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What systems thinking skills did you use?

Skill #2: Consider the Whole & Parts

I learned to recognize individual biological and earth systems that seem to belong to different fields of science and scales of life, such as Gene Regulatory Networks, the Central Dogma, and the carbon cycle. Through the lens of bioengineering with algae, I now understand how relating these smaller systems to create carbon neutral biofuels and other more sustainable materials can reduce climate change-inducing GHG emissions.

Skill #12: Characterize Feedback Loops

This means identifying places in a system where the output affects the input and then describing the specific properties of these relationships. I used this skill in Tier 2 when we learned about Gene Regulatory Networks, which control the expression of genes in different environmental conditions and therefore regulate which cell functions are carried out. For example, algae (specifically their cell functions) both affect and are affected by the carbon cycle.

Skill #5: Consider Issues Appropriately (consider complexity)

Biofuels have the potential to reduce emissions, but they are not a perfect solution, and combustion of oil from algae still releases GHGs. There are also ethical implications of gene editing. There is SO much I do not understand about all of these systems.

1. What is your role within the STEM community?

As a young person, I want to use my current and future knowledge in a way that aligns with my values, including justice and sustainability. Older generations like to say, “this new generation will change the world!” and I want that to be my goal, instead of money or power. I might be bold, but I don’t know all that much about science right now. I can use my curiosity to constantly expand what I know about the world so that I can ultimately narrow my focus a bit more, maybe to molecular biology or geoscience, while maintaining a broad view. I want to do research in college and then go to graduate school.

2. What complex problem did you address?

Climate change/unsustainable resource extraction. I learned how the genes of green algae can be edited to simultaneously maximize the rate of cell growth and the amount of lipids that are produced in order to create carbon neutral biofuels (an alternative to petroleum, a climate change-inducing greenhouse gas) or edited in other ways to create other sustainable materials. I am currently growing two stocks of green algae, one lab culture and one culture from a pond near my house, that I will later use to conduct an experiment of my choice.

3. How did you get to where you are today?

I’m still a student in high school, so I don’t have much career experience. However, I do a lot of sustainability/climate justice work, which is all about intersections and thoughtful action in the face of complexity. I helped launch a proposal at my school (Northwest) to go carbon neutral by 2030, and I currently lead a task force that is focused on researching and then creating a detailed 10 year plan to reach this goal. I’m also involved in grassroots political organizing with the Sunrise Movement. I’ve learned so much about organization and communication through these groups. I hope to be a scientist to pursue some of my questions *and* make a positive impact.

4. What advice do you have for high school students for how to become a systems thinker?

Try to learn as much as possible because without context it is hard to understand the world and invent new things. That’s what I’m doing right now. Then focus on making connections; including between STEM and non-STEM subjects. I think history in particular is essential to understanding the implications of your work. Personally, I want to specialize in a STEM field in the future, but right now I am learning about many subjects because I am most motivated when I try to understand the big picture of what is happening.