Cassie Froemming

It's Just Science: Biases & Stereotypes in Science Education

- Design Topic: Practical Application of Culturally Relevant Pedagogy
- **Subject:** STEM: An exploration of biases and stereotypes in Science Education through a social justice lens.
- **Grade(s):** K-12 Educators
- **Designer:** Dr. Cassie Froemming
- **Source:** Understanding by Design, Unit Design Planning Template (Wiggins/McTighe 2005)

Welcome to It's Just Science! I am so glad that you are here. In this course, you will develop competency for constructing a standards based, socially just science lesson plan. You will be able to demonstrate how to incorporate this new

knowledge in relation to your students' lives within your diverse classroom setting.

Each lecture within this course is interactive, so you will need to find the side bars, arrows, tabs, underlined links, and buttons...so get ready to *tap, scroll, click, and swipe!*

- Just Science
- Biases & Stereotypes in Science
- Biases & Stereotypes are Learned
- Power & Perceptions
- Just Science Lesson Planing
- Review & Practice
- Final Quiz
- End of Course & References

Just Science

Cassie Froemming

Established Learning Goals

Be the end of this course, you will be able to:

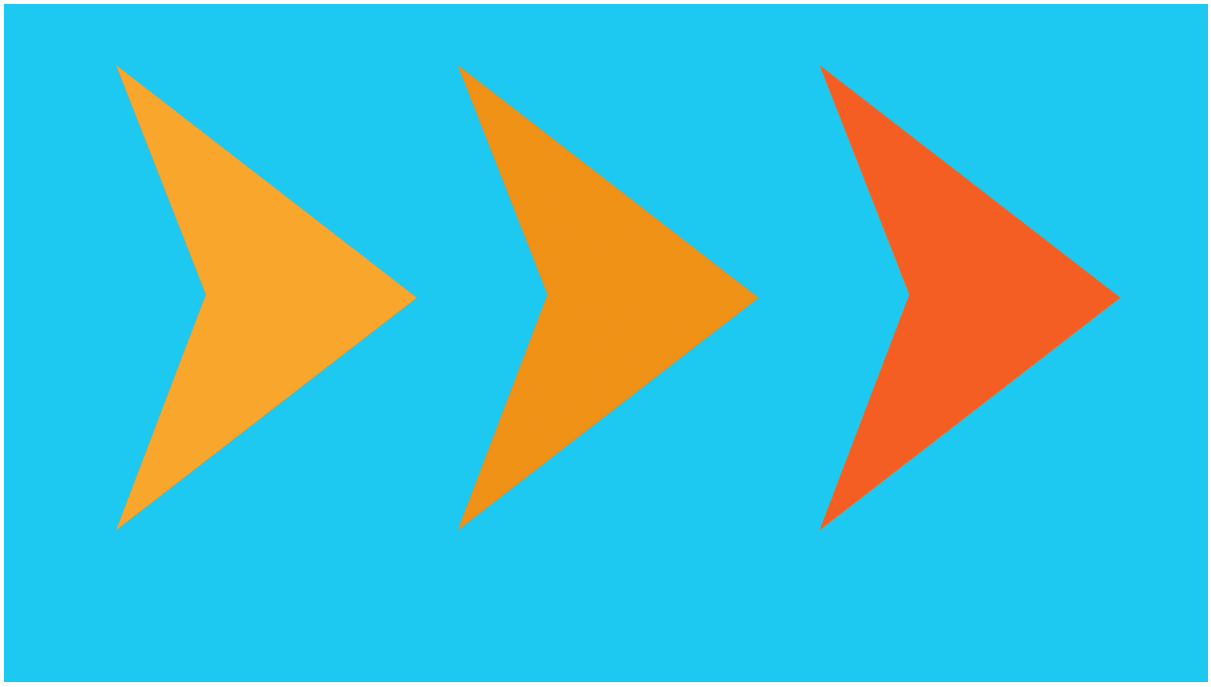
1. **Identify biases and stereotypes within the field of science and understand that everyone is a scientist.**
2. **Understand that identity, biases, prejudices and beliefs are influenced by previous learning experiences.**
3. **Identify your own biases and stereotypes.**
4. **Demonstrate competency through the development of a socially just, science lesson plan.**

Students will understand that:

- Biases and stereotypes exist and are learned about science/scientists.
- Our learning experiences shape our identity, perceptions, biases, stereotypes, and beliefs.
- Power, money and white privilege play a role in our learning experiences.
- We are all scientists, therefore, everyone is a part of the science community.
- As students learn about their world through science, they will acquire a sense of what is fair and just.
- Social justice can be taught through inquiry.
- Bridging inquiry-based science instruction to the lives of students is one way to create a more equitable and just science learning community.

Essential Questions

00:09



Let's check out the 12 Essential Questions that will guide your learning throughout this course.

Question 1

Essential Question 1

Are prejudice, bias, and stereotypes learned? How?

Question 2

Essential Question 2

Can prejudice be overcome?

Question 3

Essential Question 3

What are your responsibilities in regard to social justice issues?

Question 4

Essential Question 4

Can literature be used to create social change? How?

Question 5

Essential Question 5

Do you think power has anything to do with social justice? Why do you think that?

Question 6

Essential Question 6

What factors cause power differentials throughout society?

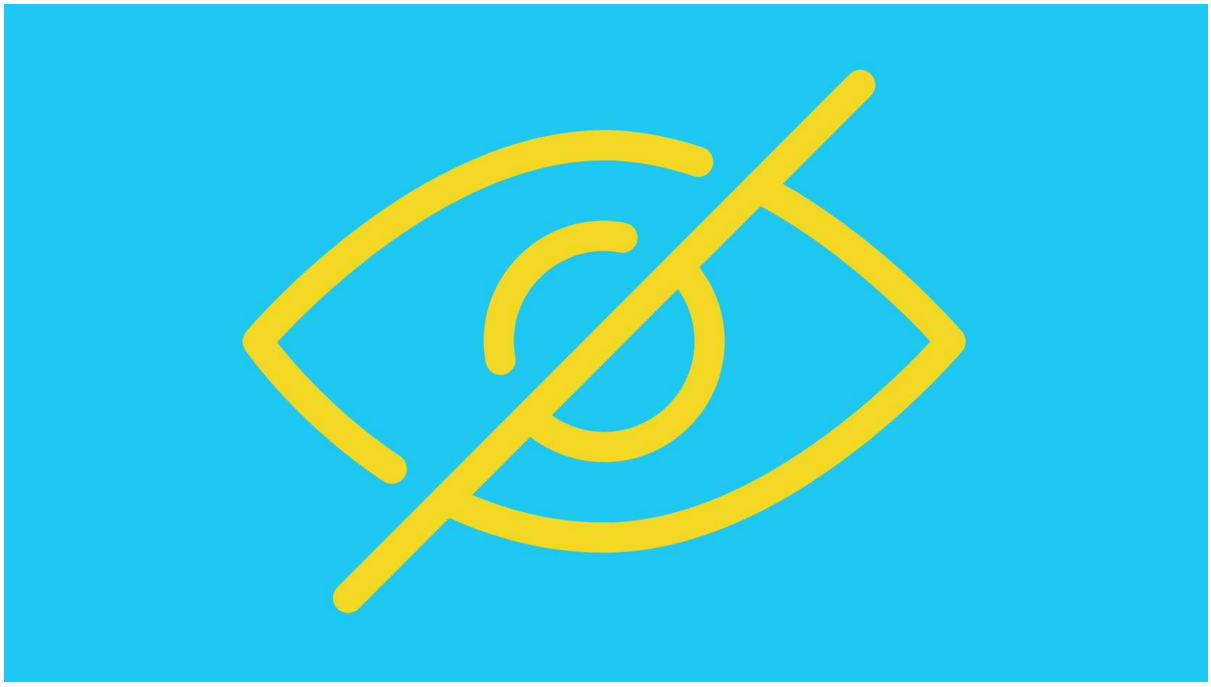
Question 7

Essential Question 7

Do prejudice, bias, and stereotypes have an influence on how we perceive our world?

Question 8

Essential Question 8



What does it mean to be color-bind? Can the color of our skin be “invisible” to others? Why or why not?

Question 9

Essential Question 9

Do you believe power is an illusion? Why or why not?

Question 10

Essential Question 10

Who has power?

"Every moment that bias goes unanswered is a moment that allows its roots to grow deeper and stronger... If you don't speak up, you are saying, in your silence, that you condone it."

–Learning for Justice

Offline Course

A downloadable pdf version of this course can be found here.

its-just-science-biases-stereotypes-in-science-education-N1Iuiixf.pdf

9.8 MB

CONTINUE

Lesson 2 of 8

Biases & Stereotypes in Science

Cassie Froemming

Learning Goal #1

Identify biases and stereotypes within the field of science.

We are all Scientists

We are all scientists, regardless of differences in culture, gender, socio-economic status, religion.

Performance Task: Draw a Scientist

First: Using paper and crayons provided (including "multicultural" colors), draw a picture of a scientist.

Next: Upload your picture in our class discussion forum. Describe your scientist and explain why you represented the scientist the way that they did.

Then: After every peer has posted, record each persons response with categorized tallies (as shown in the table below).

male	
female	
black skin	
brown skin	
white skin	
wearing	

glasses	
wearing no glasses	
wearing lab coat	
no lab coat	
Has messy "Einstein" hair	
using science instruments (beakers, measuring tools, etc.)	
other features?	

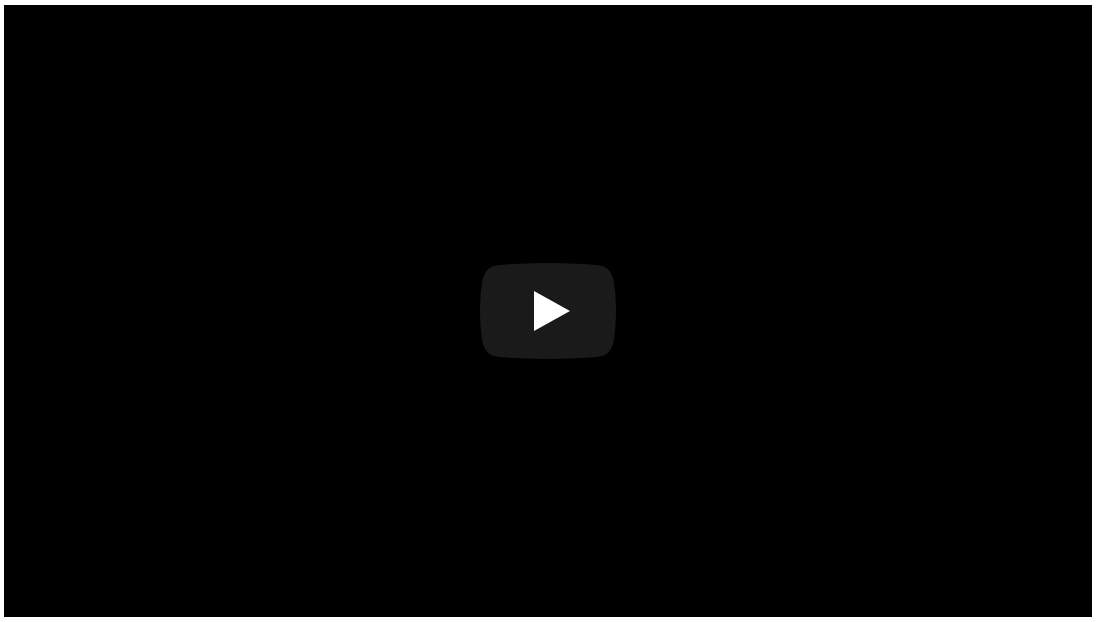
Last: Reflect upon the total tallies of the group.

Watch the Videos:

Click the "+" to open each video and the "-" to collapse the accordion page.

Girls Think of Everything Student Book Review –

Isabella Reviews *Girls Think of Everything: Stories of Ingenious Inventions*



Girls Think of Everything (Excerpt)

Book summary: “In kitchens and living rooms, in garages and labs and basements, even in converted chicken coops, women and girls have invented ingenious innovations that have made our lives simpler and better. Their creations are some of the most enduring (the windshield wiper) and best loved (the chocolate chip cookie)." Watch Ms. Higgins Reads Aloud Girls Think of Everything chapter about

YOUTUBE

Ms. Higgins Reads Aloud Girls Think of Everything BNG

VIEW ON YOUTUBE >

Required Reading: Gender and Racial Bias

Read about the African American women that "broke the racial barrier and skyrocketed to the top of their field".

B BIOGRAPHY

Katherine Johnson and 9 Other Black Female Pioneers in Science

Throughout history, Black women have faced the uphill battles of both racial and gender biases, especially in male-dominated STEM (Science, Technology, Engineering and Mathematics) fields. Even so, many overcome their adverse circumstances, making invaluable contributions to the scientific community, particularly in the United States Space Program.

READ MORE BIOGRAPHY >

Performance Task: Flipgrid Video Discussion

1. What was interesting, odd, or surprised you about the "draw a scientist" learning activity?
2. What inspired these women inventors that you learned about? How did they "turn their ideas into realities"?
3. What inventions surprised you? Why?
4. Were you able to expose any assumptions or myths that you previously had learned in school or from television?

5. How might this have changed your perspectives if you had learned this in elementary school vs. today?

Click on the link below to share a video response in Flipgrid. Log in with the username that the instructor assigned to you.

Just Science

Just Science

Flipgrid is where social and emotional learning happens! The leading video discussion platform for millions of PreK to PhD educators, students, and families.

READ MORE FLIPGRID. >

learned. It is important to establish a community of learners, give them a voice, time to reflect, and allow ownership to their classroom/lab.

CONTINUE

Lesson 3 of 8

Biases & Stereotypes are Learned

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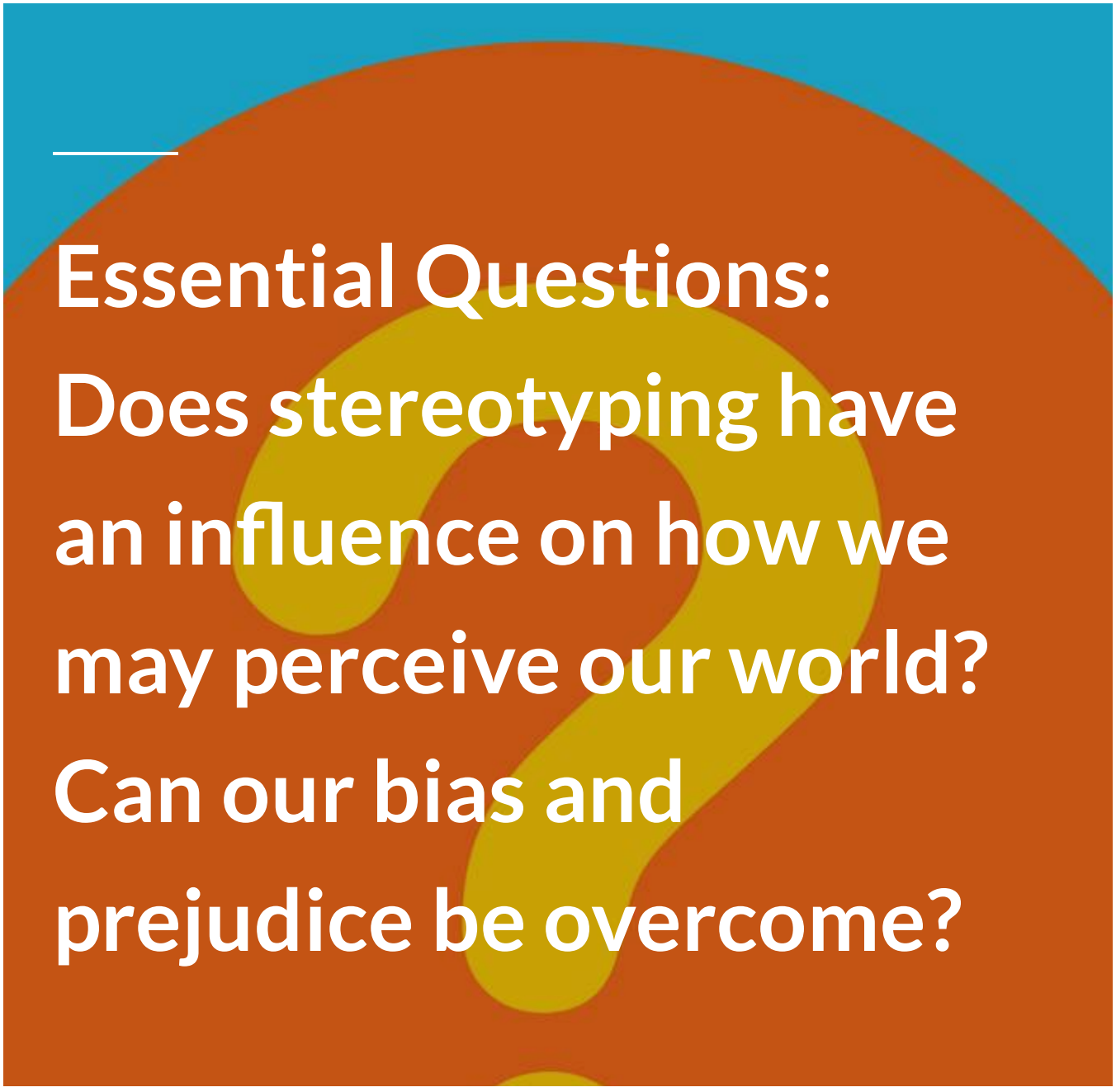


Can others? How can this be achieved?

Learning Experiences

Our learning experiences shape our identity, perceptions, biases, stereotypes, and beliefs. Teachers must examine these nuances and how this may impact their teaching and ultimately, their students' lives. Everyone plays a role in the science learning community. Each individual contributes to new discoveries as a problem solver and decision maker. Therefore, it is important that representation of all voices are heard equally for the best interest of our world.

Performance Task: Draw a Science Timeline

You will create a timeline of memories you have of using science at various stages in their life.

First: on a blank sheet of paper, brainstorm a list that includes memories of all formative years, P-12 learning experiences in school, and other experiences outside of the school setting.

Next: on a different blank sheet of paper, record your memories sequentially to make a timeline of the learning memories. If it was a positive, happy memory, record the experience *above* the line; if negative, record the experience *below* the line.

Then: take a photo of your timeline and post in the discussion forum.

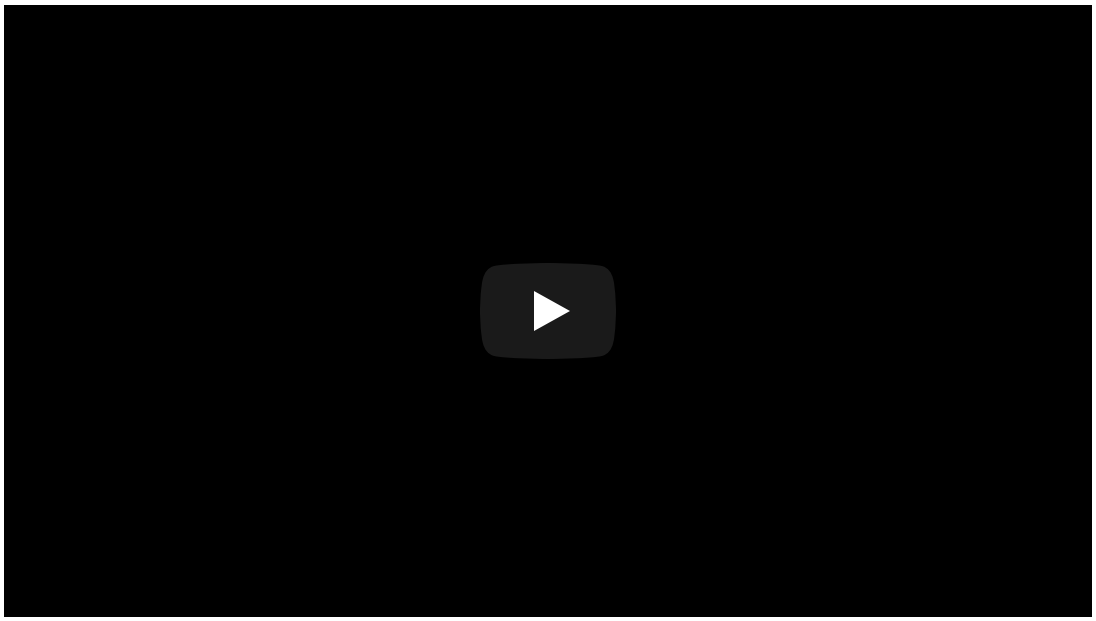
Last: Describe your memories and explain why you feel positively or negatively about your learning experiences.

Watch the Videos:

Click the "+" to open the videos and the "-" to collapse the accordion page.

George Crum and the Saratoga Chip by Gaylia Taylor; Illustrated by Frank Morrison.

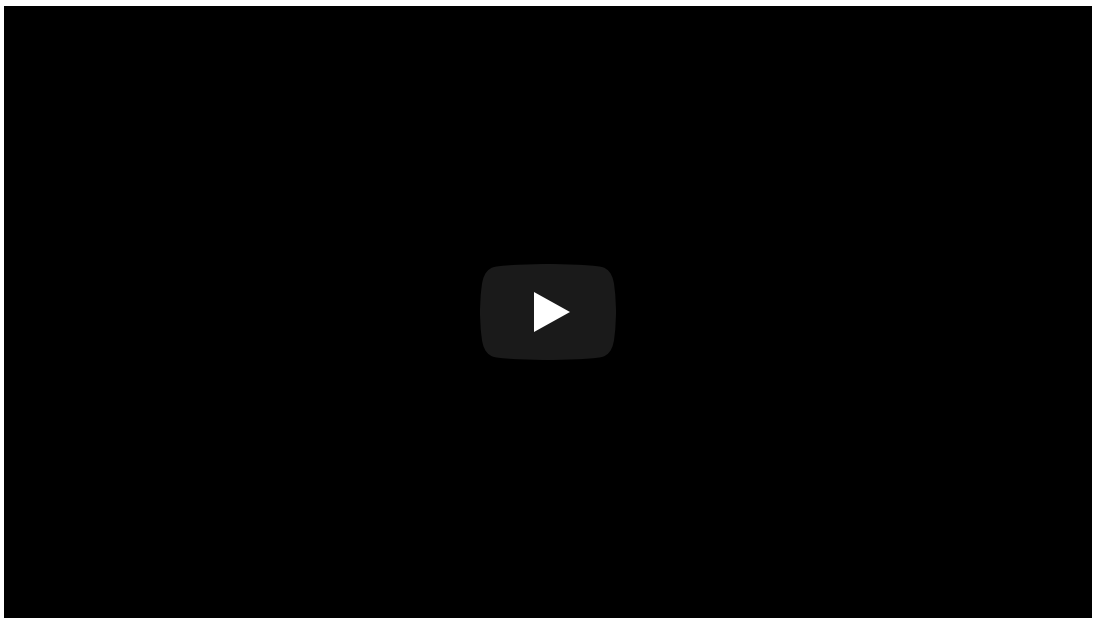
Based on historical records, Monica Maiden (2020) reads an account of the life and career of George Crum, a biracial chef who is credited with the invention of the potato chip at a Saratoga Springs, New York, restaurant in 1853.



What Color is My World Kareem Abdul-Jabbar

Kareem Abdul-Jabbar, an NBA basketball legend, discusses African-American inventors in his book and inspires students by relating important historical events to their future endeavors.

YOUTUBE

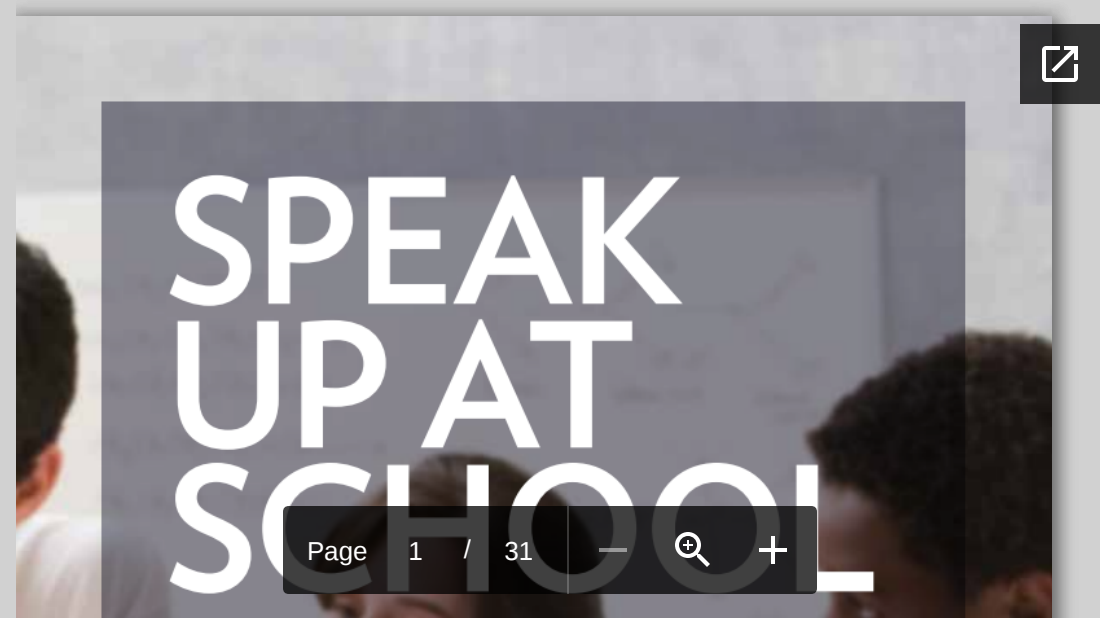


Kareem Abdul-Jabbar Teaches Verb Students from His Book, "What Color is My World?"

VIEW ON YOUTUBE >

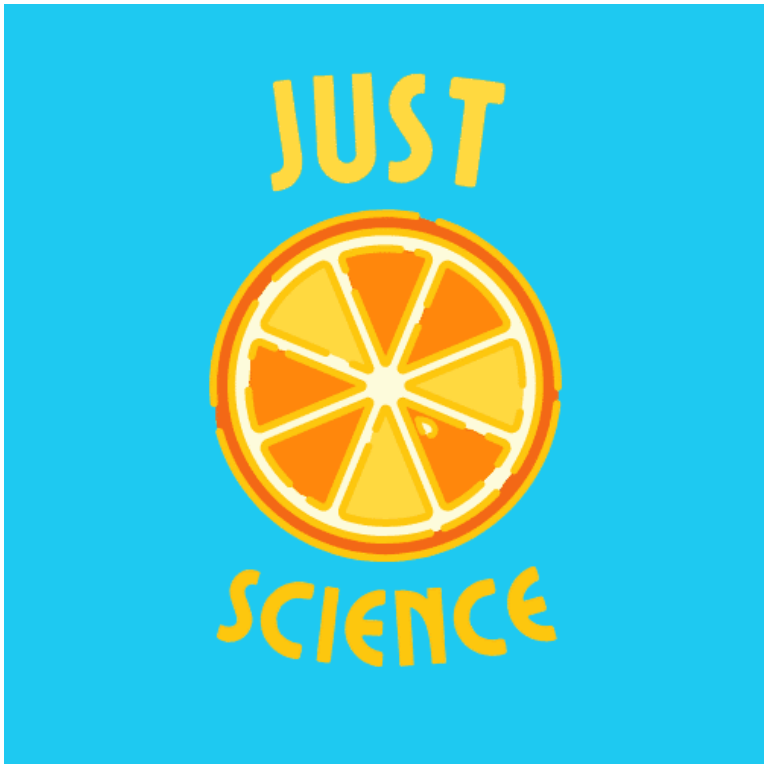
Read the Article

Learn about preparing yourself and your students to respond to prejudice, bias and stereotypes at school.



> “In the end, we will remember not the words of our enemies, but the silence of our friends.”
>
> -Martin Luther King Jr.

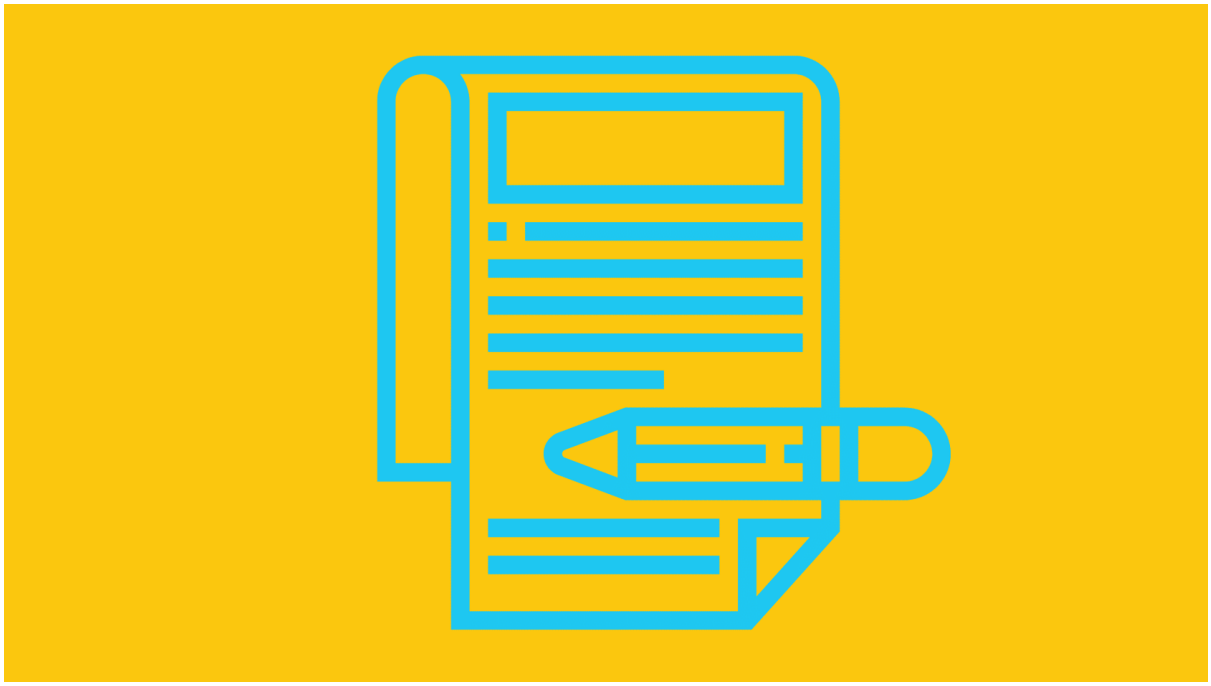
The 5 Basic Bs



Review these 5 Learning for Justice steps to champion bias.

Tip 1

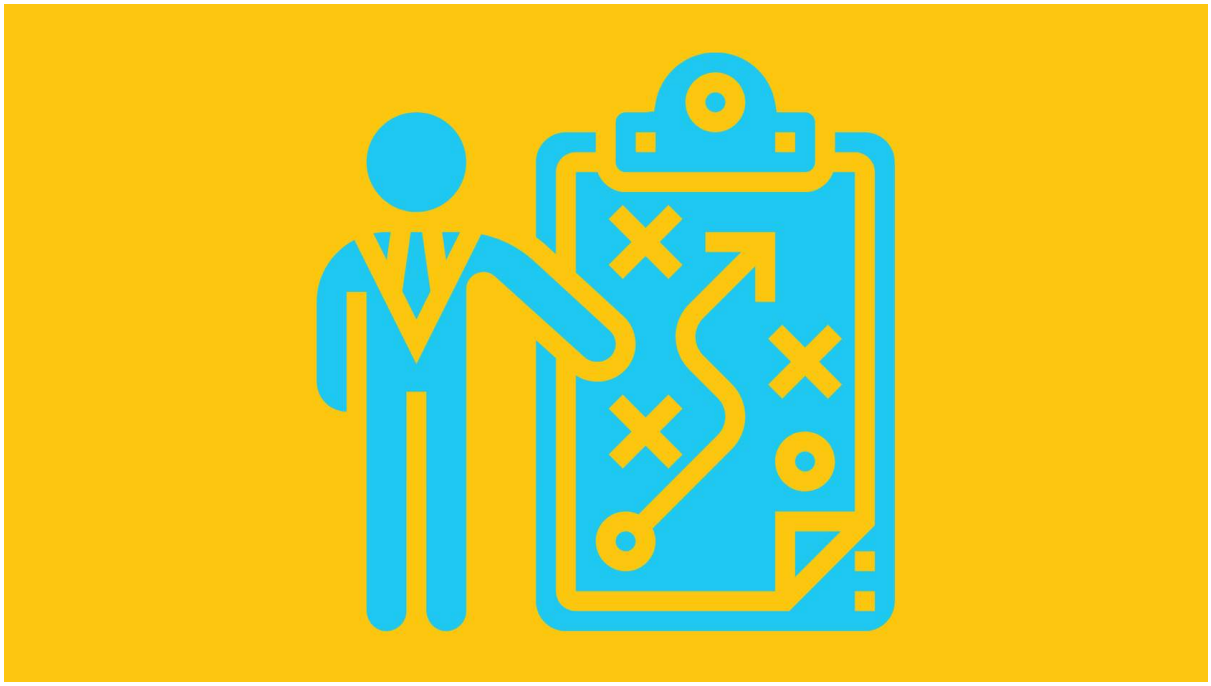
Be Prepared



Prepare yourself and your students to speak up with comfortable, helpful phrases.

Tip 2

Be Positive



Be proactive in creating a positive school climate.

Tip 3

Be Confident

Be dedicated and do not apologize or let others silence you when you call out bias.

Tip 4

Be Encouraging

Promote student voice in anti-bias messages by teaching and encouraging your students by noting their positive behaviors and phrases.

Tip 5

Be Collaborative

Mitigating oppressive school environments requires collaboration and a shared vision for creating inclusive and diverse schools.

Summary

1. Prepared: Prepare yourself and your students to speak up with comfortable, helpful phrases.

2. Positive: Create a positive school climate. By doing so you are leading a positive environment.

3. Confident: Be confident when standing up for others or correcting misconceptions. If you back down they will be unsure of what to believe.

4. **Enouraging:** Praise students for speaking up and inquiring about injustices. It is hard for students to say hi to their peers for fear of embarrassment. Teachers need to be encouraging to promote these positive lessons.

5. Collaborative: Share with school administrators and come up with a shared vision to create a learning environment and work together to get the message to as many students as possible. One person can start a movement, but it takes many to keep that movement going.

Performance Task: Flipgrid Video Discussion

1. Why were your science learning experiences positive or negative.
2. How did their friends, family and teachers impact their learning experiences?
3. Why might some find difficulties remembering learning science in school?
4. Were there certain activities that were more meaningful than others? If so why?
5. Are there common themes/trends amongst our group?
6. How do perceptions and biases play into your learning?

Big Idea:

Because our learning experiences shape our identity, perceptions, biases, stereotypes, and beliefs, we must teach and model what is fair and just.

CONTINUE

Lesson 4 of 8

Power & Perceptions

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Learning Goal #3

Identify own biases and stereotypes.

factors can cause an imbalance of power within a society or culture?

Performance Task: Discussion Forum.

Describe a time that you (or knew of someone) have been judged based off rumors and assumptions.

Watch the Videos:

Click the "+" to open each video and the "-" to collapse the accordion page.

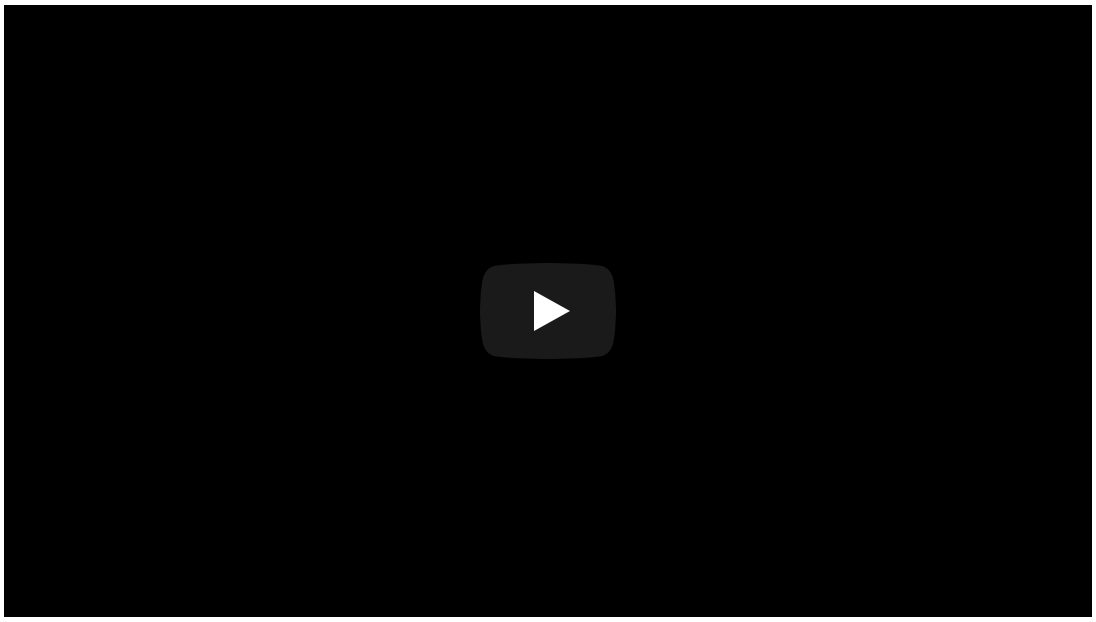
Mr. Peabody's Apples

Miss Jeannie reads a book that illuminates how assumptions and misunderstandings affect our perceptions.

Race: The Power of Illusion

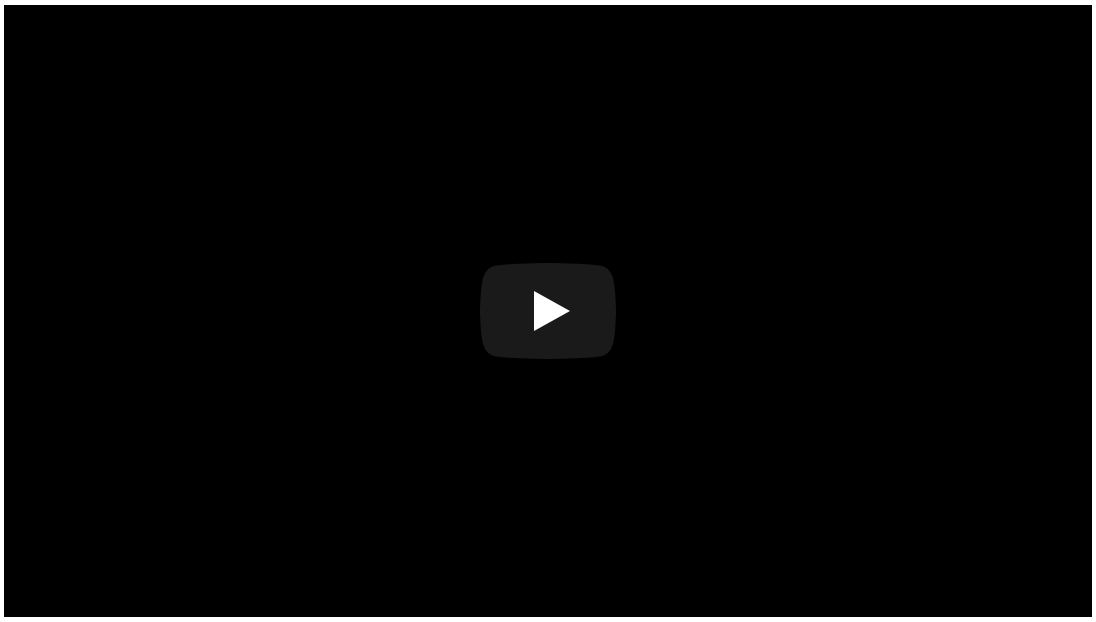
"Race has been deeply woven into the fabric of American life. Race - The Power of an Illusion examines why and how in three one-hour installments.

- *Episode 1: "The Difference Between Us,"surveys the scientific findings - including genetics - that suggest that the concept of race has no biological basis.*
- *Episode 2: "The Story We Tell, " provides the historical context for race in North America, including when and how the idea got started and why it took such a hold over our minds.*
- *Episode 3: "The House We Live In,"spotlights how our social institutions "make" race by providing different groups vastly different life chances even today, 40 years after the Civil Rights Act"* (Adeleman/Califonia Newsreal, n.d.)



The Complex Spectrum of Privilege

"Privilege is complex..."



"To get beyond racism we must first take account of race. There is no other way."

-Supreme Court Justice Harry Blackmun

Walking the Equity Talk

Culturally courageous leaders recognize failures in past equity initiatives. They learn to "walk the talk" and respect the interests of all students (Browne, 2012). In other words, they learn the universally agreed upon language to discuss race.

Racial Equity Tools

See the following racial equity tools, research, tips, curricula, and ideas to learn more about racial justice.

RACIAL EQUITY TOOLS

Glossary | Racial Equity Tools

Racial Equity Tools Glossary Words and their multiple uses reflect the tremendous diversity that characterizes our society. Indeed, universally agreed upon language on issues relating to racism is nonexistent. We discovered that even the most frequently used words in any discussion on race can easily cause confusion, which leads to controversy and hostility.

READ MORE RACIAL EQUITY TOOLS >

Downloadable pdf version of the Racial Equity Tools Glossary

PDF

RET_Glossary_updated_2020-12-30_RelatedResources_2021-05-27.pdf

368.6 KB

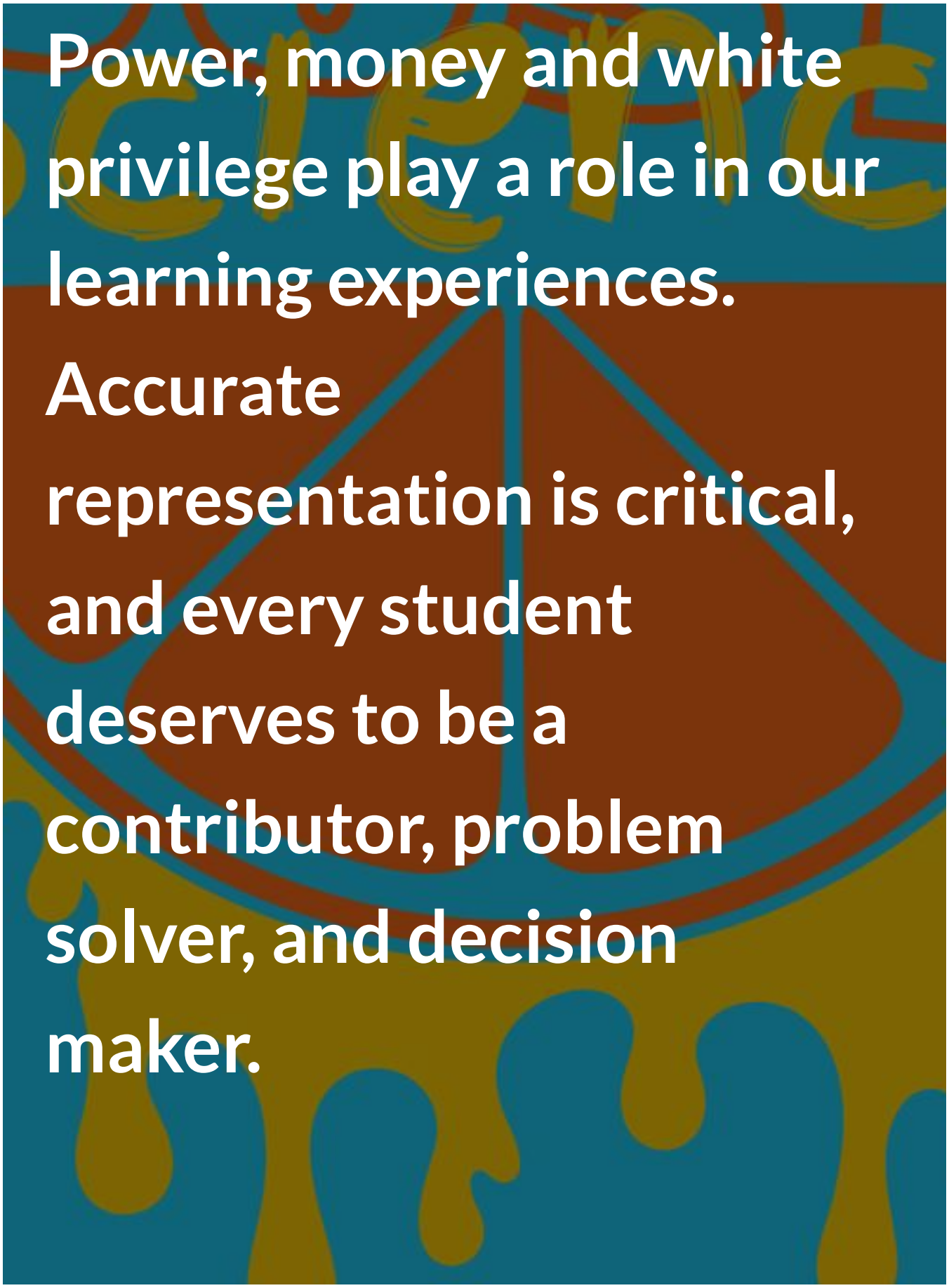
Performance Task: Summary and Reflection Paper

First: Explore the topics in the Race: Power of Illusion website.

Next: Identify a topic of interest that you would like to learn more about.

Then: Write a brief 1-2 page summary and reflection about what you learned.

Last: Submit your paper to per the instructions provided by your instructor (i.e. email, LMS assignment, post in discussion forum).


Power, money and white privilege play a role in our learning experiences. Accurate representation is critical, and every student deserves to be a contributor, problem solver, and decision maker.

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Lesson 5 of 8

Just Science Lesson Planing

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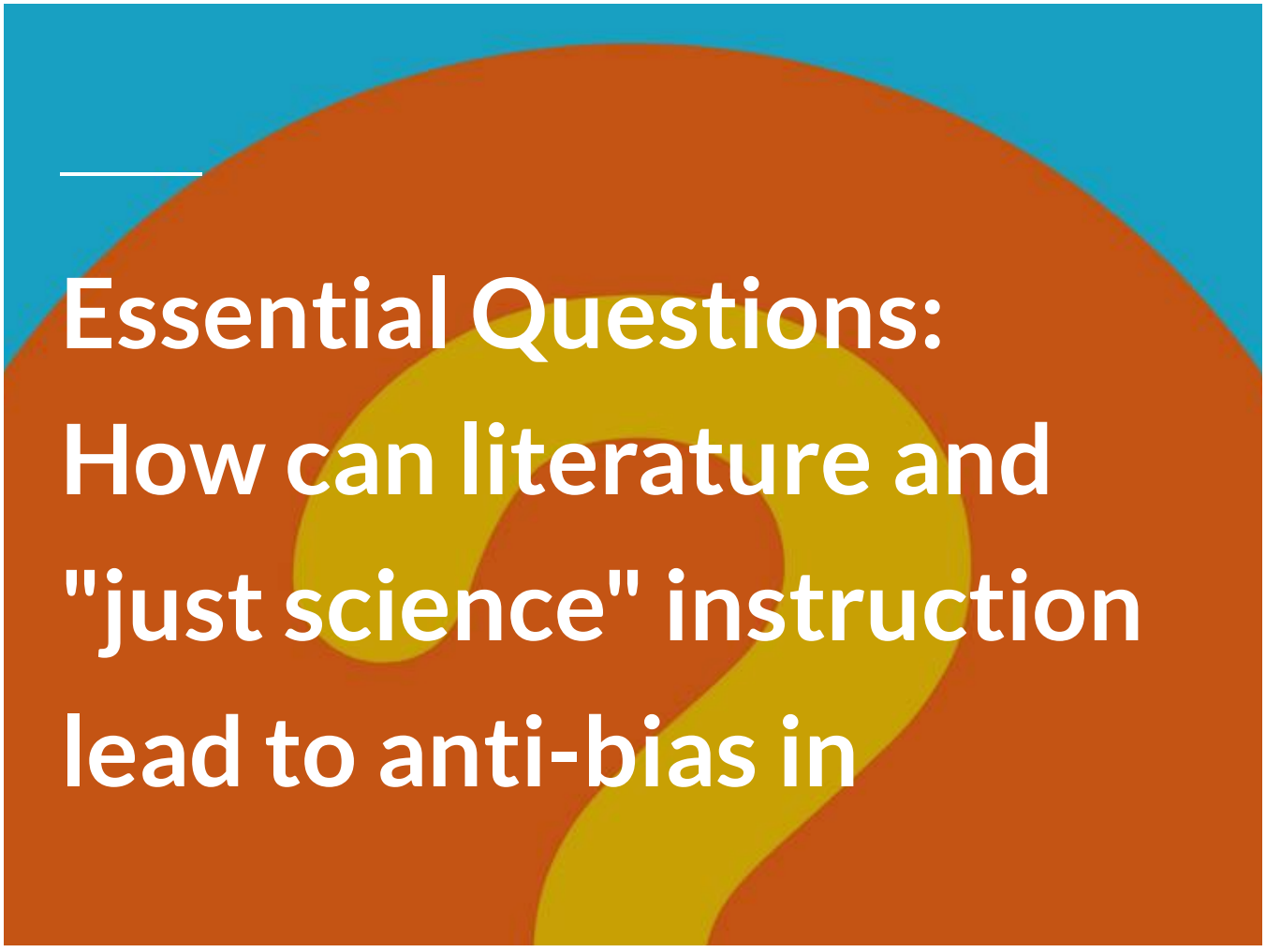
Learning Goal #4

Demonstrate competency through the development of a socially just, DEI focused science lesson plan.



Read

Read *Socially Just Science* by Brendan Foht (2015).

Big Idea: Diversity and Inclusion

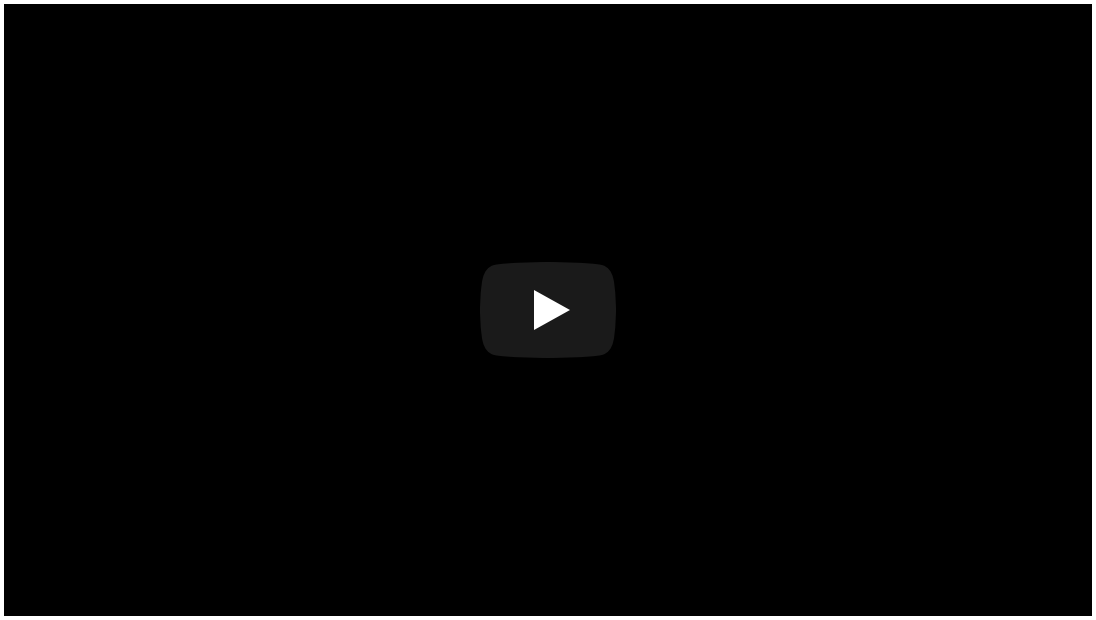
Being respectful of others opinions and responding appropriately to social justice topics are key to inclusive and welcoming learning environments.

Watch the Video:

Click the "+" to open each video and the "-" to collapse the accordion page.

Diversity, Equity, and Inclusion

Love Has No Labels



Performance Task: "Orange Peel" Model Lesson Plan

This lesson plan model involves an elementary science activity, for Grade 3 *Life Science: Standard 3.4.1.1.1.1* "Living things are diverse with many different characteristics that enable them to grow, reproduce and survive."

First: Read the children's book about individuality, culture and diversity to class: "We are all Alike, We are all Different" by Laura Dwight

Then: Buy an orange in the produce section.

Next: Examine the unique features of the orange and look for identifying marks (shape, brightness, size, texture, etc.)

Then: Take a picture of your orange and email it to your instructor (with a description of the identified marks). Refer to the deadline in your syllabus.

Next: Watch for the instructors post in the discussion forum of a collage of all orange photos submitted. The images of the oranges will be marked with a number identifier that only the instructor will know. Identify your orange and the number associated with it. Respond to the following prompts in the discussion forum.

1. Post the number in discussion forum
2. Explain the features that helped you to identify your orange.
3. Discuss whether or not it was difficult to find your orange*.
4. Would this activity be appropriate to use as an analogy for teaching social justice. If yes, why? If no, why not?

*NOTE: The photo collage posted by the instructor will first be images of peeled oranges with number identifiers (not the learners' actual photos). *Then, after all responses have been submitted to the discussion forum, the instructor will post the collage of the students' oranges. They will be asked to repost their number identifiers and respond to the same questions.*

Performance Task: Lesson Planning

First: Identify an appropriate grade and standard as it applies to the context of your teaching assignment - using the Minnesota Academic Standards (2019): *Nature of Science & Engineering, Physical Science, Earth & Space Science, Life Science.*

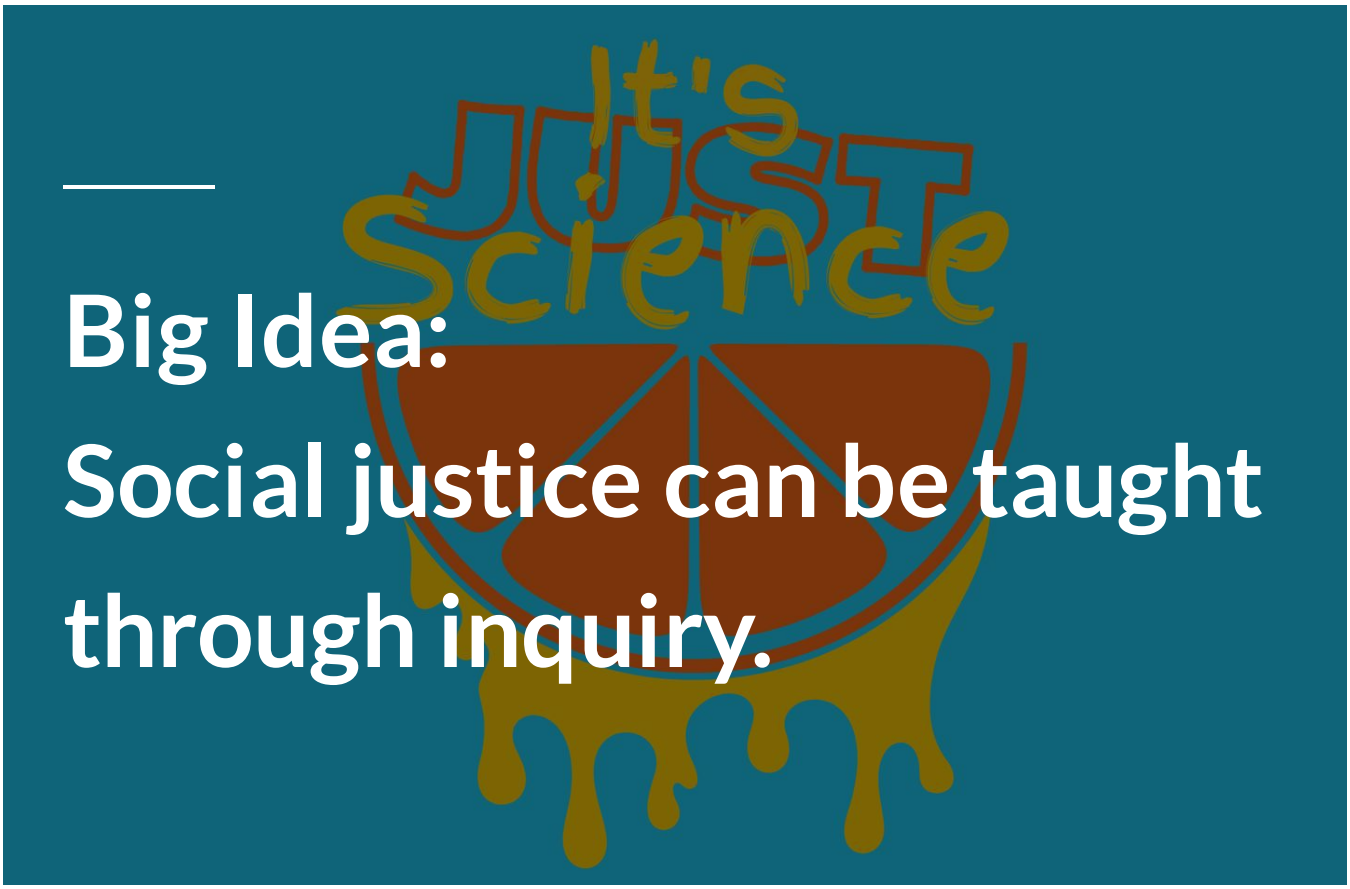
Next: Download and save the DEI Lesson Plan Template provided below. Use this template to guide your lesson planning.

Then: Teach the lesson to your students.

Last: Complete the reflection section and submit to the instructor.

DOC

6.2021 DEI Lesson Plan template.docx
22.2 KB



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Lesson 6 of 8

Review & Practice

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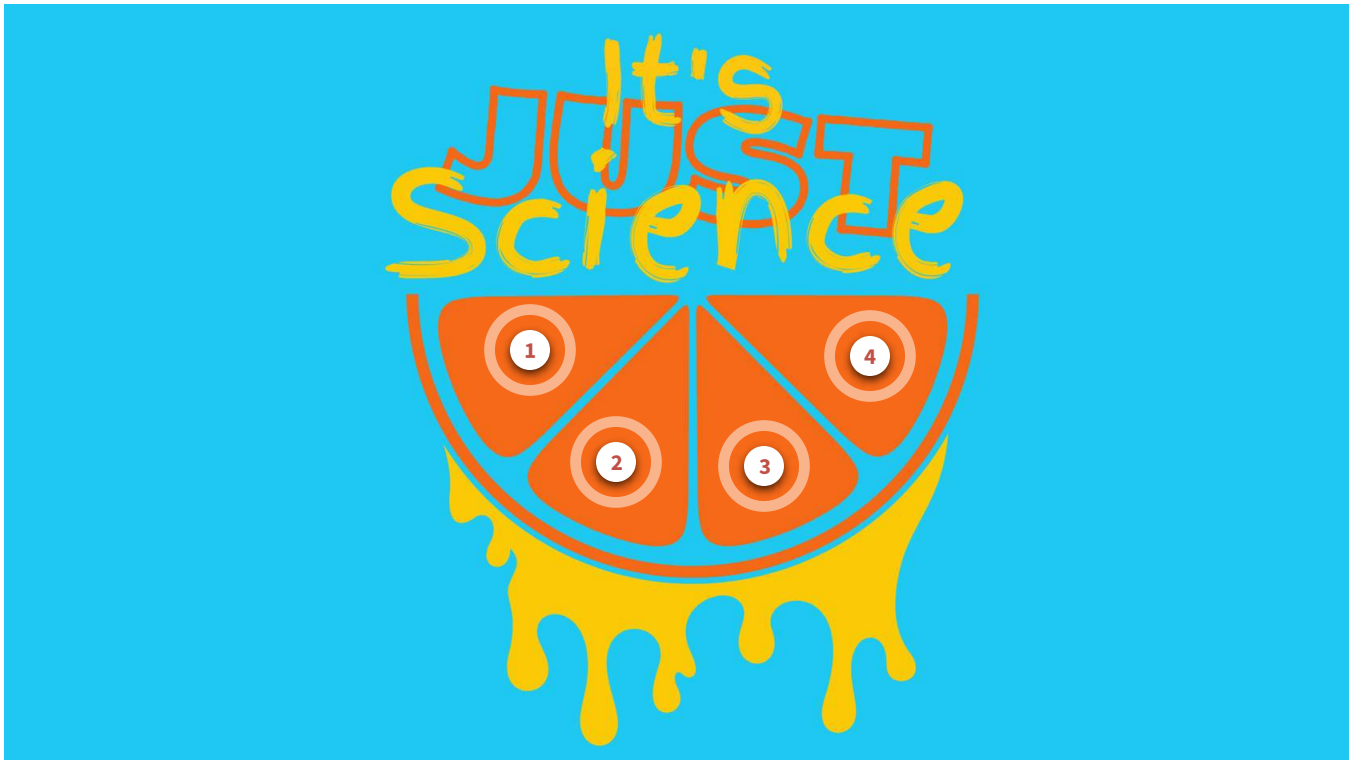
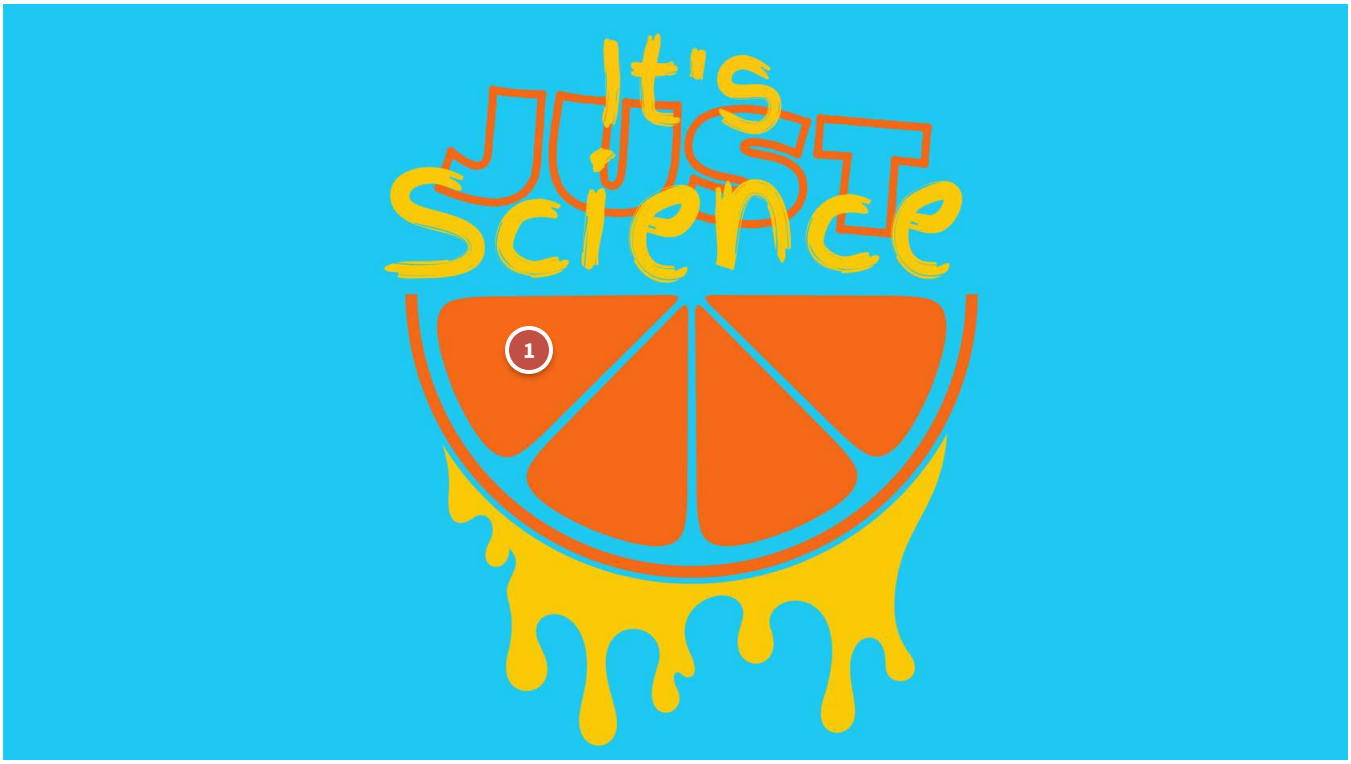
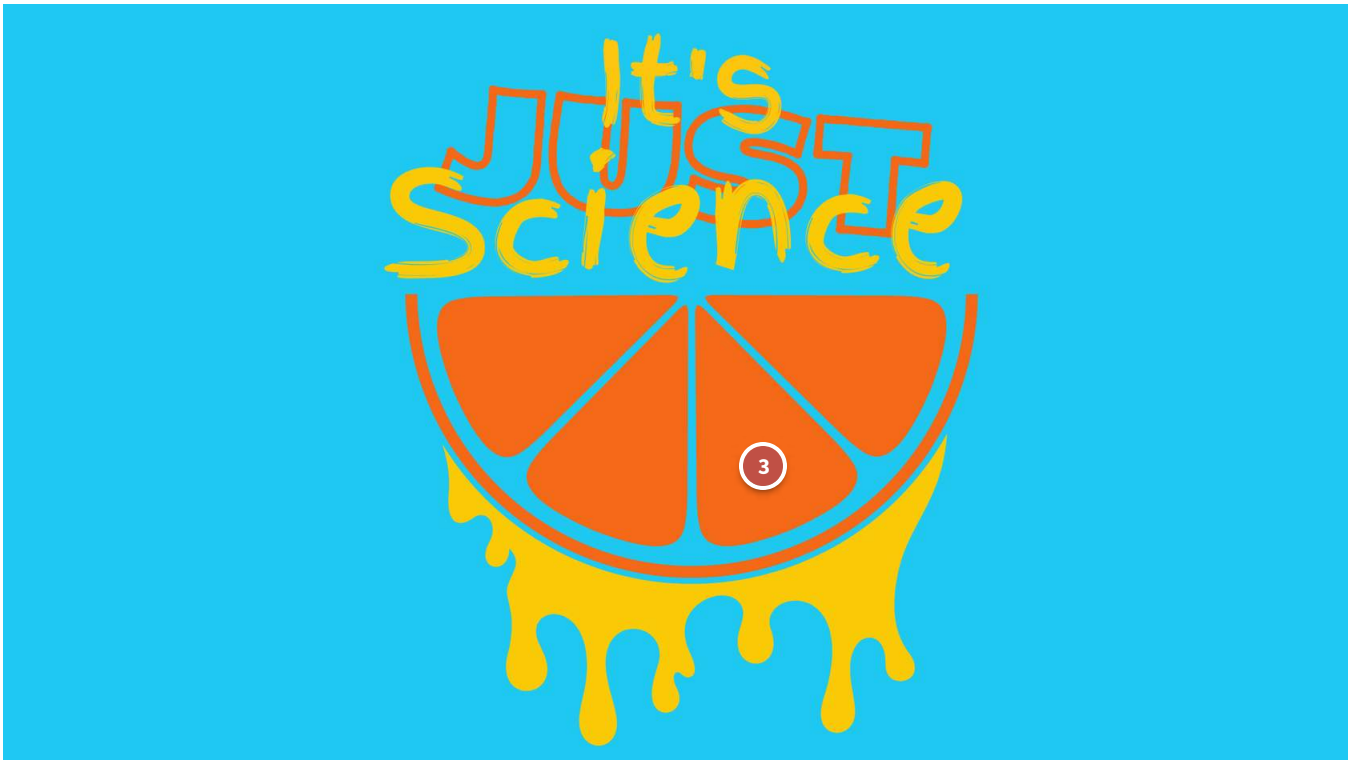
Review of Big Ideas





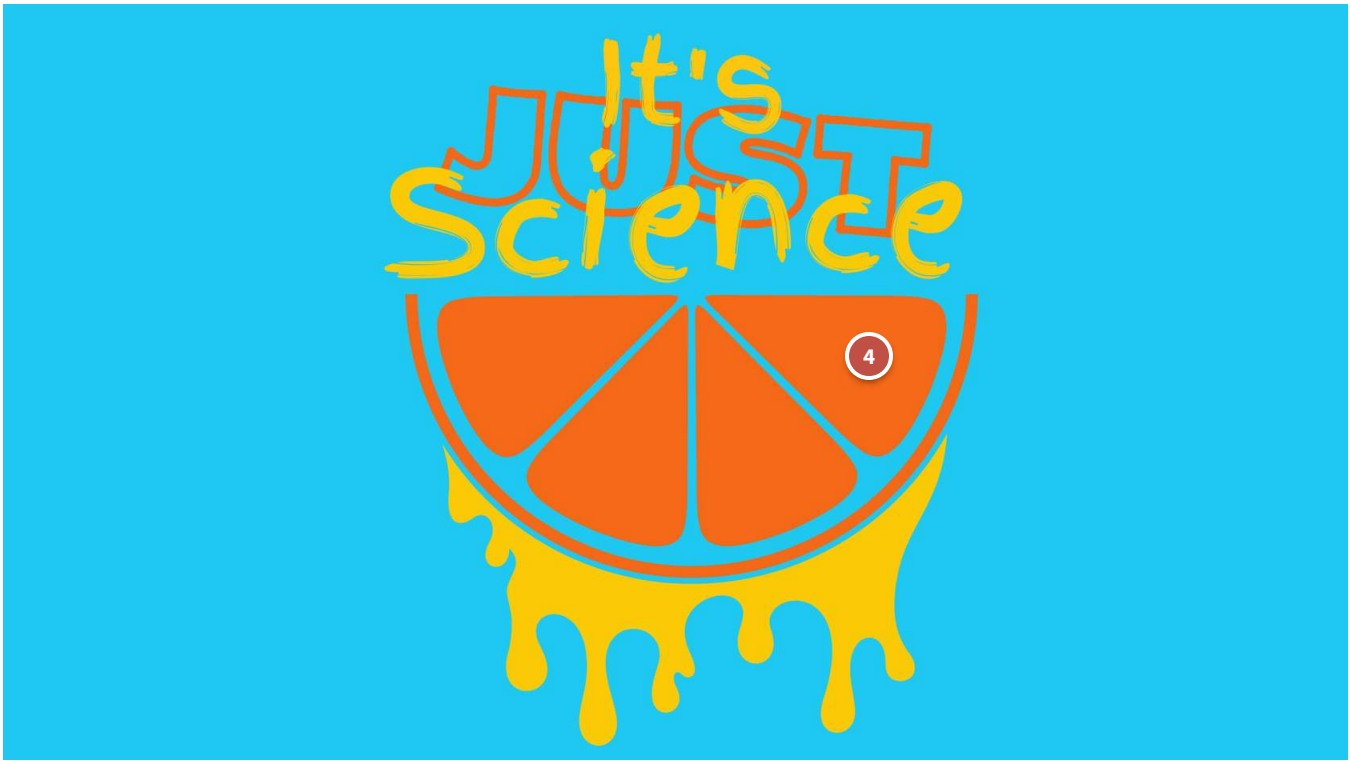
A Community of Learners

Biases and stereotypes in science exist and they are learned. It is important to establish a community of learners, give them time to reflect, and allow ownership to their classroom/lab.



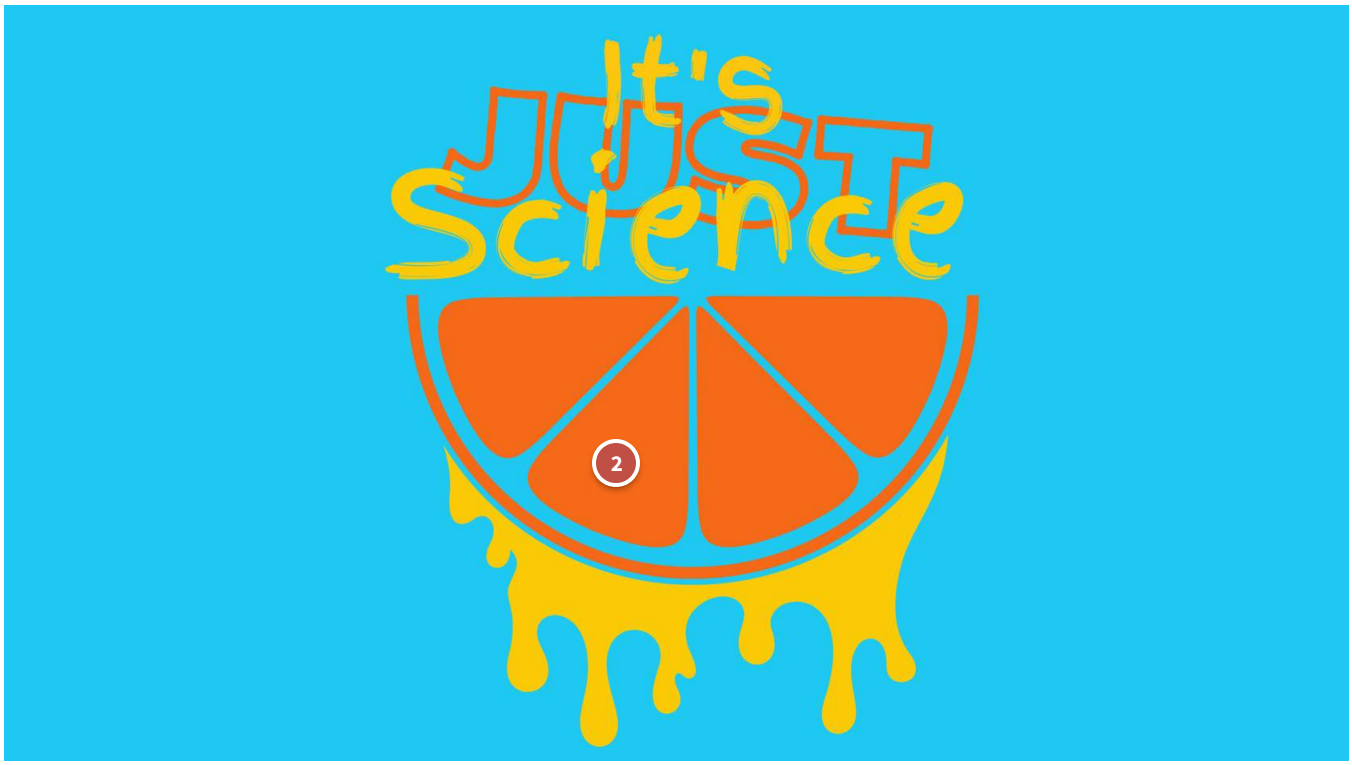
Representation is Critical

Power, money and white privilege play a role in our learning experiences. Accurate representation is critical, and every student deserves to be a contributor, problem solver, and decision maker.



Championing Anti-Bias

Social justice can be taught through inquiry.



We Are What We Learn

Because our learning experiences shape our identity, perceptions, biases, stereotypes, and beliefs, we must teach and model what is fair and just.

Practice

Women, espcially black woman, have faced the uphill battles of both racial and gender biases, in...

Male-dominated STEM (Science, Technology, Engineering and Mathematics) fields.

This is what teachers can do to address biases and stereotypes.

Establish a community of learners, give them a voice, time to reflect, and allow ownership to the classroom/lab.

These are the 5 basic steps to champion anti-bias.

Be prepared, positive, confident, encouraging, and collaborative.

To speak up against bias, students of all grades and ages

need this from their teachers.

Modeled language and context.

The play a role in out students learning experiences.

Power, money, and white privilege.

Students need this in order to become contributors, problem solvers, and decision makers in society.

Accurate representation

These constribute to social divisions.

Our deep-seated beliefs and constructs about race.

Race doesn't exist biologically. This recent concept is only about ___ years old.

A few hundred years

CONTINUE

Final Quiz

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Question

01/04

What year did Dr. Mae Jemison become the first female black astronaut?

- 1998
- 1968
- 1988
- 1958
- Mae Jemison was accepted into NASA's training program in 1987 and after a year of extensive training she became a full-fledged astronaut.

Question

02/04

What do students need from teachers to help them speak up against bias?

- Nothing. Students should use their moral compass to speak out against bias.
- Nothing. It is the teacher's responsibility to speak out. Children are there to lea
- Context and modeled language.
- Power and money

Question

03/04

Can social justice be incorporated in a science curriculum?

- ◯ Yes
- ◯ No

Question

04/04

There are 5 B’s to champion anti-bias. Select ALL

- [ ] Be prepared
- [ ] Be confident
- [ ] Be encouraging
- [ ] Be silent
- [ ] Be cautious
- [ ] Be positive
- [ ] Be collaborative

End of Course & References

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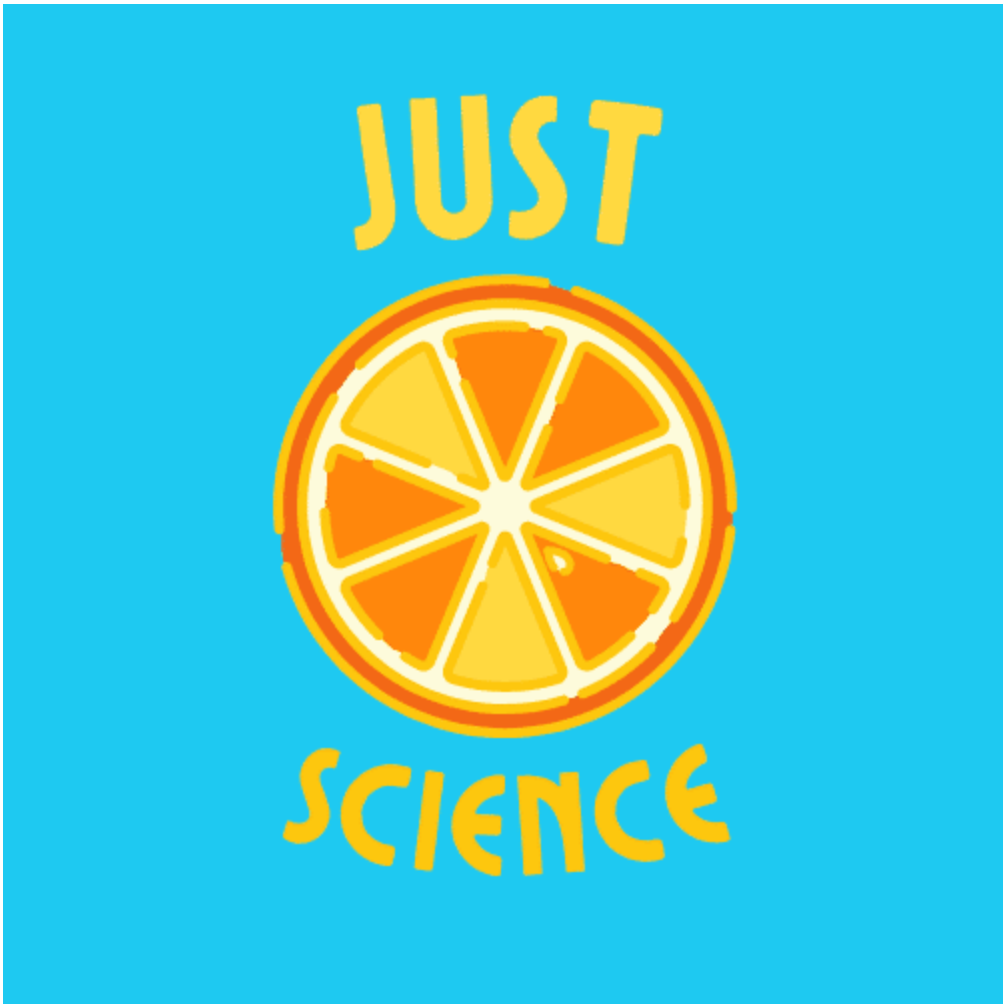
Congratulations! You did it! Orange you glad that you came?!?

You have reached the end of the course.



Click the button to exit to the Dr. Froemming's website.

EXIT LECTURE

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