



University of New Mexico

Institute for Social Research

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Dan Cathey, MPA

Preliminary Findings

Academic Year 2006-2007

- * Seven teachers and UNM graduate students are involved in the Project
- * E-MRGE Fellows had contact with approximately 750 students in classes during the Fall 2006 semester.
- * Between October 3, 2006 and December 14, 2006 the ISR staff observed a total of 41 classroom sessions, 20 in Socorro and 21 in Belen.
- * ISR Observers rated the teachers and fellows high for encouraging the students, incorporating inquiry-based learning techniques in the class activities, and allowing the students to discover science.
- * ISR suggests the Fellows produce Work Logs and attend Bi-weekly Seminar meetings led by the Principal Investigators.

Report in Brief:

GK-12 E-MRGE: Ecohydrogeology in the Middle Rio Grande Environment

Overview of the E-MRGE Project

The scientific performance level of children in U.S. public schools begins to decline in middle school. This is particularly true in New Mexico where both 4th and 8th grade science performance scores are some of the lowest in the nation. The E-MRGE Fellows work directly with teachers and middle school students to enhance their school science learning experience and collaborate with the University of New Mexico.

Program Description

The University of New Mexico partnered with the Socorro and Belen School Districts, to conduct a three-year GK-12 program exploring Ecohydrogeology in the Middle Rio Grande Environment. The resulting E-MRGE Program is designed to address the goals of the National Science Foundation's GK-12 initiative.

Graduate students from the University of New Mexico (UNM) Biology and Earth Science Departments are employed by E-MRGE to work as Fellows in the program. E-MRGE Fellows work in partnership with

middle school teachers in two rural New Mexico communities, Belen and Socorro. Fellows start the year by assisting teachers in the classroom. Fellows are expected to develop and present inquiry-based science projects for the middle school students. The program is designed to have Fellows rotate between school systems and the Sevilleta National Wildlife Refuge Outreach Program. The program calls for the Fellows and faculty from the biology and earth science departments to develop and support field trip activities for the teachers to learn about the Sevilleta Ecological Research Program. Teaching, field trips, and projects

E-MRGE Goals

1. Develop collaborations that will improve the teaching and outreach skills of the Fellows, and the content knowledge and its application for Teachers.
2. Enable graduate teaching Fellows to better understand the educational opportunities and practices of public schools.
3. Strengthen existing partnerships and create new ones among the UNM and rural school districts.
4. Provide context for collaborations among Teachers, students, and Fellows so everyone better understands and contributes to interdisciplinary scientific study, as well as teaching and learning about eco and water resources, and regionally relevant topics.
5. Actively involve teachers and students in relevant inquiry to investigate interdisciplinary ecohydro questions in the Middle Rio Grande Region using the processes, skills and tools of science, technology, engineering and mathematics.
6. Familiarize teachers and students with the literature, media, technology, and local community resources that will increase their STEM knowledge and their ability to access further knowledge.

Workshop Summary

- In August 2006, 6 teachers and 7 fellows from the E-MRGE program, as well as 4 ISR evaluators attended a two-day workshop conducted by the E-MRGE Principal Investigators at the Sevilleta Education and Research Facility near Socorro, New Mexico.
- Charlene D'Avanzo, Dean, School of Natural Science, Hampshire College, completed an evaluation of the workshop.
- D'Avanzo found that in general fellows and teachers were very positive in their responses about the workshop. They complimented the workshop leaders on their preparation and helpfulness.
- 77% of the participants strongly agreed that the workshop location was ideal.
- D'Avanzo points out that it will be important for the presenters to more clearly describe and decide on expectations and goals before they present the next workshop.
- Ironically, several participants suggested more hand-on activities were needed in the workshop. This finding is reminiscent of a goal required by the National Science Foundation's GK-12 Program for more inquiry-based techniques in the classroom.

should be designed to help teachers meet New Mexico science standards. Teachers can receive support and university credit through summer courses offered by UNM's Summer Teachers Institute. In addition to teacher focused activities, each year middle school students will present results of research projects during an Earth (Science) Day Colloquium held at UNM.

Preliminary Facts for School Year 2006-2007 Activities

- Seven UNM graduate students are employed as Fellows. Four Fellows work in the Belen Middle School and 3 work at the Sarracino Middle School in Socorro, New Mexico.
- Seven teachers are involved in the Project, 4 in Belen and 3 in Socorro.
- Fellows are typically assigned to work with a specific Teacher.
- E-MRGE focuses on 7th and 8th grade students.
- PI's conducted a two-day Workshop at the Sevilleta Education and Research Facility located 20 miles north of Socorro, New Mexico (see Workshop Summary sidebar).
- E-MRGE Fellows had contact with approximately 750 students in classes during the Fall 2006 semester.
- Between October 3, 2006 and December 14, 2006 ISR staff observed a total of 41 classroom sessions, 20 in Socorro and 21 in Belen. ISR staff also attended several program and administrative meetings during the first semester of the project.

2006 Fall Semester Preliminary Findings

Quantitative

ISR staff observations contain quantitative elements as well as qualitative information. While observing the classroom, ISR staff complete an

Observer Scale Statements

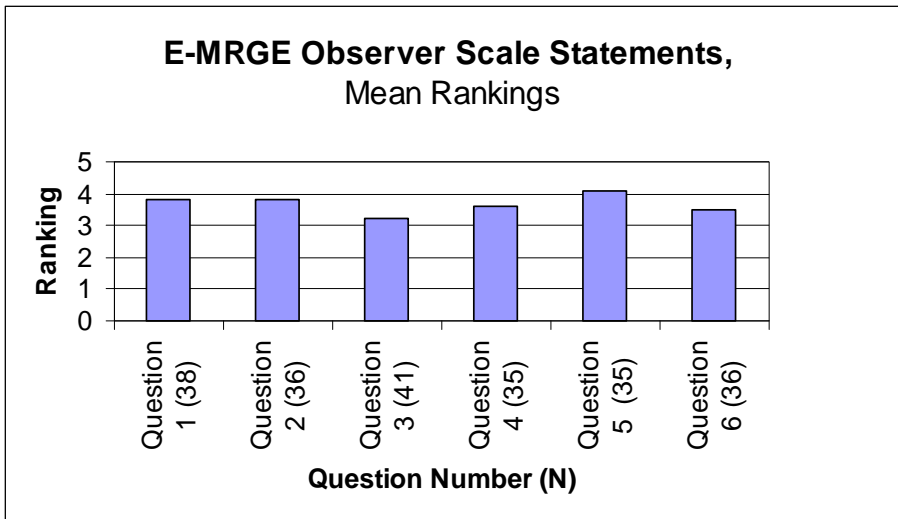
1. The Teacher encourages the Students; uses hands-on interactive activities; uses science terminology; and asks probing questions.
2. Students are allowed to discover on their own with Teacher guidance; work in groups.
3. Students appear to be interested; learning scientific method.
4. Teacher and Fellow plan together before class.
5. Fellow demonstrates confidence, expertise, and communication skills.
6. Teacher's instructional content benefits from the Fellow's contribution.

“Observer Scale” form. The Scale contains six statements that relate to the goals of the Program. Observers view the class session, focusing on behaviors they think exemplify the six statements on the Scale. The rank what they observe on a scale of 1 to 6 with 1 suggesting the behavior is not observed and 5 indicating that the behavior is displayed to a “great extent.” A ranking of 6 means the statement was not applicable.

ISR observers rated teachers and fellows high with a mean score of 3.8 for encouraging the students; incorporating inquiry-based learning techniques in the class activities; and allowing the students to discover science. Fellows were also rated high for abilities in the classroom (mean of 4.1). Teachers and fellows appear to be planning together before the class — observers rated a mean score of 3.6 for this item — and teachers seem to be benefiting from the fellow's contribution (mean of 3.5). Students appear only moderately interested in the class activities (mean of 3.2).

Qualitative

During observation sessions, ISR staff record comments and summarize their observations. Provided below is a sample of comments from the observers analytical notes.



Sample of some of the more positive comments:

“The Fellow introduced scientific techniques and process to the Teacher and Students by: finding the bacteria experiment protocol on the Internet, organizing the experiment, buying the supplies, and leading the experiment.”

“The Teacher wants to repeat this experiment next year if it is successful. The Students appear to be very interested in the experiment.”

“It is obvious that the Teacher and the Fellow work closely together throughout every aspect of the class.”

“. . . the students seemed excited about their projects.”

“The Teacher and Fellow repeat a previously successful activity.”

“Fellow did a nice job of tying the lab activity to his presentation. The Fellow rarely supplies answers too quickly, giving the Students a chance to think.”

“The Students were very interested in the lab and the Fellow’s presentation.”

“The Teacher consistently follows up questions to students with more questions... She seems to have

mastered the inquiry-based style of teaching.”

Sample of less positive comments:

“The Teacher lectures from a book. As the Fellow joins in the activity the Students become more engaged in the discussion.”

“Fellow not in attendance, so the Teacher lectured from the book.”

“The Teacher and Fellow obviously have worked separately the entire semester.”

The ISR Observer’s comments relate to the information found in the Observer Scale data. Fellows and teachers are attempting to teach using inquiry-based learning techniques; students are interested in lab activities; planning is very beneficial to the success of the labs; student participation goes down when the fellows are absent.

At this point in our analysis of the E-MRGE Program it is difficult to summarize the observer’s notes. The observations offer a range of information but formally we are looking for behaviors and activities that match with the six goals of the E-MRGE Program.

Suggestions

Obviously, the more information that exists about the Program the more can be learned about how the Program works and what needs to be improved. The observations and informal interviews are a start and the surveys will improve our ability to measure the success of the program. Still several bits of information are missing. Our suggestions include two immediate changes to the Program.

1. **Work logs** – The Fellows should be required to give the PI’s and ISR a weekly work log of their activities. The work log should include the frequency and amount of time spent on six specific activities: working in the classroom; personal planning; planning with a teacher; special events; administrative tasks, and miscellaneous tasks. This information will give the PI’s a management tool and provide ISR staff with data to compare to the surveys and observation scales.

2. **Bi-weekly Seminar** – The Program would benefit from a routine opportunity for the Fellows to meet to compare notes and reflect on their experiences. A meeting of this nature would need to be organized by the PI’s or similar persons. The UNM/APS GK-12 Optic and Photonics Education Program has benefited by having an Albuquerque Public School employee lead a bi-weekly meeting. The APS employee is an experienced middle-school teacher and is very aware of the challenges of teaching in the public school system.

Future Activities

- ISR will continue to observe the Fellows until the end of the 2007 Spring Semester.
- ISR will obtain academic records, academic progress, and application information on the Fellows to

Evaluation Methodology

ISR is drawing on multiple information sources and perspectives. The ISR staff is implementing a variety of data collection methods (quantitative and qualitative) for use in short and long-term assessments. Additionally, the staff developed a specific observation instrument, a scaled questionnaire, methods for observing, and informal protocols for use in conducting observations in the classroom. The evaluation team will make an effort to triangulate research methods because, a project as dynamic as E-MRGE cannot rely just on quantitative evaluation measures. The following quantitative and qualitative research methodologies will be used to answer research questions for evaluating E-MRGE.

Non-Participant and Participant Observation

Observations by staff are framed by guidelines put forth by standards of ethnographic fieldwork, in which interpersonal relationships and interactions are examined among the

Fellows, teachers, and students. At the observation sites, the staff take observation notes, which are objective descriptions of the activity. Additionally, the staff creates analytical notes, which offer an analysis and educated interpretation of the event or activity. Typically, the staff does not participate in program activities so as not to influence the process and impact of the services. However, in some cases, the ISR staff participates in the activities.

Interviews

To accommodate busy teachers and Fellows, ISR staff often conduct semi-structured interviews during breaks in observation sessions. ISR staff collects comments from the Fellows and teachers and these comments are included in the observer's notes. Overall, interviews have proven very useful in identifying obstacles and successes in program implementation.

Surveys

Surveys are probably the best way to sample many participants at once. In December, the ISR staff created two

survey instruments; one will be given to the E-MRGE teachers and one to the Fellows. In January 2007 the surveys instruments were approved through the University of New Mexico IRB process. ISR will distribute the surveys in February 2007 and analyze the data before the end of the spring 2007 semester.


In addition to the survey for teachers and Fellows, ISR is creating a survey instrument for students. Results from this survey will also be available before the spring 2007 semester is complete.

Official School Data

During February 2007, ISR staff will distribute consent forms to teachers and Fellows. These consent release forms will be used to acquire the Fellow's official UNM records, i.e., grade point averages, majors, etc. Teacher information will consist of for example; years of employment, education level, and major.

document experience, education level, and demographic information.

- ISR will conduct surveys to collect opinion information from the Fellows, Teachers, and sampled Students.

Finally, ISR will provide a one-year analysis of the E-MRGE Program. The analysis will examine whether and to what extent the program has achieved its goals and stated activities. 

University of New Mexico Institute for Social Research

2808 Central Ave. SE
Albuquerque, NM 87106

(505) 277-4257
Fax: (505) 277-4251
E-mail: isrnet@unm.edu



The University of New Mexico