Tying Community Science and Social Justice Together in an Urban Biology Class to Foster Environmental Responsibility

by

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Research Question

The question that guided my project design was: *How can community science and social justice be tied together in an urban biology classroom to foster environmental responsibility*?

Project Summary

Research shows that students who are involved in projects within their communities feel more sense of belonging and connection to their space. This is also true when discussing environmental justice. Students who have been historically marginalized can feel more comfort within navigating science. The unit plan designed for this project addressed the research question: *How can community science and social justice be tied together in an urban biology classroom to foster environmental responsibility*? The unit plan combined the knowledge of community science which focuses on sense of place with social justice within science or critical pedagogy in order to support the teaching framework of Critical Pedagogy of Place. The unit plan focused on explicitly teaching students about community science first followed by social justice in science before having the students research and design a project themselves within the community. The goal of the project was to foster a sense of environmental responsibility within students.

This project is a unit plan that combines social justice and community science into a semester-long project that helps to foster environmental responsibility within students. The intent of this project is to show students the power that they have within their community and also to bring awareness to environmental needs that are present within their neighborhoods. The project is designed as a semester-long project, but can be adjusted to be a year-long project as well.

I used the theoretical construct of critical pedagogy of place (CPP) (Gruenewald, 2003) as a basis for my project because it combines both culturally relevant pedagogy and community

science, both of which are main topics within my research question. Gruenewald (2003), the originator of CPP, discusses the need for place-based pedagogy for students so that they are able to have a positive impact on the surrounding environment both environmentally and socially. This framework was something that I found really important but, unfortunately, lacking within urban high schools in particular. CPP unites a sociological perspective with an ecological focus while removing the school walls, allowing students to experience both of these things outside of the classroom (Gruenewald, 2003). The overarching purpose of this unit plan is to move students in an urban setting out of the classroom and into the neighborhood where they experience their daily lives.

This unit design has three components: social justice, community science, and then the combination of the two into a CPP model where the students complete a project within the community. I wanted to begin the project with separating and explicitly teaching the concepts of social justice within science and community science because this may be the first exposure that students have to both topics. I wanted them to have a clear understanding of both frameworks before moving into their research portion of the project. This highlights the part of the research question that talks about tying community science and social justice together in an urban biology classroom. For the unit plan design, I used a template format that was created by Hamline University to create the individual lesson plans. Additionally, I used the NGSS standards HS-LS2-7, which is to "design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity" (pg. 6, para. 1) and HS-LS4-6, which is to "create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity" (*High School Life Sciences*, 2013, pg. 6, para. 1).

The intended audience for this unit plan is teachers who teach anywhere from 9th to 12th grade. The project is targeted for teachers in a science classroom; biology, environmental science, earth science, etc. The teachers are not limited to Minnesota, they can be located anywhere. Because the project is student-driven, the climate is not a deciding factor on if a teacher can use this unit plan or not; the students are able to adjust their project according to the climate. This is also designed for high school teachers in a variety of high schools. They could be at a traditional public school, a private school, or a charter school. While the plan is best implemented at a project-based learning school, it could still fit in any setting.

The project is laid out in the following order:

1. Unit At a Glance (Unit plan overview)
2. Daily lesson plans (Lessons 1-20)
3. Daily Slides
4. Lesson Materials

The link for all of the unit plan resources is CPP Unit Plan. Here are examples of what the daily slides look like from each section of the project (Environmental justice, Community science, CPP project details):

Capstone Lesson 2

File Edit View Insert Format Slide Arrange Tools Extensions Help

Slideshow Share

Menus | Background | Layout | Theme | Transition

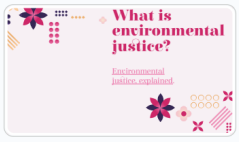
1

2

3

4

5



6

7

8

Capstone Lesson 5

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Slideshow Share

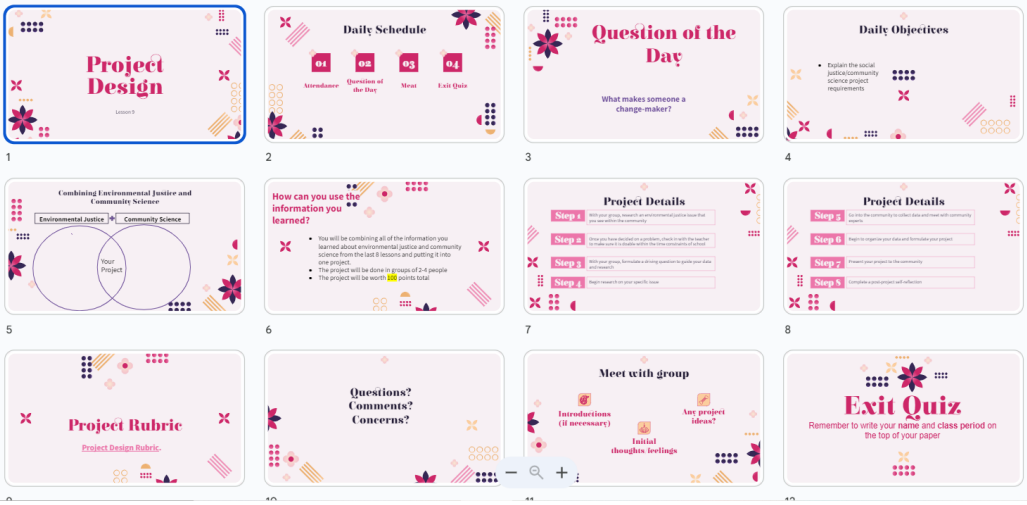
Menus | Background Layout Theme Transition

Capstone Lesson 9

File Edit View Insert Format Slide Arrange Tools Extensions Help

Slideshow

Menus | Background Layout Theme Transition



REFERENCES

Amaro, E., Pockl, L. (2023, August 21). *Air Quality and Environmental Justice (Air Quality #4)*. Subject to Climate. https://subjecttoclimate.org/lesson-plan/air-quality-and-environmental-justice-air-quality-4.

Association of Science and Technology Centers (2021). *Introduction to Community Science*. Community Science Initiative. https://communityscience.astc.org/overview/.

Cabrales, R., Chang, A., Fried, S., Mukti, A. (2014, December 4). *How to Construct an Environmental Justice Lesson Plan.* Pitzer College. https://www.pitzer.edu/redfordconservancy/wp-content/uploads/sites/6/2015/01/EJ-Lesson-Plan-web.pdf.

CBS News. (2022, October 25). CBS News investigates what led up to the water crisis in Jackson, Mississippi [Video]. Youtube. https://www.youtube.com/watch?v=S7JKbJTsW_4.

Council for Watershed Health. (2023). *#SummerScienceFriday | Community Science: This is What a Scientist Looks Like.* https://www.watershedhealth.org/single-post/2018/06/08/summersciencefriday-community-science-this-is-what-a-scientist-looks-like.

Earth Discovery Institute. (n.d.). *Community Science*. https://earthdiscovery.org/Community-Science.

Friends of the Mississippi River. (2022). *Stencil storm drains with FMR*. https://fmr.org/stenciling.

Fuller, L. (2020, December 28). *Community Science: Why we do it, and why we call it that.* eBird Northwest. https://ebird.org/pnw/news/community-science-why-we-do-it-and-why-we-call-it-that.

Green Schools Program. (n.d.). *Environmental Justice: Green Team and Classroom learning and activities.* https://kingcounty.gov/~/media/depts/dnrp/solid-waste/greenschools/documents/activities-environmental-justice.ashx?la=en.

Grist. (2016, January 26). *Environmental justice, explained* [Video]. Youtube. https://www.youtube.com/watch?v=dREtXUij6_c.

Gruenewald, D. A. (2003). The best of both worlds: A critical pedagogy of place. *Educational Researcher*, *32*(4), 3–12

High School Life Sciences (2013). Next Generation Science Standards. Retrieved July 7, 2023. https://www.nextgenscience.org/sites/default/files/HS%20LS%20topics%20combined%206.13.13.pdf.

iNaturalist. (n.d.). *How It Works*. https://www.inaturalist.org/.

MNR News (2020, October 1). *Mapping the Legacy of Racism in Twin Cities Real Estate*. Minnesota Realtors.

https://www.mnrealtor.com/blogs/mnr-news1/2020/10/01/mapping-the-legacy-of-racism-in-twin-cities-real-e.

Mote Marine Laboratory & Aquarium. (2021, September 3). *What is Community Science?* [Video]. Youtube. https://www.youtube.com/watch?v=Fy6uptbCqBI&t=169s.

National Geographic. (2023). *Citizen Science Projects*. https://education.nationalgeographic.org/resource/citizen-science-projects/.

National Oceanic and Atmospheric Administration. (2022, October 13). *Stewardship Definition*. https://www.noaa.gov/office-education/noaa-education-council/monitoring-resources/common-measure-definitions/stewardship-definitions.

National Park Service (2023, April 13). *Citizen Science*. National Park Service- U.S. Department of the Interior. https://www.nps.gov/subjects/citizenscience/be-a-citizen-scientist.htm.

SciStarter. (2023). *Project Finder*. https://scistarter.org/finder?longitude=-93.09327&latitude=44.94441&active=true&activity=32&audience=113.

Stanford School of Humanities & Sciences- Jasper Ridge Biological Preserve. (2019). *Community and Citizen Science*. Stanford University. https://jrbp.stanford.edu/education/citizen-science.

Tachibana, C. (2019, August 30). *Community science: Not just a hobby*. Science. https://www.science.org/content/article/community-science-not-just-hobby#:~:text=Com

munity%20science%20projects%20cover%20a,microbes%20to%20produce%20milk%20proteins.

Thriving Earth Exchange. (2023). *All Projects*. https://thrivingearthexchange.org/projects/.

United States Environmental Protection Agency. (2016, February 20). *Environmental Stewardship*. https://archive.epa.gov/stewardship/web/html/.

United States Environmental Protection Agency. (2023, June 26). *EJScreen: Environmental Justice Screening and Mapping Tool.* https://www.epa.gov/ejscreen.

University of Wyoming Biodiversity Institute. (2021). *Community Science*. http://wyomingbiodiversity.org/index.php/community-science.

Vox. (2016, January 21). Flint's water crisis, explained in 3 minutes [Video]. Youtube. https://www.youtube.com/watch?v=NUSiLOwkrIw.

Weisberg, D., Weisberg, M., Mertz, A. F. (2021, October, 27). *Community Science Is a Powerful Tool for Conservation*. Aspen Institute. https://www.aspeninstitute.org/blog-posts/community-science-a-powerful-tool-for-conservation/.

World Health Organization. (2023). *Air Pollution*. World Health Organization. https://www.who.int/health-topics/air-pollution#tab=tab_1.

Zhong, R., Popvich, N. (2022, March 9). *How Air Pollution Across America Reflects Racist Policy from the 1930s*. The New York Times. https://www.nytimes.com/2022/03/09/climate/redlining-racism-air-pollution.html#:~:text=Urban%20neighborhoods%20that%20were%20redlined,across%20the%20United%20States%20today.