WHO DOES SCIENCE?

OSUN Connected Learning Contest Winner

Erin McMullin
Bard College at Simon's Rock
Course: Cellular and Molecular Biology

Often in science classes we focus on content and method and less on the people whose hard work built our current body of knowledge. If we do mention names, they tend to be in an historical context (Darwin, Mendel, Watson, Crick) and represent who did science, and more importantly, who got credit for the work, in the past. While social systems still favor some researchers and their work over others, based on country of origin, economic status, race and gender, those currently involved in scientific research are much more diverse than what our books and classes present to our students. I developed this assignment as a way to let my students explore on their own the people who do science, who they are/were, what their experiences and motivations are/were. In this way, students can put faces and stories to the work, rather than learning a few 'big names' (often white men) that tend to get the most recognition.

Cellular and Molecular Biology (BIO 201)

This class covers the molecular machinery of a cell, including how proteins fold and function, how DNA is copied and accessed, and how resources and information cross cell membranes and trigger responses. Students who take this class generally are interested in pursuing careers in medicine, biomedical engineering, biomedical or basic biology research, and/or biotechnology.

Practical and pedagogical value

This assignment was introduced in the fifth week of classes. Students could begin working on it immediately if they chose, but it was designed to be completed during spring break, after the 7th week of our 14 week semester.

The goal of running this assignment over break was twofold: to keep the students engaged in the course over our long midsemester break (2 weeks) and to give them an opportunity to work on something more personal to their own experience. At this point of the semester, students had focused almost entirely on the factual content and very little on the people who do the work. Students had read quite a few pages of the textbook, which gives little to no authorship for specific content. Students had also read and responded to a number of chapters in an assigned text called "Epigenetics Revolution" which details how key scientific discoveries were made, with descriptions of both the context and the authors of those discoveries (predominantly men, of European or Asian origin). In addition, students had read and responded to three primary and secondary research papers, where I assigned them to do a little background research on the authors (mostly men, one woman, all of European descent).

At this point in the semester, I wanted the students to see more of themselves in the material they were learning, that people do this work, and that they could see aspects of themselves in those people who do this work. My goal was to make this science, this content, this research path, open and accessible for any of my students; that they could picture a future for themselves in this work, if they chose to pursue it.

With any online course content, I worry that we (the students and myself) lose the sense of community, the sense that we work together to build the experience of course over the semester. When we meet regularly in person, especially in labs which are by their very nature a collaborative space, we naturally build community. When we are working remotely, we can easily become isolated and disconnected unless the course design brings us back in contact with each other. I personally find synchronous course meetings and discussion boards awkward, veering from weirdly impersonal to overly personal, so I tend to look for other ways to bring course participants together.

Because this assignment was designed to run over Spring Break, it was originally designed to be delivered online, even before we switched to a 100% online delivery format. What worked well about this assignment was that it combined a more individual and personal assignment with a more interactive assignment. Students were first asked to find a scientist that personally resonated with them, and to explain why. They also wrote a short biography about the person they chose, which was posted, anonymously, on a course Wiki page (built within Moodle) that all students in the class could see. In the second half of the assignment, each student was asked to read all the biographies collected from their

classmates, choose one of their fellow students' posts that caught their attention, and describe what they identified with, and how they differed from, the person described in that biography. While not a direct, personal collaboration with their classmates, I think this assignment gave them insight not only into how many different types of people do science, but also how they (the students) are both similar to, and different from, their own classmates.

Logistically speaking, I think this assignment ran fairly smoothly. Because I had students in many different time zones, I did not want to make any synchronous activities or assignments. Instead, I set a due date for submitting their initial responses, via a submission link in Moodle, that was manageable for students, regardless of their time zone. I made sure that first due date gave me enough 'buffer' time to contact students who were late with their work, and still have time to build a wiki page from the biographies they wrote. When the wiki page was complete, I made it 'live' for the class and posted the 2nd half of the assignment, again to be submitted via a submission link in Moodle by a manageable due date.

I have to say, I was really excited about running this assignment for the first time this year, and I was very happy with the results. All students in my class took the assignment to heart and found/wrote biographies of very interesting scientists. Each one had very specific reasons for choosing the person they did, which they each explained clearly in their first response. All the students participated fully in the 2nd half of the assignment, clearly reading and enjoying the posts by their classmates. They each wrote insightful responses to why they chose their classmates' posts that 'resonated with them in a surprising way'. I think this was a very successful assignment, overall.

The assignment

"Who Does Science?": Due by the end of Thursday March 19 (2nd week of break) so that I can create a Wiki page (within Moodle) from the content you each generate

Description:

- I've provided a list of resources (as .docx or as .pdf) you can use to find scientists from a variety of backgrounds and personal stories.
- Use these resources to do some online research. See who these scientists are and choose one that most interests you, that you feel like you share similarities with, and/or that inspires you the most.
- Respond to the six prompts, provided here as .docx or .pdf.

- Your answers to the first three prompts will be 'public' but anonymous. I will put on a Moodle-Wiki page, without author names, where all students will be able to see. Only what you choose to write in the short biography will become public.
- Your answers to prompts 4-6 are private, and only I will read them. Anything written in response to these will not be shared with other students.

I'm excited for this assignment! SO many different kinds of people are involved in science, and I hope you enjoy learning about some of them!

Who Does Science?

Answer the following prompts. Upload your work before the end of Thursday March 19.

Answer all six prompts below. Only prompts 1-3 will be used to make our class Wiki page (inside Moodle), and only I will see your responses for prompts 4-6.

Save your work as .doc, .docx, .txt, .rtf, or .pdf.

"Public" prompts: Your responses for these prompts will be shared with the class, so edit them with that in mind

1. If you can find one, provide me a link to an image or portrait of the person you chose.
2. Write a short (1-2 paragraph) biography of the person you chose for this assignment. Describe their background, how they came to be involved in science, and give a bit of description of the type of science they do (or did). If they are/were involved in any kind of leadership, outreach or social activism, feel free to include that in your biography as well.
3. Add a short description (1-3 sentences), that will be shared with the class, of what it is that drew you to this person. I will post these biographies anonymously (without your name), so you may want to refrain from any specifics that will make your identity obvious, unless you don't mind doing so. You will have an opportunity to write more detail for the prompts below that will just be read by me, and not posted 'publicly' for the class.

"Private" prompts: Your answers for these prompts will remain private (not shared with the class). Please feel free to answer with whatever depth you feel comfortable with, knowing that I will be reading what you wrote. I am not asking for anything like a 'confessional' – share to your comfort level!

4. How did you go about searching for someone to write about? What qualities were you looking for in a scientist to read more about, and why those in particular? (a short paragraph, maybe just 2-3 sentences)
5. What was it about the person you chose that really drew you to them? What aspects of their background and experiences interested you …and why? For the "why" part - I

don't want to dig deeper than you're comfortable writing about, so answer that bit in whatever depth you choose. (1-2 full paragraphs, more if you feel it necessary)

6. As I said in class, we are all more than just a single defining characteristic. When reading about the various scientists you researched, you may have found differences between yourself and those you felt most similar, and unexpected overlaps with people that on the surface were not similar to you. Write a bit more about that. Choose two different examples to write about, two moments you were surprised by unexpected similarities or differences between you and the people you were reading about. (about 1 short paragraph for each example)

Who Does Science?

All people are more than single aspects of their identities, of course! But in order to allow you to streamline your websurfing, I've organized these scientists into groups based on specific characteristics.

Scientists of different nationalities or ethnicities: Use the links to search for specific backgrounds:

https://en.wikipedia.org/wiki/Category:Scientists_by_nationality
https://en.wikipedia.org/wiki/Category:Scientists_by_ethnicity

Female scientists:
https://en.wikipedia.org/wiki/Category:Women_scientists
https://www.elsevier.com/connect/5-women-scientists-tell-their-stories-of-hard-earned-success
https://www.intellectualventures.com/buzz/insights/humble-beginnings-to-pioneer-scientist-mildred- dresselhaus

Scientists of color:
https://en.wikipedia.org/wiki/List_of_African-American_inventors_and_scientists
https://en.wikipedia.org/wiki/List_of_African-American_women_in_STEM_fields
https://www.asianscientist.com/2011/05/features/the-ultimate-list-15-asian-scientists-watch/

Scientists who came from disadvantaged beginnings:
https://www.famousscientists.org/scientists-harsh-begin/
https://www.sciencenewsforstudents.org/article/hurdling-poverty-find

-life-science

LGBT scientists:

https://en.wikipedia.org/wiki/Category:LGBT_scientists

Trans Scientists (Mostly from: https://gravityandgender.wordpress.com/trans-scientists/)

Ben Barres	Sophie Wilson
Joan Roughgarden	Christa Muth
Lynn Conway	Karl Rutlidge
Miles Ott	Kate Craig-Wood
Julia Serano	Angela Clayton
Sarah Gibson	Karen Fields

Scientists with physical disabilities:

https://www.sciencenewsforstudents.org/article/disabilities-dont-stop-these-experts-science-and-tech
http://mentalfloss.com/article/87068/12-disabled-scientists-who-made-world-better-place Color blind scientists: Nathanial Borenstein, John Dalton

Scientist with mental health issues (D= major depressive, B= bipolar, A = anxiety)

· Buzz Aldrin (D)
· David Bohm (D)
· Nathanial Borenstein (D) · Isaac Newton (D)
· Robert Oppenheimer(D)
· Hope Jahren (B)
· Kay Redfield Jamison (B) · Ada Lovelace (B)
· Dimitri Mihalas (B)
· Gabriele Rabel (B)
· Meghan Duffy (A)
· Caroline López-Martinez (A) · John Nash (Schizophrenia)