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SKILL PREP Program for American Indian Students
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ABSTRACT
SKILL PREP ACADEMY PROGRAM
FOR
AMERICAN INDIAN STUDENTS

The Scientific Knowledge for Indian Learning and Leadership (SKILL) precollege college program of the South Dakota School of Mines and Technology (SDSM&T) concluded the 1994 PREP program on July 22, 1994. The program graduated 22 students from the 4-week residential math/science program for American Indian students. These students were selected from South Dakota's nine Indian reservations, and from an applicant pool of over 160 qualified applicants. Fourteen girls and eight boys representing 16 schools ranging from rural reservation minority, to urban non-minority schools completed the curriculum.

The primary academic focus of this program was the physics class (30 hours). Each student was given a bicycle with which they had numerous problem solving experiments to demonstrate physical principals including angular momentum and mechanical advantage. Students graphed their experimental data using various software packages in addition to conducting mathematical calculations and problem solving exercises in their mathematics class (20 hours). All students completed pre- and post tests for each of the academic classes. Preliminary results in math, physics and geology show dramatic increases in student achievement over the 4-week period.

To provide intensive role model/mentor experiences, the program paired every two students with a faculty member or research scientist (18 hours). With the guidance of a role model/mentor, each team completed a research project. At the completion of the projects students presented their research in a science fair completion which was judged by fifteen SDSM&T faculty members.

The SKILL PREP evaluation includes both qualitative and quantitative measures. In assessment interviews conducted by the evaluator with program students, faculty and staff, several threads emerged. From the students' perspective, the experiential physics and related mathematics had a great impact. Students were able to explain to the evaluator specific concepts of Physics as they applied to the bicycle. For many, the program changed their (self-expressed) attitudes towards science; for some it provided exposure to study which is unavailable in their schools. The evaluator also observed a proactive shift over the 4-week period in the peer culture. Students began to work collaboratively on projects and to share resources and ideas.

The students attended several career awareness sessions during the program where they had the opportunity to meet and discuss careers with a wide range of professionals. Some career speakers included:

Dr. Richard Gowen, President of the South Dakota School of Mines and Technology;
 Dr. Ted Gull, Assoc. Chief, Lab. for Astronomy and Solar Physics, NASA Goddard Space Flight Center;
 Dr. Lori Strong, an American Indian Pediatric Physician;
 Dr. Katie Peterson, Director of the NSF SSI for the state of South Dakota;
 Mr. Mark Ward, chemistry and physics instructor from Sinte Gleska University, the tribal college of the Rosebud Sioux Tribe;
 Dr. Frank McLeod, Director/Professor Center for American Indian Studies, Black Hills State University;
 Dr. Philip Bjork, curator of the South Dakota School of Mines Museum of Geology.

Mr. Norbert Hill, Executive Director of the American Indian Science and Engineering Society (AISES) was the guest speaker for the program graduation. Mr. Hill encouraged the students to excel to their highest potential. Mr. Hill provided students with a glimpse of the importance of their math/science achievements with his comment "I wish you well in your journeys, but we are not through. We need you to come back to your communities as doctors and teachers. Remember that."

SKILL SUMMER PREP PROGRAM 1991 - 1994

EVALUATION OUTCOME INDICATORS

I. Objective one:

The following data is derived from the 1994 PREP program participants. The outcome indicators are named with the instrument or method of evaluation used for the analysis.

To increase students math/science skills and interests.

- A. To document a significant increase in mathematic abilities using a pre-post test.

The pre-post test contained questions that focused on general mathematic skills and algebra.

PRE-TEST - CLASS AVERAGE - 43.8%

POST-TEST - CLASS AVERAGE - 76.7%

OVERALL INCREASE IN MATHEMATIC ABILITY - 32.9%-

- B. To document student interest in math/science through student exit interviews and interviews with teachers and counselors.

Student interest and attitude in math and science was documented through pre and post evaluation forms (Dutton and Podell) and daily journals. Teacher/Counselor contact will be made in the early part of 1995.

- C. All students who complete the Academy program will enroll in science and mathematic courses in the fall of 1994.

All students enrolled in science and mathematics courses in the fall of 1994. Teacher/counselor contact in the early part of 1995 will provide types of course work at each of the individual schools.

II. Objective two:

To alert students to the variety of careers that require math and science knowledge.

A. Students will be able to identify five separate science or engineering careers.

Students were questioned upon arrival and upon completion of the program about identification of careers. The results are as follows:

Question: What are five engineering fields?

Response at the beginning of the program

7% of students could name 5 engineering fields.
14% of students could name 4 engineering fields.
0% of students could name 3 engineering fields.
45% of students could name 2 engineering fields.
7% of students could name 1 engineering field.
27% could not name any engineering field.

Response upon completion of program:

23% of students could name 5 engineering fields.
14% of students could name 4 engineering fields.
41% of students could name 3 engineering fields.
14% of students could name 2 engineering fields.
9% of students could name 1 engineering field.

B. Students will be able to identify the specific courses that they will need to register for in the fall of 1994 in order to prepare for any of these careers.

Students were surveyed upon completion of the program on course work is important to become a scientist or engineer.

Question: What courses do you think are important for you to take next year to become a scientist or engineer?

<u>COURSE</u>	<u>RESPONSE</u>
SCIENCE	86%
MATH	59%
ENGINEERING	18%
PHYSICS	14%
GEOLOGY	9%
COMPUTER SCIENCE	5%

- C. Students will be exposed to a variety of science/math careers in the classroom and on-site field experience.

Results: Listed are the activities students attended, the total class hours and the amount of hours each student had in the classroom, lab and in the field.

COURSE	CLASSROOM	LAB	FIELD	TOTAL
MATH	12	8	0	20
GEOLOGY	10	10	16	36
COMMUNICATION (language arts)	12	8	0	20
STUDY SKILLS	17	0	0	17
COMPUTERS	0	12	0	12
ASTRONOMY	0	16	0	16
SCIENCE FAIR	3	18	0	21
PHYSICS	8	15	7	30
STORY TELLING	3	0	0	3
SPORTS	0	0	20	20
FAMILY MATH	0	4	0	4
TOTAL	42	71	23	199

III. Objective three:

To contribute to student confidence in their academic abilities.

- A. Students will be able to name three study skill techniques that they will pursue in the fall of 1994.

Response:

The following study skill techniques are those described by the students which they learned and will use in the future. Study skill techniques are listed in the order of the most mentioned to the least mentioned.

READ, WRITE AND REVIEW
TAKE GOOD NOTES
LISTEN CAREFULLY
COMPLETE REQUIRED WORK
SIT FRONT AND CENTER
USE MEMORY SKILL - ASSOCIATION
REPETITION
STUDY IN A QUIET PLACE
PARTICIPATE IN CLASS
READ BOOKS (more/variety)

- B. They will express an interest in their exit interview in returning to the Academy in the summer of 1995.

Response: All the students that will be eligible to return in the summer of 1995 said they would apply next year. In addition, most of the students expressed a willingness to participate in other SKILL programs offered throughout the coming school year.

- C. Students will be able to identify persons and resources that can assist them with science fair project preparation, study skill development, and allow them to identify one American Indian role model engineer or scientist.

Results: All the faculty and SDSM&T students involved with the SKILL Academy (primarily through small group work in the science fair class) established a personal relationship with each student. Each student was encouraged by the faculty they worked with to keep in touch and to call upon them for assistance that they could offer. This invitation was directed to personal situations these students might need help with as well as academic problems. The addresses and phone numbers of all faculty were made available to each student prior to their departure from the Academy.

To identify an American Indian role model engineer or scientist, students participated in an activity to locate such a person. This activity took the students atop M-Hill. M-Hill contains plaques that have the names of each graduate from each graduating class from the South Dakota School of Mines. While there, students were required to locate those American Indian graduates from the South Dakota School of Mines. Students were encouraged to write these graduates.

IV. Objective four:

To acquaint students with post-secondary education and preparation for careers in science and mathematics.

- A. Twenty-two students will complete a curriculum which will expose them to college faculty, environment, laboratories, equipment, library and computer facilities.

Results: All 22 students that graduated from the Academy completed the above requirements.

Listed below is a break down of each class, the instructor, where they are employed as an educator and the campus facilities used by each class.

LAKOTA STUDIES - Ms. Arlene Swift (Central HS)
Classroom Building - classroom

SCIENCE FAIR -	Dr. Bob Looyenga (SDSM&T) Mr. Dave Ireland (North MS) Chemistry Building - classroom Freshman lab Elect. Eng. Build. - Physics lab McLaury Building - Biology lab Mech. Eng. Build. - Mech. lab Student Union Build. - Ballroom
GEOLOGY -	Mr. Eric Fritzsich (SDSM&T) Classroom Building - classroom SDSM&T Museum of Geology
MATHEMATICS -	Ms. Terry Jacobs (Dakota MS) Classroom Building- classroom
LANGUAGE ARTS -	Ms. Sonja Saunders (Central HS) Classroom Building- classroom
COMPUTERS -	Mr. Phillip Huebner (SDSM&T) Computer Services (SDSM&T) Library computer lab
PHYSICS -	Dr. Jack Weyland (SDSM&T) Mr. Mark Farrand (Central HS) Classroom Building - classroom Graduate Physics lab
FAMILY MATH -	Mr. Art Fisher (Red Cloud HS) Classroom Building - classroom
SPORTS -	Mr. Joe Rice (North MS) New Gym, O'Hara field
RESIDENCE -	Connolly Hall
MEALS -	Surbeck Center (student union)
RECREATION -	Surbeck Center, Rapid City attractions.

- B. Through hands-on experience, students will be more knowledgeable of post-secondary preparation in science and mathematics. (logs, diaries, exit interviews)

Results: All classes were designed so that students would utilize all facilities and equipment available to each class. In addition to hands-on learning, students were required to write. The writing requirements of the classes included declaration and recognition statements, logs, data sheets, trip reports, lab write-ups, a scientific report, poetry, and a news letter pertaining to their experiences at the Academy.

All classes had an overview of what was required to achieve a career in that specific discipline.

SUMMARY

The SKILL Academy program was created to provide a learning experience for American Indian students. The majority of the students involved in the program live on South Dakota Reservations.

The reservations are thinly populated; economically deprived and to a great extent isolated. Because of this type of environment little opportunity is available for students to have access to the resources and facilities of urban area students.

One of the biggest problems facing American Indian youth (on the reservation) is creating and identifying goals. These young people are unaware of the opportunities outside the reservation that will enhance not only their lives but will also enhance life on the reservation by making the reservation a more productive environment. The SKILL Academy program allowed twenty-two American Indian youths the chance to select a goal, a way to achieve it, and have an opportunity to be apart of the higher education system.

The students of the SKILL Academy exceeded the expectations we established for the program. The Academy graduated a class of twenty-two fine young American Indian students. These young people expressed a desire to learn, a willingness to understand and generated enthusiasm in all activities. We believe they will carry this interest and excitement in learning into future endeavors.

Ultimately we believe that a share of these students will fulfill the Academy's long term goal and become scientists and engineers.

STUDENT EVALUATIONS

Students were asked to rate those classes they found to be interesting and of educational value to them. The results are as follows:

CLASSES STUDENTS FOUND INTERESTING AND OF VALUE

Classes are ranked as those receiving the most comments to least.

CLASS

PHYSICS

MATHEMATICS

SCIENCE FAIRS

COMPUTERS

COMMUNICATIONS

GEOLOGY

LAKOTA STUDIES

STUDENT COMMENTS

"I liked Science Fairs because we get to do experiments instead of just sitting in desks and listen to the teacher talk." Stephanie Vance

"I learned more and it was challenging not boring like in regular school." Student unknown

"Having all the different speakers during seminar come and take their own time to talk to kids. I especially loved the Lakota teacher and when Stacy Phelps (American Indian Mechanical Eng. student at SDSMT) talked to us." Lisa Sullivan

"New things that I never learned before really gave me something to look forward to in Geology." Bridgette Mills

"The highlight of the program was Science Fairs, we got to do our own experiments and have a science fair." Alaina Roberts

"We learned alot and had fun at the same time." Richard Turner

"The teachers are nice and they encourage us to do what's right for ourselves." Student unknown