How to Run an Effective and Inclusive REU

Val Sloan, Rebecca Haacker, and Bec Batchelor
Thank you to AGU for hosting this event
What is an REU?

NCAR | SOARS Center for Higher Education

air • planet • people
“This program changed my life....”
What does a successful REU model generally look like?

- 8 – 10 weeks long in summer with 6 – 12 students
- Individual/paired student projects
- Cohort-building for support
- Mentoring structure
- Career training
- Presentations/posters
- Follow-on support
- Evaluation

NCAR UCAR
SOARS Center for Higher Education
Why REUs?

REUs help engage students in STEM & trains students with skills that employers and grad schools look for.
Why REUs:
Research groups are often energized and science advanced by having REU students involved.
Tips: The REU Application & Recruiting

- Create an REU program description & application
- Connect and share it with faculty at Minority Serving Institutions, CCs, and 4-yr schools
Tips: Selecting Students and Finding Mentors

- Once your deadline has passed, review them and select them with a panel. Don’t hand mentors a pile of applications and let them select the students.
- Talk to students on the phone
- Find mentors from the university, USGS, NOAA, and other agencies in your neighborhood
Tips: Planning REU Logistics

- **Pay:** stipend (e.g. $600/week) in e.g. 3 increments
- **Housing:** provided by the REU (reserve early, in the fall)
- **Travel:** get students to plan travel by a deadline with an upper $ limit, and reimburse them
Tips: Orientation & team-building set the tone and students will better support each other

- Host a welcome event
- Set expectations
- ”Meet your mentor”
- Team-building activities
- Lab/field safety & sexual harassment training
- First weekly meeting or writing workshop
Tips: Prepare mentors on what to expect & REU purpose

- Provide a weekly schedule and list of deliverables & deadlines
- Discuss expectations & goals – of program and students

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UCAR
Tips: End of summer To-Do List

• Hold a poster and/or oral presentation for your students at the end of the REU program

• Do post-surveys for feedback and long-term assessment

• Set up a group on FaceBook for your REU
On recruiting & selecting diverse candidates . . .

Marianne Smith, Ph.D.
Citrus Community College, California
BROADENING PARTICIPATION

Recruiting and Selecting Diverse Candidates
Recruiting and Selecting Diverse Candidates

Rather than build a team by recruiting only “starters,”...scout early talent while it is still rough, provide the resources and training to allow that talent to blossom and mature without lowering standards or expectations, and you will sustain the future vitality of the team” (Stassun et al. 2010, p141).

- Applications
- Application Guidance
- Approach to evaluation applications and making selections
APPLICATIONS

- Ask for sufficient information on the application
  - Ethnicity
  - First-generation?
  - Receiving financial aid?
  - Work hours/week
  - Other (caregiver/parent, Veteran)

- Ask questions that can be answered by the students you’re hoping to recruit

[Provide] a one-page essay on your research interests, previous research experience/training, and how participation in the REU Program will contribute to your academic and professional development (UC Merced, 2015).

*Why does participation in the REU program at SIU interest you? Describe how skills (experience and training) you possess will serve as an asset to conducting ecological research within the context of the faculty mentor’s research program you selected (Southern Illinois University, 2015).*
APPLICATION GUIDANCE

Provide webinars, material on your website, an opportunity to participate in a telecon, or on-campus sessions.

- Asking for LORs
- Resume frame
- How to draw on life/academic experiences in personal statement
- Review what a complete application includes + other basics
**SELECTION PROCESS**

- Develop a rubric that accounts for the items in your application
- De-emphasize GPA
## CITRUS COLLEGE SUMMER RESEARCH EXPERIENCE 2015 - APPLICATION SCORING RUBRIC

<table>
<thead>
<tr>
<th>5 Points</th>
<th>4 Points</th>
<th>3 Points</th>
<th>2 Points</th>
<th>1 Point</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>STEM Major</strong></td>
<td>Applicant is a declared STEM major</td>
<td>Applicant has not declared a STEM major but has completed 5+ STEM degree transferrable courses</td>
<td>Applicant has not declared a STEM major but has completed 2-4 STEM degree transferrable courses</td>
<td></td>
</tr>
<tr>
<td><strong>Target Population(s)</strong></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Applicant is underrepresented Hispanic</td>
<td>Applicant is underrepresented woman in engineering, math, physics, or computer science; Black, Native American/ Hawaiian/Pac. Islander</td>
<td>Applicant is woman in STEM other than engineering, math and physics; Foster Youth; Veteran; or DSPS</td>
<td>Applicant is a non-traditional student over the age of 25</td>
</tr>
<tr>
<td><strong>First-Generation Status</strong></td>
<td>Applicant’s parents did not complete college</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Low-Income Status</strong></td>
<td>Applicant is PELL Grant eligible and/or receives CalWorks or Cal Grant</td>
<td>Applicant is BOG Fee Waiver and/or FWS eligible</td>
<td>Applicant is AB 540</td>
<td>Applicant receives benefits under the GI Bill</td>
</tr>
<tr>
<td><strong>Overall GPA</strong></td>
<td>3.7-4.0</td>
<td>3.3-3.69</td>
<td>2.9-3.29</td>
<td>2.6-2.89</td>
</tr>
<tr>
<td><strong>Employment</strong></td>
<td>Applicant works 30+ hours per week during the academic year</td>
<td>Applicant works 20+ hours per week during the academic year</td>
<td>Applicant works 15+ hours per week during the academic year</td>
<td>Applicant works 10+ hours per week during the academic year</td>
</tr>
<tr>
<td><strong>Short Answers and Personal Statement</strong></td>
<td>Applicant clearly articulates a strong interest in STEM, STEM research, and clear career &amp; educational goals. The statement is thoughtful and detailed.</td>
<td>Applicant articulates an interest in STEM and clearly addresses her/his educational and career goals.</td>
<td>Applicant expresses interest in STEM and mentions goals.</td>
<td>Student addresses either interest in STEM or goals.</td>
</tr>
<tr>
<td><strong>Faculty #1 Recommendation</strong></td>
<td>110-120 points AND/OR Excellent Recommendation</td>
<td>100-109 AND/OR Strong Recommendation</td>
<td>90-100 AND/OR Moderate Recommendation</td>
<td>80-99 AND/OR Recommendation indicates reservations</td>
</tr>
<tr>
<td><strong>Faculty #2 Recommendation</strong></td>
<td>110-120 points AND/OR Excellent Recommendation</td>
<td>100-109 AND/OR Strong Recommendation</td>
<td>90-100 AND/OR Moderate Recommendation</td>
<td>80-99 AND/OR Recommendation indicates some reservations</td>
</tr>
</tbody>
</table>

Questions/Comments/Concerns: 

Citrus College 2014: M Smith/marsmith@citruscollege.edu
Small group questions

Q1: What questions do you have about creating a strong and inclusive application form for your program?

Q2: Where will you recruit for diverse students in your region, or in the nation?
Preparing and Supporting Mentors

Dr. Rich Loft
loft@ucar.edu
Computational and Information Systems Laboratory
National Center for Atmospheric Research

REU Workshop @ AGU
December 14, 2015
To those of you running or planning to run an REU program: I salute you!

• It is the most
  – rewarding
  – nerve-wracking
  – impactful
  … thing you’ll likely ever do.

• But you can’t do it alone!
It takes a family to put on a successful REU summer program...

REU's cannot function without mentors, administrative support, and program leadership.
Mentor life-cycle: Recruitment

• How will mentors find out about your program?
  – Keep an eye out for unexpected sources of mentors.

• What value will they perceive in participating?
  – New scientific collaborations, results, and new energy!
  – Is mentoring valued in your organization, i.e. for promotion?

• How will summer project ideas be created and evaluated?
  – Apart from the time investment, not having a well scoped project idea is a big obstacle to mentor engagement.
Mentor life-cycle: Training

• Mentors need mentoring too! In roles like…
  – Job supervisor
  – Project manager
  – Teacher of
    • research skills
    • basic workplace skills
    • values
  – Career counselor
  – “Go-to” for student safety, security and well-being

They also need someone they can go for help: You!
Project design and scale: Hit the Learning Zone!

Optimal learning zone and stress

Sources: http://smallworldadventures.blogspot.com
http://www.corvusintl.com
TEACH approach to mentoring

- Truth-telling
- Empathy
- Asking
- Cheerleading
- Hoping for the best
Mentors, acting as coaches, should empower students.
Mentor life-cycle: the Summer

• Prior to Arrival
  – Welcome student/discuss project
  – Provide preparatory material
  – Prepare work area/equipment

• During Internship
  – Define deliverable/success
  – Establish lines of communication
  – Set up student training
  – Ask questions, don’t provide answers (A in TEACH)

• End Game
  – Feedback and reflection; lessons learned
Mentor life-cycle: Refit

- Mentors may need a fallow year
  - Competing professional commitments
  - Summer vacation!
  - Exhaustion!
- Watch out for mentors that take on too much (multiple students, etc.)
- Sometimes a co-mentor can help relieve the pressure.
- Don’t panic if they sit out a year! They’ll come back…
Helpful mentoring resources

http://www.theleadershipalliance.org/Portals/0/PublicDocs/LAMentor.pdf

http://www.lifescitrc.org/resource.cfm?submissionID=6202

http://scied.ucar.edu/soars/reu

“Tim Gunn: The Natty Professor A master class on mentoring, motivating and making it work!” ISBN: 1476780064
Thanks you for your attention!

Question?

Dr. Richard Loft
NCAR
loft@ucar.edu

December 14, 2015
Professional Development for students
Internships as preparation

Relative Importance of Attributes in Evaluating Graduates for Hire

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Experience</th>
<th>Academic</th>
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<tr>
<td>Internships</td>
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<tr>
<td>Employment During College</td>
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<td></td>
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<tr>
<td>College Major</td>
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<tr>
<td>Volunteer Experience</td>
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<tr>
<td>Extracurricular Activities</td>
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<tr>
<td>Relevance of Coursework</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>College GPA</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>College Reputation</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

Scale=0 to 100

Chronicle of Higher Ed 2013
Future of atmospheric sciences

88% of master’s graduates and 80% of PhD graduates were working in non-academic careers (NSF, 2010)

Weather and climate applications for the private industry are in demand

Opportunities for atmospheric scientists will increase more rapidly in the private industry than in other sectors
Which non-technical skills are useful in the workplace for STEM graduates?

- Hard-working, reliable, diligent
- Problem solving & critical thinking
- Communicating well by email, by phone, and in person
- Collaborating with others
- Presenting & speaking publicly
- Leadership and vision

Collected in a survey of alumni of NCAR’s Undergraduate Leadership Program and from an AMS-NCAR Panel on the ‘skills gap’ between employers’ needs and graduates skills.
Project & time management, communication
Mastering teamwork & leadership
Which professional development activities do students need?

✓ Communicating with your mentor
✓ Writing a 2-page project proposal or report
✓ Presentation skills
✓ Career panel
✓ Resume writing
✓ Writing cover letters/statements
Small group questions & discussion

Q1. If you were a new REU mentor, which information would you want about the REU program?

Q2. What kinds of Professional Development skills and seminars could you envision holding for your REU students?
Care and Feeding of REU Students
Before, During, and After

Martin Snow and Erin Wood
Laboratory for Atmospheric and Space Physics
University of Colorado
snow@lasp.colorado.edu
Outline

• Before
  - Logistics
  - Making the students feel welcome

• During
  - Minimizing problems
  - Maximizing experience

• After
  - Reporting responsibilities
  - Maintaining relationships with friends
Before

- Payroll Forms
Before

- Payroll Forms
- Travel
Before

- Payroll Forms
- Travel
- Housing

As an REU student, you will be staying in **Bear Creek Apartments** located south east of main campus and south of LASP in Williams Village. The apartments are a short bus ride or walk to main campus, LASP, and shopping areas. There will be four students per fully furnished 4-bedroom, 2-bath, non-smoking apartment. Upon arrival, LASP will provide you with cookware, utensils, and dishes...
Before

- Payroll Forms
- Travel
- Housing
- Tourist Information about Boulder
Before

• Payroll Forms
• Travel
• Housing
• Tourist Information about Boulder
• Expectations
Before

• Payroll Forms
• Travel
• Housing
• Tourist Information
• Expectations
• Mentor communications
  - Email
  - Facebook group
During

• Weekly brown bag lunches

Double feature:
Spot problems early
Professional Development
During

• Weekly brown bag lunches
• Informal activities
During

• Weekly brown bag lunches
• Informal activities
• NSF Annual Report Demographics
After

- End of summer summative evaluations
After

- End of summer summative evaluations
- Tracking Publications & Presentations

### SAO/NASA Astrophysics Data System (ADS)

**Query Results from the ADS Database**

Selected and retrieved 1 abstract.

<table>
<thead>
<tr>
<th>#</th>
<th>Bibcode</th>
<th>Score</th>
<th>Date</th>
<th>Authors</th>
<th>Title</th>
</tr>
</thead>
</table>
After

• End of summer summative evaluations
• Tracking Publications & Presentations
• Long-term program evaluation

Description of Post-Undergraduate position? If grad school, where did you go and what department? If you are working, what sort of job is it, etc.? The goal is for us to understand where people end up a few years after the REU program.

Responses: 70

PRO FEATURE
Use text analysis to search and categorize responses; see frequently used words and phrases. To use Text Analysis, upgrade to a GOLD or PLATINUM plan.

Categories: 70

Upon graduating I commissioned as a 2nd Lieutenant in the United States Air Force as a Weather Officer. I work at an Operational Weather Squadron where I lead a 32-member operations team producing forecasts and providing weather protection for 70 bases and 98 joint locations spanning 13 states. I have recently been accepted into the Air Force Institute of Technology to pursue my degree in Atmospheric Electricity. My fellowship will be at Patrick AFB (Cape Canaveral) where I will be a Launch Weather Officer.

I would recommend this REU program to...

My REU experience helped prepare me for my academic professional career.

I have opportunities that did not exist at my university.

I was able to gain practical experience in the field.

I looked into graduate schools or programs.

I have been able to gain knowledge from my mentor.

The skills I learned during the REU program I will use in my current role.

I look back on this REU program as a positive experience.

AGU REU Workshop
After

- End of summer summative evaluations
- Tracking Publications & Presentations
- Long-term program evaluation
- REUnions
Two Overall Goals

• This year’s cohort – best experience
• Improve the program for the future
  - Better experience next year
  - Results for the reports and renewal! (3 Rs)
Tips on writing an REU proposal
Got an idea?

Call up your Education Program Director at NSF (or NASA), pitch the REU concept, and get feedback

Then . . .

• Get some faculty on board to mentor
• Focus on the student program in the proposal
The National Science Foundation encourages applications to its REU solicitation

- One annual deadline
- Usually 3-year awards
- Proposal is 15 pages long
- Budget: most $$ for students
- **Emphasize the student program more than the mentors’ science**
- Focus on students of interest: 2 YC, Veterans, non-traditional & underrepresented minority students
Use the REU calendar to help outline key programmatic elements

- Recruiting and selecting diverse students
- Travel, housing, stipends
- Orientation and team-building
- Mentoring structure for students
- Student presentation opportunity
- Program evaluation
- REU alumni FaceBook page
Tip: “Intellectual Merit” in the NSF proposal

✓ Focus mainly on the merit of increasing student engagement and training in the geosciences for U.S. workforce development

✓ The scientific intellectual merit of the research is important but secondary
Tip: “Broadening Participation” in the NSF Proposal

✓ Outline your strategy for recruiting and supporting diverse students

✓ Discuss the rationale for diversifying the geoscience workforce, e.g.
  ➢ Accessing talent in underrepresented groups
  ➢ Providing opportunities for all citizens
  ➢ Mirroring the demographics of the U.S. population
Get to know colleagues in the REU community

- Get ideas on program management
- Evolve your thinking on inclusion & other concepts
- Feel connected, supported
Use others’ experience and resources

• Join the REU email listserv
• Attend talks/posters on REUs, workforce development, diversity

NCAR UCAR
SOARS Center for Higher Education
REU CENTER

RUNNING AN REU

Tips, tools, and strategies for managing an REU in the geosciences effectively

Applications and recruiting
Mentoring & project design
REU logistics (calendars, travel, pay, etc)
Science communication

» Read all Running an REU

BROADENING PARTICIPATION

How to recruit and support students from underrepresented groups, 2-year colleges, Veterans, and those with disabilities

Recruiting diverse students
Writing an inclusive application
Selecting strong diverse students
Adapting your REU to 2-year community college students

» Read all Broadening Participation

SPOTLIGHT

Accessible geology field trip of sea-to-sky highway at CSA conference in Vancouver

Learn how to develop field courses that accommodate students with disabilities on this field trip with IAGD. Learn more about the IAGD field course.

EVALUATION & RESEARCH

How do we know whether our REU is effective? What is the latest research on undergraduate research?

REU EVENTS & COMMUNITY

Get involved! Join the REU listserv, workshops, telecons, or sessions at large conferences

NEWSFEED

NSF Program solicitation: REU – solicitation deadline: fourth Wed. in August.
AGU Sessions on "Challenges & Approaches to Running Effective REUs in the Geosciences"

Wed. Dec. 17th, 8:00a.m.–12:20pm.: Poster session at Moscone South Poster Hall ED31A

scied.ucar.edu/soars/reu
Look at the different models of REUs that are being supported by NSF

- Group projects with multiple mentors
- Different mentoring structures
- Split times, split places, traveling field work
And now, ladies and gentlemen . . .

- Take this chance to make connections (networking time)
- Join the REU listserv & use the GEO REU website for resources
- Come to dinner tonight to continue the conversation