**Building Diversity Awareness to Promote Student Success:**

**A Workshop for Science faculty**

**October 3, 2016**

**Workshop facilitators: Julie Sexton, Mathematics and Science Teaching Institute, and Cindy Shellito, Department of Earth and Atmospheric Science**

**Handout: Resources for Broadening Participation**

**Contents**

[Findings on Promoting Diversity 2](#_Toc467140824)

[1. Promote self-efficacy and interest 2](#_Toc467140825)

[2. Develop positive faculty-student interactions in and out of class 2](#_Toc467140826)

[3. Integrate student-centered and transformative teaching throughout classes 3](#_Toc467140827)

[4. Develop awareness of and work to reduce discrimination 4](#_Toc467140828)

[Steps in an Action Plan to Broaden Diversity 6](#_Toc467140829)

[Steps in an Action Plan 6](#_Toc467140830)

[Resources 6](#_Toc467140831)

# Findings on Promoting Diversity

Findings on Promoting Diversity based on research conducted by Julie Sexton, Kevin Pugh, and Eric Riggs titled "Recruitment and Retention of Women in Geosciences -- An Investigation of Individual and Environmental Factors." We gratefully acknowledge the support of the National Science Foundation Gender in Science and Engineering Program, grants HRD 1136233 and HRD 1136238. Contact Julie Sexton ([Julie.sexton@unco.edu](mailto:Julie.sexton@unco.edu)) with questions.

## Promote self-efficacy and interest

Findings

* 1. Higher self-efficacy leads to stronger interest.
  2. Interest is strong predictor of academic and career choices.
  3. Female students tend to have lower self-efficacy and interest than do male students.

Recommendations

1. Use teaching strategies to make content relevant to students.
2. Provide some opportunities for students to choose what and how they learn.
3. Help students find solutions when they struggle with learning.
4. Help students establish connections between their interests, class content, and career opportunities.

Further Reading and Resources

Hidi, S. (1990). Interest and its contribution as a mental resource for learning. *Review of Educational Research*, *60*, 549-571.

Hidi, S., & Renninger, K. A. (2006). The four-phase model of interest development. *Educational Psychologist, 41,* 111-127.

Linnenbrink-Garcia, E., Patall, E. A., & Messersmith, E. E. (2013). Antecedents and consequences of situational interest. *British Journal of Educational Psychology*, *83*, 591-614.

Pugh, K. J., Linnenbrink-Garcia, L., Phillips, M., & Perez. (2015). Supporting the development of transformative experience and interest. In K. A. Renninger, M. Nieswandt, & S. Hidi (Eds.), *Interest in mathematics and science learning* (pp. 369-383). Washington, DC: AERA.

## Develop positive faculty-student interactions in and out of class

Findings

1. Students who have a stronger connection to their instructors are more engaged and have better learning outcomes.
2. Students who have a stronger connection to their instructors are more likely to undergo transformative experiences.
3. Students with stronger connection to their instructors are more likely to select and persist in a science major and career.
4. Departments that are successful at broadening participation, intentionally foster positive faculty-student interactions in and out of class.

Recommendations

1. Learn students' names and engage in informal conversations with students before and after class.
2. Express explicit concern for well-being of all students.
3. Provide opportunities for individual attention for all students (for example via mentoring and research).
4. Promote active participation in undergraduate research so that students engage in mentoring relationships with faculty and/or graduate students.
5. Use more interactive teaching techniques during class.
6. Hold academic seminars intentionally designed for undergraduate students to engage with faculty.

Further Reading and Resources

Auster, C. J., & MacRone, M. (1994). The classroom as a negotiated social setting: An empirical study of the effects of faculty members' behavior on students' participation. *Teaching Sociology*, *22*, 289-300.

Cotten, S. R., & Wilson, B. (2006). Student–faculty interactions: Dynamics and determinants. *Higher Education, 51*(4), 487-519.

Kim, Y. K., & Sax, L. J. (2009). Student–faculty interaction in research universities: Differences by student gender, race, social class, and first-generation status. *Research in Higher Education, 50* (5), 437-459.

## Integrate student-centered and transformative teaching throughout classes

Findings

1. Students who undergo transformative learning experiences in science are more likely to select and persist in science majors and careers.
2. Departments that are successful at broadening participation, integrate student-centered learning throughout their courses. They demonstrate a commitment to improving student learning by improving teaching.

Recommendations

1. Use active learning techniques in all classes.
2. Use formative and summative assessments to understand and improve student learning.
3. Use teaching strategies to promote transformative experiences:
   * Teach content that has relevance to students and use metaphors to awaken student anticipation about how the content could change the way students see and experience the world.
   * Help students see everyday objects and events through the lens of the content they learn in the classroom.
   * Professors tell students about their own transformative experiences with the content.

Further Reading and Resources

Angelo, T. A., & Cross, K. P. (1993). *Classroom assessment techniques: A handbook for college teachers*. San Francisco: Jossey-Bass.

Fink, L. Dee. (2013). *Creating significant learning experiences: An integrated approach to designing college courses*. John Wiley & Sons.

Pugh, K. J., & Girod, M. (2007). Science, art and experience: Constructing a science pedagogy from Dewey's aesthetics. *Journal of Science Teacher Education*, *18*, 9-27.

Pugh, K. J., Linnenbrink-Garcia, L., Phillips, M., & Perez. (2015). Supporting the development of transformative experience and interest. In K. A. Renninger, M. Nieswandt, & S. Hidi (Eds.), *Interest in mathematics and science learning* (pp. 369-383). Washington, DC: AERA.

Savory, P., Burnettt, A., & Goodburn, A. (2007). *Inquiry into the college classroom: A journey toward scholarly teaching.* Bolton, MA: Anker Publishing Company, Inc.

## Develop awareness of and work to reduce discrimination

Findings

1. Faculty can have implicit and explicit gender and racial biases. These biases can affect interactions with other faculty and students and judgment about students' abilities. If unaddressed, these biases can promote an unwelcoming, hostile climate for all students and particularly for underrepresented students.
2. Unwelcoming, hostile climates can dissuade students from selecting and persisting in an academic and career path.
3. Departments that are successful at broadening participation, have a lower number of hostile sexist experiences per person.

Recommendations

1. Develop awareness of your own implicit biases. For example, complete an implicit bias test at Project Implicit (https://implicit.harvard.edu/implicit/takeatest.html).
2. Develop awareness of microaggressions and stereotypes and implement strategies to reduce them.
3. Faculty and departments can adopt strategies known to promote diversity (see other research findings above)

Further Reading and Resources

Ashburn-Nardo, L., Morris, K. A., & Goodwin, S. A. (2008). The confronting prejudiced responses (CPR) model: Applying CPR in organizations. *Academy of Management Learning & Education, 7*(3), 332-342.

Smith, W. A., Allen, W. R., & Danley, L. L. (2007). “Assume the position…you fit the description”: Psychosocial experiences and racial battle fatigue among African American male college students. *American Behavioral Scientist*, 51, 551-578.

Smith, W. A., Hung, M. H., & Franklin, J. F. (2011). Racial battle fatigue and the miseducation of Black men: Racial microaggressions, societal problems, and environmental stress. *Journal of Negro Education*, *80*(1), 63-82.

Steele C. M. (1997). A threat in the air: How stereotypes shape intellectual identity and performance. *American Psychologist*, *52*, 613–629.

Steele, J. R., & Ambady, N. (2006). "Math is hard!" The effect of gender priming on women's attitudes. *Journal of Experimental Social Psychology*, *42*, 428-436.

Sue, D. W. (2010). *Microaggressions in everyday life: Race, gender, and sexual orientation*. John Wiley & Sons.

Sue, D. W., Capodilupo, C. M., Torino, G. C., Bucceri, J. M., Holder, A., Nadal, K. L., & Esquilin, M. (2007). Racial microaggressions in everyday life: implications for clinical practice. *American psychologist*, *62*(4), 271.

Tsui, L. (2007). Effective strategies to increase diversity in STEM fields: A review of the research literature. *The Journal of Negro Education, 76* (4), 555-581.

# Steps in an Action Plan to Broaden Diversity

## Steps in an Action Plan

1. **Describe the issue, problem, or concept you want to investigate. Decide if the investigation will be at the individual, course-level or at the department level. Decide if this is an investigation to collect data or if you will collect literature only.** 
   1. Course-level example: Do I use student-centered strategies? Do students develop a stronger interest in the topic and find my class more welcoming if I increase my use of student centered strategies?
   2. Course-level example: How can I improve my faculty-student interactions?
   3. Program-level example: What are student perceptions of our department climate? In what ways can we promote a more welcoming climate?
   4. Program-level example: What are student perceptions of teaching in our department? In what ways can we integrate more student-centered teaching throughout our program?
   5. Literature collection only: What does the literature say about microaggressions in science and how to address them?
2. **Based on the issue, problem, or concept you will investigate. determine what information needs to be collected.**
   1. Course information examples: demographic data of who takes the class, grades and GPA for students in your class, questionnaire/survey data related to your investigation (e.g., students' interest in science, student perception of social climate), description of your teaching strategies and an evaluation of how student-centered they are.
   2. Program information examples: demographic data of who takes introductory classes versus who majors, GPAs for students in your program, questionnaire/survey data related to your investigation (e.g., students' interest in science, student perception of social climate).
   3. Literature examples: literature on how to promote interest, literature on microaggressions, literature on developing a strong undergraduate research program.
3. **Determine who will collect the information, where you will get the information, and when you will get the information. Collect the information.**
4. **Organize and analyze the information.**
5. **Determine an action plan based on the results of the analysis.**
6. **Implement action plan.**

## Resources

1. Gather institutional data from your institution's Institutional Research Office.
2. Savory, P., Burnettt, A., & Goodburn, A. (2007). *Inquiry into the college classroom: A journey toward scholarly teaching.* Bolton, MA: Anker Publishing Company, Inc. This book describes a process to examine your classroom.
3. Bensimon, E. M., Malcom, L. (Eds.). (2012). *Confronting equity issues on campus: Implementing the equity scorecard in theory and practice*. Stylus Publishing, LLC. This book describes a process to examine demographic and achievement data to address equity issues.