Annual Report

Track 2: Developing a Sustainable RESESS Program

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Organization: UNAVCO, Inc.
What are the major goals of the project?

RESESS, Research Experiences in the Solid Earth Sciences for Students, is a summer internship program designed to increase the number of individuals from underrepresented populations in geosciences who will enter graduate school and complete Master’s and PhD degrees in the Earth sciences, with support from the National Science Foundation under Award No. 0917474 GEO-OEDG. RESESS accomplishes this through three project goals:

1. Increase the impact of RESESS with the purpose of increasing the number of undergraduate students in geosciences who will enter graduate school and complete a Master’s degree or higher.

2. Build a RESESS Sustainability Framework.

3. Provide opportunities for research interns to articulate the relevance of geoscience to societal problems to a variety of audiences, particularly in recruiting students to RESESS.

Accomplishments

Major Activities

The primary activity of RESESS is to provide a summer research experience for undergraduates from underrepresented groups. This cohort of interns spends the summer in Boulder, Colorado conducting scientific research and engaging in professional development through various programmatic activities. The 2014 intern group is the tenth cohort to move through the program. The 2013 cohort includes 11 interns (7 new, 4 returning) and 2014 includes 10 interns, five new and five returning. Interns are selected via panel review with a goal of selecting high-potential, qualified applicants from a variety of educational institutions.

Forty-nine undergraduates participated in RESESS during the 10-year history. Interns conducted authentic geoscience-focused research with local mentors from UNAVCO, NCAR, University of Colorado or the U.S. Geological Society, or with remote mentors at a UNAVCO-member university. In 2013 two returning interns worked offsite at the University of Oregon and Syracuse University. Cornell University and the University of Nevada-Reno hosted two returning interns in 2014.

Specific Objectives

RESESS provides an authentic research experience for students in a geoscience discipline. Interns worked closely with research mentors to develop a project, project plan, collect data, analyze data and write up results. Research results and a summary of their experience were presented at a colloquium at UNAVCO Headquarters, followed by a poster session joint with Significant Opportunities in Atmospheric Research and Science (SOARS) and interns at the National Ecological Observatory Network (NEON).

Students developed communication skills through focused writing and communication workshops. University of Colorado faculty member, Dr. Rolf Norgaard, who has 25 years experience in teaching writing and technical communication, led the writing workshop. The workshop short-term objectives included supporting interns as they develop three key deliverables as they work: a major research article, a professional oral presentation, and a poster session on their work. The long-term objective of the workshop is for interns to develop writing and communication skills for their professional careers.

A weekly communications seminar was formalized in 2014 and taught by communications and education specialist B. Bartel of UNAVCO. The purpose of the seminar was to explore non-academic communications as a student and a scientist. Objectives included (1) giving interns the tools needed to make a broader impact with their scientific results, (2) improving intern confidence in public speaking and using social media for outreach, (3) improving interns professional presence online, including on LinkedIn, (4) giving interns the tools needed to apply for a job or graduate school, including tips on professional communication and how to sell yourself over e-mail, phone, at meetings, in applications, and in interviews, and (5) having fun while doing this!

Significant Results

Publications and Presentations. See publications listing.

Intern and alumni awards.

- M. Carnicle: 2013 - 3rd Place Oral Presentation Award at AISES for "Terrestrial Laser Scanning (TLS) as a Tool to Differentiate and Correlate Unconsolidated Glacially Derived Sediments, Yellow Medicine County, Minnesota”
- C. Chesley: NOAA 2013 Hollings Scholar
- Y. Cuddus: AAPG Imperial Barrel Award 2014 Participant
- A. Grijalva: UTEP APO Student Award 2013
• A. Labrado: 2014 Santander Summer School: Summer School Scholar, sponsored by the NASA Astrobiology Institute (NAI); Africa Array 2011-2012, 2012-2013 Academic Scholarship
• N. Mathabane: MS PHD award (Minorities Striving and Pursuing Higher Degrees of Success in Earth System Science – 2012-2013 class); 2013 CAS Promising Scholar Scholarship (conferrred to incoming graduate students at the University of Oregon who have exhibited potential for significant contribution to the mission of the Graduate School and to the departments that they will be joining)
• A.M Prue: Dean’s List 2012, 2013 University of Wisconsin-River Falls
• D. Rattanasith: Thomas Walsh Scholarship (2013); California Federation of Mineralogical Societies Scholarship (2013)
• F. Martinez Torres: MS PHD award (Minorities Striving and Pursuing Higher Degrees of Success in Earth System Science 2012-2013 class)
• J. Nakai: MS PHD award (Minorities Striving and Pursuing Higher Degrees of Success in Earth System Science 2012-2013 class)

Evaluation. Programmatic evaluation is conducted via a subaward to the Integrated Research Institutions for Seismology (IRIS). In 2013, eleven interns participated in RESESS. Seven were new to the program and the remaining four were completing their second year of participation. In addition, there were 22 mentors that participated in the program. This included eleven science mentors and eleven writing mentors. Data for the 2014 cohort is in process due to the timing of this report and the collection process for the 2014 Interns.

2013 Data include:
• Intern pre-survey, May 2013. Survey administered in person by staff from UNAVCO Human Resources Department.
• Mentor post-survey, October 2013. Survey administered to all mentors (science and writing) electronically.
• Intern post-survey, November 2013. Survey administered to both new and returning interns electronically.

Interns. The intern pre-survey was completed by 10 of 11 interns as one intern was at field camp during the orientation week. The intern post survey was completed by 9 of 11 interns after three email notifications. The data collection effort generated 7 sets of paired responses for analysis, as three pre/post surveys could not be matched successfully and one student did not complete a pre-survey.

Mentors. Three email notifications generated response from 12 of 22 mentors. Nine were primary science mentors, while three were secondary writing mentors.

Data Analysis. Pre and post quantitative data, collected via participant surveys, will be analyzed for change over time using repeated measure tests, such as paired t-tests, when appropriate. Descriptive data will be presented using central tendency and/or frequency distributions. Given that this report is based on small populations and self-reported data, it is recognized that there are limitations to the types of conclusions that can be drawn.

Qualitative data collected through open-response questions will be analyzed for and coded according to both priori and emergent themes. From these, patterns and trends will be identified and conveyed along with representative data samples.

Summary of Findings
• The racial and ethnic makeup of the 2013 internship class is well aligned with the goals of RESESS.
• Suggesting that the programming associated with RESESS is appropriate; nearly all RESESS interns reported confidence gains in a variety of task related to academic success several months following the program. The new Matlab/Computing workshop was perceived to be less effective than the writing workshop and may require fine-tuning in the future.
• All the interns Agreed or Strongly Agreed that as a result of RESESS, their understanding of what graduate school will be like has increased. Several months after participating in RESESS surveys showed an increased perception of personal knowledge regarding geoscience career options and aspects of preparing for such careers.
• During RESESS, interns reported an increased opportunity to discuss their career plans with Scientists or Faculty, and Graduate Students. The later category appears to have been particularly important to the students as all respondents Agreed or Strongly agreed that the graduate mentor
served a positive role in their summer experience. Additionally, eight of nine interns agreed or strongly agreed that they felt supported by the other interns and all reported having kept in touch with at least some other RESESS participants three months after the program.

• Upon entering RESESS, all of the 2013 interns reported that they were considering entering graduate school after graduation. Several months following RESESS, there was a slight decrease in degree of their interest in full-time graduate school. This was offset by a slight increase in the degree of interest in full-time employment post undergraduate graduation.

• RESESS was perceived positively by the nearly all of the 2013 participants. Seventy-eight percent Strongly Agreed that RESESS was one of the best learning experiences they have ever had and all Agreed or Strongly Agreed that their understanding of the research process had increased.

Population. Based on the responses provided in the pre-survey, the 2013 program primarily attracted the stated targeted population. Seven interns identified themselves as Black/African American, American Indian or Native Pacific Islanders, or Hispanic/Latinos. The remaining three students identified themselves as Asian, which, while not a stated target of the program, is also an underrepresented race in the sciences. The gender distribution of the 2013 internship class was 8 women and 3 men.

Recruitment. The primary way interns learned about the program is from web searches (n=8) and by emails from departmental listserves (n=2). Additional program information was gained primarily from reading the website (n=9), but personal contacts with past participants, RESESS staff, and the RESESS video were also informational sources (n=3 for each).

There are a number of factors that are important to students’ decision to apply to and participate in the program. The most important factors were the desire to learn to conduct research, the support package, and the desire to meet other students with interests similar to their own. Students also found the opportunity to participate in the program for multiple summers to have appeal.

Application Process. Annually, students are asked about any problems they encounter during the application process. The current system did not appear to present any significant problems for the majority of users.

Writing Workshop. The interns felt the writing program was beneficial to them, as all but one perceived that their writing abilities improved as a result of RESESS. When asked to identify the best or most useful parts of the writing enhancement program, 8 of the 9 responses included a reference to feedback received about their writing.

Career Pathways. Prior to participating in the program, most interns felt they knew a moderate amount about geoscience career options and the preparation (e.g. class work, graduate school, etc) required to become a geoscientist. After participating in the programming provided through RESESS, students’ perceptions of what they knew about such topics increased with many expressing that they now had a great deal of knowledge about nearly all topics.

Key outcomes
Sustainability. A goal of the Track 2 RESESS Proposal was to develop external financial support for an increasing number of interns over the five-year period of the award. The Plate Boundary Observatory (PBO), Continuously Operating Caribbean GPS Observational Network (COCONet), UNAVCO, and ExxonMobil provided funding support to RESESS in 2013 and 2014.

The PBO and COCONet projects provided funding to support one intern in 2013. COCONet also provided full support for an intern in 2014. UNAVCO provided program infrastructure support and management, allowing for originally allocated administrative funds to be reallocated to intern support. UNAVCO also provided travel funding for the program director to attend the annual meetings of GSA, AGU, and SACNAS (2013) as well as conduct recruitment visits to Ft. Valley State University, Fort Valley, Georgia, and Spelman College, Atlanta, Georgia.

ExxonMobil provided financial support to RESESS in 2013 and 2014 through scholarships. Interns were provided with conference travel support and academic financial support.

Program Alumni Outcomes. Through 2014, the total number of RESESS program interns is 49. When interns are promoted out of the program they become RESESS Alumni. Follow ups with alumni regarding their activities and achievements are conducted bi-annually.
Recruitment and program applicants. Beginning in 2013, program marketing and recruitment was incorporated into the existing UNAVCO Human Resources infrastructure. This provided additional support to RESESS staff allowing them to focus on programmatic implementation rather than functions where other in-house expertise is available.

A formal RESESS Intern Position Description was created and posted on the UNAVCO Career Portal. Prospective interns applied through the formal application process. Referees submitted letters of support via email to an administrative program address. Ninety-six completed applications were received for the 5 available first-year positions. Seven completed applications were received for the 5 available returning intern positions.

Training and professional development
The structure of RESESS provides interns the opportunity to develop critical thinking skills, learn to read and analyze journal articles, develop scientific writing skills, enhance scientific and informal communication skills as well as strengthen presentation skills. Students receive a tour of UNAVCO (NSF’s geodetic facility), NCAR (National Center for Atmospheric Research) and NEON (National Ecological Observing Network). Interns participated in local field trips where instruction on geology was provided.

First-year interns were provided with a GRE preparation course taught by Kaplan in both 2013 and 2014. The intent was to help prepare interns for the GRE as well as to learn general test taking skills and strategies. UNAVCO paid for the course as well as for the GRE fee (interns typically take the GRE in the fall after the summer research experience).

Interns also participated in a graduate school round table discussion hosted by the University of Colorado designed as an informal way for interns to meet graduate students and talk with them about graduate school-related questions. In 2013 and 2014, the University of Colorado-Boulder (CU) Geology Department provided support via the conference room and supplying lunch for attendees. The summer sessions in both 2013 and 2014 kicked off with Leadership Week where interns participated in activities, led by program staff and outside consultants, to help them develop a strong sense of group with their cohort and to provide them with a toolbox of leadership skills to practice during the time of their summer internship. Evidence of the effectiveness of the leadership week includes interns keeping in close contact with each other throughout the year via Facebook, conferences, and visiting each other, as well as communication with RESESS staff.

Field Trip. As part of a subaward to the University of Colorado-Boulder (CU), interns participated in a 2-day field trip focused on the geology, geomorphology, and Earth processes of Colorado's Front Range and the broader Rocky Mountain region, with an overnight stay at CU’s high elevation Mountain Research Station. Dr. Mahan and six CU graduate students led the field trip. This trip provided field experience for the interns, an opportunity to learn about the local geology, and a bonding experience for the cohort.

Graduate Assistant Professional Development. The RESESS subaward to the University of Colorado-Boulder supports a Graduate Assistant (GA) for the summer. The GAs for 2013 and 2014 were both graduate students in the Department of Geological Sciences. The focus of this position is to provide support to the program director by assisting interns with feedback and support on their a) research project b) poster and oral presentations, c) abstract preparation for conference submission and for the RESESS annual calendar. The GA also contributed to the weekly Writing Workshop and met with students individually to provide feedback on scientific writing.

Mentor Professional Development. All mentors (research and writing) were provided with training and professional development opportunities throughout the summer. The primary mechanism was one-on-one mentoring with the RESESS Director.

Dissemination of Results
Lecture Series. The Geophysics Minority Recruitment Lecture Series is jointly funded by RESESS and the IRIS REU Award. The lecture series provided alumni of both programs the opportunity to connect with potential program applicants, share information and outcomes of RESESS and answering questions about the programs.

To advertise the lecture series, over 40 (2013-14) and 30 (2012-13) physics departments at Historically Black Colleges and Universities (HBCU) and geoscience and/or physics departments Hispanic Serving Institutions (HIS) around the country received emails announcing the program, plus follow-up phone calls.
Intern Speakers from RESESS included:
- Olamide Dada – 2010 RESESS Alumnus, M.S. Student at University of Louisiana, Lafayette
- Stephen Hernandez – 2009 Internship Alumnus, NSF Graduate Research Fellow, & PhD student at UC Santa Cruz, Dept. of Earth & Planetary Science

Conference Recruiting. Intentional recruiting is conducted at annual meetings and conferences where future RESESS interns may be attending, or where faculty from institutions with potential candidates are attending. Conference recruiting for the 2013 and 2014 cohorts included:

- National Association of Black Geoscientists (NABG) 2012 and 2013 Annual Meeting
- Society for the Advancement of Chicanos and Native Americans in Science (SACNAS) national meeting, 2012 and 2013. SACNAS geoscience field trip (jointly sponsored by UNAVCO and IRIS) provided with the opportunity to broaden their geosciences experience and learn about RESESS and how to apply
- American Indian Science and Engineering Society 2013 Annual Meeting in Denver, Colorado
- GSA 2013 Annual Meeting in Denver, Colorado
- AGU 2013 Annual Meeting in San Francisco

Additional outreach avenues included the RESESS Facebook page and through social media via UNAVCO (Facebook, YouTube), and sharing social media strategies and posts with IRIS, the EarthScope National Office and the Geological Society of America (GSA).

RESESS Newsletters highlight program activities and intern accomplishments. Newsletters in Fall 2013, Winter 2014 and Spring/Summer 2014 were distributed to the broader “Friends of RESESS” contact list including over 100 individuals.

Plans for next reporting period
This is the final annual reporting period. During the no cost extension we will wrap up a few minor lingering support items for the 2014 summer interns.

Products
Conference Papers and Presentations


Evidence for Partial Contributing Area Runoff. AGU Fall Meeting. San Francisco, CA.


Journals

Other Products
15-month Calendar. Printed 1500 calendars featuring student intern biographies, research abstract, figure and photographs of field work. Calendar information is also posted online.
http://resess.unavco.org/about/abstracts.html

Websites
RESESS program
http://resess.unavco.org/

The address above is the programmatic web site for RESESS and a primary communication mechanism for the program. Content includes information about current interns, program alumni, mentors and program staff. Announcements, news, photos, video and other media information is provided. An FAQ provides information for students about the program and how to apply. Links to the online application and calendar of events are also provided. The web site includes information for interns during their internship including writing workshop assignments, forms for travel authorization and other programmatic elements. The web site is housed within the UNAVCO web domain and maintained by UNAVCO personnel.

Impacts
RESESS is dedicated to increasing the diversity of students entering the geosciences. RESESS provides undergraduate students from historically underrepresented groups the opportunity to conduct scientific research as well as provides a support structure to help them gain entry to graduate programs and careers in geosciences. Since it's inception, RESESS has provided 49 undergraduate students with the support structure and experience necessary to complete a Bachelor's degree in the geosciences.

RESESS is a year-round program and staff continue to support RESESS alumni after their participation in the summer program. This
support of a RESESS Alumni Network provides an infrastructure within the solid earth sciences expanding beyond just the interns. As the alumni move into graduate programs and into the workforce, their network expands and they are able to connect other alumni to this broader network.

**Impact on other disciplines**
The geosciences are part of the broader Earth system sciences including atmospheric and oceanic sciences. Due to the nature of the geosciences being part of a broader systems science there are organic collaborations and interactions at professional conferences and meetings, within academic departments and in research efforts. Increasing the number of diverse geoscientists, as RESESS does, results in a more diverse environment for the broader Earth system science community.

**Impact on the development of human resources**
RESESS collaborates with SOARS (Significant Opportunities in Atmospheric Research and Science) and the NEON (National Ecological Observing Network) intern programs. Through joint activities, these collaborations provide all interns with both insight into the science of related disciplines as well as help to organically develop a larger network of student interns with common academic and career goals. The SOARS program is also focused on providing opportunities for students from underrepresented groups. RESESS and SOARS interns live together in the CU apartments, and interact socially during the summer, thereby increasing the networking opportunities and increasing the diversity of a broader geoscience network.

**Mentors**
RESESS relies on volunteers to mentor interns in conducting research and developing writing skills. Mentors include university faculty, graduate students and professionals from the USGS, UANVCO and other organizations in the Boulder area. Mentors work closely with the undergraduate intern during their 11-week summer experiences. Through this experience, mentors develop skills that can be transferred to other mentoring relationships with students.

In particular, RESESS partners each undergraduate student intern with a professional scientist to guide them through an authentic research project and with a second mentor that provides feedback on their writing assignments. Mentoring undergraduates is typically challenging because they are in the formative stages of their scientific careers, with significantly less geoscience content knowledge and mathematics background compared to graduate students.

**Student Skills**
RESESS prepares undergraduates from underrepresented minority groups for graduate programs and careers in geosciences through an intense summer research experience and continued support through an Alumni Network. The program exposes students to research, the research process, and the spectrum of career options available with geoscience degrees. RESESS interns are influential with their academic peers. They share programmatic information and experiences with non-RESESS students in the home academic department of the interns.

**Impact on physical resources that form infrastructure**
Increasing Diversity of NSF Facility. The NSF geodetic facility (UNAVCO) manages RESESS and provides infrastructure. During summer, when interns are participating in the program, the mere presence of a more diverse workforce has an indirect effect on the perceptions of staff working full-time in the facility.

**Impact on society beyond science and technology**
The majority of RESESS interns come from families that have not been involved in science as a profession or career. Interns share their experiences with their friends and families. Discussing the research they conducted, the knowledge they gained about graduate school, and how to apply all have a profound influence on individuals in the community that are not directly involved in the program.