgrounds tend to do better when parents and professionals collaborate to bridge the gap between the culture at home and the learning institution.

**Budget Narrative**

**Staff:** The budget items included here represent faculty release time, consultancies, and overload pay.

- **Co-Principal Investigator - Dr. Brent D. Bowen:** Dr. Bowen will be the local ASA contact for this project. Dr. Bowen is a faculty member at UNO and will provide institutional leadership for this project. Funding for his participation will be from other sources.

- **Co-Principal Investigator - Dr. Henry R. Lehrer:** The Project Leader is a UNO faculty member associated with the Nebraska Space Grant. Dr. Lehrer will have the responsibility for project leadership and curriculum development and management, budget oversight, and scheduling. His award is based on 11% of salary per academic term.

- **UNO Native American Co-Ordinator - Ed Zendajas (Omaha):** Dr. Zendajas will be a coordinator of tribal and culturally related activities. His stipend will be for faculty overload.

- **NICC Consultant - Shelley Avery:** Shelley Avery is a full-time faculty member and science teacher at the Nebraska Indian Community College. She will be the on-site science resource and Santee team leader.

- **Santee Community Schools Consultant - Wanda Henke:** Ms. Henke is an elementary teacher in the Santee Community Schools. She is a full-time member of the faculty and has attended an NASA Ames Summer Teacher workshop specifically focused on NASA curriculum for Native American students.

- **NASA Langley Education Liaison - Dr. Tom Pinelli:** The NASA Langley liaison will provide support services and will act in an advisory capacity for the project. While no stipend will be paid, travel expenses will be part of the following budget.

**Supplies:**

- **Classroom:** The items that will be used for family science projects will include model airplane and kite kits, construction paper, household items that can used for science demonstrations, as well as other small educational supplies such as paper, pencils, and notepads.

- **Family Science Night:** An unusual part of the Family Science Night will be the expense for an evening meal. An integral part of the Native American culture is to enjoy a fellowship meal prior to any family activities so such an expense is critical to program expense.
Travel:

$ **Instate:** Instate travel will be to attend the monthly Family Science Nights are Santee Schools. Since the reservation is several hours drive from Omaha, an overnight stay and per diem will be required. Additional expenses for the Family Science Educational Summit (FSES) will involve mileage and meeting expenses.

$ **Conference:** Attendance at one ASA conference is included for the project leader to present the findings of this project.

$ **NASA Personnel:** One member of the NASA Langley Office will be invited to attend a Family Science night each semester.
# Budget Sheet

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