

**P 1.11 STUDENT EVALUATIONS OF THE OKLAHOMA WEATHER CENTER REU PROGRAM:
1995, 1998, AND 1999**

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Introduction

The Research Experiences for Undergraduates (REU) program is a National Science Foundation (NSF) educational effort to provide opportunities for American undergraduates to join research projects each summer. Students are given a chance to experience first-hand how basic research is carried out, and to contribute consequentially (NSF 1999) to the scientific community. The Oklahoma Weather Center¹ (OWC) conducted REU programs in 1991, 1992, 1995, 1998, and 1999. A total of 59 students from around the country, and from a variety of institutions and academic majors participated in the five programs. Each student participant worked closely with research mentors from the Weather Center on a variety of meteorological problems.

The primary mission of the OWC REU program was to provide a rich and stimulating meteorological research experience for the students involved. It was important to expose the students to the processes of science, research tools, latest technologies, and experienced scientific professionals. REU administrators match students with their prospective projects and mentors by examining their academic backgrounds and detailed personal essays. It was also important for the students to be able to complete their projects within an 8 to 10 week period. Furthermore, students and mentors were encouraged to continue their research collaborations after the program.

Oklahoma Weather Center mentors and staff worked together to create the most realistic research experiences for the students. This included developing hypotheses, collecting data, analyzing results, and forming conclusions. REU students were also responsible for writing a short paper and giving oral presentations to members of the Weather Center scientific community. Over the years, several

student participants and their mentors have published articles and presented at various conferences. By the conclusion of each program, it was hoped that the REU students would have a better idea of what research is all about.

The best way for administrators of this program to judge its effectiveness is through student evaluations of the program as a whole. This paper will focus upon student evaluations of the program's research experiences, science lectures, hands-on workshops, mentors, infrastructure, and overall experience.

Methods of Evaluation

The primary method of evaluating the OWC REU program was achieved by the application of pre- and post-program questionnaires. Questionnaires were submitted to students who participated in the 1995, 1998, and 1999 programs. Each student participant was sent a post-program questionnaire approximately two weeks after the REU concluded. All 34 participants completed and returned the final questionnaires. The 17 questions on the survey helped administrators examine the student's research experience, perception of science, perception of scientists, program infrastructure, science content, workshops, and overall mission of the program. Responses found on the post-program questionnaire were used in the results of this paper.

Student Evaluations

1. Evaluation of Research Experiences

The 1995 OWC REU was a field experience featuring research topics related to the VORTEX field project (Cortinas et al. 1996). The 1998 and 1999 programs were heterogeneous in nature, drawing from a number of different topics of interest to the scientists. Table 1 shows that 100% of the 1998 and 90% of the 1999 students felt they learned a significant amount of information about research science. Complimenting this experience, 90% to 100% of the 1998-99 students responded that they learned new and enlightening information about their project. In 1995, 13 of 14 students stated that the VORTEX field program was an

¹ The Oklahoma Weather Center is the title given to the meteorological community in Norman that consists of several federal, state, and University of Oklahoma organizations.

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important and educational component of the program. Studies reveal that field oriented REUs tend to be the most popular among students (Cortinas et al. 1996; Orville and Knight 1992).

Table 1. How much did you learn about research science this summer?

	Nothing	1	2	3	4	5 Extensive
1998	0	0	0	3	3	7
1999	0	0	1	2	2	7

Table 2. How much did you learn about your research topic?

	Nothing	1	2	3	4	5 Extensive
1998	0	0	1	4	4	5
1999	0	0	0	3	3	7

Table 3. Do you think the field experiment component of the program was important to your educational experience? 1995 Student responses.

No	Unsure	Yes
0	1	13

On the pre-program questionnaire, students were asked if they regarded themselves as potential research scientists. Of the students questioned, 68% stated yes, 23% stated unsure, and 9% stated no. They were asked the same question on the final survey. Results showed that 53% stated yes, 29% were unsure, and 18% said no. The goal of this program was to provide a true research experience, and not sway a student's opinion one way or another. There were no right or wrong responses to this question. Ultimately, the experience gives students the opportunity to decide whether or not a research career is for them.

Table 4. Do you think of yourself as a potential research scientist? 1995, 1998, 1999 responses.

	No	Unsure	Yes
Pre-REU	9%	23%	68%
Post-REU	18%	29%	53%

2. Evaluation of the Science Lectures and Schedule

A number of lecturers from the Oklahoma Weather Center were selected each year to speak on a various meteorological topics. Many of the topics presented are on pre-determined subject matter such as the science of tornadoes, lightning, and thunderstorm development. Others pertain to the speakers' own research interests. This educational enrichment component helps the student participants, regardless of academic background, learn more about scientific research being conducted at the Oklahoma Weather Center. Most of the REU students felt the lectures and scheduling were at or above average. When working with a diverse body of students, it was difficult to meet everyone's needs. For example, many of the meteorology majors thought the lectures were too general in content and needed to be more sophisticated. At the same time, several non-meteorology majors had a hard time grasping the new material or said the material was very enlightening.

Over the years, REU administrators have found that scheduling lectures can be very complicated business. Most of the scheduling was done at the speaker's discretion. The REU program manager was responsible for contacting the speakers and setting up an appropriate time for the lecture. Many times, the speakers have a preferred time, or a room was available only at certain time of day. Thus, it was hard to provide a program that meets everyone's needs. REU administrators hope to utilize videoconferencing in the future to help reduce time lost when traveling from one location to another.



Figure 1. Dr. Scott Richardson talks about instrumentation.

In the real world, research scientists constantly make time for presentations, speakers, and conferences. This is an important part of communicating results among any scientific community. Several students felt as though the lectures cut into their research time or were scheduled during a bad time of day. Administrators felt as though time management of research was the responsibility of each student. Time management is something that is acquired over time and is not something that can be found in a book. Thus, the management of time serves as a learning experience and should be an integral part of any REU program.

3. Evaluation of the Mentoring Component

Mentoring is the most important component of any REU program. It requires the research scientist to give a significant amount of time to the students. Mentors offer guidance, expertise, and advice to those students who have never conducted real research. It is also understood that students from non-meteorological academic backgrounds need extra attention in terms of learning new subject matter. To further complicate matters, students have different personalities that can compliment or sometimes clash with their mentor's personalities. Ultimately, there will be good student-mentor pairings and there will be not-so-good ones. Overall, 71% of the students said they had an excellent working relationship with their mentors, 18% said average, and 11% said poor.

Table 5. Give us an overall assessment of your working relationship with your mentor

	Poor	Average	Excellent
1995	1	4	9
1998	1	1	8
1999	2	1	7

Table 7. How would you rate your mentor in terms of availability, professionalism, motivation?

	Poor	Average	Excellent
1995	1	4	9
1998	1	2	7
1999	2	0	8

4. Evaluation of Infrastructure

An important part of the summer program is the logistics of where to house the students. Careful consideration was taken into account as to the location of where the students should be placed so that they could thrive within their environment. After lengthy debates as to whether the students should be placed in dorms or University housing, the REU administrators decided that the best place for the students to reside while conducting their research was in University housing. However, the students from 1995 spent part of their summer in the dorms before moving to University apartments. The students from 1995 stated that they did not enjoy staying in the dorms because their environment was not conducive for research due to too many distractions from other residents (several summer camps are housed within the dorms). As a result of their responses, the students in the subsequent years were placed directly in University apartments.

Table 7. Give us an overall assessment of the housing.

	Poor	1	2	3	4	5 Excellent
1995	2	2	6	3	1	
1998	0	0	1	5	4	
1999	0	0	1	5	4	

Essential transportation for the program was provided for the students. Each of the students was provided transportation to and from Oklahoma. An allowance was given to those students who chose to drive to Norman. Daily transportation during the 10 week period was also provided by the program, which included: round trips to the students' place of research, weekly trips to supermarkets, and finally means of transportation for field trips, tours, and other REU-related activities. Public transportation in Norman was adequate, but some students found that relying on public transportation was inconvenient. Personal transportation appeared to be the best solution so students could set their own schedules versus relying on the program's schedule. For this reason, the program encouraged students to bring their own mode of transportation if at all possible.

Table 8. Give us an overall assessment of the transportation.

	Poor	1	2	3	4	5 Excellent
1995	0	1	11	2	0	
1998	0	2	4	4	0	
1999	0	2	5	2	1	

5. Overall Evaluation of the Program

Most of the students who participated in the REU program felt that the program gave them an opportunity to not only conduct research with leading scientists, but to enrich their undergraduate learning experience as well. When polled, all 34 students from 1995, 1998, and 1999 felt that the REU program was a positive experience and would recommend the program to other students.

Table 9. What is your overall rating of the Oklahoma Weather Center REU?

	Poor	Average	Excellent
1995	0	2	12
1998	0	0	10
1999	0	0	10

Conclusion

Students who participated in the Oklahoma in 1995, 1998, and 1999 were a diverse group of students from various regions of the country and majoring in a variety of academic subjects. Overall, the students included in this study learned a great deal about scientific research and the commitment it takes pursue a career as a researcher. Most of those surveyed stated that they learned new and exciting information about their research topics. This shows that REU programs are invaluable as curriculum enhancement components that provide real-life experiences for undergraduates majoring in science.

REU programs should go beyond the analysis of data. Student participants should be exposed to the latest research in a given academic field and ask questions about the science and methodologies they are learning. Science lectures and presentations by senior scientists are perfect vehicles for these activities. The students surveyed in this study stated that the content

presented by the scientists at the OWC was very good. Though some of the students did have a problem with lecture schedules, managing one's time is an important part of any research project. Students should be responsible for the management of their projects.

The most important elements of any REU program are the research mentors. Many research scientists at the OWC have donated their time to the REU program and have had a significant influence on the students they worked with. Students were encouraged to continue developing their projects for future studies. Several of the students have gone on to produce publishable articles and developed thesis topics based on their REU work. The investigators of this project highly recommend that other university and research organizations provide mentor-based research programs for undergraduate students.



Figure 2. Students take a closer look at a NSSL storm chasing research vehicle.

Acknowledgments. Principle funding for this project was provided by the National Science Foundation grant ATM-9820587 Mesoscale Dynamic Meteorology.

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