Unpacking Human Migration

Kaleidoscope Journal
/
Fall 2022

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A lesson on human migration provides a way to explore how the tools of science can be used to empower students to explore social injustices.

On the morning of November 9, 2016, I found one of my students crying in the hallway. Thinking that the reason for her tears might be the election results, I asked her if Trump's victory upset her. She answered by telling me that while she was getting her morning coffee at Dunkin' Donuts, an older woman behind her grew impatient after my student made a change to her order. The older woman proceeded to shout at the student, "I'm so glad that he won! I can't wait for all you motherf***rs to get deported." At that point, my student just simply canceled her order, walked out and walked into school; she did not ask for a refund or eat breakfast that morning.

When my student arrived at school, it really hit her! She, an American-born citizen, was being told that she does not belong in our country because of her heritage. At that moment, all I could do is to comfort her, remind her that she does belong, and that society is waiting for her to develop her skills so she can take her rightful place in our world. Like this student, I felt pained and hurt—I knew I had to do

more.

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As science educators, it is part of our jobs to contextualize science for our students and help them develop the skills they need to improve our world. In other words, our students need to appreciate that science is a tool of empowerment and the knowledge they gain in our classrooms is transportable into other arenas in their lives. In this way, the tools and practices of science—asking questions, analyzing and interpreting data, engaging in argument from evidence, etc., as listed in the Next Generation Science Standards (2013)—are also the tools needed to explore and change our world by addressing unjust social constructs. In particular, incidents involving hate speech and hate crimes have risen over the last few years, and I think it’s important that students understand that they can use science to explore the topics underlying hate-filled actions.

After some time thinking about what had happened to the student that morning, this situation gave me an idea about a set of lessons on human migration. I wanted to utilize the tools of science to look at the current political rhetoric on human migration and its biological validity.

I began with two main driving questions: (a) why do humans migrate? and (b) what are the effects of migration? Activities would entail a student-led exploration of migration, and the resulting assessments would include a group presentation and a 500-word (or fewer) essay. I kept the essay short, similar to lab reports (really, lab abstracts) because students need to be aware that writing concisely and precisely is a powerful scientific practice. I envisioned the essay as an individual assessment and the group presentation as a collaborative grade.

The set of activities looked at the then current political climate in the U.S. and questioned if the rhetoric that had been utilized was, in fact, warranted and backed by science. Table 1 lists the sequence for each of the components of this lesson. At the end of the unit, students presented their collective group findings to the rest of the class and submitted their essays for feedback and grading.

Table 1

Components of the Lesson Series

Sequence of events:	Notes
• Literature Review	Topics: 1. Animal Migration 2. Early human migratory patterns 3. Human migration into the USA 4. Current political rhetoric about immigration
• Student Discussion	Completed in small groups of four students, each student as an expert on one of the topics.
• Weighing the evidence and reaching individual conclusions	Students solidified their thoughts after completing a t-chart based on the discussion.
• Essays and presentations	Both individual and collective grades were assigned, followed by a self-reflection grade.

All students began the assignment by priming their thinking by watching a short video like We Are Wanderers – Carl Sagan | A Profound Speech (RedFrost Motivation, 2017), in which Sagan reads part of his 1997 book, *The Pale Blue Dot*, "We were wanderers from the beginning . . . When the drought was prolonged, or when an unsettling chill lingered in the summer air, our group moved on—sometimes to unknown lands . . . We could always begin again" (p. 5).
There were four major topics to the literature review. The four students in the group divided the topics, each becoming an expert in their area:

(a) animal migration: nonhuman animal migration including migratory patterns of whales and monarch butterflies in North America, as well as wildebeests in Africa
(b) early human migratory patterns, namely the patterns of humans out of Africa around 65,000 years ago
(c) human (historical) migratory patterns into the territory now comprising the United States, from those early migratory patterns of people that crossed around 20,000 years ago into what has happened over the last 500 years due to mass European migration and the enslavement of Africans, and
(d) recent political rhetoric about immigration made by political figures.
Resources were provided for each of the topic areas, but students were free to find additional information and use their critical thinking skills to evaluate the validity of the sources of information. Some potential sources of information are included at the end of the article in Table 2. After each expert had conducted their basic research, students met in uniform groups (e.g., all experts on animal migration) to ensure the students were able to exchange information and share their experiences before going back to meet with their mixed-topic working group.
At the beginning of the activities, some students were vocal about their uncertainty with why we were looking into political rhetoric in an AP Biology class. After some discussion, collectively we came up with the benefits of utilizing the tools and methodologies of science to explore these concepts. These benefits included the utilization of science as an exploratory and democratic endeavor, where “who said it, how loudly they said it, and how often they repeated it” are irrelevant and all voices matter. The true currency for science is empirical evidence.
This certainly was a charged set of activities and one in which I had to carefully nurture the students in order to have productive engagement without emotional harm. Nurturing these young minds entailed conveying to the students that they were genuinely cared for individually and en masse, as their culture, emotions, and intellects were and are valued. I took students’ questions seriously through showing focus and used a tone of voice that demonstrated I valued their ideas as I addressed each group’s questions specifically. I also wrote down student questions

or comments and tried to reference a student's name when I talked about an idea that they first brought up. From the very beginning of the assignment, I set high expectations for student performance, and tried to help students feel that the knowledge gained and skills practiced would help them to have conversations about this topic with a greater sense of understanding.

During the third part of this lesson, students compared the reasons for, advantages and disadvantages, problems and solutions, and facts and opinions by using a t-chart graphic to organize their insights and record new information in a purposeful way. Once students determined the type of information that was to be recorded in each column, they added details based on prior knowledge, background information, their additional research, and student comments during class discussion.

The focus questions I planned for the group discussion included:

> "What does science actually have to say about migratory patterns of animals?"
>
> "What about human migratory patterns?"
>
> "What does history say about migration into the United States?"

This activity sequence resulted in high engagement, as evidenced by an immensely productive classroom discussion. Student contributions to the conversation addressed issues by utilizing the lenses of science with only minimal prompting from me. My students were eager to contribute and used other students' names when they were building off a previous point. There were lots of personal stories shared about immigration, allowing students to explore their own and each other's backgrounds. I was happy to see and hear students asking questions, analyzing and interpreting data, engaging in argument from evidence, and working with information as specified in the Next Generation Science Standards (NGSS). Even more importantly, I was glad that students' comments and questions, both in the class discussion and with thinking partners as they shared

their notes-in-progress, showed they were considering how the skills and practices of science can play a vital role in exploring the natural and socially-constructed world in which we live.

Students' final essays for this lesson series were full of high-quality critical analysis that blended biology knowledge with analysis of modern rhetoric (see quotes in Figure 1). The first quote is from a Black student who did not consider himself an immigrant, but whose ideas matured as he explored the topics. The second quote is from a Latina student who is the daughter of immigrants. These quotes demonstrate the type of critical analysis that was utilized by the students.

Figure 1

Samples of Student Work from Final Migration Study Essays

> "Humans have always migrated, that's how we've developed as the species we are today. To say that immigration is bad, is to say that our nature as a species is bad. Even so, there is still a huge debate that continues to accelerate, and probably will continue to do so as long as we have people from different backgrounds in our country. But that in itself is what makes America great and the human species great. The fact is that we need to have discussions about topics such as immigration so that the world can be a better place."

> "Since the beginning of human time, there has always been migration. Organisms move from place to place in order to better their living conditions. Humans have migrated all over the world. We first started in Africa and we began leaving Africa about 60,000–70,000 years ago (Science Insider, 2015). When migrants move, they bring a range of skills and perspectives, which nurture innovation and stimulate economic growth. For example, when humans migrated from Africa to colder climates, they figured out how to deal with their new environments. They created sophisticated weapons, which allowed them to hunt efficiently."

Our students bring a variety of backgrounds to our classes, but the one thing that they have in common is they are all growing up in an era with potential for tremendous personal growth and power. After the activities, the students demonstrated greater understanding of biological concepts. Namely, they were better able to describe the unity and diversity of biological life. Additionally, students had a greater sense of the reasons for migration, the migratory pattern of early humans, the homogeneity of human groups, and how environmental

pressures can lead to phenotypic changes in populations over time—evolution. These themes showed up in student essays, as well as their presentations. Anecdotally, several students described how they felt more prepared to deal with people who made erroneous or incomplete claims about human migration. Lessons that cover biological patterns and then socio-political phenomena and are relevant to the students' lives, enable and encourage rich discussion as demonstrated by the many intricacies of the immigration debate.

It is important to highlight that I did not voice my opinion about political sides. I did not say that one side of the argument is right (or wrong). The data speak for themselves. In my role as a biology teacher, I try to help students understand that science is, in fact, the pursuit of knowledge; because knowledge is power, those who understand and do science have power. I planned this activity centered on argument based on evidence so that students could feel part of the larger scientific community (see NGSS science practices, 2013). We were learning applicable and meaningful science—an endeavor in which all can participate.

Lessons that address social justice are just one of the ways in which a liberating culture can be fostered in our classrooms. The kind of classroom where I want to teach is one where all members are valued and empowered. In science classrooms, the what (the content) matters as much as the how (the pedagogical practices). In front of us each day are the future problem-solvers of the world and it is up to us to enable them to recognize their great potential. We have more power than we recognize, and we are either part of the problem or the solution. The injustices in our society did not begin with the rhetoric of a single person and these problems will certainly not go away with a different federal administration. It is important for us to recognize the insidious ways in which the terminology, tools, and symbols of patriotism were weaponized, and no longer represent the intellectual, if not the actual, history of our country. Last year, our school's girls volleyball team traveled to a suburban high school where the student body is predominantly white. As my students (many of whom had darker skin pigmentation than the all-white home team) entered the gymnasium, a group of rowdy boys started chanting the lyrics of a song which they had altered to be, "It's

getting DARK in here.” As the game progressed, the rowdy group of boys shouted from the stands that my students should “go home, where you belong.” The conclusion of the night was that, as the young ladies from my school boarded the bus to come home, the boys proceeded to get in their trucks. With some of them standing on the bed of the trucks waving American flags, the boys began circling the bus. The trucks made several passes before our school’s bus was able to drive out of the parking lot. In arguably the most advanced country in the world, a country founded in the principles and empiricism of the Enlightenment, the young ladies from my school’s team were reduced to their phenotypic characteristics and treated as unwanted human beings. The event highlights the need for discussing social justice in ways that benefit students from both schools.

As a society we MUST do, and be, better than this. We can begin by utilizing the science classroom, where evidence is valued, as a place where the tools enable us to look deeply into the natural world, as well as the socially constructed world. Darwin wrote, “If the misery of the poor be caused not by the laws of nature, but by our institutions, great is our sin” (p. 456). Let’s use our classrooms as places where we can explore Darwin’s question and find solutions!

Table 2

Potential Data Sources for the Literature Review Portion of the Migration Lesson

NEXT GENERATION SCIENCE STANDARDS EVIDENCE STATEMENTS FOR REFERENCED STANDARDS

HS-LS4-2. Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.
HS-LS4-5. Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.
HS-LS2-8. Evaluate evidence for the role of group behavior on individual and species' chances to survive and reproduce.
HS-LS4-6. Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.
HS-ESS3-1. Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.

AP BIO ENDURING UNDERSTANDINGS:

EVO-1: Evolution is characterized by a change in the genetic makeup of a population over time and is supported by multiple lines of evidence.
SYI-3: Naturally occurring diversity among and between components within biological systems affects interactions with the environment.
IST-1: Heritable information provides for continuity of life.

CITATION

Upegui, D. (2022). Unpacking human migration. *Kaleidoscope: Educator Voices and Perspectives*, 9(1), 20–25.