

FINAL REPORT

North Carolina Leadership Network for Earth Science Teachers ESI-9355614

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Participants: Who has been involved?

What people have worked on the project?

PI and Instructor: Geoffrey Feiss, currently at William and Mary University
PI: Russell Rowlett, University of North Carolina at Chapel Hill (UNC CH)
PI: Paul B. Hounshell, (UNC CH)
PD: Cynthia F. Copolo, (UNC CH)
Curriculum Coordinator: Nancy West, currently residing in Williamsburg, VA
Professional Writer: Mary Russell Robinson, Durham, NC
Graduate Student: Cyndi Loudon, currently residing in Texas

Instructor: Suellen Cabe, UNC Pembroke,
Instructor: C.Q. Brown, East Carolina University
Instructor: Andy Bobyarchick, UNC Charlotte
Instructor: Jack Callahan, Appalachian State University
Instructor: Virginia Peterson, Western Carolina University

Master Teachers:

Robert Larrick, Smithfield-Selma High School
Sue Deal, Franklin High School
Florence Gullickson, Southwest Guilford High School
Linda Eller, Wilkes Central High School
Robert Byrd, Scotland High School
Carolyn Elliott, South Iredell High School

Teacher Assistants:

Patrick Abele, UNC Pembroke University
Dee Nistl, Forsyth County Schools
Jeff Frey, Croatan High School
Stephanie Kozel, East Carolina University
Glenn Beck, East Carolina University
Florence Gullickson, Southwest Guilford High School

Technical Team:

Charles Brown, East Carolina University
Bob Butler (deceased), UNC Chapel Hill
Suellen Cabe, UNC Pembroke
Vickie Furlough, Creswell High School
Rod Gonski, National Weather Service
Tom Hocking, UNC Morehead Planetarium
Robert Larrick, Smithfield-Selma High School
Dee Nistl, High Point High School
Richard Spruill, East Carolina University
William Ussler, UNC Chapel Hill
Rob Young, Western Carolina University

What other organizations have been involved as partners?

Ben Meadows Company
Carolina Section of the Society for Mining, Metallurgy and Exploration
National Forest Service
NC Aggregates Association
NC Discovery Place
NC Department of Public Instruction
NC Emergency Management
NC Geological Survey
NC Teacher Academy
NC Mining Commission
NC State Parks Dpt.
NC Zoological Park
NC Chapter of the National Association for Geoscience Teachers
National Weather Service
Potash Corporation of Saskatchewan
Rock and Mineral Clubs
Soil and Water Conservation Agency
UNC Geology Department
UNC Curriculum for Marine Sciences
UNC Morehead Planetarium
Vulcan Materials, Inc.

Have you had other collaborators or contacts?

Participating Centers of the UNC Mathematics and Science Education Network:

East Carolina University
Fayetteville State University
UNC Chapel Hill
UNC Charlotte
Appalachian State University
Western Carolina University

Activities and Findings: What have you done? What have you learned?

What were your major research and education activities?

- 1994 Advisory Board Meeting
- 1995 Instructors' Planning Meeting
Spring Kick-off Meetings
3-week summer institute at UNC Pembroke
3-week summer institute at East Carolina University
Advisory Board Meeting
Academic Year Follow-up workshops
Spring Kick-off Meetings
Follow-up meeting at NCSTA Conference
- 1996 Advisory Board Meeting
3-week summer institute at UNC Chapel Hill
3-week summer institute at UNC Charlotte
Coastal follow-up for Coastal Plain participants
Academic Year Follow-up workshops
Follow-up meeting at NCSTA Conference
Spring Kick-off Meetings
- 1997 Advisory Board Meeting
3-week summer institute at Appalachian State University
3-week summer institute at Western Carolina University
"Earth Through Time" workshop at UNC Charlotte
"How to Organize and Plan a Workshop"
Coastal follow-up for Piedmont Region participants
Academic Year Follow-up workshops
National GSA/NAGT Conference
Follow-up meeting at NCSTA Conference
NCSTA Conference Presentations by Teachers
International Geoscience Education Conference
State NAGT Spring Field Trip Workshop
Spring Fossil Workshops, funded by the NC Mining Commission
ESLICE (Engaging Students by Linking Investigations to Current
Events) Workshop
ESSTEP (Earth Space Science Technology Education Project)
GLOBE workshop
- 1998 Advisory Board Meeting
Coastal follow-up for Mountain Region participants
Follow-up meeting at NCSTA Conference
State NAGT Spring Field Trip Workshop
NSTA Convention Presentations
Planning meetings for the 1999 "Changes Over Time" workshop

- 1999 Advisory Board Meeting
 Collaborative summer workshop)”Changes Over Time” with NC
 Teacher Academy
 GLOBE Instructors Workshop
 Academic Year Follow-up workshops, 4 fall workshops
 NCSTA Conference Presentations by Teachers
 Planning Meetings for “Changes Over Time”
 NSTA Convention Presentations
 State NAGT Spring Field Trip Workshop
- 2000
- Two spring Academic Year Follow-up workshops
 Collaborative workshop with NC Teacher Academy, “Changes
 Over Time”
 Adult Learning Workshop for Teacher Mentors

What were your major findings from these activities?

This program reached directly over 335 teachers through these professional development programs and reached indirectly over 1600 teachers through teacher-instructed programs. We also built a network of scientists and professional earth science educators as a result of the project.

We found the inquiry approach to instruction is difficult for university instructors (and some teachers) to grasp, even though training was provided. Future projects might consider using the teacher as a primary provider for instruction if the chosen pedagogy for the program is inquiry-based instruction.

However, the program was successful with its emphasis on field-based instruction encouraging teachers to use their own campus for investigations. We developed a model for this type of instruction using a “seed question” when introducing the instructional unit. By using a seed question, the teacher is able to focus instruction, begin the process of student engagement and allow student-led questions to foster deeper investigations for learning. We called the student-led questions “daughter questions” borrowing the term from genetics to refer to subsequent generations of questions that spring from the seed question.

What opportunities for training and development has the project helped provide?

In addition to the professional development training listed above, this program has developed a network of teacher leaders (mentors) who are highly capable of providing training to other teachers across the state. A workshop titled “How To Organize and Plan a Workshop” was provided in 1997 to assist these teachers with offering professional development to school systems in their areas. In fact, using curriculum materials

developed by this project, participating teachers have already done so by offering training in their local school systems, in their region, at the NCSTA conferences and through organizations such as the Mathematics and Science Education Centers, the NC Teacher Academy, the NC Zoological Park, the NC Environmental Education Association, Sci-Link, Regional Education Coalitions, and Earth-View (NSF funded project). Several served as instructors and/or participants in projects such as the SOLAR program (Dwight D. Eisenhower funded project), ESSTEP (GSA project) and the GLOBE program.

What outreach activities have you undertaken?

The project staff has also visited participating school and assisted teachers with field instruction when needed, helped to install wells or weather stations, or helped to pave the way for better understanding of the purposes of fieldwork with school administrators.

Presentations have been made by the project staff and by teacher leaders at state science conferences and national conferences such as the NSTA Conference and GSA Conferences.

Nancy West and Cynthia Copolo have both served as state coordinators of NAGT. Katherine Cummings, an active participant of the project, has also served as a state coordinator of NAGT.

3. Products: What has the project produced?

What have you published as a result of this work?

“Taking Earth Science Outdoors in North Carolina”, published by Morton Publishing Company (Student edition and Teacher Edition)
Copolo, C. 1999. “North Carolina Leadership Network for Earth Science Teachers.” Raleigh, NC: The Journal.

What Web sites reflect this project?

Some of these sites no longer include NCL NEST since this project has ended.
LEARN NC
NC Geological Survey
MSEN Center websites
IMSEnet

What other specific products have you developed?

This project has developed inexpensive field equipment such as magnetometer, water sampler, and pvc-made telescopes.

4. Contributions: How has the project contributed:

to the development of the principal discipline of the project?

- Contributions to earth science education:

- This project has provided professional development training directly to over 335 teachers across the state to be better prepared to teach an earth science course.
- The staff of this project was instrumental in securing the earth science as a new high school graduation requirement
- This program built a network of teacher leaders across the state to continue to provide professional development for their colleagues. These teachers have taught over 1600 colleagues through workshops, conference sessions, and field trips.
- The staff of this project has written a field manual for students and teachers in earth science, published by Morton Publishers, Inc.
- The teacher participants of this project have been active with the state revised science curriculum development initiative (currently underway through the Department of Public Instruction).

- Contributions to other disciplines of science:

Several of the teachers in this program are active GLOBE members. Through this program, their students can provide data in areas of atmosphere, hydrology, soils, and land cover. Some schools such as Lincoln High School serve as field sites to pilot test future protocols for the GLOBE program. The earth science teacher of this school is an active NCL NEST member and leader of innovative astronomy programs in her area as well.

Many schools actively investigate the water quality of their school's area and are active with issues surrounding it. This becomes a valuable contribution to organizations such as the Soil and Water Conservation Agency. Other schools have initiated research programs that involve organizations such as the NC Forestry Division, the National Weather Service, the Geological Survey of America and local university geology, marine (hydrology) and astronomy departments

- To the development of Human Resources?

We have provided trained, knowledgeable teachers capable of leading field investigations with their earth science students. This training helps meet the critical need of trained earth science teachers who can offer the required courses in earth science needed for high school graduation. This state will be better equipped to provide professional development for earth science teachers through these trained mentors as a result of this program; however, the need is very great considering the shortage of certified earth science teachers across the state.

- To physical, institutional and information resources?

This program helped to bridge the gap between science research and education. Teachers who became active in this program are enthusiastic about learning the latest in research in the earth science disciplines. Several have pursued advanced courses and are also partnering with university researchers to pursue areas of interest.

- To public welfare beyond science and engineering?

By providing knowledgeable teachers in the earth science and by relating this knowledge to the environmental needs and issues of the state, education can have a greater impact on the population. By reaching students and educating them about the earth, its resources, conservation practices and natural disaster issues, this state will be better equipped to deal with environmental concerns that affect the well being of every citizen.