Katie Carter

Lee Fisher and Angelina Momanyi

CI 5465: MWP Writing for Social Justice

July 20, 2018

Science and the Power of Names

Title of Unit	DNA	**Grade Level**	10
Curriculum Area	Biology	**Time Frame**	7 days
Developed By	Katie Carter		

Overview of the Unit

In this unit, students will explore the role of language and power in science. We will start by exploring naming conventions in science. Next, students will learn about a scientist missing from the credit of the discovery of the structure of DNA. Finally, students will choose a biologist from an underrepresented group. They will complete research and a presentation on their biologist. Students will then share what they have about names in science, voices that are kept out of the history of science, and their own biologist profile with 7th grade science students at a local middle school.

Content Standards

9.1.1.1.2
Understand that scientists conduct investigations for a variety of reasons, including: to discover new aspects of the natural world, to explain observed phenomena, to test the conclusions of prior investigation, or to test the predictions of current theories.

9.1.1.1.3
Explain how the traditions and norms of science define the bounds of professional scientific practice.

9.4.4.1.3
Describe contributions from diverse cultures, including Minnesota American Indian tribes and communities, to the understanding of interactions among humans and living systems.

Understandings	**Essential Questions**

<table>
<tr><td>

Students will understand that…

- Discoveries in science are rarely made by one person in isolation
- Language has power in science, and names have been assigned by people in power
- Science is done by more people than the ones usually represented in textbooks, history books, and the media.

</td><td rowspan="3">

Who names things in science?

Do names matter?

Does the person who makes a scientific discovery always get the credit?

Who are scientists? Are all scientists alike?

</td></tr>
<tr><td>Related Misconceptions</td></tr>
<tr><td>

Students may struggle with these understandings because…

- students think that science is a solitary pursuit
- science is done by old white men

From: Understanding Science: how science really works. Misconceptions about science. https://undsci.berkeley.edu/teaching/misconceptions.php

</td></tr>
<tr><td colspan="2">Learning Objectives</td></tr>
<tr><td colspan="2">

- Student is able to describe how language and power affect names in science
- Student is able to describe Rosalind Franklin's role in the discovery of DNA
- Student is able to identify multiple scientists who are usually underrepresented and describe their contributions to the field of biology
- Student is able to identify patterns in the underrepresentation of scientists from different backgrounds
- Student is able to plan and give a presentation to middle school science students about language and power in science and their own biologist profile

</td></tr>
<tr><td colspan="2">Assessment / Evaluation</td></tr>
<tr><td>Performance Tasks</td><td>Other Evidence</td></tr>
<tr><td>

Students will demonstrate their understandings through:

- Biologist profile presentation (graded on clarity and accuracy)

</td><td>

Students will reflect upon or self-assess their learning through:

- Writing prompts about language and power

</td></tr>
</table>

• Writing about Rosalind Franklin activity (graded on understanding of the role of power in the credit for the discovery of DNA) • Teaching middle school students about their learning (graded on active involvement and engagement of middle school students, and thoughtful response to middle school students' writing)	• Biologist profile presentation reflection • Middle school teaching experience reflection

Lesson Plan	
Topic	**Activity**

Introduction: names in science	1. Warm up: Have students brainstorm "What do names mean in science?" Class discussion/brain dump on whiteboard.
	  1. Have one student record class discussion
	  2. Take a picture of board at the end (to refer to again at the end of the unit).
	2. Give students a list of famous names in science (Examples: Richter scale, Geiger counter, Heimlich maneuver, fuchsia, pasteurization, Fibonacci, Shrapnel, Newton, diesel, Pythagorean theorem,…)
	3. Writing prompt: "What does it mean to have something named after you? Is this important? Why or why not?"

Names, Power, Science: Discovery of the structure of DNA	1. Writing prompt: Can you think of a scientist who discovered something? 2. Students share their ideas with a partner 3. Whole class discussion- share examples 4. Question: Do we always know who discovered something in science? Does everyone get credit for their work? Why or why not? 5. Distribute DNA Discovery Profile Cards (Watson, Crick, Franklin). Put class into groups of 3 students. 6. Call up all students with Watson and Crick cards to the front. Present them all with paper Nobel Prizes. Take their pictures, shake their hands,

	show their pictures on the cover of books and magazines. 7. Group prompt: as you read about and share information about your scientist, think about the scene that we just acted out. Who is receiving credit? Who was missing? 8. Students read about their scientist. Write notes on the back. Share them with their small group. 9. Instructions: Complete a character silhouette for these three scientists. Give student groups an outline (silhouette) of the 3 scientists. On the outside of the body, they write the key influences that shaped this person. Ex: education (degree earned) and experience, race, class, gender, societal restrictions. On the inside of the person's silhouette, they list the person's traits. Ex: goals, actions, discoveries, personality traits. 10. Students answer wrap-up questions individually after completing the three character silhouettes together as a group.
Biologist profile project	1. Introduce the biologist profile project: Explain the purpose: to give students a chance to research an underrepresented scientist. To discover the challenges each faced, and how they overcame the obstacles. To discover voices that are missing in most science textbooks. 2. Give assignment with project details: # of power point slides, deadline, format, rubric 3. Students pick their biologist (Give list of scientists. No repeats. Students may choose their own if they check with teacher.) 4. Present the 5 risks, described by Lissa Soep, of involving youth in civic action. (Simplification, Sensationalization, Slippage, Unsustainability, and Saviorism) Discuss simplification. 5. Writing prompt: How can you present your report without falling into the danger of simplification? 6. Research/work days

	7. Students present their research to the whole class. Students take notes on each scientist. 8. Writing prompt: What patterns do you notice? Were the struggles similar? What different ways did these scientists work to achieve their goals? 9. Prepare to teach middle school students about the power of names in science and about their biologist. Students choose a partner. Together student pairs create a writing prompt for the middle school students and decide how they will organize their presentation.
Field trip to Sanford Middle School	1. High school students (teachers) work in pairs with small groups of middle school students 2. Each student (teacher) presents their biologist profile to the small group 3. Students (teachers) give writing prompt to the middle school students. 4. Students (teachers) bring back the writing prompts and read them together and make notes on them (responding thoughtfully). 5. Teacher will send back their comments to middle school students. 6. Students (teachers) write a reflection about the process of presenting to and teaching the middle school students.

Adapted From: Wiggins, Grant and J. Mc Tighe. (1998). *Understanding by Design*, Association for Supervision and Curriculum Development
ISBN # 0-87120-313-8 (ppk)

ROOSEVELT HIGH SCHOOL
Name_____
Biology Date_____

<u>Writing & Discussion</u>: Who Discovered the Structure of DNA?

The quest to discover and define the molecule responsible for inheritance is filled with much of what scientific progress is really like – building on previous discoveries, experimental evidence, theoretical hypotheses, as well as competition, desire for recognition and fame, conflicting egos and personalities. It is also an example of the history of language and power in science. Science is carried out by people, and people come to the process with different privileges and power.

Today we are going to read an excerpt from Bill Bryson's *<u>A Short History of Nearly Everything</u>* (a great book that I highly recommend!). It describes a period in scientific history that clearly highlights how language and power are at play in scientific discoveries.

<u>A Short History of Nearly Everything</u> by Bill Bryson

Excerpt:
If you were going to make a bet about who would discover the shape of DNA, you would have placed your money on Linus Pauling. In the 1950s he was the most important chemist in America and worked at a place called Caltech.
Pauling was famous for discovering the shape of molecules and was one of the first people to do X-ray crystallography. This technique was the most important part of the discovery of the shape of DNA.
Pauling was very famous and won two Nobel Prizes (chemistry in 1954 and peace in 1962). He didn't figure out the shape of DNA, though, because he was sure that it was a triple helix, not a double helix. The team that figured it out was a group of scientists from England. They didn't really work as a team, often didn't want to talk to each other, and were new to this type of science.

<u>Character Silhouette Assignment</u>
As a group, work together to complete a character silhouette for the three scientists, Franklin, Watson and Crick. Use what you learned about your own scientist *and* the other two scientists that your group members taught you about.

Character Silhouette Instructions:

Outside:
On the outside of the scientist's head, write the key influences that shaped this person. Include things like education, laws, race, class, gender, historical events, and societal restrictions. What other outside influences can you think of? What challenges or privileges do you think this person experienced?

Inside:
On the inside of the scientist's head, list their personal traits. Include things like their goals, actions, discoveries, academic degrees, and personality traits. Are there traits that you can infer from the short description?

– Students could also choose to improvise a short scene with the three characters to show their understanding.

James Watson
The most unconventional was James Watson. He was an American prodigy (had exceptional abilities) who had made a name for himself as a boy as a member of a highly popular radio program called The Quiz Kids. He also claimed to be at least part of the inspiration for some of the members of the Glass family in Franny and Zoey and other works by J.D. Salinger. He entered the University of Chicago at age fifteen and earned his Ph.D. by the age of twenty-two and then worked in the famous Cavendish Laboratory in Cambridge, England. In 1951 he was a gawky (nervously awkward) twenty-three year-old with wild hair that appears in photographs to be straining to attach itself to some powerful magnet just out of frame.
He was not formally trained in biochemistry and wanted to determine the shape of a DNA molecule by doing as little work as possible, beyond thinking, and no more of that than was absolutely necessary. Watson cheerfully remarked in his autobiography, "It was my hope that the gene might be solved without my learning any chemistry." He wasn't actually assigned to work on DNA, and at one point was ordered to stop it. Watson was supposed to be mastering the art of crystallography.

Francis Crick
Francis Crick spent his war years working on land mines for the British government. Crick was twelve years older than James Watson and still did not have his Ph.D. According to Watson, Francis Crick was loud, nosy, cheerfully argumentative, impatient with anyone slow to share his ideas, and constantly in danger of being asked to go elsewhere.
Crick was not formally trained in biochemistry, like Watson.
He also wanted to determine the shape of a DNA molecule by doing as little work as possible, beyond thinking, and no more of that than was absolutely necessary. He wasn't actually assigned to work on DNA, and at one point was ordered to stop it. Crick was supposed to be completing a thesis on the X-ray diffraction of large molecules.

Rosalind Franklin

Rosalind Franklin was the most enigmatic (mysterious) character. She spent her war years working on coal mines for the British government. She earned her PhD in 1945 then worked at King's College in London.

In his autobiography, James Watson describes Franklin in a severely unflattering way as a woman who was unreasonable, secretive, chronically uncooperative, and – this seemed especially to irritate him- almost willfully unsexy. He said that she "was not unattractive and might have been quite stunning had she taken even a mild interest in clothes," but in this she disappointed all of his expectations. She didn't even use lipstick, he noted in wonder, while her dress sense "showed all the imagination of English blue-stocking adolescents."

However, Rosalind did have the best images in existence of the possible structure of DNA, achieved by the means of X-ray crystallography. Only Rosalind Franklin was managing to get good results from the process, but she refused to share her findings.

Females working at King's College at that time were treated differently than the men. No matter how senior or accomplished, they were not allowed into the college's senior common room but instead had to take their meals in small room that Watson described as gloomy, small and cramped.

She was being constantly pressed- at times actively harassed- to share her results with James Watson and Francis Crick, who were desperate to get a peek at them but did not give her any respect. Crick admitted, "I'm afraid we always used a patronizing attitude toward her." Watson and Crick were also from a competing institution. It's not surprising that she kept her results locked away.

One of Franklin's colleagues got on the side of Watson and Crick and showed them Franklin's X-ray images "without her knowledge or consent." (Some describe this action as them stealing her work.) Years later Watson admitted that seeing her X-ray images is the key event that helped Watson and Crick work out the shape of the DNA molecule.

Rosalind Franklin died of ovarian cancer at the age of thirty-seven as a result of her constant exposure to X-rays through her work.

Character Silhouette

James Watson
[note: I will make this an outline so that students can write inside]

Character Silhouette

Francis Crick
[note: I will make this an outline so that students can write inside]

Character Silhouette

Rosalind Franklin

[note: I will make this an outline so that students can write inside]

Wrap Up Questions

1. Who are the key contributors to the discovery of DNA's structure? What did they each contribute? What were they like as people?

2. What were some aspects of the story of the search for the structure of DNA that surprised you? Why?

3. Who held more power in this story? Why did that matter? What role did power play in this example of the progression of science?

ROOSEVELT HIGH SCHOOL
Name_____
Biology Date

<u>Project</u>: Biologist Profile
Introduction

LO: Describe contributions of different people to our understanding of living systems.

Who are biologists? What do they do? What have they contributed? To help you deepen your understanding of the contributions of many different scientists to the field of biology over time (from ancient times to modern times), you will each prepare a presentation on the biologist of your choice.

<u>Assignment Details</u>:

- You will work individually and no two students can research the same person.
- You will submit a final draft of your presentation on **<u>(date TBD)</u>**. You will receive feedback from me before you present to the class.

<u>Content Requirements</u>—this information must be included in everyone's presentations:

- Basics: the person's name, when he/she was alive, personal/cultural information, educational and career pathway, and a photo/image of him/her
- Describe his/her contributions to biology. Some topics may require explanation so that the audience can understand. Include details that you find interesting, for example how they made a discovery, the techniques they use(d), and/or who they collaborated with.
- Describe challenges that he/she faced (societal, economic, …..) What is the context of the challenge?
- How did he/she overcome these challenges and go on to "do science"?

<u>Presentation Requirements</u>:

Document	Speaking
• Should be 5 - 10 slides / 5 - 7 minutes long. • Start by telling the audience what you will be covering. • Text in slides is proofread, spaced, and formatted correctly. • Materials are very interesting: each slide should have a useful image on it and very little text (no complete sentences).	• During your presentation, you must ask your classmates questions at least twice. This is to encourage them to think about what you are saying. • Speak with an enthusiastic demeanor, but also slowly, clearly, and loudly. Make regular eye contact with the audience and avoid (obviously) reading off of slides.

• Conclude by summarizing/reviewing what you have covered in your presentation. • You need to list your references (minimum three and in MLA format) on the last slide of your presentation.	

Research

Use this document to take notes while you research your biologist.

1. Basics: the person's name, when he/she was alive, personal/cultural information, educational and career pathway and a photo/image of him/her

2. Describe his/her contributions to biology. Some topics may require explanation so that the audience can understand. Include details that you find interesting, for example how they made a discovery, the techniques they use(d), and/or who they collaborated with.

3. Describe challenges that he/she faced personally and professionally (societal, economic, ….) What is the context of the challenge? (Ex. Were women not allowed to go to medical school at that time?....)

4. How did he/she overcome these challenges and go on to accomplish what they did in their field of science?

Other interesting notes…

ROOSEVELT HIGH SCHOOL
Biology

Name: _____ Date_____
Hour_____

Scientist_____ Topic
_____

Grading Checklist: Scientist Profile Project

Learning Target: Describe contributions of different people to our understanding of living systems. ___ / 4

	4	3	2	1
Background: basic personal & background info, educational & career pathway, photo or image	All content requirements addressed. Content was thoroughly developed and demonstrated detailed knowledge of the topic.	Each of the content requirements mostly addressed. Included many details that demonstrated knowledge of the topic.	Covered basic background information, but had difficulty explaining the contribution of the scientist and/or connecting to our class topics.	Presentation did not cover the content requirements.
Contribution & Challenges: Describe their work, what they did, what they added to the field of biology. What challenges did they face and how did they overcome these?	Content option selected clear. Thoroughly developed and demonstrated detailed knowledge of the topic.	Included many details that demonstrated knowledge of the topic selected.	Very little information about option selected.	Presentation did not include an option.
Understanding/ fluency	Demonstrated a thorough knowledge of the subject matter—correct information and in your own words. Able to use audience questions to further demonstrate understanding of the topic. Appeared to be an expert on the subject.	Demonstrated a working knowledge of the subject matter—correct and in your own words. Able to satisfactorily answer audience questions and provided additional information upon request.	Demonstrated a basic knowledge of the subject matter—mostly correct and mostly in your own words. Able to address audience questions by repeating parts of the presentation—did not provide any additional information.	Demonstrated little or no knowledge of the subject—incorrect information and/or using terminology that you didn't understand. Unable to answer audience questions or comment further on any part of the presentation.

Learning Activity ___ / 4

	4	3	2	1
Document requirements: ____Presentation of an appropriate length (5-10 slides); ____Structured for ease of audience understanding (including intro and conclusion); ____Text is limited but proofread; ____Relevant visual on every slide.	Four requirements completely addressed.	Three requirements completely addressed.	Two requirements completely addressed.	Only one requirement completely addressed.
Speaking requirements: ____ Presentation 5-10 minutes in length; ____ Asked classmates two questions to initiate a discussion; ____ Enthusiastic speaking style, but also slow, clear, and loud; ____ Regular eye contact with audience, no reading off of slides. No notecards used.	Four requirements completely addressed.	Three requirements completely addressed.	Two requirements completely addressed.	Only one requirement completely addressed.
References provided	Minimum of three sources are cited on final slide, listed alphabetically and in correct MLA style.	Minimum of three sources are cited on final slide, not organized alphabetically and/or not in proper MLA style.	Less than three sources are cited on final slide.	No sources are cited on the final slide.

Strengths	Considerations for future presentations

Writing Prompt: After Biologist Profile presentations

1. What patterns do you notice when you look at the whole group of biologists that were presented?

2. Which struggles were similar?

3. In what different ways did these scientists work to overcome obstacles in order to achieve their goals?

CI5465 Lesson Plan Reflection

I am fired up to bring more social justice awareness into my classroom through writing. I am excited to add new strategies and new perspectives to my curriculum that I have learned about in this social justice writing class. I think that my purpose as a science teacher is to teach students to be critical thinkers and scientifically literate citizens of the world and I want to help students to connect what they know about the real world with what they learn in my science class. During this unit I hope to help students better understand that science is not a stand-alone subject that is free from social issues and produced by only one type of person. This unit represents my deliberate work towards bringing social justice issues into my class, and in this reflection I will explain my thinking around my plan.

As Linda Christensen reminds us in *Teaching for Joy and Justice*, I need to question practices that harm children and not fall into easy patterns (10). In the past in my biology classes I have addressed issues of tolerance, acceptance, and environmental justice, to name a few. I can see myself as a social justice teacher in some specific units in biology (evolution and skin color, climate change and environmental justice) but I want to become a social justice teacher throughout the year, in all parts of the curriculum. This can be difficult when looking at state science standards like DNA replication, cell theory, and membrane transport. I chose to put these activities together into a single unit with a focus on the power of language and names, and hope that students will see themselves in the curriculum and will take these lessons into other classes when they challenge texts and ask whose voices have been left out.

I am including some pieces that I have taught before along with some new activities so that I can create a conversation about language and power in science. I am attempting to build a learning experience that is better for all of my students. To do this, I will reexamine work that I have done in the past, and introduce some new strategies from the Christensen's curriculum. I want my students to work together cooperatively, use each other as resources, and support each other in their learning. Cooperative learning strategies help to increase student learning by showing them that they all are expected to learn the standards, but that we recognize that they come to school with different backgrounds and that their learning process may be different. The activities that I have planned for this unit will promote student learning by first looking for their prior knowledge as we start each topic, and then building the knowledge together in groups or through their own research. These opportunities allow students to act as teachers, use each other as resources, and pass their interests and passions on to younger students in the community, through the middle school teaching activity. Commonly science classes do not address issues like social power. Doing so should increase students' interest in the activities as they explore the issues and make their own discoveries. As they research their biologist and share their learning with middle school students, they will be practicing using their voices to create change. I want them to think about science and the scientists who "do" science and about who gets the credit for "doing" science by getting their name in textbooks. I am also trying to bring what Ladson-Billings describes as sociopolitical consciousness into the classroom, by asking students to take their learning beyond the classroom and to analyze the real-world problem of unequal power in science (Ladson-Billings, p.75).

By starting the unit with how things are named in science, I hope to get students to see real-world examples of the power of language and names. So much of science is taken as facts and as unchangeable pieces of information. As Christensen encourages us to do, I can make the biology curriculum about analyzing, questioning and creating, not about fact finding and memorizing (*Teaching for Joy and Justice*, 7). Christensen shows how names can be a jumping off point in a language arts course, and she always starts with names by telling students that "to say the name is also to begin questioning whose story is told"(*Reading, Writing and Rising Up*, p.10). When we make a class list of things in science that are named after people, we can think about whose names are left out. We can question how things are named and what those conventions are in science. This lesson offers students an opportunity to talk about real-world examples of the power of language and names while bringing in their own funds of knowledge. As we move on, there will be chances for students to challenge ideas in standard textbooks and present diverse perspectives. The unit provides opportunities for the students to develop awareness about social issues, like bias in texts and scientists who are marginalized or left out of the history. I hope to give students a place for their voice in the classroom and a chance to challenge negative stereotypes, while reflecting on their own diverse experiences and views.

I have always included Rosalind Franklin in my teaching when I teach the unit on DNA. In fact, I have a picture of Rosalind's face on a stick that I inevitably hold in front of my face as I passionately talk about the injustice of her concealment in history. As a social justice teacher, I recognize that my choice of stories is important, because as Christensen tells us, when we choose those stories we encourage students to imagine a more humane, democratic world (*Teaching for Joy and Justice* p. 162). Asking students to write and have discussions about these stories also

provides what Christensen describes as "moments of hope and glimpses of a society we could live in" (*Teaching for Joy and Justice* p. 61). Additionally, any opportunity to confront and evaluate texts is an opportunity to improve students' academic writing and critical thinking skills.

After we have explored names in science and students have learned the side of Rosalind Franklin's story that is usually kept invisible, I will have students come face-to-face with people they don't usually meet in science textbooks or the media in the Biologist Profile project. Christensen describes a similar type of activity that she does to build community in her classroom. When her students meet the people in the stories that they wouldn't normally meet, they break down their preconceived ideas about people from other cultures (*Reading, Writing, Rising Up*, p.7). When my students research these scientists who are not typically represented, we will be able to explore whose "voices are left out and whose stories are buried" (*Reading, Writing and Rising Up*, p.169). If I want to create a curriculum of empathy, even inside of a science course, I need to put my students inside the lives of others. The biologist profile project will be one way to help get them there.

I have done this biologist profile project with students before, but the results have always fallen flat. Some students are engaged and interested in the scientist that they chose, but as a whole class there has been little reflection on the collection of scientists as a whole and aspects of their experiences that they share in common. I have not done a good job asking students to look at the profiles together and find patterns or trends. What are things that all of these minority scientists have in common? What surprised you? What does this mean for the fields of science? What does this mean for you? I want to help students see how parts of our identity like race and

class and gender work to privilege some and marginalize others. But I don't want to leave the stories there, like short biographies or book reports. I want to also highlight the resistance of the oppressed, not their defeat (*Teaching for Joy and Justice* p. 165). When students learn about their biologist and tackle the topic themselves, they will benefit by learning about the nature of science, how scientists create knowledge, and how scientific knowledge changes over time. I also hope that learning about thirty or more diverse scientists (from many different fields, time periods, racial, ethnic, social, etc… backgrounds) will improve students' ability to recognize differences as Ellsworth also hoped her students would see them as "different strengths" and "forces for change" (Ellsworth, p.319). I am still struggling with how I will frame the choices that I give students for the biologist profile project, keeping in mind Ellsworth's warnings about being a critical pedagogue, and "removing myself as the origin of what can be known and what should be done" (Ellsworth, p.323). For now my plan is to give students the list that I have offered in the past, while being transparent about my choices and offering the chance for students to make their own choice as well, as long as it fits within our learning objectives.

When students have done the work of researching their biologist and learning about their challenges and accomplishments, they will then share their new knowledge and become the teachers. Christensen describes how she works to create situations for her students to work outside the classroom, and that these experiences help develop students as intellectual activists who struggle together to achieve a common goal (*Reading, Writing and Rising Up,* p.8). I am eager to work with a middle school in our community that is only two miles from my high school and is one of our feeder schools. I have worked with some of their science teachers before and know that I can find a way to work with them to bring our students together. Having my

students teach middle school science students about their biologists gives them the chance to be teachers and leaders, to share what they have learned, and to spread their knowledge to younger students in the community and feel that they have a voice beyond our classroom. I want my students to move from their ideas into an action set in the real world. Students don't get enough chances to take their learning into the real world.

By engaging in meaningful work students will hopefully make connections between the content and their own lives. By offering some active tasks and allowing students to be able to choose some of their learning experiences, I hope that they will stayed engaged and interested in the content. Students will have some choices in the learning activities when they choose their own scientist to research, create their own plans for teaching middle school students, and decide how they will complete their character silhouette. All of these techniques will increase student engagement and hopefully their chances of success. Students will practice their empathy as they learn about the lives and struggles of the different scientists. They will analyze and critique the history of the discovery of the structure of DNA and look for the role of power in the process and the credit given. Students will also practice being leaders and teachers as they take their knowledge to a classroom of younger students.

Throughout this unit there will be many opportunities for formative assessments like discussions, short writing prompts and written questions. Students will show their understanding when they create the character silhouettes and present their biologist profiles. We will also check in with our understandings at the beginning of class with warm up review questions and at the end of class by writing some wrap up statements about what they have learned. By using different assessment practices students will be able to show their

understanding and learning in a variety of ways and I will be able to give them feedback early in their learning process. When students can evaluate their own work they are more involved in the learning process and more likely to succeed. I will ask students to reflect on both the biologist profile project research and presentation and their teaching experience with the middle school students.

Christensen encourages social justice teachers to put students' lives at the center of the curriculum. (*Teaching for Joy and Justice* p.4) This can include connecting the issues that they are experiencing to the topics of the class, examining the issues in their lives, and writing and talking about it. When studying a topic like DNA, it is not always easy to see how I can make this relevant for students. This sometimes feels hard to do in a high school science class with a rigid set of standards, but I think that this unit is a good start. I am committed to providing this opportunity for my students, and then reflecting on it afterwards to see how students feel about their learning and look for any transformations in our classroom community.

Works Cited

Bryson, Bill. "The Stuff of Life." *A Short History of Nearly Everything*, Broadway Books, 2003, 403-407.

Christensen, Linda. *Reading, Writing, and Rising Up: Teaching about Social Justice and the Power of the Written Word*, Rethinking Schools, 2017.

---. *Teaching for Joy and Justice: Re-imagining the Language Arts Classroom*, Rethinking Schools, 2009.

Ellsworth, Elizabeth. Why Doesn't This Feel Empowering? Working Through the Repressive Myths of Critical Pedagogy. *Harvard Educational Review*, vol.59, no.3, 1989, pp.297-324.

Ladson-Billings, Gloria. Culturally Relevant Pedagogy 2.0: a.k.a. the Remix. *Harvard Educational Review*, vol.84, no.1, 2014, pp.74-84.

Soep, Elisabeth. "Mind the Risks." Participatory Politics: Next-Generation Tactics to Remake Public Spheres. *The John D. and Katherine T. MacArthur Foundation Reports on Digital Media and Learning*, The MIT Press, 2014, pp. 63-68.