

Introduction

- What: KEYS is a program dedicated to providing a hands-on experience in science that gives students a way to participate in science, applying the knowledge you know and teaching new skills in practical science. KEYS achieves this by providing students with experience working in a real laboratory setting, showing how science can be used in real scenarios. KEYS, this summer, showed the application of science with the use of computers and data.
- How: Ask students if they know how the material they are learning could be used in a “real-world” scenario. Most likely they will not know how to answer this and I will introduce the KEYS program as a way to learn the answer to this question. I will give a brief explanation of the program itself and how it can achieve that goal.
- Why: This will help the 6th-grade students understand the basic intent behind KEYS and why such a program exists.

My Specific Experience

- What: The lab that the KEYS program put me in is overseen by a professor at the UofA, Dr. Akoglu. His lab’s research is trying to find a way to improve the way our immune system responds to pathogens. The adaptive immune system relies on white blood cells known as T cells to directly fight off antigens. The T cells that our body makes have receptors that attach to antigens so they can start the process of regulating the rest of the immune system process, like creating more white blood cells that can fight that specific type of antigen. Many scientists have had trouble predicting the outcome of this whole process because there are so many of these receptors on T cells. The reason there are so many T cell receptors is that the DNA used as a blueprint to create those receptors is cut and recombined in various ways to create many unique receptors on each T cell. My lab is trying to figure out how we can find out more about this process so we can provide more knowledge on which receptors we should focus more on. My lab is trying to do this by taking all the data we have collected so far and using a supercomputer to find the “best” receptors because there is too much information for a smaller computer to handle.
- How: Because these are 6th-grade students and they have learned basic biology, I will simplify the work I am doing and connect it to the material they have learned. I will ask them what type of blood cells there are and other related questions like that to continue to keep them engaged.
- Why: This explanation of my project can give the students some sort of idea on how science is conducted outside of a classroom setting and can give them more of a reason to continue to engage themselves in science. They will come to understand how I, as one of the many participants of KEYS, will spend my internship. They will learn why my research is important to conduct and how it is conducted.

Hands-On Activity

- What: I will give the students 3 pieces of paper each, labeled V, D, and J with different markings on each paper showing how far to cut each paper. Once they cut each paper, I will give them small pieces of paper from 0 to 10 small pieces, all labeled as “n”. The amount of paper will be chosen randomly. They will glue the paper

labeled “D” to the small pieces of paper they have, then glue this combination to the paper labeled “J,” Then, I will give each student more small pieces of paper. The amount will be the same number of pieces that I previously gave them. They will combine these pieces with the paper labeled “V,” then combine this with the “DnJ” combination of paper. They can compare their final combinations of paper to each other, seeing how different each of their final paper combinations are different.

- How: This activity can be conducted very quickly, but still be effective in demonstrating the sheer variety in the DNA after the process of DNA recombination. The students should see that everyone in the class has a different looking paper even though they all started with the same paper, just with different markings on the initial papers.
- Why: The 6th-grade students will understand how my internship will be focusing on using a model for DNA Recombination to model TCR and their participation in immune responses. This explanation will learn why specific things like DNA recombination plays such an important role in the immune response. They will also understand why we need the HPC system to model this recombination.