

## Ethics and Bias in the Practice of Science – v.11-2020

Science and science education have been complicit in enacting and perpetuating bias and racism, but many science educators never learned about these acts, nor were they trained to recognize and confront the problems. These resources were compiled to help science educators learn more about the history of bias and racism in science, to find ways to create more inclusive science classrooms that honor students' cultures and experiences, and to suggest concrete ways to bring up these topics with a variety of audiences in an educational context. The materials are intended to supplement the professional learning needs of individuals or groups. Please, read the goals and objectives for each of the areas and choose resources that are useful for your situation.

Goal 1: [Provide educators with historical and modern day examples of bias and racism in science.](#)

Goal 2: [Help science educators expand their definition of what “counts” as scientific knowledge, language and practices](#)

Goal 3: [Consider concrete steps for addressing bias and racism in school science](#)

Goal 1:

Provide educators with historical and modern day examples of bias and racism in science.

Objectives:

1. Educators recognize the work of science and scientists as cultural, not objective.
2. Educators recognize that science has been complicit in perpetuating racism and other forms of bias.

Resource	Why useful
<a href="#">The Eugenics Crusade American Experience.</a> (2018). PBS: American Experience.	Video examining the historical connection between science, politics, social movements related to eugenics in the US. How bias created harmful outcomes for many
Gould, S. J. (1996). <a href="#">The Mismeasure of Man.</a>	Historical examination of how science was used to create and justify racial hierarchies.
Roberts, D. (2011). <a href="#">Fatal invention: How science, politics, and big business re-create race in the 21st century.</a>	Focuses on racism/bias in medicine, despite knowing race is not biological, decision-making goes by race. Discusses how systemic racism in social systems causes inequitable outcomes that appear genetic
Jardins, Julie: <a href="#">The Madame Curie Complex: The Hidden History of Women in Science</a>	Explores the nature of women being disregarding female scientists and their contributions. Touches both on feminism and ethnicity (potentially only read the intro and first chapters). Also provides other reflections on the creation of the atomic bomb.
Saini, A. (2019). <a href="#">Superior: The Return of Race Science.</a>	Examines the re-emergence of beliefs in biological racial differences in modern science.

<a href="#"><u>Hidden Figures</u></a> (book) by Margot Lee Shetterly and <a href="#"><u>Hidden Figures</u></a> (movie)	Book and movie about little recognized African American women working as “computers” for NASA during the Apollo era.
<a href="#"><u>Radium Girls: The Dark Story of America’s Shining Women</u></a> by Kate Moore	Book about women who were watch dial painters. They paint contained radium, leading to prolonged, painful deaths from radium poisoning. The industry denied the problem.
<a href="#"><u>The Bell Curve</u></a> , Charles A. Murray and Richard Herrnstein	A controversial book connecting race and class to intelligence – <a href="#"><u>an interview with Murray in 2014</u></a> .
<a href="#"><u>Koch Industries: Secretly Funding the Climate Denial Machine</u></a>	The super-rich, right-wing Koch brothers “contribute to science” and appear objective by sponsoring Nova, but they do not support a scientific understanding of climate change.

Goal 2:

Help science educators expand their definition of what “counts” as scientific knowledge, language and practices

Objectives:

1. Educators recognize and include ways of knowing beyond White Supremacist, heteronormative, Misogynistic science
2. Educators value students’ cultural thinking, languages and voices about science
3. Educators value students’ curiosity and experiences around the way the diverse world works.

Resource	Why useful
Bang, M., Warren, B., Rosebery, A. S., & Medin, D. (2012). <a href="#"><u>Desettling expectations in science education</u></a> . <i>Human Development</i> , 55(5–6), 302–318.	Focuses on ways to use Indigenous knowledge and science together with students, build off student strengths, connect to their culture
Emdin, C. (2016). <a href="#"><u>For White Folks Who Teach in the Hood... and the Rest of Y’all Too: Reality Pedagogy and Urban Education</u></a> .	Written from his experience as a high school science teacher working in an urban high school where he didn’t know the culture, Chris Emdin discusses the steps he took to get to know his students, building off of their knowledge.
<a href="#"><u>Braiding Sweetgrass</u></a> , Robin Wall Kimmerer	Speaks to her experience blending Indigenous background/knowledge with work as a botanist--examples of how she teaches with both. Chapters stand alone or can be read as a whole book.
<a href="#"><u>The Boy Who Harnessed the Wind</u></a> (Children’s Book and <a href="#"><u>adult book</u></a> )	Modifying the thinking that only adults are responsible for invention and changing the way of

By <a href="#">William Kamkwamba</a> and Bryan Mealer	life. Children innovating despite limitations. There is also a movie.
<a href="#">Tiny Stitches: The Life of Medical Pioneer Vivien Thomas</a> (Children's Book) by Gwendolyn Hooks and Colin Bootman	Vivien Thomas is an African American doctor that developed a procedure for blue baby syndrome as well as other cardiological procedures
Ballenger, C. (1997). <a href="#">Social identities, moral narratives, scientific argumentation: Science talk in a bilingual classroom</a> . <i>Language and Education</i> , 11(1), 1-14.	How to use student background knowledge and prior knowledge to engage in science talks (may require library or university access).
Brand, B. R., Glasson, G. E., & Green, A. M. (2006). <a href="#">Sociocultural factors influencing students' learning in science and mathematics: An analysis of the perspectives of African American students</a> . <i>School Science and Mathematics</i> , 106(5), 228-236.	The voices of African American students reveal sociocultural factors that influence their achievement in science and mathematics classes. The students' discussions provided insight into their beliefs about the varied ways in which sociocultural factors impact their learning in science and mathematics classrooms (may require library or university access).
<a href="#">Stars of the First People: Native American Star Myths and Constellations</a> , by Dorcas S. Miller	This book, for adults and young people alike, treats Native American star myths and constellations present an alternate view of astronomy.

### Goal 3:

#### Concrete steps for addressing bias and racism in school science

- Provide classroom resources about bias and racism in science.
- Provide honest representations of science using diverse examples for the classroom.
- Increase educators comfort level and confidence talking about racism and bias in science.

#### Objectives:

1. Educators will bring diverse representations of science to their curriculum, regardless of their school population
2. Educators will engage in courageous conversations about bias and racism in science with colleagues, families and students.

Resource	Why useful
Sue, D. W. (2016) <a href="#">Race talk and the conspiracy of silence: Understanding and facilitating difficult dialogues on race</a> .	Talks through what to look for, gives scenarios and responses, not specific to science or to education, however.

<p><a href="#">Transgender perspectives in the biology classroom</a>, by Elizabeth Hobbs</p>	<p>Provides examples of what this teacher did in her biology classroom to be more inclusive on many different levels. Language considerations. Note this resource was contested in the July/Aug 2020 Science Teacher--interesting editorial discussion.</p>
<p><a href="#">How one 2nd grader's story inspired climate justice curriculum</a>, By Rachel Hanes</p>	<p>Article from Rethinking Schools, provides an example of what one teacher did, techniques used to build off student knowledge, connect to community</p>
<p><a href="#">Handling controversial topics in discussion</a>, University of Michigan CRTL</p>	<p>University oriented, general resource, but provides ideas for laying ground rules, questions to ask, etc. If we find something more specific to our situation, delete this</p>
<p><a href="#">The Underrepresentation Curriculum Project</a></p>	<p>Curriculum resources for science teachers at all levels addresses underrepresentation in STEM, systemic racism, sexism, etc. Connected with Teaching Tolerance.(author has physics focus in examples)</p>
<p>M Furman, <a href="#">AC Barton</a> - Journal of Research in Science Teaching, 2006 - Wiley Online Library. Capturing urban student voices in the creation of a science mini-documentary.</p>	<p>Follows two seventh grade boys in low income urban setting and how their voices changes the outlook of science and the teacher.</p>
<p><a href="#">Becoming a Culturally Relevant Science Educator</a>, by Valerie Butler</p>	<p>This article has useful information for teachers that are just starting to examine their classroom practices. There are also several linked resources that will be helpful.</p>
<p><i><a href="#">The Boy Who Harnessed the Wind</a></i> (Children's Book and <a href="#">adult book</a>) By <a href="#">William Kamkwamba</a> and Bryan Mealer</p>	<p>Modifying the thinking that only adults are responsible for invention and changing the way of life. Children innovating despite limitations. There is also a movie.</p>
<p><i><a href="#">Tiny Stitches: The Life of Medical Pioneer Vivien Thomas</a></i> (Children's Book) by Gwendolyn Hooks and Colin Bootman</p>	<p>Vivien Thomas is an African American doctor that developed a procedure for blue baby syndrome as well as other cardiological procedures</p>