Assessing the impact of an REU experience in attracting and retaining a diverse pool of undergraduate students in marine and earth sciences

1. Defining the Challenges

The OCE REU program exists to help attract and retain a diverse pool of talented undergraduate students into graduate school and careers in earth, marine, and atmospheric sciences at a national level.

Challenges:
- How to define diversity?
- How to recruit diverse students?
- How to assess success in increasing the pipeline of diverse students in graduate school and careers?

2. The Scripps Undergraduate Research Fellowship: SURF

Program Components include:
- Original research project
- Research and career seminars
- GRE preparation class
- Final symposium and presentation
- Field trips, dinners and social events

3. Evaluation Plan

Outcome Area | Measurable outcome | Evaluation Method; Analysis | Timeline
--- | --- | --- | ---
Knowledge and research skills | Changes in students’ perceived knowledge and research skills | Pre/post-survey, t-test, ANOVA | Beginning and end of REU program
Confidence to conduct scientific research | Changes in students’ confidence to conduct scientific research | Pre/post-survey, t-test, ANOVA | Beginning and end of REU program
Interest in pursuing a career in ocean/earth sciences | Changes in students’ interest in pursuing a major and career in ocean/earth sciences | Pre/post-survey, t-test, ANOVA | Beginning and end of REU program
Level of career expectations | Changes in students’ levels of academic and career goals | Pre/post-survey, t-test, ANOVA | Beginning and end of REU program
Enrollment in graduate school | Career placement | Each spring after completion of the REU program

4. Recruiting Diverse Students

**Year 1: Participant Demographics**

<table>
<thead>
<tr>
<th>Year</th>
<th>Undergrad Institution</th>
<th>First Generation college student</th>
<th>URM</th>
<th>Male/ Female</th>
<th>Academic Status</th>
<th>GPA</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>n=20</td>
<td>70%</td>
<td>30%</td>
<td>75%</td>
<td>65% Female</td>
<td>15% Soph, 65% Junior, 20% Senior</td>
</tr>
<tr>
<td>2013</td>
<td>n=18</td>
<td>22%</td>
<td>27%</td>
<td>72%</td>
<td>72% Female</td>
<td>22% Soph, 50% Junior, 28% Senior</td>
</tr>
</tbody>
</table>

N=11; "URM" = Underrepresented minority (self-identified as African American, Hispanic, American Indian, Native Hawaiian or Pacific Islander). Academic Status is that of participant at time of application submission.

In Year 1 (2011) we were successful in selecting and recruiting strong URM students from our applicant pool. Participants rated project components as very useful and reported being very satisfied with all aspects of the program. Participants expressed strong perceived gains. However – as shown in 5a-5d, participants in this cohort did NOT demonstrate overall significant pre/post gains in any of the goal areas. Pre-survey scores indicated that the students were already very strong in all goal areas and, thus, did not have much to gain in our program.

Our singular focus on recruitment of underrepresented minorities in Year 1 did not translate into any measurable increase in outcomes, mainly because the participants were already strong in all goal areas upon entering the program.

**Years 2 & 3: Participant Demographics**

<table>
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<tr>
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In Year 2 (2012) and Year 3 (2013) we continued our focus on URM students, but additionally sought out partnerships to connect us to diverse pools of students that were not as well positioned for success in oceanographic and earth sciences. Students in these cohorts reported significant gains in the goal areas (see figures 5a-5d).

5. Evaluation Results

5a. Scientific Knowledge and Skills

Results from a composite of ten questions to measure students’ level of knowledge and research skills. 2012 and 2013 SURF participants’ scientific knowledge and skills increased significantly.

5b. Confidence and Ability to Conduct Scientific Research

The 2012 and 2013 students’ confidence in their abilities to conduct research increased significantly from pre-to-post survey. Student gains in this goal area were the highest of any observed over the course of the project.

5c. Attitudes/Interest in marine and/or earth sciences

Students from all cohorts entered the program with a high initial level of interest in oceanographic and earth sciences.

5d. Likelihood in pursuing a career in marine and/or earth sciences

For all years, students’ likelihood in pursuing oceanographic or earth science careers was high in pre-surveys. While gains are not significant, they have been consistent.

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Solutions

In order to have the most overall impact, REU Sites should actively recruit and involve students who are not already involved in research or who are in other ways not already well positioned for success in STEM careers. Our solution was to adapt our recruitment strategy to consider lower division students (i.e., sophomores or community college students), students who had not had exposure to research opportunities, and/or students who had struggled in their coursework in the past, but who demonstrate significant interest in research (i.e., students with a GPA < 3.0).