

Overview of National Science Foundation Math and Science Partnership Grant submitted December 2003 by Diné College. Expected notification date: June 2004.

K'é hólóogo ahídahwül'aah: Community-Math-Science Relationships in Navajo Nation Schools

The College's application for a National Science Foundation Math and Science Partnership Grant has been submitted to NSF with the title, *K'e ólóogo ahídahwül'aah: Community-Math-Science Relationships in Navajo Nation Schools*. If the proposal is accepted, it will fund a five-year working partnership to encourage student performance in science and mathematics in grades K-14. Initially, the focus will be on grades 5-7 and broaden to both lower and upper grades based on benchmarks. The project will be coordinated by principal and co-principal investigators consisting of Diné College faculty and superintendents from Chinle and Window Rock school districts. In addition, teachers, support staff, and community members will be asked to participate in the variety of activities identified in the project.

As lead institution, the Navajo Nation's Diné College seeks a Targeted Partnership Grant through the NSF Math & Science Partnership Program to advance the teaching and learning of math and science in Reservation schools. We will challenge K-14 educators to promote institutional change through a mutually shared and self-directed inquiry. Success will result from a sequence of rigorous evaluations of activities and strategies tested for effectiveness and sustainability. As evidence indicates positive outcomes, activities and strategies will be disseminated to participating schools and the wider educational community via website, person-to-person interactions, and print. By gathering and assessing data disaggregated by race, ethnicity, ability, SES, and English proficiency, we will provide a deeper, more contextualized understanding to inform No Child Left Behind.

Our project will identify, record, and analyze teacher and student math and science content knowledge, cultural relevance, test-taking strategies, and active engagement. Institutional-level indicators will measure the effectiveness of the Partnership, the impact of contributions made by faculty, and the effect of institutional practices and policies generated by this project. The product resulting from this grant will identify a dynamic process for content delivery responsive to cultural and regional needs. The project's core will include five Co-PIs: a faculty member from the Math, Science and Technology department, a faculty member from the Teacher Education department, and the Academic Vice-President as well as two superintendents from the participating districts. This Partnership Leadership team will oversee and advise those involved primarily in on-site interactions with 12 K-12 schools, 7400+ students, 490+ teachers, and 90+ teacher aides. As partners to promote systemic change throughout the K-14 school environment, we will learn from each other best practices for strategies to link culture, mathematics, and science for classroom delivery.

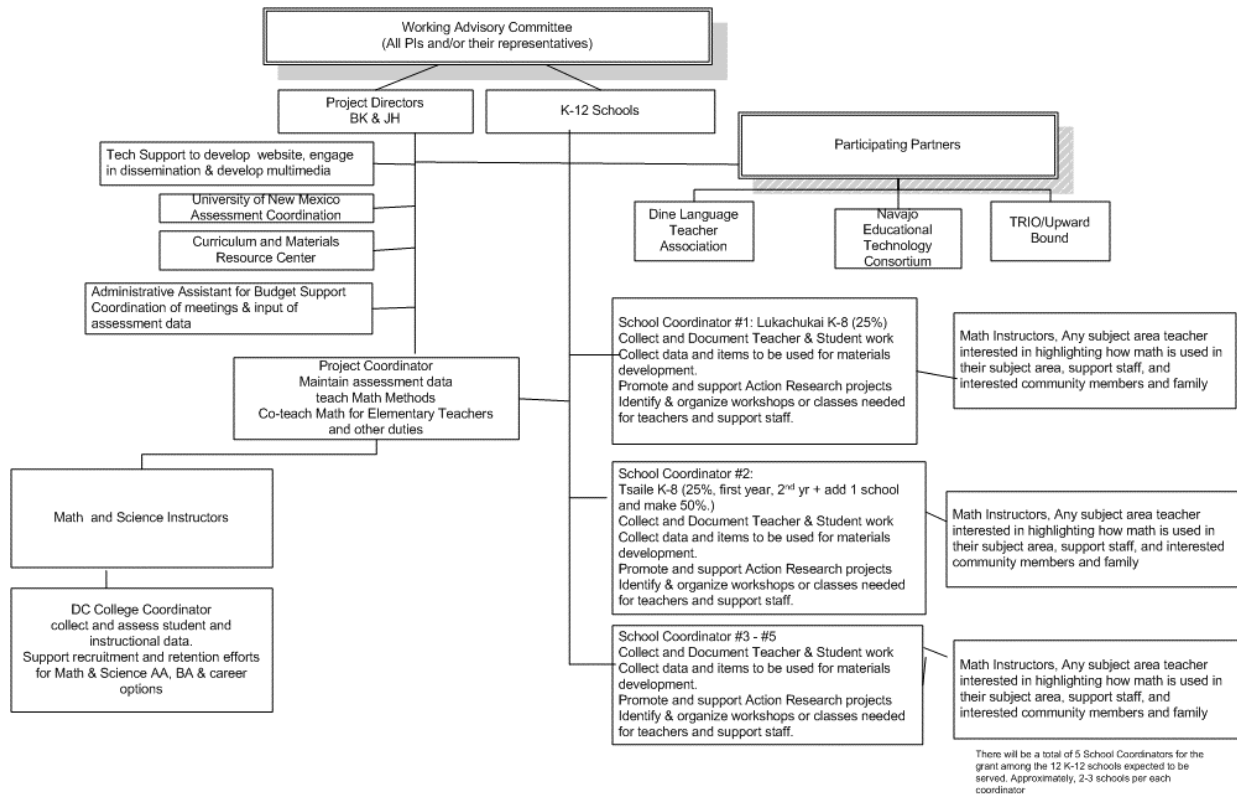
Engaged as participating partners will be: College and tribal-related agencies including Navajo

Educational Technology Consortium, the Diné Language Association, and Upward Bound and TRIO. With our supporting partners we will facilitate the desired change in schools by bridging knowledge, experience, expertise, and materials drawn from the richness of Navajo culture with a heightened explicitness of math and science. Ninety-seven percent of Navajo school children come from families bearing at least four generations of assimilation-oriented, passive learning experience in boarding schools or local schools where Navajo language and culture were, at best discounted and at worst abolished. Even with this history, parents and educators look to today's public and community schools to ensure success for children. Yet the legacy endures. At Tsaile Elementary—one of our targeted schools--50% of the third graders, 47% of the fifth graders, and 83% of the eighth graders scored "Far Below the Standard" on the Arizona Institutional Math and Science Test (AIMS), compared with statewide results of 11%, 14% and 39% respectively. Only through intense, committed efforts of educators informed by parents and community will change occur. As an on-site presence, we will make this happen.

The underlying purpose of this project is to integrate Diné culture and everyday Navajo Nation life in the teaching of math and science. Features of the project will include professor-teacher exchange, teacher-defined workshops, teacher-generated activities, older student mentoring, formal coursework, a materials resource center, a test bank, family day camps, school-wide awareness, annual research conferences, and an annual retreat for all participants in the project.

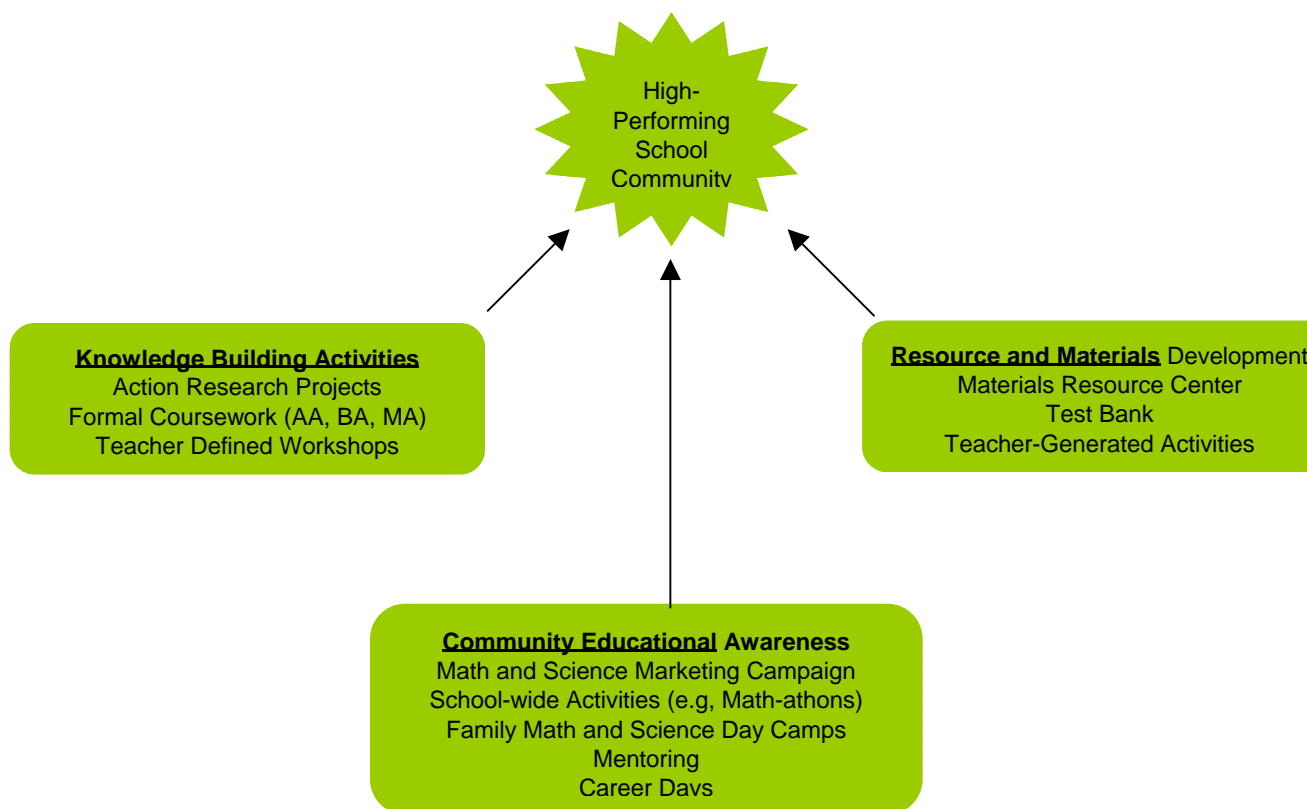
Goals for the Partnership include: I) Increased standardized test scores in math and science; II) Increased student and teacher comfort in using math and science; and III) Increased student and teacher comfort with learners and learning. Project interventions will be organized around a dynamic holistic learning approach and include 1) Action Research Projects; 2) Teacher-defined, on-site workshops offered by Diné College faculty throughout the year; 3) Professor-teacher exchange; 4) Formal coursework at the Associate, Bachelor and Master of Arts levels; 5) College student, K-12 mentoring; 6) Math and Science career days; 7) Socratic seminars; 8) Math-athons and science fairs; 9) Math Marketing; 10) A curriculum center; and 11) A materials development program. Interventions will be undertaken circumspectly under close assessment to comply with carefully defined benchmarks within the framework of a distinctly native world view. At once innovative and traditional they will draw from both the Navajo past and the present, since the modern and the traditional interface in unique ways

The people commitment to the project is provided through a snapshot of the organizational chart:



A model of program delivery follows a conceptual framework. Our proposed partnership program seeks to identify the most viable components for the delivery of instruction in the Native community. Moreover, we will work within a curricular framework defined not only by tribal and community level standards and values, but by national and state standards as well. We seek to invigorate to the whole person as each student articulates solving problems and applying scientific method throughout the formal learning process and beyond--all from an abiding Navajo perspective. By publishing and broadcasting our way of delivering instruction and identifying the context in which it occurs, we will encourage others to consider how they can build their own educational programs with strategies for useful and doable interventions tied to content and local community values and practices.

Conceptual Framework for Delivery



We want to train our own children to self-determine as comfortably outside the Navajo community as within it. We hope to do this by helping them negotiate the demands of a technologically-oriented multicultural society. We will encourage them to consider options for how they will participate in the labor marketplace, and how they can address the needs of their own immediate communities and chapters (local, county-like governmental units governed by elected officials). In other words, we want to provide students with options for how they shape their lives. The starting point in pursuit of that vision lies with the recognition that most Navajo children under-perform at every level; their scores are relatively low in early grades and decline further as schooling advances. To improve overall performance, we realize that we must first specify strengths and shortcomings teachers have and address them. Diné College faculty, staff and administration will work closely with their counterparts in the Navajo Nation's school system.

An identified school-level individual designated as a K-12 coordinator will be responsible for facilitating at least two schools within a particular district. This individual will be responsible for:

Collect and Document Teacher & Student work
 Collect data and items to be used for materials development.
 Coordinate and encourage Action Research projects.
 Facilitate teachers identifying topics and then organizing workshops or classes needed for teachers and support staff.
 Coordinating Math Instructors, as well as any subject area teacher or support staff interested in highlighting how math is used in their area. Encourage involvement of interested community members and family

Proposed K-12 schools directly-related financial support from grant:

Line Item	Year 1	Year 2	Year 3	Year 4	Year 5	Totals
School Coordinator Lukachukai, 25% release time	8,750	8,750	8,750	8,750	8,750	43,750
School Coordinator, Tsaille (25% 1st year, 50% all other years)	8,750	17,500	17,500	17,500	17,500	78,750
School Coordinators, 3@ 50% release time		52,500	52,500	52,500	52,500	210,000
"Test Bank" Contributors, \$2/prompt meeting guidelines	600	1,500	1,800	1,800	1,800	7,500
Action Research Stipends for Teachers, \$500 each	7,500	15,000	20,000	25,000	25,000	92,500
Scholarship: fee remission for teacher or teacher assistants taking DC courses, \$25/cr hr per semester	1,500	2,400	2,400	2,400	2,400	11,100
Scholarship: fee remission for teacher or teacher assistants taking ASU courses, \$200/cr hr per semester	12,000	12,000	12,000	12,000	12,000	60,000
Other-advertising/recruitment: Math-a-thons, Math Fairs, 1/school district/year	6,000	6,000	8,000	8,000	8,000	36,000
Other-awards & gifts for student achievement recognition of "most improved" and "highest achiever", \$200	800	2,000	2,800	3,600	4,400	13,600
Computer equipment: laptops for Coordinators	4,000	6,000				10,000
All-in-one copier, scanner, & FAX for coordinators, \$400	800	1,200				2,000
Computer software for schools, \$2000/ school	4,000	18,000				22,000
Instructional supplies for math supplementals for K-12 teachers, \$3000/school	6,000	27,000				33,000
Personal mileage (.325/mile)	6,500	9,750	13,000	13,000	13,000	55,250
Commercial fare to Conferences, \$600 per flight (3 people/year)	1,800	1,800	1,800	1,800	1,800	9,000
Other travel expenses	3,000	3,000	3,000	3,000	3,000	15,000
Totals	72,000	184,400	143,550	149,350	150,150	699,450

In summary, partnering agencies include respectively, Chinle United and Window Rock Unified School Districts. Diné College, Diné Language Association, Lukachukai Community School, Navajo Educational Technology Consortium, and TRIO and Upward Bound. The Partnership leadership team and disciplinary partners include respectively lead partners include: Dr. William

Kincaid, Dr. Janel Hinrichsen, and Academic Vice-President Maggie Necefer from the College, together with school district representatives Dr. Leon Ben and Dr. Deborah Jackson-Dennison; internal evaluator Dr. Alexis Kaminsky, University of New Mexico School of Medicine; and peer reviewers Dr. Karen Benally, Professor of Anthropology, San Juan College, and Dr. Edward Walsh, Emeritus Professor of Chemistry, Allegheny College.