

Student Learning Commentary following Biology Class (Spring 2006)

My sciences requirements are finally done! I thought when I first signed up for these classes that when I completed I would be relieved, and never want to take any others. Unfortunately, it is not the case. I am more intrigued than ever to discover the answers to the questions left by physics, geology and biology.

Like all of the other classes in this series, I had never taken biology class before this quarter. So my knowledge was minimal in the beginning. I have to say that it has been my favorite class in the series. I think that I have been able to learn more in class than the others. While physics was the most organized class of the three, I had less experience with this kind of teaching and learning styles of the class so it was harder for me to take everything I could from that class. Geology was really amazing and gave me an appreciation of geological processes, like volcanoes or earthquakes. I really am excited that I finally understand plate tectonics. It was just so much information and hard to follow how exactly all the things we learned interacted with each other. Biology was the happy medium. It was definitely more information than physics, but at the same time was not nearly amount of information that encompassed geology. I think the reason that biology was such a great experience was that the class started with a few a few ideas about food; what is it and how organisms get it and use it. Those were the ideas and they continued to be the central theme to all that we learned throughout the quarter.

In cycle 1 we were looking at ecosystems and how living and non-living interact. My understanding before we went out and looked at an ecosystem was basically that ecosystems include living and non-living that interact with each other. I think my understanding has evolved to include things like the CO₂ in the air and that the dirt is also considered a non-living element to ecosystem. I think that this was a good place to start because as the quarter progressed we came back to ecosystems with a complete a more involved understanding.

The first thing that we looked at in cycle 2 was how to define food. We were asked to list the food we eat and how could we figure out what our food was made of. My initial idea was to categorize it to raw and cooked. My idea about testing the food was to put all the similar looking food into a certain category. After doing the experiments and talking about the results I came to the understanding that everything that we eat in comprised of proteins, carbohydrates and fats. In addition, I learned that we as humans are also comprised of proteins, carbohydrates and fats.

Then we were asked to give our ideas about how organisms used proteins, carbs, and fats. My idea was that the organisms use what they need and dispose of the rest. I was very vague with that answer, but obviously I had no clue what we used "food" for. We did an activity where we looked at how proteins, carbs and fats are broken up into amino acids, glucose, glycerol, and fatty acids. Then we jumped right into cellular respiration. I was lost for some time trying to figure out how food was able to go into the cell and be converted into energy and building blocks. We did experiments to test for H₂O and CO₂ to give evidence to cell respiration. I finally thought that I understood the process when we were given the formula $6O_2 + C_6H_{12}O_6 \Rightarrow 6CO_2 + 6H_2O$. So then we went through the energy diagrams and they were a bit inconsistent with our prior knowledge with our prior knowledge in physics, but it worked out the same in the end. At this point I understand that in cell respiration, sugar (glucose) mixed with H₂O went

into the cell and in the process that reconfigured the molecules energy was released to do things within the cell. I was not, however, clear on how exactly building blocks were made. I did fine on the exam with my knowledge that food was used as energy and building blocks, but it wasn't until we were into cycle 3 that I understood how part of the food before it went through cellular respiration was made into the structure or building blocks of the cell. Also, it was not that I was able to understand this by doing the experiments; I had to talk to John to figure this out.

Moving on to cycle 3 we looked at how plants get their food and how they use it. In the beginning I was very unsure of how plants got their because we had just gone through an entire cycle and explaining that organisms had to eat their food and I was pretty sure that plants didn't eat other thing organisms. Finally through many experiments I was able to glean that plants did photosynthesis which, combined with light energy, is the opposite process that animals do. Through the process of figuring out how plants got their energy and building blocks I was able to answer most of my questions that cycle 2 could not. So at the end of cycle 3 I was really confident about my understanding of how plants and animals got there food and what exactly they used it for.

Cycle 4 was more confusing because we started looking what happens to plants and animals when they die. I thought that plants and animals decomposed, and that there were enzymes with in the organisms that were released after they died. After we started looking at bacteria and fungi as decomposers I realized that they were something that was living too. I figured out that the decomposers were using the dead organisms as food, by looking at pieces of bread that were covered mold noting that as the amount of bread decreased the amount of mold increased. Then we tested to see what kind of process the decomposer going through. I was able to figure out that it was going through cellular respiration, but the difference was that it was getting food for dead organisms. So then I was able to see how dead and living organisms interact.

After understanding the processes and interactions of the organisms, we moved to cycle 5 and looked at how energy and matter flows and cycles in an ecosystem. At first it was really difficult to separate the energy interactions that took place because there was so many possibilities in the directions it could go. Also, I thought energy cycled through living systems. After we made our complex energy diagrams it was clear that energy does not cycle through an ecosystem.

In this cycle we also looked what types of organisms are in ecosystem. Before the game I thought that there were less producers than primary or secondary consumers because there was only one trophic level that ate the producers. Through the game I was able to see that within an ecosystem there has to be more producers, but what I didn't understand was why. I tried to figure it out and talk to the others; they seemed to understand it in their way, but couldn't explain it to me. After talking to John, I understood that at every trophic level there is less available energy because it was partially used up by the organism; so there also is less biomass because there simply are fewer organisms at each trophic level.

Last but not least, cycle 6 we looked at populations of species and why there are differences within the species. My initial thought was that different species must need or prefer different food. After doing an experiment that simulated different bird beaks, I figured out that some species of birds have an advantage to obtain food over others. Although I was still unsure of why there were different species within a population and

how those species were able to have the advantage. Finally through extensive discussion in class and reading the article about evolution I was able to understand that through random mutation, a population of species will evolve through the natural selection process. Natural selection being the theory that some of a species will go through random mutations and the mutations will make that portion of species have different advantages and disadvantages over the others in the population. So when exposed to stress it could survive, but decreasing the population that didn't have the mutation and increasing the one that does. In a way my initial idea was partially true because there are different food sources that are available and the species that can get the most food will ultimately survive.

I realize that this is a really long reflection but I felt it was important to address all of the cycles. As I said before, my knowledge of biology was very limited and I think that I have learned enormous amount in a relatively short period of time. I think that the most amazing and successful part of this class was having a central idea and maintaining it throughout every step of the course. I think that this is the element that physics and geology especially lacked. I am very thrilled that I was able to be part of this new method of teaching science, and I think for the most part it has been a success. I have learned more than I ever would have imagined.