

Faculty as Change Agents: Broadening Participation in the Geosciences

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Resource Development (HRD) Program Strategist*



A young girl's pathway to the ocean



- <http://ailesapprentice.foxnews.com/blog/2016/02/18/black-history-month-chemical-oceanographer-dr-ashanti-johnson/>
- <http://beta.criticalmention.com/app/#clip/view/21188337?token=6f79f2a9-3695-4340-8fb5-58efe318a842>

Agenda

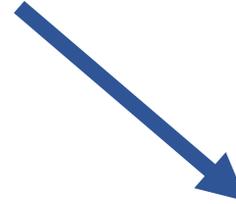
- Welcome & Intro
- Case for Diversity
 - Lessons Learned Table Talk
- Diversity is in your Court
 - Telling Your Story and Concept Mapping
- Positive Factors: Research-Based Evidence
 - Small Group Activity
- Recruitment and Retention Strategies
 - Mentoring Resources and Best Practices
 - Cultivating 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

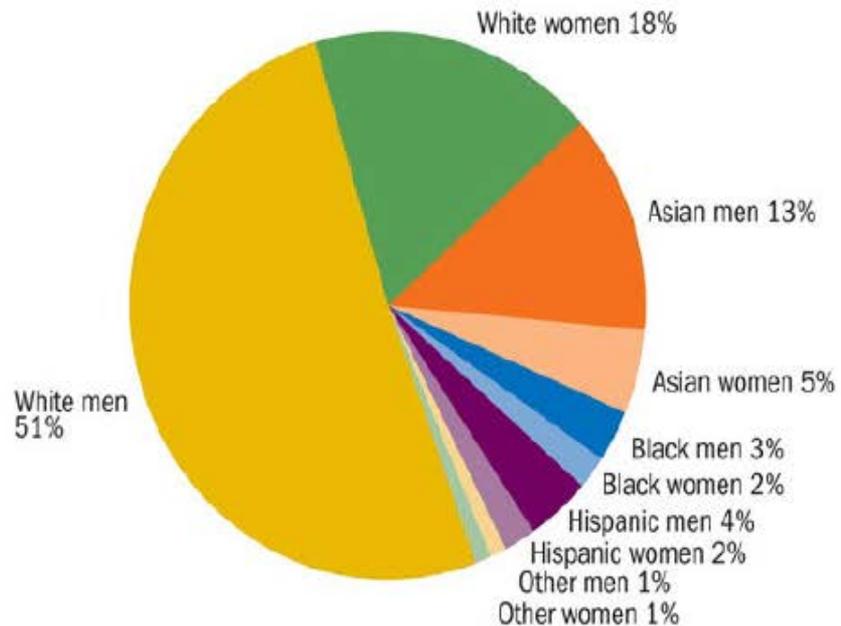
other Pacific Islanders

Blacks or African Americans



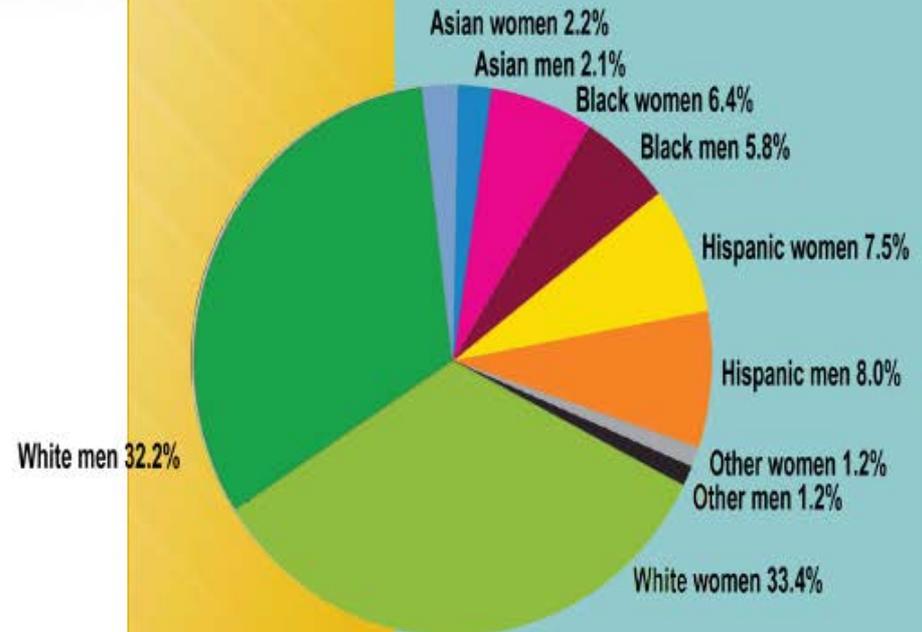
Scientists and engineers working in science and engineering occupations: 2010

Resident population of the United States: 2008

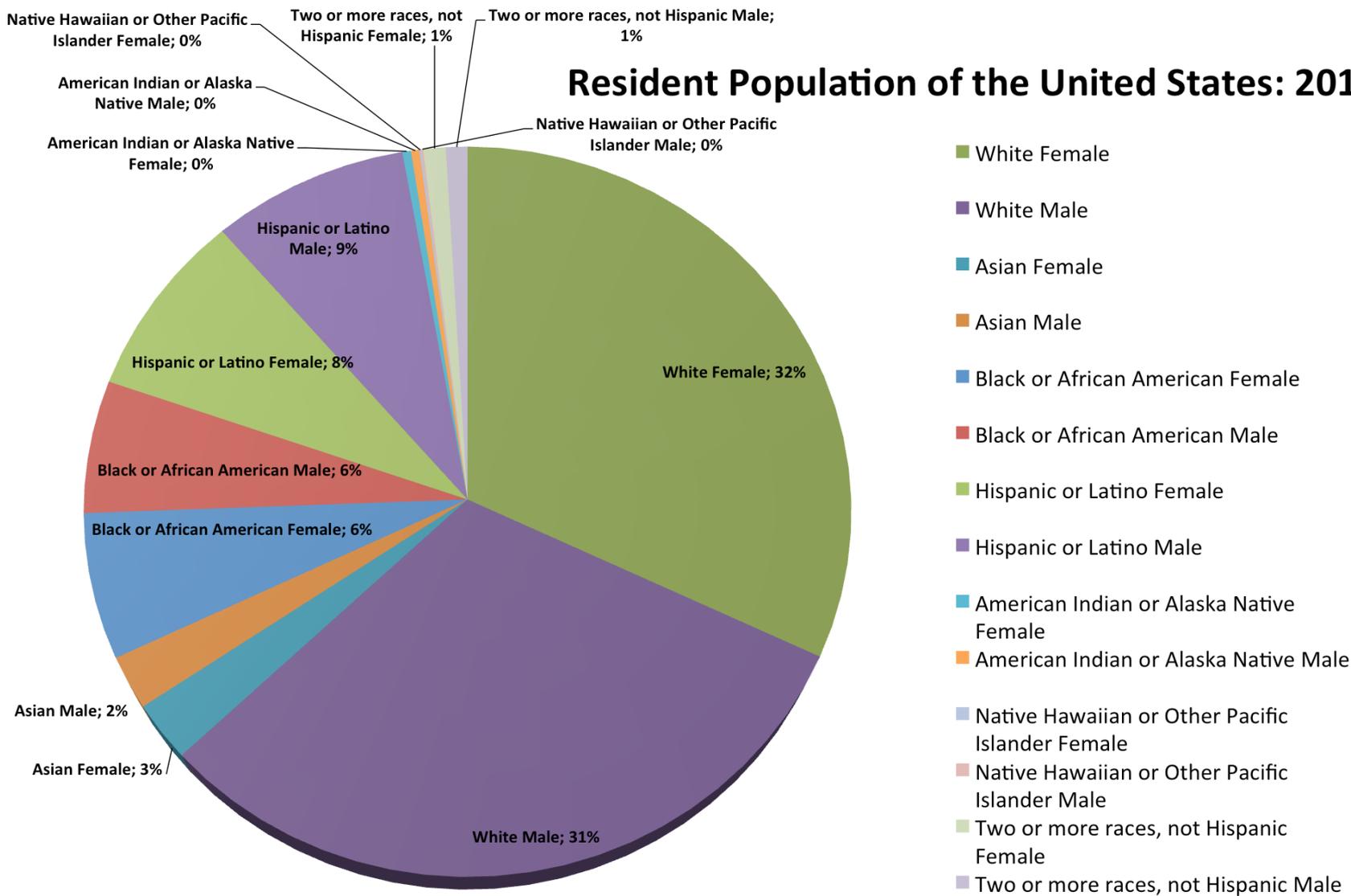


NOTE: Hispanic may be any race. Other includes American Indian or Alaska Native, Native Hawaiian or Other Pacific Islander, and multiple race.

Women, Minorities, and Persons with Disabilities in Science and Engineering | Arlington, VA | NSF 13-304 | February 2013

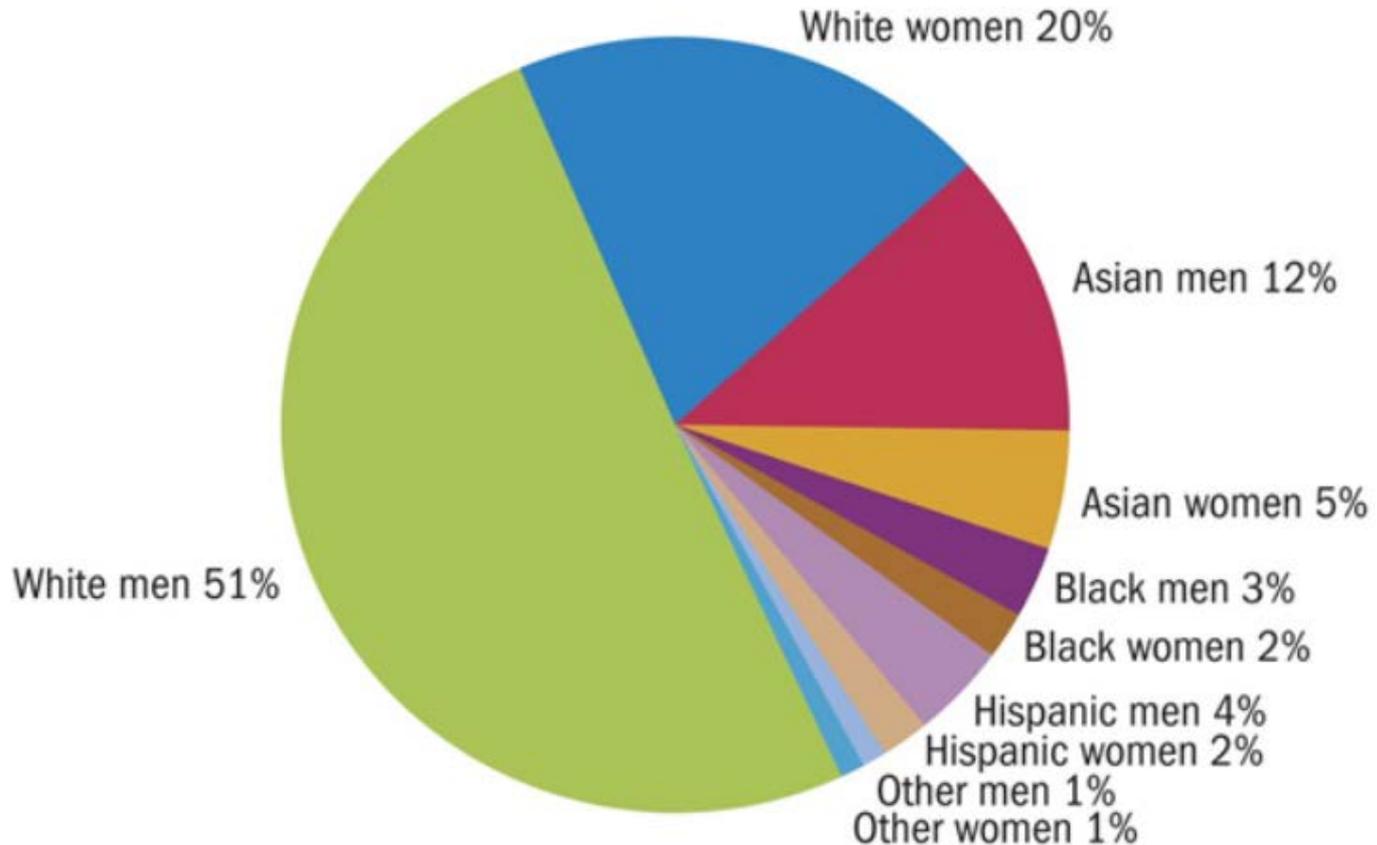


Resident Population of the United States: 2012



How is it going?

Scientists and engineers working in science and engineering occupations: 2013

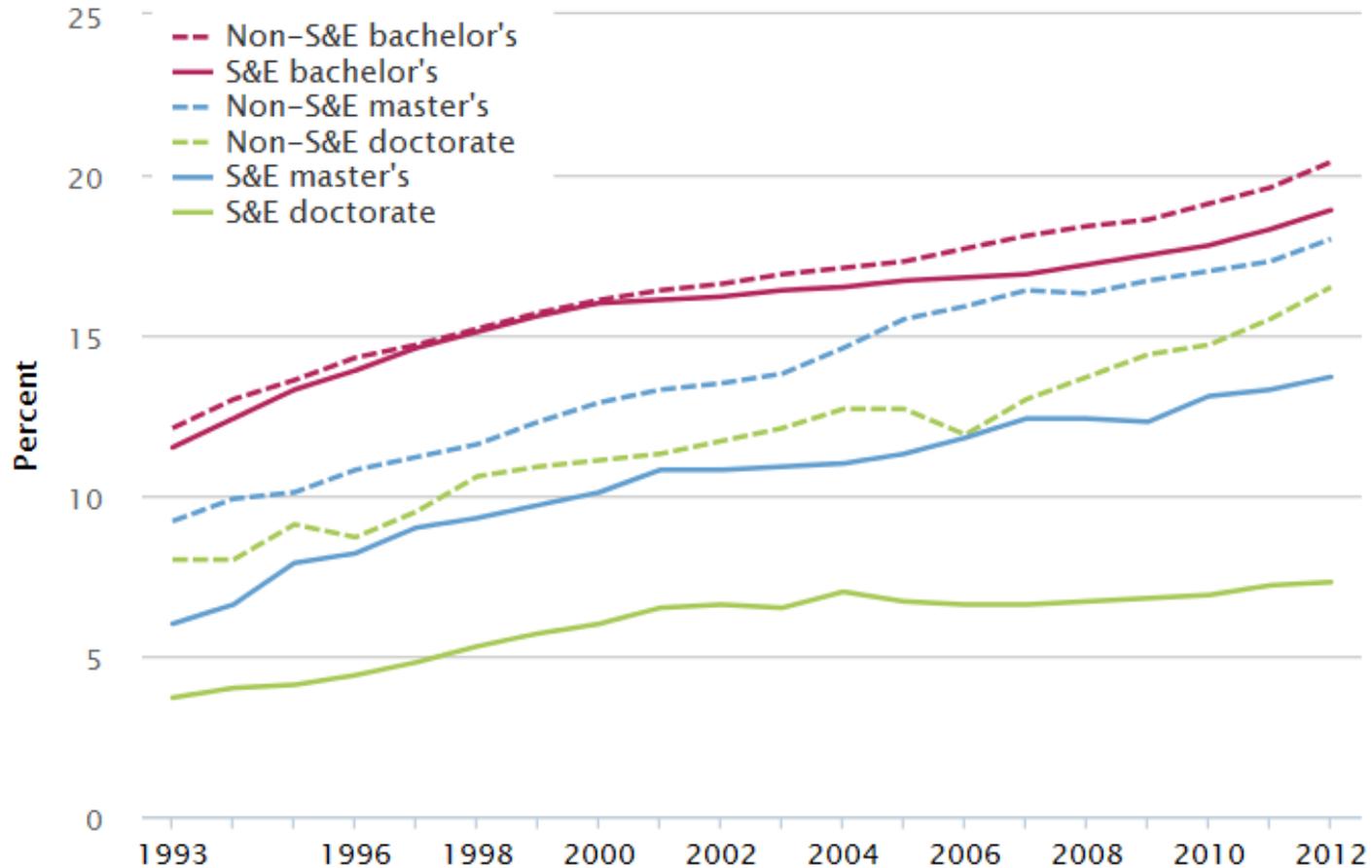


NCSES report: *Women, Minorities, and Persons with Disabilities in Science and Engineering*: <http://nsf.gov/statistics/>



How is it going?

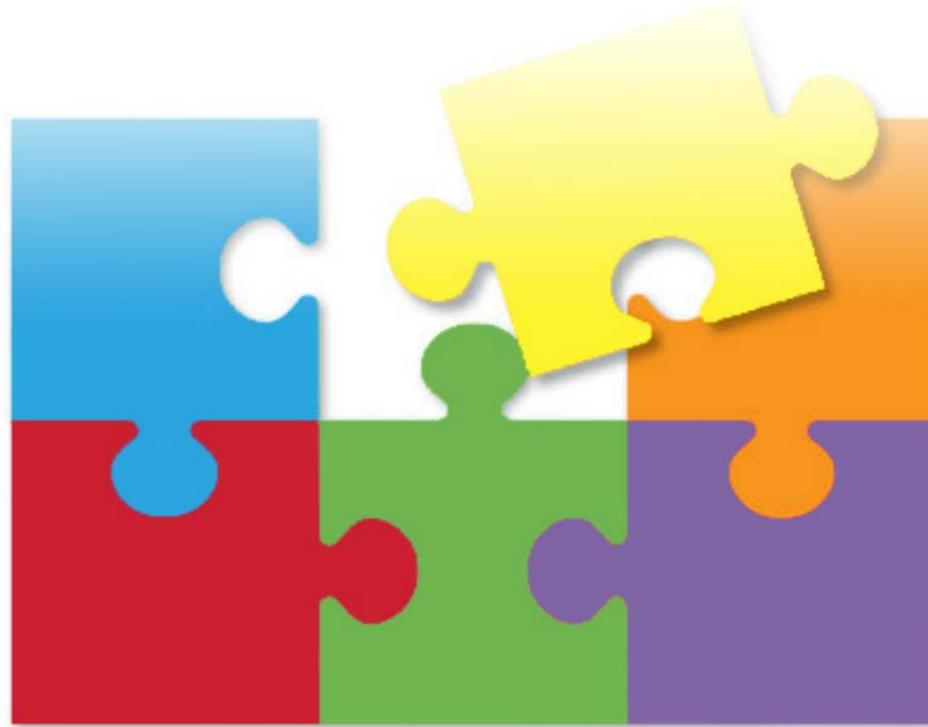
Degrees earned by URM, 1993-2012 (S&E are solid lines)



NCSES report: *Women, Minorities, and Persons with Disabilities in Science and Engineering*: <http://nsf.gov/statistics/>



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

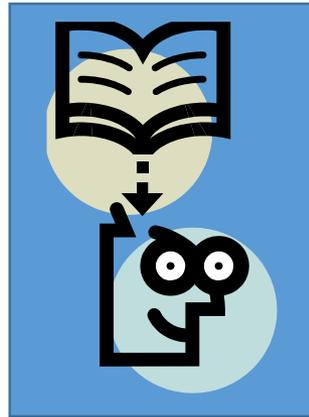


Table Talk



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



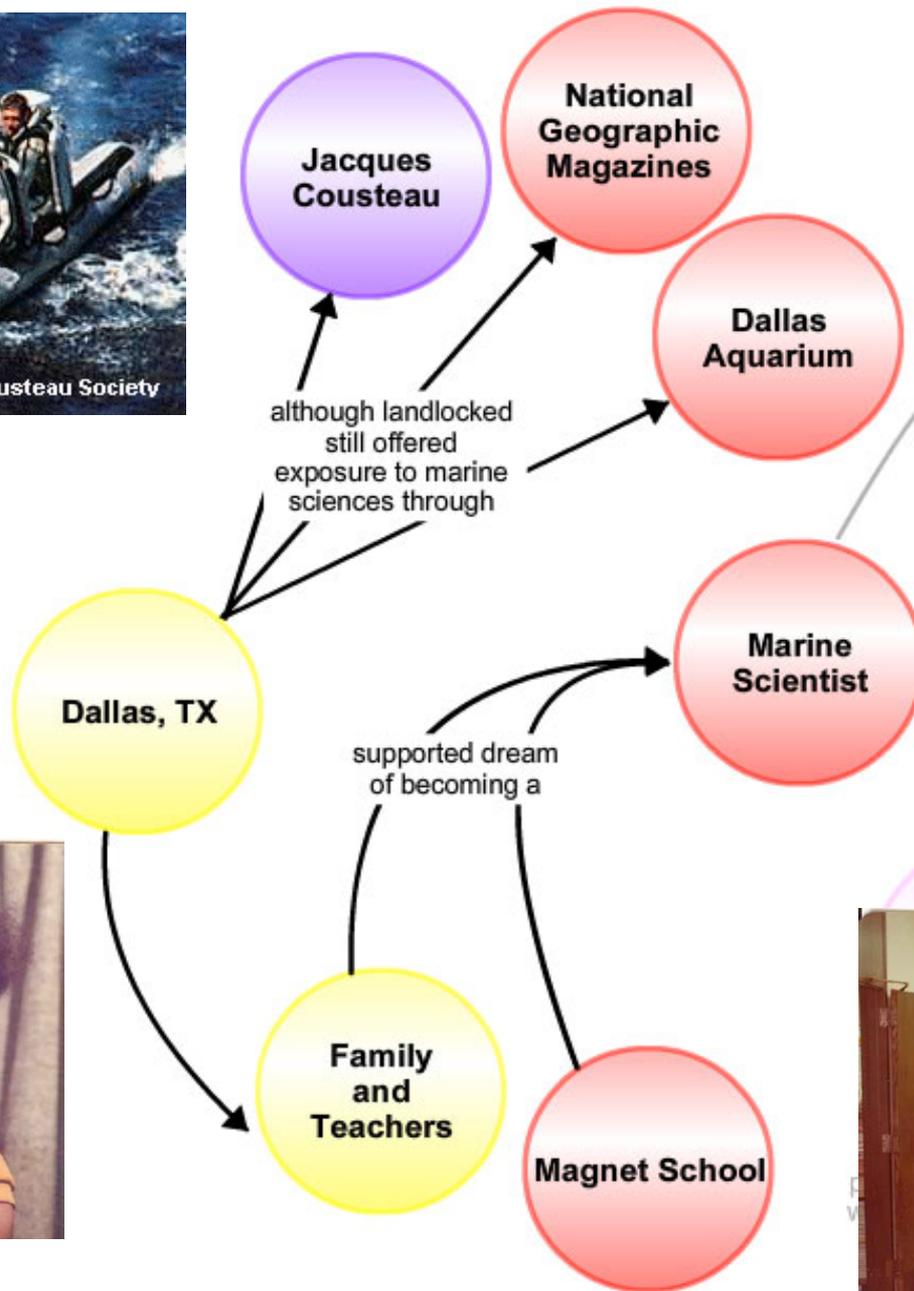
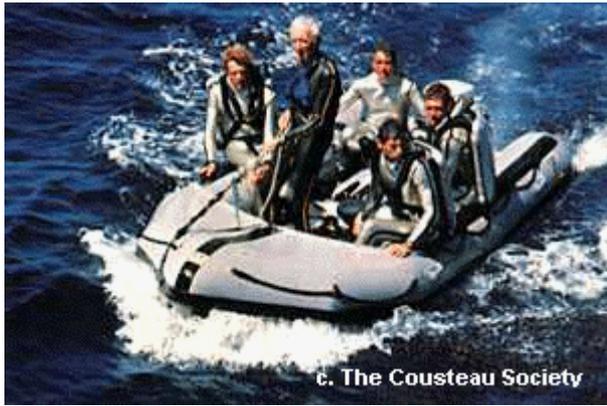
Articulating your Story using Concept Mapping:

- **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.







Texas A&M Galveston

received a full scholarship to

joined a



while here was mentored by

while attending



marine biologist

Texas Instruments Internship

Alpha Kappa Alpha Sorority

**Willie Crayton
Director of Multicultural Services**

turned to support from

Da Un

Pastors James & Wanda Turner

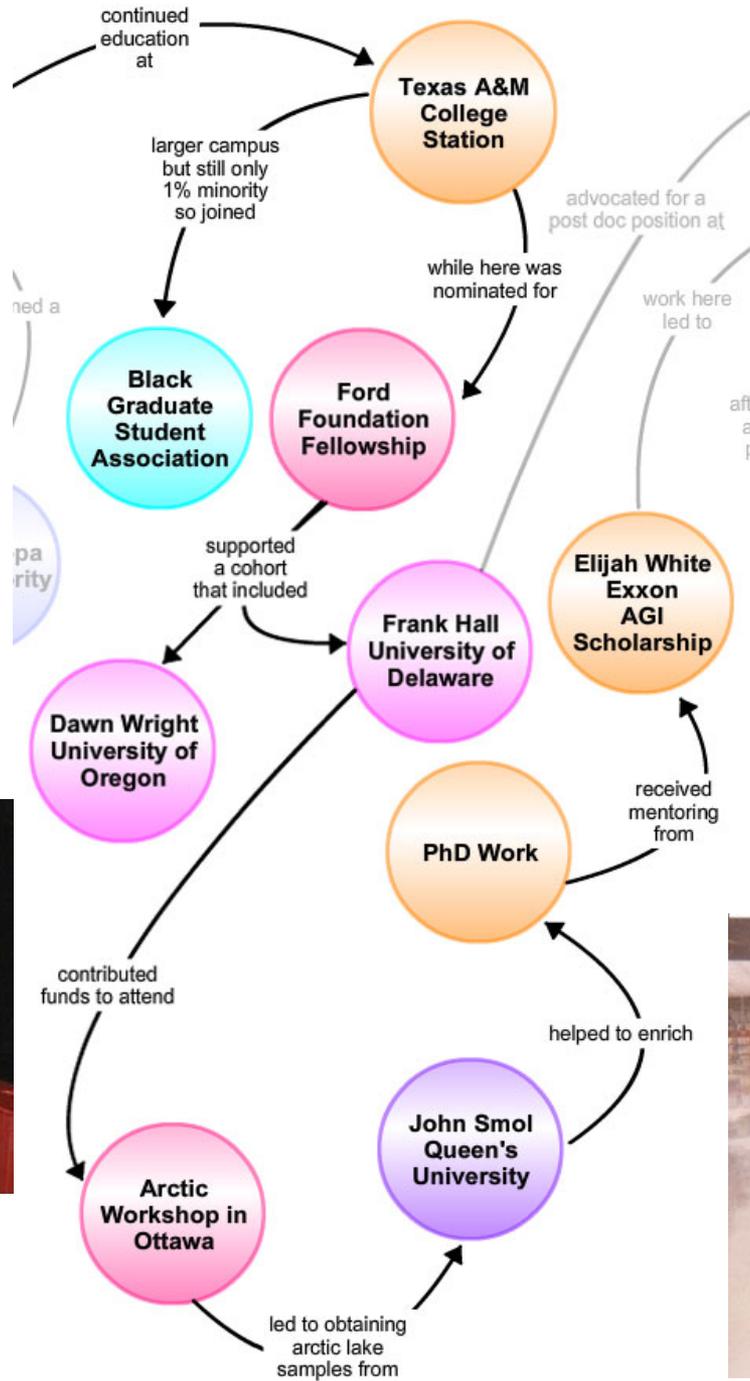


despite fear of public speaking, was encouraged to run for

Student Government

co fund







as A&M
college
tation

while here was
nominated for

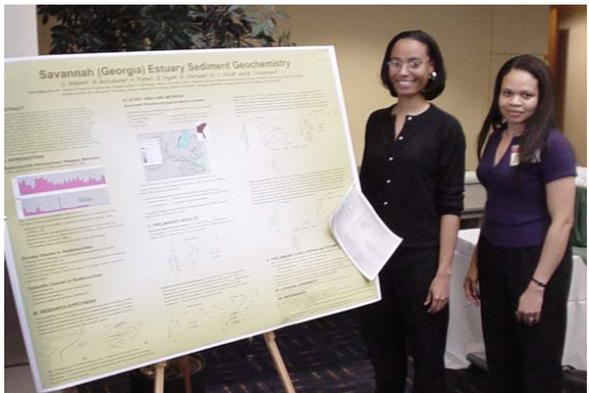
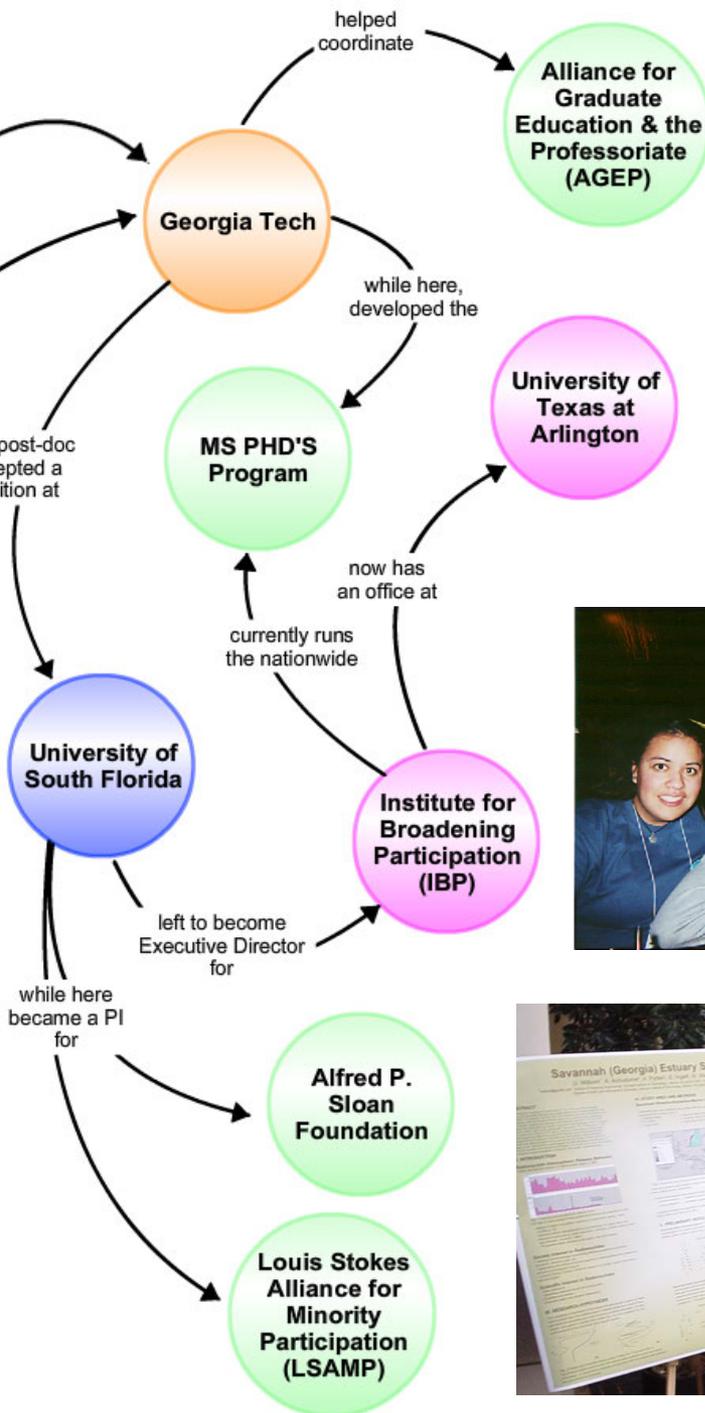
Frank Hall
University of
Delaware

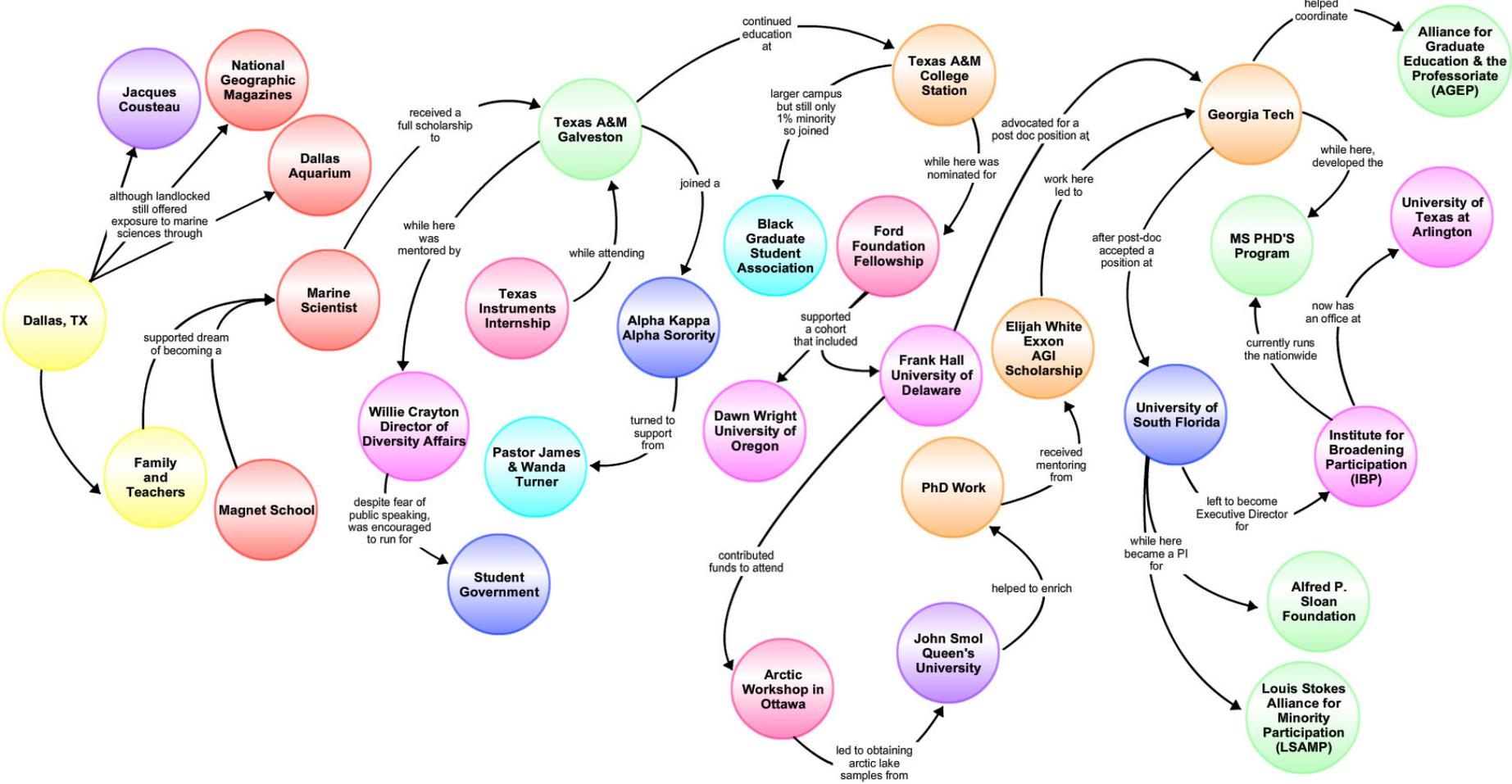
Elijah White
Exxon
AGI
Scholarship

received
mentoring



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ke
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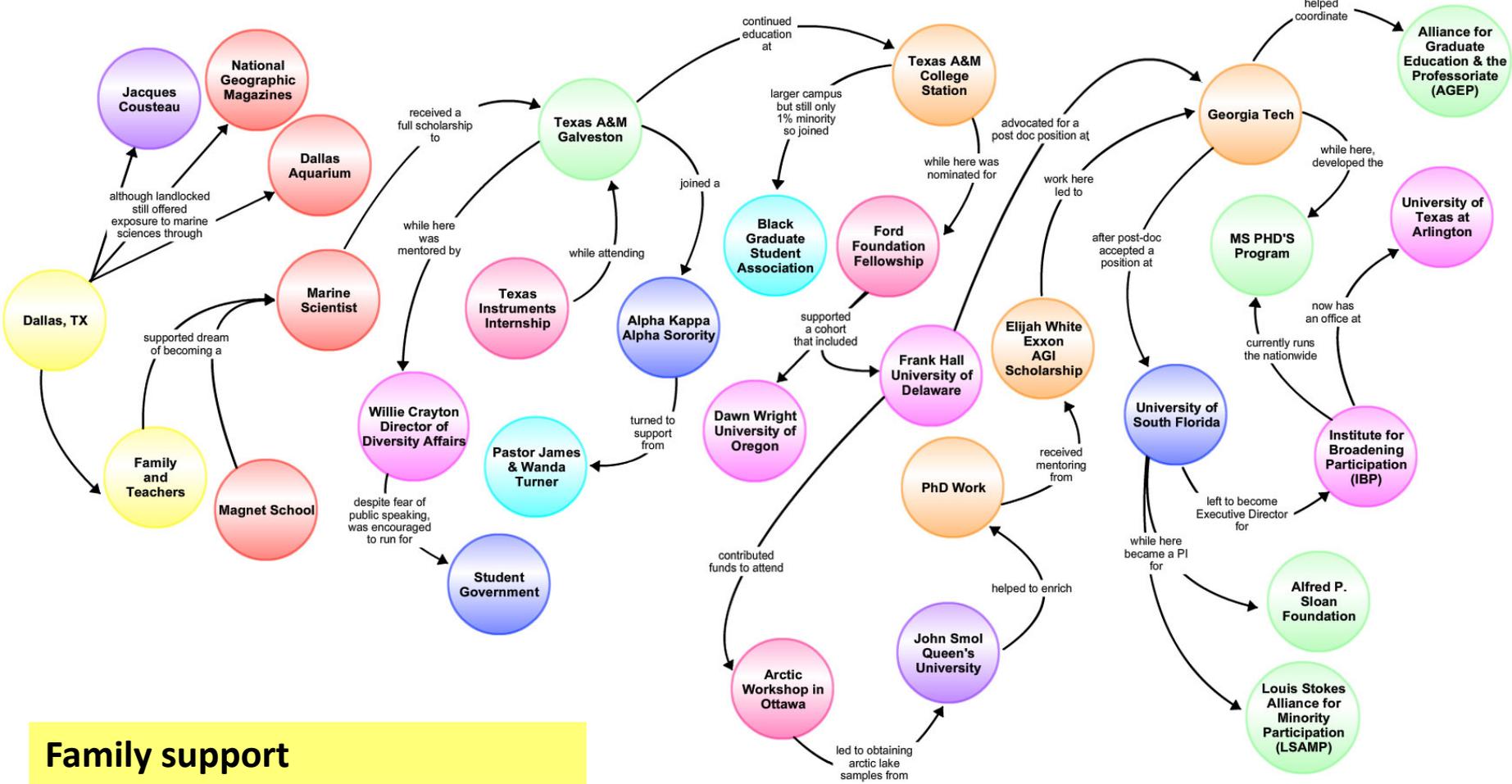


Ashanti's "life map" thus far....

.... 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

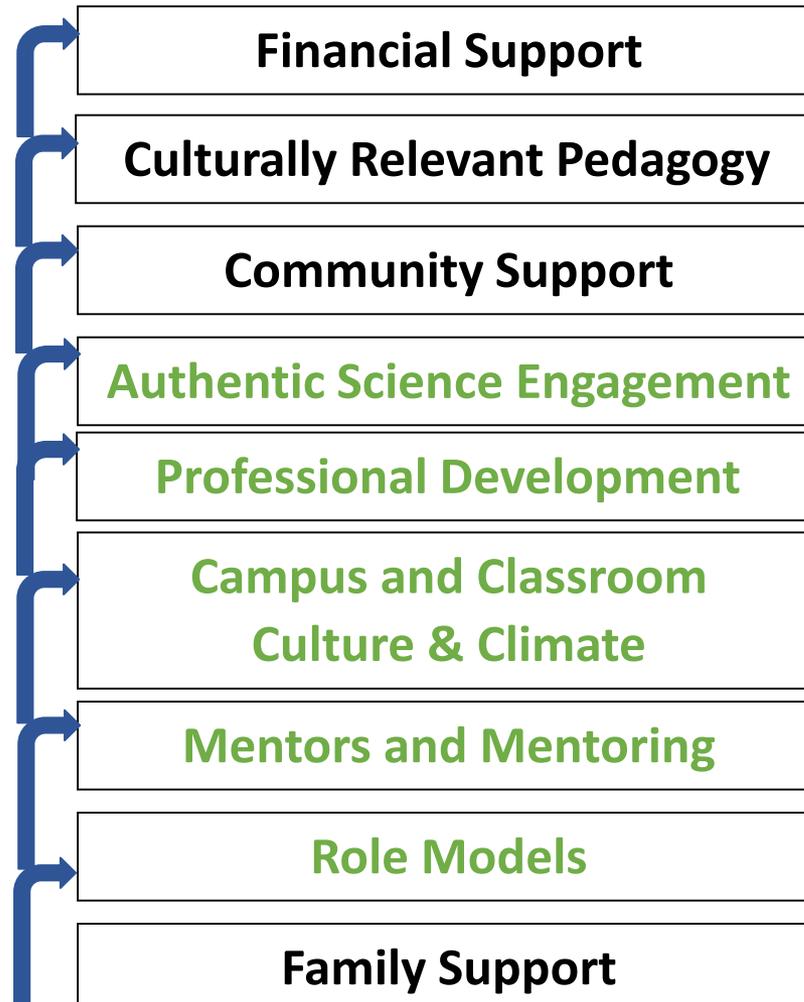
Positive Factor	
Early exposure to STEM fields in K-12	✓
Family Support	✓
Authentic Science Engagement	✓
Resiliency	✓
Role Models	✓
Mentors & Mentoring	✓
Campus & Classroom Culture and Climate	✓
Community of Support	✓
Professional Development	✓



Cultivating a Positive Campus Community



Positive Factors: A Multi-layered Approach



Role Models

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



Mentors and Mentoring

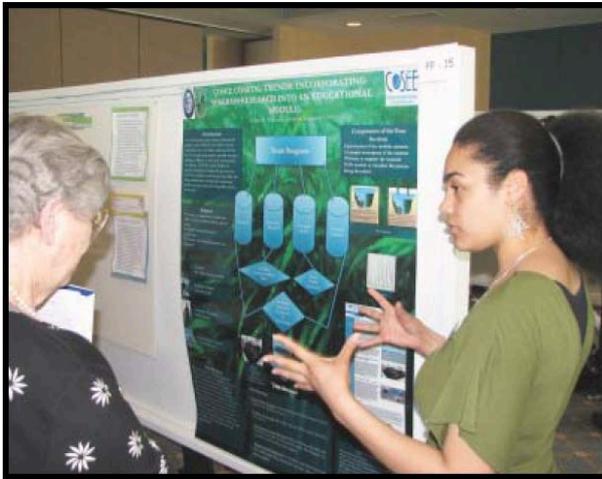
“An intentional relationship or partnership, focused on the needs of the mentee that encourages individuals to develop to their fullest potential.”

- 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”



Authentic Science Engagement

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





K-12 STUDENTS

K-12 TEACHERS

UNDERGRADS

GRAD STUDENTS

POSTDOCS

FACULTY & ADMIN



Search Programs

By Field of Study

By Institution

For Women

Resource Library

Profiles

Events

News

Partners Directory

Sign Up For Funding & Grad Program Info

About IBP

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.

 **Students**
Sign up to receive
 information on funding and programs!

 **Programs**
Search over 1,500 programs in a variety of disciplines and education levels!

- K-8 Students
- High School Students
- K-12 Educators
- Undergraduate Students

 **Faculty**
 Interested in posting your program, news, or event?

- What we Post
- Post your Program
- Post your Event
- Post your News Item
- Post your Profile

PROJECT SPOTLIGHTS!

- » Pathways to Science
- AGEP Pathways and Connections
- Maine STEM
- MS PHD'S
- NASA One Stop Shopping Initiative
- Pathways to Engineering
- Pathways to Ocean Science
- View IBP's Project Portfolios*

NEWS

- NC-LSAMP Bridge to the Doctorate Fellowship Applications Now Being Accepted!
- Hispanics Struggle To Graduate: An Issue of School Choice?
- Applications open for Rocky Mountain Sustainability and Science Network Academy-Extended Deadline! Apply Now!

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 factors that help students succeed in Science, Technology, Engineering, and Mathematics (STEM) fields and persist in educational and professional pathways to full baccalaureate degrees. Faculty can design for student success by creating programs that adapt and adopt to these positive factors in their environments and curricula. This document, which lists 17 positive factors, offers examples and successful implementation of current and past programs, and references for further reading.

Early exposure to STEM

“Early” is early enough in the primary school years when the opportunity arises. Research shows that early exposure to science and mathematics careers and long-term success (see Powell and Hall 2010; Fullilove and Treisman 2009; Powell 1990; Seymour and Hewitt 1997; Museus et al. 2011). Early interest is positively related to students’ desire to pursue STEM careers.

RECRUITMENT STRATEGIES

Develop a plan and set specific goals.

Implement, review and adjust your recruitment and retention plan as needed. Be sure to 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. A link to the recruitment and retention plan is available under the link for Faculty and Administration.

Review your admissions and enrollment

Is the pathway through your admissions and enrollment criteria appropriate? Do you involve faculty and students?

Use the resources on your own

- www.pathwaystoscience.org to find current and past programs, and references for further reading.
- 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, campus events

Turn your website into a recruitment tool

- FAQs about your program
- Photos and bios of the students
- The contact information for staff
- A printable brochure – even if it is just a one-page flyer
- Links to collaborating institutions

Build real partnerships with industry

- Relevant departments at an

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: _____

Mentoring Manual

Overview and Home

Basics for Everyone

Undergrads

Grads and Post-docs

Faculty

Faculty Directors

Overview and Home

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



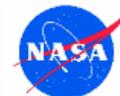
Mentoring: to mentor, or be mentored? That is the question! And the answer is: both! All of us encounter many opportunities in our lives to either mentor, or be mentored; and in any mentoring relationship the responsibility to foster and guide the process falls to both the mentor and the mentee. The 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:



AMERICAN Scientist

PERSPECTIVE

How to Recruit and Retain Underrepresented Minorities

From kindergarten through fulltime positions, what works to engage aspiring minority researchers in studying ocean science?

Ashanti Johnson, Melanie Harrison Okoro

Editor's Note: Ashanti Johnson not only studies aquatic environments but also is committed to mentoring young underrepresented minorities pursuing careers in science, technology, engineering, or mathematics (STEM). More than 10 years ago, she began a mentorship program for such students. Melanie Okoro is a former graduate mentee, now her coauthor and colleague, and is an environmental scientist at the National Oceanic and Atmosphere Administration (NOAA). Their story of mentorship and collaboration starts before they met, when Johnson was a child.

I became interested in science in the 1970s, when African Americans and U.S. Hispanics comprised only 5 percent of the STEM workforce: As a third grader growing up in Oak Cliff, which at the time was a predominately African American community in Dallas, Texas, I was given a class assignment as part of my school's talented and gifted program to identify a career that I wanted to pursue and then to conduct independent research on it. Some kids weren't sure what they wanted to do, but for me, that was easy: I wanted to be the "next" Jacques Cousteau. I watched the TV icon and oceanographer on PBS almost every Saturday. He worked with people of various nationalities, who spoke with different accents, as they explored exotic underwater locations. Inspired by his program, each year from third through twelfth grade, I conducted a new independent project related to the ocean.

At home, my parents supplied me with *National Geographic* magazines, took me to the Dallas Aquarium at Fair Park, and purchased individual volumes of *Funk and Wagnalls Encyclopedia* at the neighborhood grocery store to support my fascination with the sea and science. At school, my teachers, strong African American women, encouraged me to pursue my dreams, even though none of them had any experience related to oceanography or could point me to a single person of color who could serve as my role model. My family and teachers instilled in me the belief that if I applied myself I could achieve my career goal. They also taught me that it was important to be successful so that I could give back to the community and help others achieve.

These lessons served me well throughout my education, from public school through my doctoral studies at Texas A&M University in College Station. Despite any challenge, I was determined to persevere. My success represented success for my family and community. I felt that each career achievement would put me in a better position to reach out and help others.

When I stepped onto the research vessel *Gyre* to collect sediment samples from the Gulf of Mexico during my



enlarge image

h
agement within my community and
arduous journey of learning how to d

al programming, along with mentor
inority students aspire to STEM maj
ey have lower completion rates, acc



Recent Publications

STEM

HIGH SCHOOL & UNDERGRADUATE RESEARCH EXPERIENCES

CRUCIAL COMPONENTS OF STEM STUDENT PATHWAYS

By Ashanti Johnson, Liv Detrick and David Siegfried

Internships, research experiences and science exposure programs are pivotal to student success in science, technology, engineering and mathematics (STEM). Many high school students first affirm their career interests in STEM and many college students discover their passion for research, hone their disciplinary interests, and identify their future graduate program advisor through participation in a research experience. Undergraduate research experiences — typically occurring during the summer months — give students insight into graduate

administrators; therefore, it is important to understand how to support promising students from all backgrounds in obtaining a summer research internship, starting in their high-school years and continuing through their undergraduate careers.

Equipping High School Students for STEM Success

Research experiences, internships and exposure programs help students succeed and persist in the STEM fields, both during their high school years and beyond, as they transition into college. These paid or voluntary opportunities engage students in authentic STEM experiences and research topics relevant to their communities, two

in an internship and/or research program during high school can strengthen students' applications to college and to undergraduate research programs, particularly when they can acquire letters of recommendation from mentors and directors of the high school level programs they attended. The PathwaysToScience.org website (<http://www.pathwaystoscience.org/K12.aspx>) contains resources for high-school students — including a search link for nationally recognized programs — and many local and regional programs can be found through state education department websites and through the Change the Equation website (<http://changetheequation.org/stemworks/>). High school students applying to college

GRADUATE EDUCATION IN THE OCEAN SCIENCES

Strategies for Increasing Diversity in the Ocean Science Workforce Through Mentoring

By Ashanti Johnson, Melanie J. Huggans, David Siegfried, and LaTanya Braxton

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 to scientific discovery and addressing

Americans, Hispanics, Native Hawaiians, and other Pacific Islanders are referred to as URM(s). This broad-based and concerted approach that includes industry partners, academic and civic institutions, and individual change agents can facilitate the retention and production of URM ocean science graduate degree recipients by facilitating focused strategies across the entire professional and educational STEM system. Specifically, a number of positive factors have been demonstrated to foster increased URM engagement throughout the STEM educational pathway. These factors include, but are not limited to: (1) early exposure to STEM fields during K–12 years (Fries-Britt et al., 2010; Fullilove and Treisman, 1990; Oakes, 1990); (2) culturally relevant pedagogy and science relevancy (Ladson-Billings, 2005; Nelson, Barber, and Fritze

Academic Mentoring and Professional Development

Programs Training

College Specific

Non-profits and professional organizations

Collaborations

Industry and government

Online Resources

Reference Recruitment Strategies handout



Mentoring & Professional Development 2.0

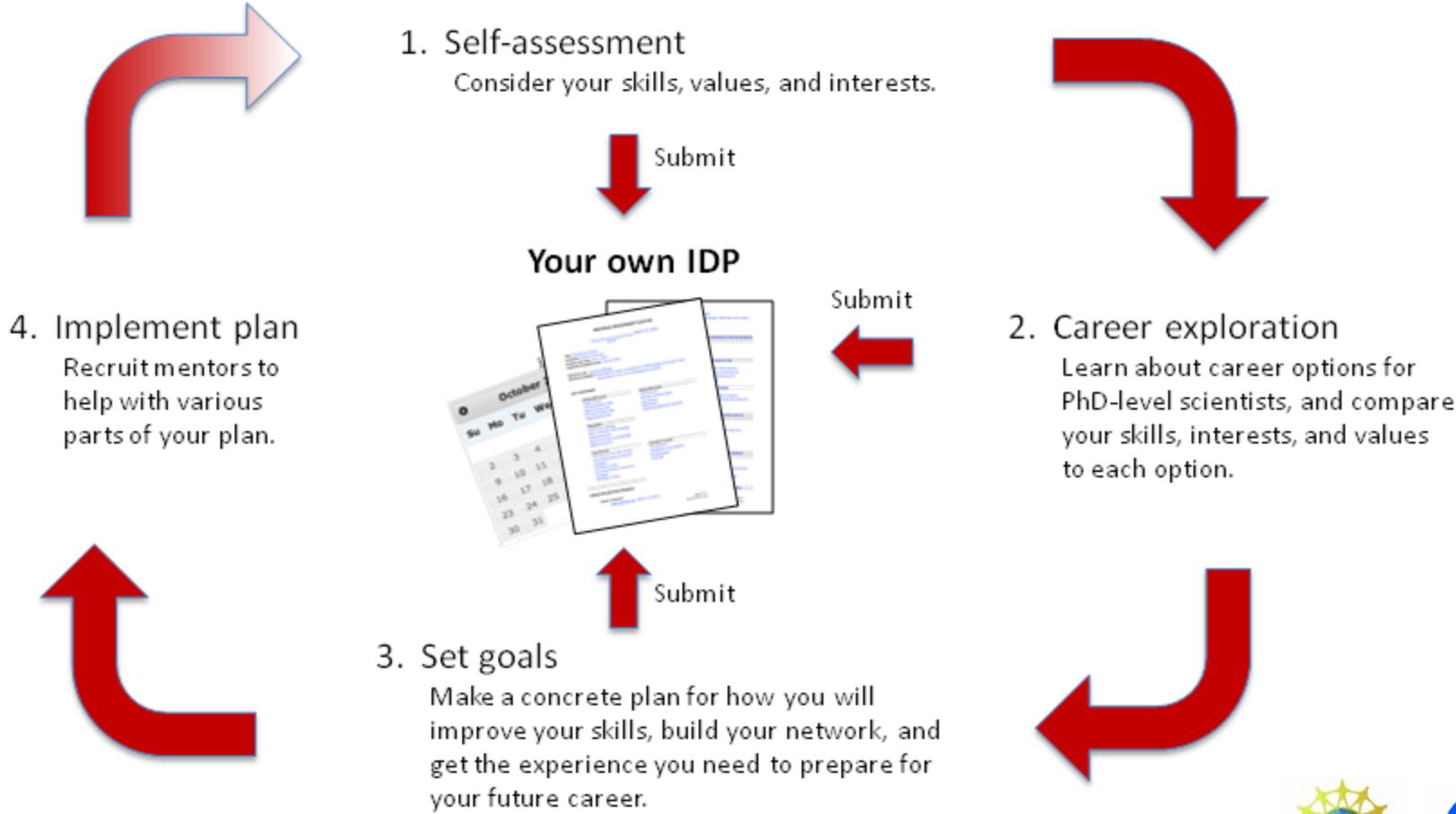
- **Establish Relationship/ Determine Expectations**
 - Handling your Business Questionnaire
- **Determine Next Steps**
 - Self Assessment, Skills Assessment, Career Exploration, Personality Testing
 - Consultation with Intra-Campus development centers and programs
 - Suggestive Readings
- **Complete 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:



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 institution?
- 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.

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

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

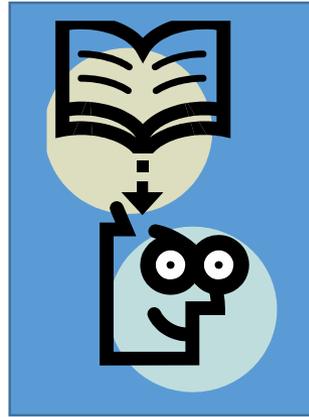


Table Talk



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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