Faculty as Change Agents: Broadening Participation in the Geosciences

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A young girl’s pathway to the ocean


Agenda

• Welcome & Intro
• Case for Diversity
  • Lessons Learned Table Talk
• Diversity is in your Court
  • Telling Your Story and Concept Mapping
• Positive Factors: Research-Based Evidence
  • Small Group Activity
• Recruitment and Retention Strategies
  • Mentoring Resources and Best Practices
  • Cultivating a Positive Graduate Community
  • Lessons Learned Table Talk
• Individual Action Planning
• Closing Thoughts
The Case for Diversity
Need for Diversity

Scientific Excellence & Ingenuity

Workforce Development

"Diverse groups of problem solvers outperform groups of the best individual problem solvers."

Scott Page, 2007
The Difference: How the Power of Diversity Creates Better Groups, Firms, Schools, & Societies, Princeton University Press
GENERALLY:

Women
Persons with Disabilities
Native Americans
Hispanics
Alaska Natives
Native Hawaiians
other Pacific Islanders
Blacks or African Americans
Scientists and engineers working in science and engineering occupations: 2010

Resident population of the United States: 2008

NOTE: Hispanic may be any race. Other includes American Indian or Alaska Native, Native Hawaiian or Other Pacific Islander, and multiple race.

How is it going?

Scientists and engineers working in science and engineering occupations: 2013

How is it going?

Degrees earned by URMs, 1993-2012
(S&E are solid lines)

It is a complex issue...

It’s not usually just about one missing piece
What we have learned

- **Timing and coordination** is important at various scales: from academic calendar to academic and professional transitions.
- There is still an unmet need for resources that synthesize best practices.
- **Access to resources** is a big obstacle for both students and faculty, and is therefore a big opportunity for impact.
- **Partnerships** enable scaling out of project impacts and outreach.
- There is no one best strategy: multiple and complex challenges to STEM participation require a suite of integrated strategies.
Lessons Learned

Table Talk
Discussion Topics:

Timing and Coordination, Access to Resources, Partnerships and Integrated Strategies

• What diversity support resources are on your campus?

• What are potential opportunities to build new collaborative partnership on your campus to support diverse students?
Individual Activity

Begin an outline of your Individual Action Plan

Objectives:
1) For participants to begin formulating “individual action plans” for forge Intra-campus partnerships.
Diversity is in your court

Articulating Your Story and Concept Mapping
Mentoring Resources and Best Practices
Cultivating a Positive Campus Community
Change Agents:
Telling your Story & Concept Mapping with Positive Factors

Successful Models, Best Practices, Benefits
Articulating your Story using Concept Mapping:

- **Constructing** your pathway to becoming a scientist.
- **Identifying** positive factors in your own pathways to science.

...My Story

*Objective: For participants to be introduced to some of the positive factors that support STEM career pathways.*
Dallas, TX

Jacques Cousteau

National Geographic Magazines

although landlocked still offered exposure to marine sciences through

Dallas Aquarium

Marine Scientist

supported dream of becoming a

Family and Teachers

Magnet School

c. The Cousteau Society
Ashanti's "life map" thus far....

.... what does the color-coding mean?

COLORS HIGHLIGHT SPECIFIC TYPES OF POSITIVE FACTORS!
Family support

Early exposure to STEM in K-12

Resiliency

Community of support

Professional development

Role models

Campus & classroom culture

Mentors & mentoring

Authentic science engagement
## Positive Factors—Survey Results

<table>
<thead>
<tr>
<th>Positive Factor</th>
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<tbody>
<tr>
<td>Early exposure to STEM fields in K-12</td>
<td>✓</td>
</tr>
<tr>
<td>Family Support</td>
<td>✓</td>
</tr>
<tr>
<td>Authentic Science Engagement</td>
<td>✓</td>
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<tr>
<td>Resiliency</td>
<td>✓</td>
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<tr>
<td>Role Models</td>
<td>✓</td>
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<tr>
<td>Mentors &amp; Mentoring</td>
<td>✓</td>
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<tr>
<td>Campus &amp; Classroom Culture and Climate</td>
<td>✓</td>
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<tr>
<td>Community of Support</td>
<td>✓</td>
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<tr>
<td>Professional Development</td>
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Cultivating a Positive Campus Community
Positive Factors: A Multi-layered Approach

- Financial Support
- Culturally Relevant Pedagogy
- Community Support
- Authentic Science Engagement
- Professional Development
- Campus and Classroom Culture & Climate
- Mentors and Mentoring
- Role Models
- Family Support
Role Models

“a person whose behavior, example, or success is or can be emulated by others”
Mentors and Mentoring

“An intentional relationship or partnership, focused on the needs of the mentee that encourages individuals to develop to their fullest potential.”

- One-to-one
- Faculty-to-student
- Peer-to-peer
- Group
- E-mentoring
- A shorter-term mentoring match at a conference
- Long term
Campus & Classroom Culture and Climate

“very specific, minimal changes can make a difference”
Relies on student-based, project driven, discovery-based and often independent course work or research that provides a direct way for students to experience the feeling of authentic discovery, innovation, and individual ownership, creating engagement that is inspiring, and motivating, and interesting.

“Discovery-based: the possibility of true discovery & exploring the unknown. Independent research and individual ownership. Inspiring and motivating.”
Professional Development

- Institutional Leadership
- Engaged Faculty
- Bridging to the Next Level
- Continuous Evaluation
- Workshops
- Networking
- Coaching
- Participation in Professional Society Meetings

Campus-based programs include: LSAMP Bridge to the Doctorate, Alfred P. Sloan, Alliance for the Advancement to the Professoriate (AGEP), GK-12 Fellowship Programs and S-STEM
Positive Factors: Group Exercise

Successful Models, Best Practices, Benefits

Objective: For participants to recognize how the positive factors presented in the workshop are supported by research-based evidence.
Small Group Activity

Focusing on 4 Positive Factors
1. Authentic Science Engagement
2. Role Models
3. Campus & Classroom Culture and Climate
4. Mentoring

Objectives:
1) For participants to gain deeper understanding of one positive factor through hands-on activities.
2) For participants to begin formulating “personal action plans” for implementing positive factors in their own work, personal or academic environments.
Individual Activity

Begin your own Concept Map:
http://cosee.umaine.edu/climb/index.cfm

Work in Pairs:
Gather Feedback

Objectives:
1) For participants to begin formulating “individual action plans” for forge Intra-campus partnerships.
Change Agents: Recruitment and Retention
IBP’s Mission

“To increase the diversity of the STEM workforce by helping students navigate their pathways to success in STEM.”

Students and mentors in DC as part of IBP’s MS PHD’S professional development program
Pathways to Science

Pathways to Science is a project of the Institute for Broadening Participation (IBP). Pathways to Science supports pathways to the STEM fields: science, technology, engineering, and mathematics. We place particular emphasis on connecting underrepresented groups with STEM programs, funding, mentoring and resources.

Use this website to find programs such as undergraduate summer research opportunities, graduate fellowships, postdoctoral positions, as well as resources and materials pertaining to recruitment, retention, and mentoring.
Recruitment & Retention Materials

Designing for Success

Positive factors that support success in STEM pathways and reduce barriers to participation: what does the research say about what enables students to succeed and persist in STEM fields?

Research has identified a number of positive factors that help students succeed in Science, Technology, Engineering, and Mathematics (STEM) fields and persist in educational and professional pathways to full-blown STEM careers. Faculty can design student support programs that adapt and adopt these factors to cultivate these positive factors in their environments and curricula. This 17 positive factors, offers examples of successful and successful implementation of these strategies, and references for further reading.

Early exposure to STEM

“Early” is early enough in the primary education period when the opportunity arises. Research in earth science, economics, and mathematics careers and long-term goals (Powell 1990; Seymour and Hewitt 2003; Museus et al. 2011). Early interest is positively related to students’ desire to pursue a STEM career.

RECRUITMENT STRATEGIES

- Develop a plan and set specific goals.
  - Implement, review and adjust your recruitment and retention plan as needed. Be sure and set deadlines and assign faculty and staff to specific tasks. Involve your staff, faculty and students. Check to make sure you are achieving your goals. Advise under the link for Faculty and Admin.
- Review your admissions and enrollment projections.
  - Is the pathway through your admissions criteria appropriate? Do you have faculty and students?
- Use the resources on your own.
  - www.pathwaystoscience.org to find resources.
    - Office of Graduate Recruitment and Diversity
    - Graduate Studies Office
    - Student Career Services
    - Office for Campus Diversity
- Increase your visibility on campus.
  - Host bi-weekly or monthly seminars.
  - Host student brown-bag lunches.
  - Find out about, and participate in, professional networking opportunities.
- Turn your website into a recruitment tool.
  - FAQs about your program.
  - Photos and bios of the student and faculty.
  - The contact information for your program.
  - A printable brochure – even better.
  - Links to collaborating institutions.
- Build real partnerships with industry.
  - Relevant departments at other institutions.

RETENTION PLAN

GOAL: to engage, assist and retain all students and faculty to succeed professionally.

Spring/Summer Term

- Annual departmental/program self assessment
  - Review student and faculty retention history
  - Assess institutional support and plans to access external support
- Set goals for the academic year
- Assign mentors, advisors, committees, and tasks for upcoming academic year
- Plan enriched teaching and research activities
  - Retreats
  - Seminars
  - Social Activities
  - Professional Development Workshops
  - Internship/Field Research/Lab Rotations
  - Teaching Assistantships
- Develop/Review the Graduate Student Support Plan
- Develop/Review the Institutional Support Plan
- Plan formative evaluation to be integrated into activities and documented

Person(s) responsible: ________________________________
Overview and Home

- How to contribute to this manual
- What is Mentoring?
- How to use this manual
- Acknowledgments

Mentoring: to mentor, or be mentored? That is the question! And the answer is: both! All of us encounter many opportunities in our lives to either mentor, or be mentored; and in any mentoring relationship the responsibility to foster and guide the process falls to both the mentor and the mentee. The goal of this online manual is to highlight the value of mentoring and to help students, faculty, and administrators be better mentees, and become better mentors.

This version of the manual focuses generally on mentoring within the science, technology, engineering and mathematics (STEM) fields, especially on the mentoring process for underrepresented students, and in some cases specifically on the context of summer research for undergraduates. However, it provides information that mentors and mentees alike may find valuable in variety of circumstances.

How to contribute to this manual

This manual is a living document and will continue to develop with your help. While we strive to include the most up to date and relevant content, there are resources of which we are as yet unaware, and there is first hand expertise and experience that can enhance and supplement the existing material; we can only get this additional content from a greater community of mentors and mentees. We welcome your input!

Please use our comments and contribution form to submit:
Recent Publications

STRATEGIES FOR INCREASING DIVERSITY IN THE OCEAN SCIENCE WORKFORCE THROUGH MENTORING

By Ashanti Johnson, Melanie J. Huggins, David Siegfried, and LeTanya Breston

ABSTRACT: Establishing and maintaining a diverse US workforce that fully engages all populations represents a tremendous opportunity not only for furthering ocean science-related enterprises but also for cultivating future global ocean science leaders who collaborate effectively to make discoveries, achieve solutions, and develop technologies. A growing body of evidence suggests that a more diverse professional US workforce that better reflects the nation’s demographics can be achieved through numerous strategies aimed at effectively recruiting, supporting through graduation, and facilitating the increased participation of underrepresented minorities in Earth, atmospheric, and ocean sciences (and other related) graduate degree programs. To provide background and context for understanding the diversity challenge, we first describe expectations for the future US population and compare these projections to information about today’s demographic realities and the situation for the geosciences (including the ocean sciences) in particular. Descriptions of several specific implementations provide examples of successful strategies and reflect the research-based positive factors shown to foster increased engagement of underrepresented minorities.

INTRODUCTION

Why does increasing diversity in the ocean science workforce really matter? Research (STEM) fields, including ocean sciences, is essential for maximizing and fostering progressive innovation that is critical for solving complex societal challenges such as climate change, energy diversity, food security, and national defense.
Academic Mentoring and Professional Development

- Programs
- Training
- College Specific
- Collaborations
- Non-profits and professional organizations
- Industry and government
- Online Resources

Reference Recruitment Strategies handout
Mentoring & Professional Development 2.0

• Establish Relationship/ Determine Expectations
  • Handling your Business Questionnaire

• Determine Next Steps
  • Self Assessment, Skills Assessment, Career Exploration, Personality Testing
  • Consultation with Intra-Campus development centers and programs
  • Suggestive Readings

• Complete an Individual Development Plan
  • Goal Setting and Career Mapping
  • Prep for Applications: Letters of Recommendation, Personal Statements, etc.
An Individual Development Plan (IDP) is a structured planning tool designed to help you:

- identify **long-term career goals** that fit with your unique skills, interests, and values,
- make a plan for **improving your skills**,  
- set goals for the coming year to **improve efficiency and productivity**, and
- structure productive **conversations with your mentor(s)** about your career plans and development.

This module will guide you through the process of creating an IDP:

1. **Self-assessment**
   Consider your skills, values, and interests.

2. **Career exploration**
   Learn about career options for PhD-level scientists, and compare your skills, interests, and values to each option.

3. **Set goals**
   Make a concrete plan for how you will improve your skills, build your network, and get the experience you need to prepare for your future career.

4. **Implement plan**
   Recruit mentors to help with various parts of your plan.

Submit
Talking Points to Encourage Students to Complete a Self-Assessment

(an example presentation)
Marketing for Student Success

Introvert/Extrovert

• Either way, it’s necessary to be seen as a team player
• Scientifically talented
• Approachable and interested in work on group projects

Connect/network with broad group

Develop “elevator” presentation

Maximize interactions at conferences for purpose of identifying future collaborations
Handlin’ Your Business
a necessary conversation

How many of you...

• Are from outside of the state of (Insert your state here)?
• Are from outside of the US?
• Are 1st generation students?
• Are/were in organizations on campus?
• Hold/held leadership positions on campus?
• Are/were in honor societies?
How many of you...

• Are in STEM discipline organizations?
• Know what minority focused professional conferences are key for your discipline?
• Know what non minority-focused professional conferences are key for your discipline?
• Would like to conduct research and present your results at a professional society meeting?
• Have presented or will present your research at a professional society meeting?
How many of you...

• Have participated in a research experience at your home institution?

• Have participated in a research experience away from home intuition?

• Have taken or planned to take math classes up through Calculus III?

• Have taken a GRE prep course?

• Have planned to take a GRE prep course?

• Have co-authored a research publication?
How many of you...

• Have identified 3 possible universities that you would like to attend?
• Have identified at least 2 possible graduate schools that you would like to attend after receiving a B.S. degree?
• Have developed a networking strategy to connect with potential research advisors or opportunities?
• Who has a 5-year plan/goal?
• Who has a 10-year plan/goal?
How many of you...

• Who has a 20-year plan/goal?
• Who knows what is meant by digital identity?
• Who has purposefully kept their digital identity professional and would be comfortable with a potential employer carefully reviewing it?
• Who is on track with their 5-year plan/goal?
• What are your immediate next steps to reaching your goals?
How many of you...

• What barriers have you identified to reaching your immediate next steps?
• What would you like to accomplish through this meeting?
• What would you like to accomplish in this semester?
• What steps have you taken or identified you need to take to illuminate those barriers?
• Who is willing to admit that they could do a better job handling their business?
Handling Your Business

These are not random questions; they are points that make up the profiles of competitive applicants for REU’s, internships, B.S. and graduate school degree programs and jobs.

How do I know this?
I will tell you how by giving you some information about my background and experiences.

(Change Agent inserts her/his story here)
Student Session Closing thoughts:

Remember:

* Your job is not to be eliminated because you have not handled your business
* Your job is to make anyone you represent be represented well
* Your job is to stay connected to your passions, and do what it takes to make it happen and let no one or anything keep you from your goals
  • Your job is to run your race...and complete it!!!

And while you are running your race look around and behind you to see others who are running their race. Encourage them. Support them. Help them. Lift them up as you climb!

At the end of your race you should be able to look at what you have accomplished in fulfilling your own goals, and see who you have helped along the way and what good you have done to leave an inheritance for future generations and be able to say “I have handled my business!”
Change Agents:
Additional Resources Handout and Highlights
Direct your Students to our Resource Library for Professional Development Materials & Webinar Archives

**GETTING STRONG LETTERS OF RECOMMENDATION**

A necessary step in applying to summer research opportunities or graduate school is obtaining letters of recommendation. Unfortunately, many students find the very prospect of asking a professor to write a letter of recommendation daunting.

Don’t worry! This article will help you understand the process, get organized, and navigate the twists and turns of asking for a letter of recommendation.

Remember, faculty expect a certain percentage of their students to ask them for letters of recommendation each year. Writing letters of recommendation is part of their job. Your job is to make it as easy as possible for them to write you a strong letter.

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**Susanne Kauer**  
Policy & Program Analyst in Student Affairs  
Office of the President, University of California

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Thanks to contributors Susanne Kauer, Scott D. Anderson and Michael Ernst. Also, parts adapted with permission from the UC Berkeley EECS Undergraduate Notes.

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**Why are letters of recommendation so important?** First, letters of recommendation shed light on who you are as a person – most selection committees want to know something about your character from someone who knows you well! Second, university professors travel a lot and are tied into an international network of experts in their field. They know many of the faculty at other institutions, at least by reputation. One strong letter of support by a respected faculty member can do a tremendous amount of good for your application. With such a letter, you
Lessons Learned

Table Talk
Discussion Topics:

Diversity is in your Court:

Positive Factors
Recruitment Strategies
Student Self-Assessment and Individual Development Plans
Intra-Campus Rolodex
Classroom and Campus Implementation
Individual Activity

Finalize Individual Action Plan
Thank you!
Questions?
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