

Make Course Content Societally Relevant



Goal: Engage student interest and participation in geoscience by choosing topics for your course that are relevant to your students' lives and their sense of place.

Advantages:

- Including course content that focuses on societal issues and environmental justice topics promotes engagement of all students and motivates student learning.
- Exposes all students to inequities in political decision making.

Strategies

Teach about local geoscience: Incorporate topics that are relevant to your campus and community wherever they can fit into your courses.

Engage students in project-based learning: Help make geoscience real by having students explore topics in depth. For example, the Lifestyle Project (resource 5) engages students in taking action to decrease their own environmental impact. Service learning projects also connect course content to students' lives.

Bring the geosciences to life: Invite a "local expert" to talk about a geoscience issue in your community, such as flooding, oil/gas pipeline installation, water diversions, fracking, sea level rise, air quality, radon mitigation, loss of topsoil, hazards, etc.

Teach about environmental justice: Explore the environmental justice activity collection and the implementation examples of the InTeGrate project (see resources 1 and 2) or environmental justice case studies (resource 4).

Implementation:

Depending on your situation this could be a unit in a course or could involve an entire course revision; see the resources to the right.

Resources

1. Environmental justice activity collection of the InTeGrate project: <http://serc.carleton.edu/integrate/workshops/envirojustice2013/activities.html>
2. Implementation examples from the InTeGrate project: https://serc.carleton.edu/integrate/teaching_materials/freshwater/perez_story.html and https://serc.carleton.edu/integrate/teaching_materials/freshwater/villalobos_story.html
3. Connect service learning with societal issues: http://serc.carleton.edu/integrate/teaching_materials/service_learning.html
4. Environmental justice case studies: <http://www.umich.edu/~snre492/cases.html> and <http://nativecases.evergreen.edu/collection/themes/environmental-justice.html>
5. The Lifestyle Project: <https://serc.carleton.edu/introgeo/enviroprojects/lifestyle.html>

References

- Ladson-Billings, G. 1995. Toward a Theory of Culturally Relevant Pedagogy, *American Educational Research Journal*, 32(3), 465-491.
- Nelson-Barber, S. and Trumbull Estrin, E. 1995. Bringing Native American Perspectives to Mathematics and Science Teaching, *Theory Into Practice*, 34(3), 174-185.

Make implicit rules visible to all students



Goal: Academic culture contains many “hidden” or implied expectations for classwork and student behavior that may be clear to some students but not all. Making these expectations more obvious can help level the playing field for all students.

Advantages: Even among those with some understanding, these unwritten rules for academic success can vary by course, by program or by institution, so making them clear is helpful for all of your students.

Strategies

Illuminate the implicit rules for

- student preparation for class
- participation in class
- group work
- office hours

Starting with the syllabus, describe your expectations and explain terms and policies that may have different meanings in other cultures (e.g., what constitutes plagiarism).

Give concrete examples

Before leading class discussion, offer samples of specific phrases that students can use to make their point, to respond to another student, to change the topic, and so on.

Encourage help-seeking

Students may view asking for help as a sign of weakness. Encourage students to view office hours as an opportunity to confirm understanding of course content, learn about helpful resources, clarify expectations for assignments, and explore research opportunities.

Disagreement is okay

Some students may feel that it is disrespectful to challenge authority, whether critiquing a published article or asking questions about a presentation by the instructor. Be explicit about the value we place on a respectful exchange of differing perspectives. Underscore that there is often more than one way to approach a problem or interpret findings and we are eager to hear multiple perspectives. As one example, provide sample phrases that students can use to introduce differing ideas: “*It is possible to approach this problem from another angle*” or “*We might consider an alternate explanation*” or “*I interpreted the issue in a (slightly) different way...*”

Social behavior is part of the equation

Social aspects of common interactions in an academic setting are often unspoken. Students may benefit from guidance on how to write emails to their professors, make an appointment for extra help, interact with other students in labs or study groups. These initial points of contact can have a direct impact on the success of these interactions.

Implementation

- Describe expectations on the syllabus.
- Talk about implicit rules for your course with your students. Give a short presentation and/or distribute a handout.
- Give an assignment that requires meeting with the instructor as a model for office hour meetings.

References

1. Burk JA, Zeman JL, Wulf KA, Robison JE, Dickter CL (2015) Supporting neurological difference on college campuses: The Neurodiversity Initiative at the College of William and Mary. *Presented at the Society for Neuroscience Meeting.*
<http://www.wm.edu/sites/neurodiversity/resources/forfaculty/index.php>
2. Deussen, T., E. Autio, B. Miller, A. Lockwood, and V. Stewart (2008). What Teachers Should Know About Instruction for English Language Learners: A Report to Washington State.
3. Burk J and LeBlanc, PH (1993) Implicit Nonverbal Rules in the Classroom: A Study of Gender and Status Differences. Presented at the Annual Meeting of the Speech Communication Association
4. <http://communication.utsa.edu/leblanc/articles/art02.pdf>

Recognize Implicit Biases

Definition: Implicit biases are *unconscious* negative associations we hold about groups of people, which are embedded in our culture and which often contradict our conscious beliefs.

Goal: Improve student learning by counteracting unconscious biases prevalent in our society.

Advantages

- Sends students the message that you believe they can succeed in your courses and in the geosciences
- Helps students identify and overcome their own implicit biases



Photo courtesy of the US Department of Education

Strategies

Develop your awareness of your biases: Take the Implicit Association Test.¹ Pay attention to your assumptions about members of groups.^{3,4} Make the effort to treat each student as an individual, regardless of gender, race, or other identities.³

Consider the potential for bias when you are making decisions: When you are grading student work or considering whom to invite to participate in a special event or project, ask yourself whether you would make the same decision if the person in question belonged to a different demographic.³

Engage with individuals and communities that are different from you: Spend some time getting to know people who have backgrounds and identities that are different from yours.^{2,3,4}

Implementation

- Take the Implicit Association Test from <https://implicit.harvard.edu/implicit/takeatest.html>.
- Keep a journal of your assumptions about people and/or incidents as a tool for awareness and reflection.
- Connect with your multi-cultural affairs office.
- Attend social / cultural events on campus.
- Encourage students to reflect on their identities, including their cultural identities, and to write about what they value and why.
- Review objective criteria immediately prior to evaluating student work. Focusing on criteria can interrupt unconscious patterns of thought.²
- Find a way to grade assignments without knowing whose work you are evaluating as you grade.

Build counter-stereotypical associations:

Actively work to build conscious associations for yourself between stigmatized groups and positive characteristics. Educate yourself and your students about counter-stereotypical individuals, such as scientists who are women, people of color, or both.^{2,3}

Develop an awareness of your own cultural identities: Cultural biographies are a means of exploring our multi-faceted personal identities – the ones we are born with and the ones that we learn. Recognizing and affirming our own cultural identities helps us to be more aware of others' identities.⁵

References

1. Greenwald, A. G.; McGhee, D. E.; Schwartz, J. L. K. 1998. Measuring individual differences in implicit cognition: The implicit association test. *Journal of Personality and Social Psychology*, v. 74(6), pp. 1464-1480.
2. Lai, C.K, Hoffman, K. M., and Nosek, B. A. 2013. Reducing Implicit Prejudice. *Social and Personality Psychology Compass*, v. 7, n. 5, pp. 315-330.
3. Miller, K. 2016. How to Fight Your Own Implicit Biases. Retrieved from <https://www.aauw.org/2016/03/30/fight-your-biases/>.
4. Reese, B., Workshop on Unconscious Bias. Reese is the Vice President and Chief Diversity Officer for the Office for Institutional Equity at Duke University.
5. Weissmann, G. and Ibarra, R. 2015. Developing Your Cultural Competency: Individual Actions to Improve the Climate for All. *Earth Educators' Rendezvous*: Boulder, CO.

Scientist Spotlights

Goal: Provide all students with opportunities to see someone in geoscience that reflects them in terms of gender/race/ethnicity, and to whom students might personally relate, based on interests and experiences.

Advantages:

- Shows under-represented students that people like them can be scientists.
- Shows majority students that science is a diverse enterprise.



SCIENTIST SPOTLIGHT

Dr Karletta Chief is an assistant professor and extension specialist in the Department of Soil Water and Environmental Science at the University of Arizona. In her extension specialist work she brings relevant science to Native American communities in a culturally sensitive manner by providing hydrology expertise, transferring knowledge, assessing information needs, and developing applied science projects. Dr. Chief is Diné originally from Black Mesa, AZ.

Resources you could use:

- Her web page at the University of Arizona that shows her accomplishments and has links to her work: <https://swes.cals.arizona.edu/people/faculty/karletta-chief>
- One of her links is to the American Indian Science and Education Society: <http://arizonaaises.weebly.com/index.html>
- An 2.5 min video about her pathway of her career and her community involvement: <https://www.youtube.com/watch?v=TxfhVV9YfEo>
- She co-authored guidelines for considering traditional knowledge in climate change initiatives: <https://climatetkw.wordpress.com/guidelines/>

Strategies

Explicitly show diversity in your teaching. Use a diversity of people in the images you include in your presentations. Showcase the work of geoscientists who are women &/or people of color in your courses. Use both historical and modern examples of diverse individuals.

Expose students to geoscientists who represent the human diversity of our world. Invite speakers or arrange a social event. Include young people (recent alumni?) who are working in geoscience. Arrange a visit or field trip to an appropriate place for your class that has a diversity of geoscientists.

Use “Scientist Spotlights” as homework assignments. Feature scientists who, collectively, present diverse examples of who scientists are and how science is done. Match scientist spotlights to the content areas being covered in class. For each homework assignment, have students read an article about the scientist’s research and a resource about the scientist’s personal history. See Schinske et al. (2016) for further details.

References

1. Rodriguez, Sarah L., Kelly Cunningham, and Alec Jordan, 2016. What a Scientist Looks Like: How Community Colleges Can Utilize and Enhance Science Identity Development as a Means to Improve Success for Women of Color, Community College Journal of Research and Practice, DOI: 10.1080/10668926.2016.1251354.
2. Schinske J., Perkins, H., Snyder, A., and Wyer, M. 2016. Scientist Spotlight Homework Assignments Shift Students' Stereotypes of Scientists and Enhance Science Identity in a Diverse Introductory Science Class. CBE - Life Sciences Education 15 (3):1-18.

Implementation

- Use scientist spotlights to add a human dimension to science course topics.
- Weave examples of diverse geoscientists throughout the course, not just as a one-off session.

Student Engagement Practices

Goals

- Provide students with multiple opportunities to be involved in educationally beneficial practices that promote their learning and development as geoscientists.
- Help students develop a sense of belonging.

Advantages:

Practices that provide academic, social, and financial support for student engagement within and outside the classroom increase students' sense of belonging, and increase course completion and retention rates.

Strategies within the classroom

Emphasize active and collaborative learning.

Engage in frequent and timely assessment and feedback.

Make course content societally relevant.

Provide information about geoscience-relevant activities beneficial to your students.

Strategies outside the classroom

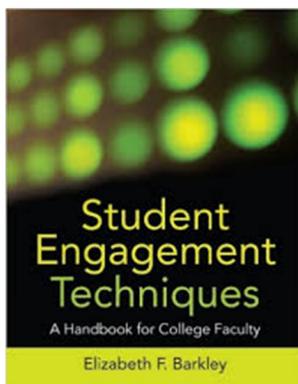
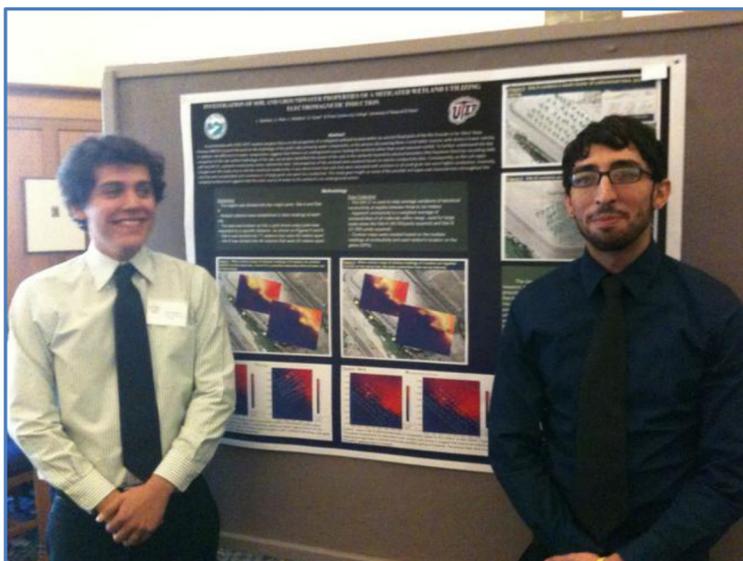
Foster opportunities for student-faculty interactions e.g. field experiences, coffee shop discussions, visits to geoscience professionals, meetings or conferences.

Create opportunities for students to work with classmates outside of class.

Make sure all students have opportunities to participate in internships, research experiences and service learning.

Encourage/require a study skills course.

Give all students information about scholarship opportunities and provide assistance with applications.



Implementation

Research shows that different groups of students may respond in different ways to different strategies but all students benefit by opportunities to interact with peers and faculty within and outside the classroom.

References

1. Barkley, Elizabeth F. 2009. Student Engagement Techniques: A Handbook for College Faculty. Jossey-Bass ISBN: 978-0-470-28191-8.
2. Hurtado, Sylvia and Deborah Faye Carter. 1997. Effects of College Transition and Perceptions of the Campus Racial Climate on Latino College Students' Sense of Belonging. *Sociology of Education*, v. 70, pp. 324-345.
3. Lundberg, Carol A. and Laurie A. Schreiner. 2004. Quality and Frequency of Faculty-Student Interaction as Predictors of Learning: An Analysis by Student Race/Ethnicity. *Journal of College Student Development*, v. 45, pp. 549-565.
4. Price, Derek V. and Esau Tovar. 2014. Student Engagement and Institutional Graduation Rates: Identifying High-Impact Educational Practices for Community Colleges. *Community College Journal of Research and Practice*, 38:9, 766-782.

Build Students' Science Identity

Goal: Promote the development of a science identity in your students.

Advantages:

As students start to see themselves as scientists they become more comfortable and competent with science content, skills, and practices and show a greater interest in science subjects.

Strategies

Use the tools of geoscience in your courses. Be explicit: Tell your students when they are doing what scientists do.

Provide opportunities in your courses for students to talk about science. This helps students to become comfortable using the language of science.

Be explicit about the process of science. Include examples of how scientists have generated new knowledge and how scientists work. Talk about scientific failures as well as scientific discoveries.

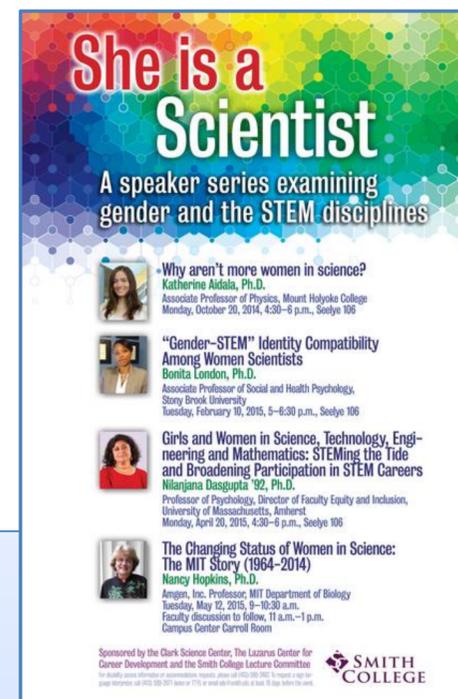
Implementation

- Regularly include some of the strategies in your courses – when you introduce a new topic, show a scientist whose work is relevant. Use a diverse set of examples over the course of the semester.
- Talk about your own experiences as a scientist.
- Invite scientists, including recent alumni if possible, to be visiting speakers in your courses and/or department.

Show your students examples of scientists.

In particular, show students examples of scientists who look like them. Role models are useful, but they represent people students are expected to become. Students may find it easier to relate to younger scientists.

Include topics that are relevant to your student's lives. Connect core concepts in your course to everyday life, such as relevant topics in the news or events on and off campus. Use these examples to show students the relevance of scientists' work.



References

1. Carlone, H. B., & Johnson, A. 2007. Understanding the science experiences of successful women of color: Science Journal of Research in Science Teaching, 44(8), 1187-1218.
2. Rodriguez, Sarah L., Kelly Cunningham, and Alec Jordan, 2016: What a Scientist Looks Like: How Community Colleges Can Utilize and Enhance Science Identity Development as a Means to Improve Success for Women of Color, Community College Journal of Research and Practice, DOI: 10.1080/10668926.2016.1251354.
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4. Hazari, Zahra, Philip M. Sadler and Gerhard Sonnert. 2013. The Science Identity of College Students: Exploring the Intersection of Gender, Race, and Ethnicity. Journal of College Science Teaching. 42(5):82-91.

Develop an Inclusive Community

Goal: Consistently communicate to all students that they are welcome and can succeed in the geosciences.

Advantages:

- Gives students a sense of belonging
- Promotes student engagement and success
- Allows multiple voices to be heard



Strategies

Make implicit rules visible: Be explicit about your expectations for classroom participation, preparation for class, help-seeking, office hours, group work, and interactions with you and between students.

Recognize implicit biases: Develop your own and students' awareness of implicit biases and how they can impact interpersonal interactions. Make a habit of considering the possibility of bias in your own decision-making.

Affirm multi-cultural perspectives: Explicitly ask students to consider the perspectives of different cultures in relation to the human dimensions of the geosciences.

Implementation

- Post your community values statement in your department and refer to it in your syllabus.
- Describe your expectations and explain terms and policies that may have different meanings in other cultures (e.g., what constitutes plagiarism).
- Take an interest in your students' perspectives.

Community values statement: Post a statement in your classroom and/or department about valuing the perspectives and contributions of all students and stating the expectation that all members of your community will treat each other with respect.

Develop an “asset model” mindset: Look for evidence of students' capabilities. Assume that all students have the capacity to succeed in your course, given appropriate opportunities and support.

Offer micro-validations: When students persist in the face of difficulty or act like scientists in training (e.g., generate hypotheses or ask what data they could use to test a hypothesis), point out that these are the behaviors that will make them successful as students and as scientists.

References

1. Alber, R. 2013. Tools for Teaching: Ditching the Deficit Model. Online at <https://www.edutopia.org/blog/teaching-tool-ditching-deficit-model-rebecca-alber>.
2. Bartlett, T. 2017. Can We Really Measure Implicit Bias? Maybe Not. Chronicle of Higher Education, available at http://www.chronicle.com/article/Can-We-Really-Measure-Implicit/238807?cid=trend_right_a.
3. Greenwald, Anthony G.; McGhee, Debbie E.; Schwartz, Jordan L. K. 1998. Measuring individual differences in implicit cognition: The implicit association test. *Journal of Personality and Social Psychology*, Vol 74(6), pp. 1464-1480.
4. Ladson-Billings, G. 1995. Toward a Theory of Culturally Relevant Pedagogy, *American Educational Research Journal*, v. 32, n. 3, pp. 465-491.
5. Nelson-Barber, S. and Trumbull Estrin, E. 1995. Bringing Native American Perspectives to Mathematics and Science Teaching, *Theory Into Practice*, v. 34, n. 3, pp. 174-185.

Mitigate Stereotype Threat

Goal: Avoid activating stereotype threat and help students become more resistant to its effects.

Advantages:

- Students who are given strategies to deal with Stereotype Threat perform better on academic tasks and maintain higher GPAs overall.



Strategies

Self-Affirmations: Having students write self-affirmations enumerating their individual positive qualities can counteract the effects of both stereotype threat and solo status in subsequent tasks.

Level the Playing Field: Framing social adversity in school as a shared - and short-lived - experience during freshman year can improve the students' GPA over the whole course of college, especially for African Americans.

Using Validation: Allow students to contribute to the classroom conversation, and acknowledge that the perspective and knowledge they bring is as valuable as what others think and know.

Role Models who “look like me”: Seeing and learning about examples of successful people defying common stereotypes can help students overcome the challenges themselves. Guest speakers and biographical information about in-group role models can serve as examples that it's possible to be successful regardless of the stereotype.

Implementation

- Before an exam, prompt students to write about their strengths or their personal characteristics, skills, values, or roles that they value or view as important.
- Point out that everyone has trouble adjusting to college and the higher expectations that come with it, but that they are capable of meeting those standards.
- Include pictures of scientists who are women and people of color in lectures and presentations.

References

1. Steele, C.M. (1999). Thin Ice: Stereotype Threat and Black College Students. *The Atlantic Monthly*.
2. Steele, C. M. and J. Aronson (1995). Stereotype threat and the intellectual test performance of African-Americans. *Journal of Personality and Social Psychology*, 69, 797-811.
3. ReducingStereotypeThreat.org: This website offers summaries of research on stereotype threat and discusses unresolved issues and controversies in the research literature. Included are some research-based suggestions for reducing the negative consequences of stereotyping, particularly in academic settings.