

Abstract

Integration of Research into both outreach and instruction is gradually becoming a more substantial part of our activities. We currently have a self-imposed active outreach and recruiting schedule. Feedback from participants has shown that one of the most effective outreach tools is allowing students to participate in research projects that they view as being useful. Our programs have generally proven useful in generating interest in the geosciences in students. Small research project that can be completed within two to three days have been p18

University of Texas at El Paso

The University serves binational metropolitan area of over 2 million. The university is becoming a doctoral-intensive institution with enrollment of just over 20,000 and research expenditures of over \$40 Million. .

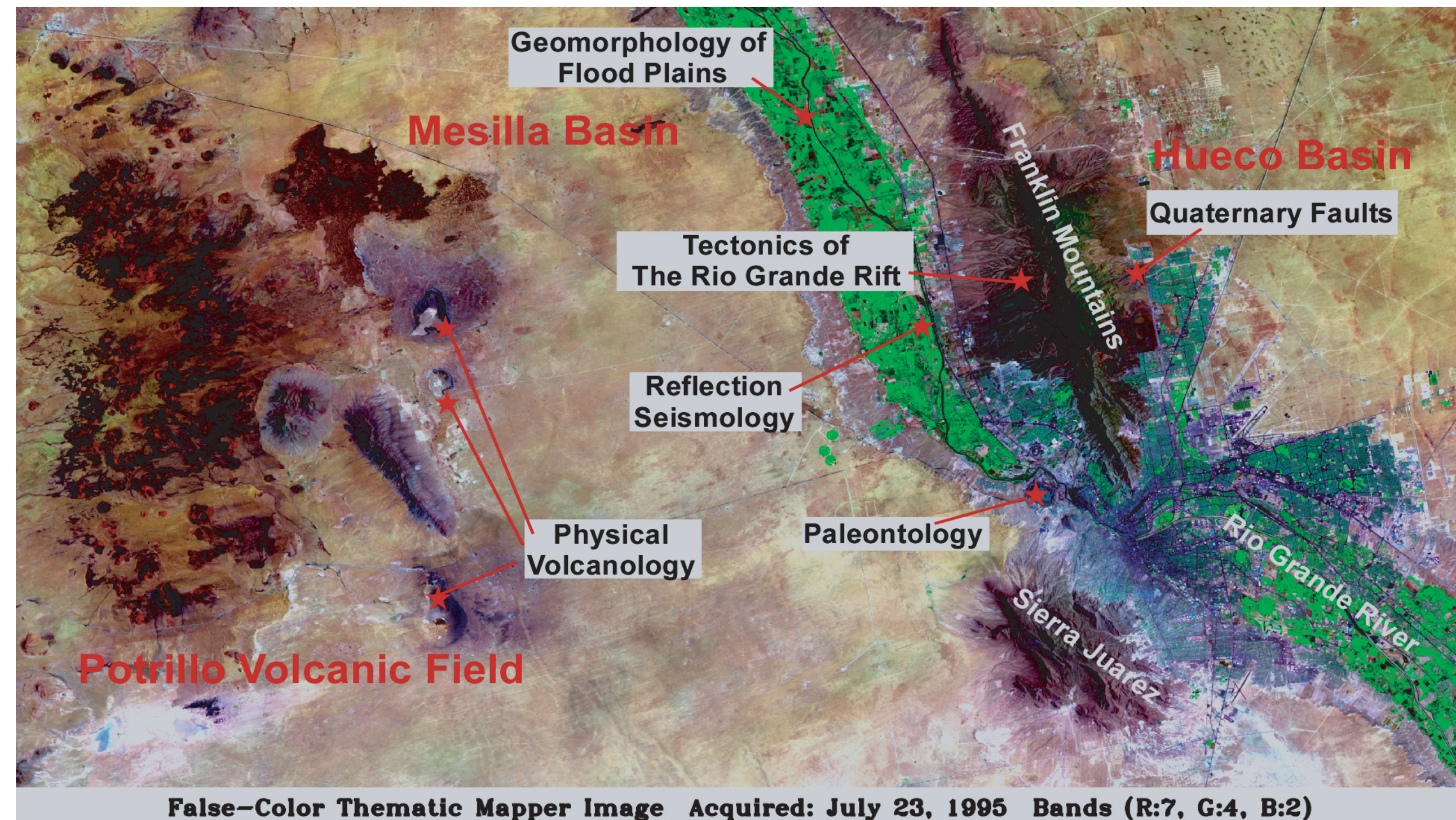
Student Demographics: 71% Hispanic, 10% Mexican National; reflects demographics of the region, which is the source of 90% of our student body.

The geosciences are a traditional strength of the university which was founded as the Texas College of Mines and Metallurgy. The geology PhD was the first Ph.D. Program on the university.

Our Resources

We are a research intensive, Ph.D. granting department with a large graduate student population (about 35 MS and 35 Ph.D.). Institutional Education grants provide graduate fellowships for outreach and educational activities with the public schools. Our students, both undergraduate and graduate freely contribute to our outreach and recruiting activities.

We also are lucky in being situated in an area with wonderful and well exposed local geology. With rocks ranging from Precambrian to Holocene and spectacular structures, minalogy and stratigraphy, almost any subject can be addressed.



Integrating Research into teaching and outreach: from Ph.D. to High School

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Our Constraints

We commit a large amount of resources to recruitment and community outreach as the population we serve is largely unaware of the Geosciences. The subject was dropped from the High Schools. Our student body comes from low-income families and is more resistant to taking on debt than most populations. Therefore our students usually work long hours during their B.A. It is extremely difficult to schedule our of class projects, such as research experiences.

Outreach and Recruiting Programs.

Pathways Summer Camp - 2002 to 2007 Two summer camps each year, each involving 30 high school students and 3 teachers. Students receive a stipend for attending the camp, which lasts two weeks. A total of 390 students have attended the summer camps. The camps use faculty volunteers to conduct one to three day projects that introduce them to different fields in the earth sciences. All three different types of projects have been used in the camps. Feedback at the end of camps shows that the most popular are the ones that involve the students in research.

Earth Science Week. This is a new and growing event. For the last three years we have opened up the department and advertised an open house. With events on at least four days spread over the week. We typically have classes come through. In fall 2006 we had over 600 elementary and middle school students attend. Students and faculty volunteer to host demonstrations and events, where visiting student can spend between half an hour to two hours. Conducting experiments and watching demonstrations.

Outreach to High Schools. Faculty and teaching fellows involved with the GK 12 grant (NSF) work in high school classrooms helping to integrate earth science into the curriculum. Graduate student teaching fellows are responsible for creating laboratory/lessons and integrating them into



Students standing at an intrusive contact near campus



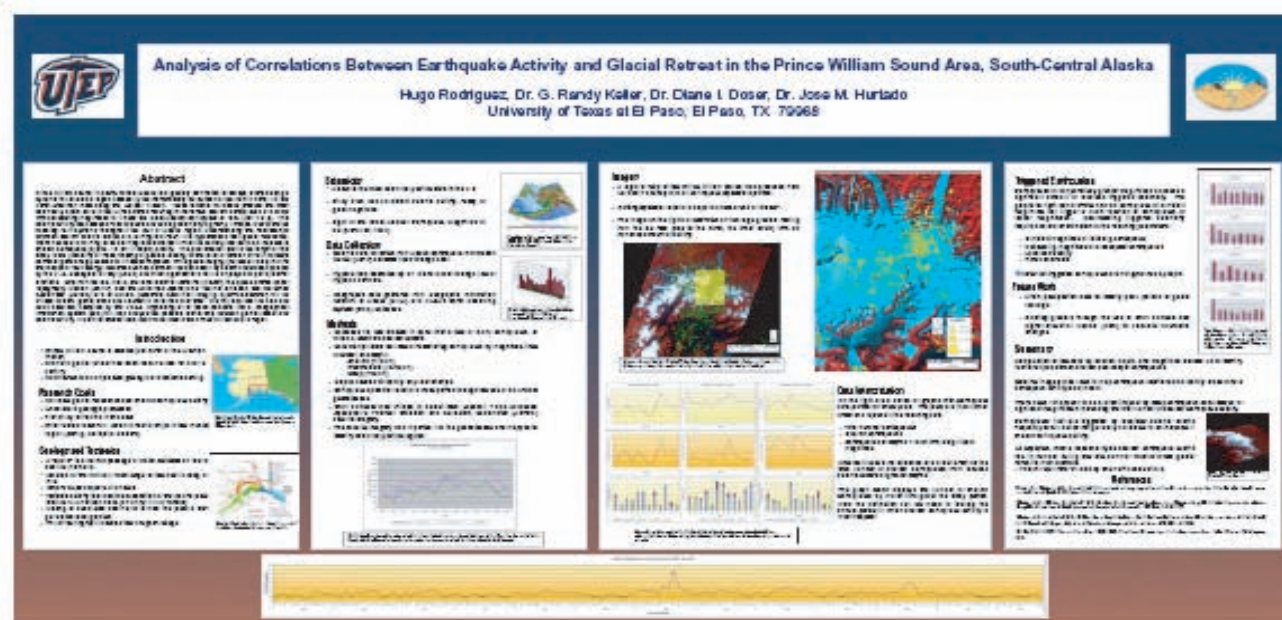
High School Students boring for a piezometer using a hydraulic drill

Research within the Department

Research Experience for Undergraduates. The Pathways NSF grant provides up to 8 research stipends for undergraduates. These are awarded to sophomores and juniors, who can renew them until graduation as long as progress is made toward the degree. We have has a total of more than 20 REU students. Of these, over 3/4 have gone on to graduate schools. Most of the REU students are majoring in Environmental Geosciences or Geology.

Undergraduate and Graduate Classroom Projects. There is a long history in many departments of integrating research projects into upper division and graduate courses. Our departmental culture actually is much more oriented toward lecture courses and the graduate students in particular tend to become frustrated by research and seminar courses. This is something we are working on.

The Student Research Colloquium. Graduate and undergraduate students present their research a a student run day long "mini GSA" This year 40 research presentation were made to 9 judges from government and industry.



Colloquium
Poster

Types of Student Involvement

Activities that involve students can take a variety of forms. For the purposes of this poster, we can subdivide projects into four informal types, based not on the goals, but on the style of student involvement. Involvement in a part of a longer term research project. Students either acquire or analyze data gathered as part of a large and longer term project. The course-long research project. Students either find a topic of their own, or are assigned a topic and spend a large part of a semester analyzing results. The field day. We use this particularly in our summer camps and upper division courses. Taking students out and showing them exciting geology, both to educate through exposure, and to help build interest in the earth and science. Small projects that students can complete in a day. Usually little or no background understanding is required of the students. However, we try to complete the project and have a research conclusion by the end of the 2 or three day project.

An Example of a Small Project

Background

A small wetlands park along the Rio Grande contains a pond used as a wildlife refuge. Park operators would like to take out invasive species and replace them with native cottonwood and Mesquite, however, the cottonwood has a low tolerance for saline soil.

Methods

Students from two summer camps and a senior level environmental science class each conducted a two day research project. The students used a hydraulic drill to emplace piezometers. Holes were augered and soil samples collected. Water samples were collected from the pond and the bases of the piezometers. Water levels in the pond and in piezometers at different depths were recorded to determine whether groundwater was flowing into or out of the pond. Slug tests were performed to determine the hydraulic conductivity of the shallow soil.

On a second day of laboratory tests and analyses, Students measure grain size distributions Conductivity and wet chemistry were used to measure soil and water salinity. The area of the pond, the hydraulic gradient and the Hydraulic conductivity were used to estimate the discharge into the groundwater from the pond.

Results

Finally, The results were posted on a board and the students were asked if they would recommend placing the trees at any of the locations they sampled. The park has subsequently used the students results to locate plantings.

Effects of Outreach and Recruiting

Previous Summer Camp participants
o 10% are Geology majors
o 55% still in the geoscience pipeline
o 92% will definitely or probably take geology in college

75% of previous Undergraduate REU students are attending or have graduated from a Geoscience Graduate School.



Lessons Learned

Small and simple is good. Simple doesn't mean simple science. It means that conclusions can be drawn from the measurements and observations in the project without significant background knowledge.

Practical inspires students. The students, particularly the high school students were most inspired when they believed their work had practical import. We are working to add more projects that can provide information to the community for our classes and summer camps.