Heritage College

NAG 2-6034

Final Report Summary
Enhancing Science Teacher Training using Water Resources and GLOBE

Submitted to: Adriana Cardinas
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National Aeronautics and Space Administration
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Introduction

Heritage College, located on the Yakama Indian Reservation in south central Washington state, serves a multicultural, underserved, rural population and trains teachers to staff the disadvantaged school districts on and surrounding the reservation. In-service teachers and pre-service teachers in the area show strength in biology but have weak backgrounds in chemistry and mathematics. We are addressing this problem by providing a 2-year core of courses for 3 groups of 25 students (15 pre-service and 10 in-service teachers) using GLOBE to teach integrated physical science and mathematics. At the conclusion of the program, the students will qualify for science certification by Washington State. Water resources is the focal point of the curriculum because it is central to life in our desert area. The lack or excess of water, its uses, quality and distribution is being studied by using GIS, remote sensing and historical records. Students are learning the methodology to incorporate scientific protocols and data into all aspects of their future teaching curriculum.

In addition, in each of the three years of the project, pre-service teachers attended a seminar series during the fall semester with presentations by collaborators from industry, agriculture, education and government agencies. Students used NASA educational materials in the presentations that they gave at the conclusion of the seminar series. All pre- and in-service teachers continue to have support via a local web site for Heritage College GLOBE participants.

Enrollment Data

Our MASTAP project has completed the third 12 months of the 3-year project. The College continues to be a GLOBE Franchise, and 6 faculty members have completed the Train the Trainer program. Two of the Heritage staff gave a presentation at the Annual GLOBE meeting in Blaine, Washington last summer.

During the last year of the project, we completed one GLOBE Teacher Training session for 17 students. We also revised the course on Methods for Teaching Secondary Science, PHSC 354, to include many of the GLOBE protocols. This course now has a greater percentage of class time devoted to hands-on teaching methods. It also includes hands-on practice teaching under the supervision of faculty.

This follows the introduction of a new science education, Ed 403 that is being taught as a practicum for science teachers using the GLOBE curriculum. Both courses continue to be well received by local area schools, by the students who receive additional science training and by the faculty who supervise the students. The Methods for Teaching Secondary Science course was evaluated by a GLOBE assessment team in March. Their assessment is incorporated as Appendix A in this report.

The Heritage College GLOBE web site has continued to be serviced by 4 students, three of whom are Hispanic. The four teacher assistants for the Globe Course are minority individuals. Of the 34 pre-service teacher scholarships awarded, 31 of the NASA

Scholars were minority individuals. For the first time, 3 graduate student fellowships in Science Education were awarded. We closed the web site at the end of the project period in order to revise the chat room software. It should be back on line this fall.

Outcomes

Measurable outcomes for the third year of the proejct are as follows:

1. During the academic year, one additional Teacher Training session for approximately 17 students was held.

2. The Heritage College GLOBE web site to support local teachers has been maintained through the year by students. The site has a chat room, e-mail, a bulletin board and links to other resources.

3. 34 scholarships have been awarded to 31 NASA/TEACHER undergraduate students and 3 graduate education majors during the budget period.

4. The Environmental Seminar series was completed during the fall semester. The series included presentations by scientists, by outstanding teachers, and by the NASA Scholars. The Scholars were encouraged to select a topic that interested them for their presentations and all of them did so. The topics ranged from traditional methods of water conservation and use of plants as food and medicine by Native American Scholars to a presentation on Global warming

5. PHSC 354, Advanced Methods in Teaching Secondary Science, was offered during the spring semester of 2002. This course is offered to education majors and in-service teachers who have received GLOBE training. Students taking this course received more science training to support their implementations of the protocols in GLOBE. Heritage college students were placed in the Yakama Nation Tribal School and the Toppenish High School to practice teach in area secondary schools with high Native American and Hispanic student populations.

12. The Heritage Science Program has been expanded to teach the science courses required for the granting of a Master Degree in Science Education with the Education Program.

Partnerships

The superintendents of all seven of the local school districts agreed to support our MASTAP project. All superintendents, principals and the Washington State Educational Service District 105 publicized our GLOBE workshop. The ESD 105 agreed to give Clock Hour credits to any teachers who wished to have them. The response to our efforts to train science teaching methods to teachers in the classroom has been very favorable. A letter from one area elementary school is attached as Appendix B.

Individuals from the following organizations have committed the time of one of their staff to give a presentation for the fall science seminar series: U.S. Department of Agriculture, Washington State Department of Agriculture, U.S. Department of Energy, Washington Department of Ecology, Yakama Indian Nation Natural Resources Division, Battelle Northwest National Laboratory, Tree Top Corporation, Yakima County Development Association, one grade school teacher, one middle school science teacher and one high school science teacher.

Overall Progress During the Three years of the Project

1. Six faculty members have been trained as GLOBE trainers.

2. Seven faculty and staff members have been trained as GLOBE teachers in order to give the department members a clearer concept of the GLOBE program objectives and protocols.

3. During 3 years of the project, 99 students were enrolled and completed GLOBE Teacher Training workshops.

4. 105 scholarships have been awarded to NASA/TEACHER undergraduate students. Of these 79 were awarded to underrepresented minorities. The remaining scholarships were awarded to teachers and tutors who work at hard to staff minority schools in the area.

5. The Heritage College GLOBE web site to support local teachers has been constructed. The site has a chat room, e-mail, a bulletin board and links to other resources. It was designed and is being serviced by students.

6. Environmental Seminar series was completed each of three fall semesters. The series included presentations by scientists, by outstanding teachers, and by the NASA Scholars. The Scholars were encouraged to select a topic that interested them for their presentations and all of them did so. The topics ranged from traditional methods of water conservation to use of plants as food and medicine by Native American Scholars and Hispanics, to the Schematic Presentation in PowerPoint of a municipal water system. Fish recovery and habitat preservation and establishment were also discussed. Global warming and the potential effects that it could have on changes in rain and snow patterns in the local Shrub Steppe ecosystem were also discussed. The

Globe Workshop is very popular in Eastern Washington. By the request of pre-service students and members of the faculty of the education program at Heritage, the third Globe Workshop will be offered during the spring semester of 2000.

7. Two Globe workshops were presented at area schools. Both schools have a high percentage of Hispanics in the student population. These workshops were structured to be 40-hour course that can be taken for undergraduate credit or for clock hours.

8. A forty-hour graduate level environmental science course was developed and offered to graduate students who have taken the Globe Workshop.

9. Ed 403, Advanced Methods in Science Education, was offered during the spring semester of 2000. This is a course requested by a number of the students who completed the GLOBE workshop to receive more science training to support their implementations of the protocols. . In this course, emphasis was placed on teaching the students in the Tribal School and in the Heritage High School Equivalency Program Alliance to use computers and the fundamentals of GIS. The Native American and Hispanic students in turn acted as student assistants to Globe teachers in their classes.

10. The Heritage program in Science has been expanded to teach the science courses required for the granting of a Master Degree in Science Education with the Education Program.

11. The original plan was to incorporate GLOBE into 4 classes. We decided to totally revise two courses such that the entire set of protocols and many of the activities can be included into EnSc 101, Introduction to Environmental Science. Physical Science 101 has been totally revised with new laboratory studies and equipment. These two courses will fulfill the new Washington State requirements for teachers in Elementary Schools. We are using portions of the protocols in the 2 existing classes: PhSc 354 Secondary Science Teaching Methods and Math 354 Secondary Mathematics Teaching Methods.

12. The Heritage program in Science has been expanded to teach the science courses required for the granting of a Master Degree in Science Education with the Education Program.

Overall Project Enrollment Data

The table below summarizes the enrollment data for the entire duration of the project.

Number of Participants											
Black, not of Hispanic origin		Hispanic		American Indian or Alaskan Native		Asian or Pacific Islander		White, not of Hispanic origin		Total	
M	F	M	F	M	F	M	F	M	F	M	F
	1	10	31	5	15	1	1	13	29	29	77

Number of Pre-Service Participants											
Black, not of Hispanic origin		Hispanic		American Indian or Alaskan Native		Asian or Pacific Islander		White, not of Hispanic origin		Total	
M	F	M	F	M	F	M	F	M	F	M	F
		3	19	4	8		1	5	14	12	42

Number of Participants Graduating with a Baccalaureate Degree											
Black, not of Hispanic origin		Hispanic		American Indian or Alaskan Native		Asian or Pacific Islander		White, not of Hispanic origin		Total	
M	F	M	F	M	F	M	F	M	F	M	F
		2	8	1	7		1	5	11	8	27

Number of Undergraduate Participants Achieving Certification											
Black, not of Hispanic origin		Hispanic		American Indian or Alaskan Native		Asian or Pacific Islander		White, not of Hispanic origin		Total	
M	F	M	F	M	F	M	F	M	F	M	F
		1	1		2		1	2	8	3	12

Number of Participants Awarded an Endorsement											
Black, not of Hispanic origin		Hispanic		American Indian or Alaskan Native		Asian or Pacific Islander		White, not of Hispanic origin		Total	
M	F	M	F	M	F	M	F	M	F	M	F
								2	3	2	3

Number of Participating In-service Teachers											
Black, not of Hispanic origin		Hispanic		American Indian or Alaskan Native		Asian or Pacific Islander		White, not of Hispanic origin		Total	
M	F	M	F	M	F	M	F	M	F	M	F
		1	3					7	18	7	11

Number of Participating In-service Teachers Employed in Hard to Staff Schools											
Black, not of Hispanic origin		Hispanic		American Indian or Alaskan Native		Asian or Pacific Islander		White, not of Hispanic origin		Total	
M	F	M	F	M	F	M	F	M	F	M	F
		1	3						18	7	8

Number of Participating Para-pros Supporting Hard to Staff Schools											
Black, not of Hispanic origin		Hispanic		American Indian or Alaskan Native		Asian or Pacific Islander		White, not of Hispanic origin		Total	
M	F	M	F	M	F	M	F	M	F	M	F
			2		4		1		2	0	9

Number of Participating Tutors Supporting Hard to Staff Schools											
Black, not of Hispanic origin		Hispanic		American Indian or Alaskan Native		Asian or Pacific Islander		White, not of Hispanic origin		Total	
M	F	M	F	M	F	M	F	M	F	M	F
					2		1	3	2	3	5

Number of Participating Graduate Students											
Black, not of Hispanic origin		Hispanic		American Indian or Alaskan Native		Asian or Pacific Islander		White, not of Hispanic origin		Total	
M	F	M	F	M	F	M	F	M	F	M	F
		1	2		2				3	2	5

Number of Participating Graduate Students Completing a Masters Degree											
Black, not of Hispanic origin		Hispanic		American Indian or Alaskan Native		Asian or Pacific Islander		White, not of Hispanic origin		Total	
M	F	M	F	M	F	M	F	M	F	M	F
		1	2		2				3	2	5
Number of Graduate Student Participants Employed at hard to Staff Schools											
Black, not of Hispanic origin		Hispanic		American Indian or Alaskan Native		Asian or Pacific Islander		White, not of Hispanic origin		Total	
M	F	M	F	M	F	M	F	M	F	M	F
		1	2		2				3	2	5

Dissemination of Project Results

Project results were disseminated in three ways. First Heritage education majors participating in the program presented the results of their work at the Society for the Advancement of Chicano and Native American Scientists national meeting in 1999 and at the GLOBE conference meeting in 2000. WE also gave presentations at the MASTAP peer review meeting in 2001.

Secondly we shared on results on Web pages. Throughout the project we maintained a web GLOBE web page at Heritage College. We also contributed material as a GLOBE STAR school in 2001. Our results were highlighted on NASA's GOLBE web page in that year.

Finally we gave numerous presentations to colleges and high schools in the region. These include presentations at Highline Community College in the Seattle area. Presentations at WSU and the University of Washington GEARUP meetings for Central Washington middle and high schools.

Appendix A: Stanford Research Institute Evaluation

May 30, 2002

GLOBE Project Evaluation – Year 7
Site Visit Report Summary

School: Heritage College/Toppenish Tribal School

Location: Toppenish, Washington

Date of Visit: Wednesday, April 17, 2002

Main Contact: Pat Falco

Meeting Location: Heritage College Main Auditorium, meeting room.

Site visitors: Yuki Toyama, SRI
Tom Hinojosa, SRI

Teacher: Pat Falco, Heritage College

Others interviewed:
Nan Little, Director of Sciences and Tribes Educational Partnership (STEP) Program
Tina Allen, Master's student at Heritage, an assistant to Pat Falco
Irma Lange, Master's student at Heritage, an assistant to Pat Falco
Lewis Malatare, Yakama tribal elder involved in STEP program
Ray Agure, student at Heritage
Jim Falco, Heritage College (retired)

Two students at Toppenish High School who participated in after school program.

Toppenish is a rural town, located 170 miles southeast of Seattle. The town's traditional main industry is (has been) agriculture. Its main crops include apples, pears, peaches, apricots, and cherries. It is a motherland for theeYakama Tribe of Native American Indians. In the last 5-10 years, there has been a growing interest and movement amongst the young adults population to seek out higher education opportunities in order to better understand and address some of their social/economic concerns. One of the major movements has been an increased interest in teacher preparation by locals who intend to return to their local communities and schools to improve student achievement, opportunity, and overall academic experience. The hope is that through better education, the community will be better able to address their own needs.

Heritage College is currently collaborating with the University of Washington to provide a program to enhance the science knowledge and understanding of their local students and teachers. The pre-service course taught at Heritage College by Pat Falco (Phy. Sci. 354--Methods in Secondary Science) works collaboratively with the "Sciences and Tribes Educational Partnership" **(STEP)** Program, administered through University of Washington. The STEP program is directed by Nan Little.

This science education program chose to incorporate learning materials and data collection protocols from the Global Learning and Observations to Benefit the Environment (GLOBE) Program as part of a grant proposal initiated four years ago.
In their proposal they proposed to create of a course of study that would increase the science content of pre- and in-service teachers and also help to enrich the program of science study for local (high school) students. It was not stipulated that they had to use GLOBE, but after several Heritage staff looked over the GLOBE materials, they all decided that it would strengthen their proposal if they incorporated a "modified" GLOBE component in their proposed program. The program which results today, is a wonderful example of how hands-on environmental data collection protocols can be used to enhance student (& teacher) understanding

of science content, improve understanding of the nature of science, and increase student interest and enjoyment of science learning.

The program staff feel strongly that the GLOBE materials are a good way to teach science concepts to students of all ages. As such, GLOBE is used as an introduction to teach scientific concepts for both student teachers and students in the classroom. The Heritage College/STEP program appears to be a model of adaptation of an international program to serve the needs of the local community. In this case, the hope is that this strategy will build local educational capacity and have a greater long term impact. Asked about the grade level which benefits the most from GLOBE, one participant said, "because of its hands-on nature, teachers (and students) find GLOBE easy to use and make science enjoyable for their students. It reduces teachers' fear towards science and makes it fun to do in the classroom." Our observations indicate that the program serves to address a vital educational need for the community and makes exemplary use of a freely available educational resource.

STUDENT COMMENTS:

Reasons why they have been participating in the after school program:

"Because I like science and would like to become a science teacher. I want to know more about different fields of science."

"Because I like science and I like to study it more at college. Participating in this club is good because you get to know people from colleges."

Compared to regular science classes:

"It's fun because you actually go out in the field and learn about the nature. Data collection out in the field was really fun."

"Again, it's really cool because you get to know people from colleges. This is particularly so at the Summer Camp."

Whether or not to recommend the program to other students:

"Yeah, definitely. It's fun and people would enjoy. I'd recommend to 9th or 10th grade students so that they can continue participating in long term."

"I'd also recommend it to others. I myself am thinking about continue participating in the program."

Appendix B: Example Support Letter

SAINT PAUL CATHEDRAL SCHOOL

March 23, 2001

James W. Falco, PhD PE
Dean of Arts & Sciences
Heritage College
3240 Fort Road
Toppenish, WA 98948

Dear Doctor Falco,

St. Paul Cathedral School has benefited in so many different ways from the Grant you received. It has provided us with the GLOBE Program as well as many science materials we would not have had available to us. Our funding for science material has been this year and will be extremely limited next.

It is my belief that in our society today, schools must excel in the total education of the children it serves. I also believe that we must prepare these students to take their place as leaders in society and for that to happen, students must not only be solidly grounded in the 3-R's but must also be skilled in science and technology. The Globe program has started to change our way of looking at education, teaching and planning. Where we had one teacher involved in the program, now we have another four or five willing to step out, become trained and change their method of teaching science next year. This is a first for our school and as an Administrator; it is exciting to see the teachers willing to try new things and change.

In February, the Catholic Diocese of Yakima received a Gates Grant for excellence in Education. I know that our involvement with the GLOBE Program and Heritage College helped us obtain that grant. I also know that the Gates Foundation will be watching us expand that program as it helps us further our teaching in the Earl's using technology.

I want to thank you for your work in providing the program, scientists and the materials needed to implement this in the fourth grade. I am praying that you will be able to continue to help us find the materials needed to expand the program next fall. I also want you to know that if I can personally be of any assistance to you, I would be most happy to do so.

Please feel free to call me anytime. And again, I thank you for your continued support to the students, staff and children at St. Paul Cathedral School.

Sincerely in Christ,

Tonia L. Wanecek, CSJP
Principal

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