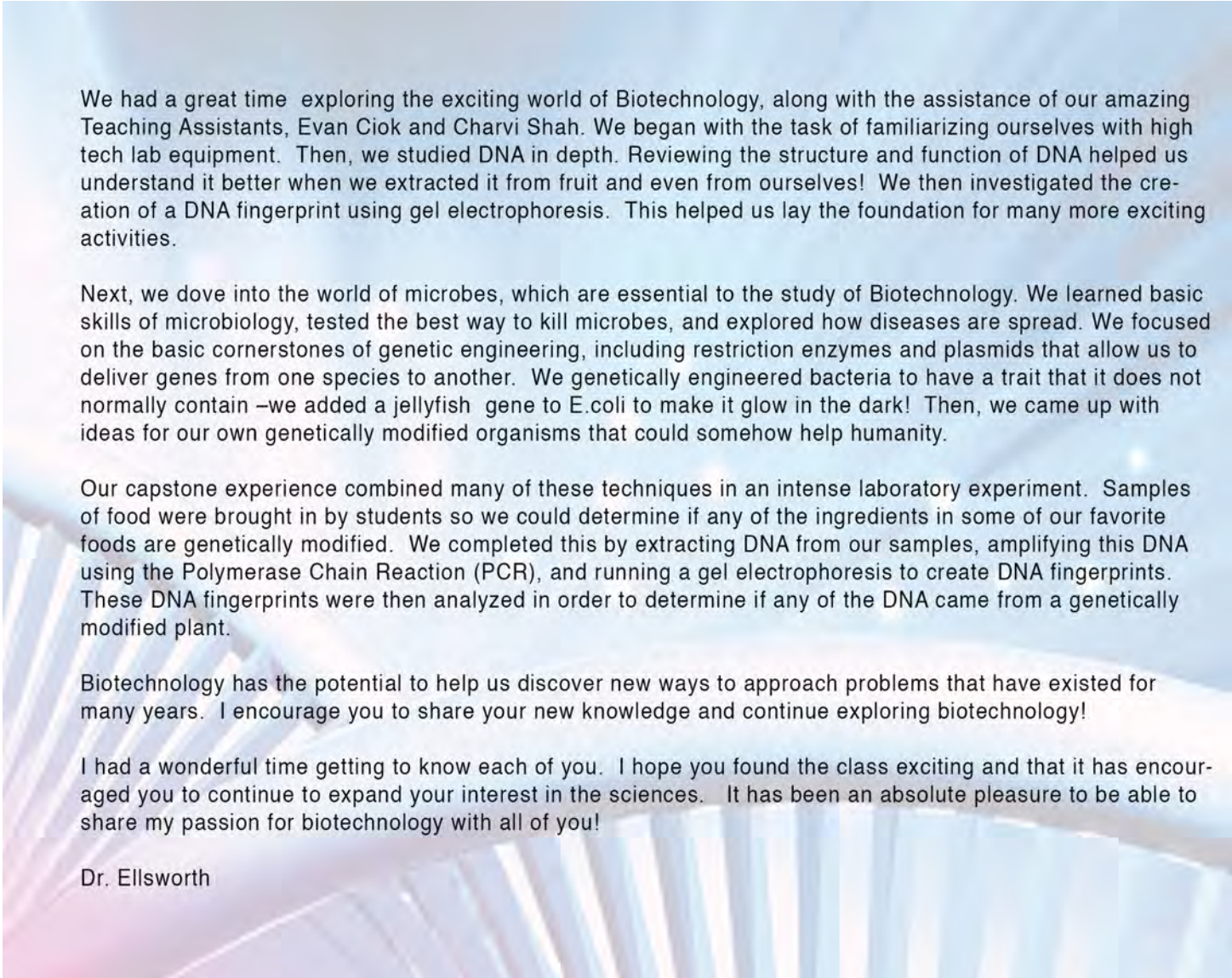




the stars  
challenge

Explore  
**Biotechnology**  
Winter 2019





We had a great time exploring the exciting world of Biotechnology, along with the assistance of our amazing Teaching Assistants, Evan Ciok and Charvi Shah. We began with the task of familiarizing ourselves with high tech lab equipment. Then, we studied DNA in depth. Reviewing the structure and function of DNA helped us understand it better when we extracted it from fruit and even from ourselves! We then investigated the creation of a DNA fingerprint using gel electrophoresis. This helped us lay the foundation for many more exciting activities.

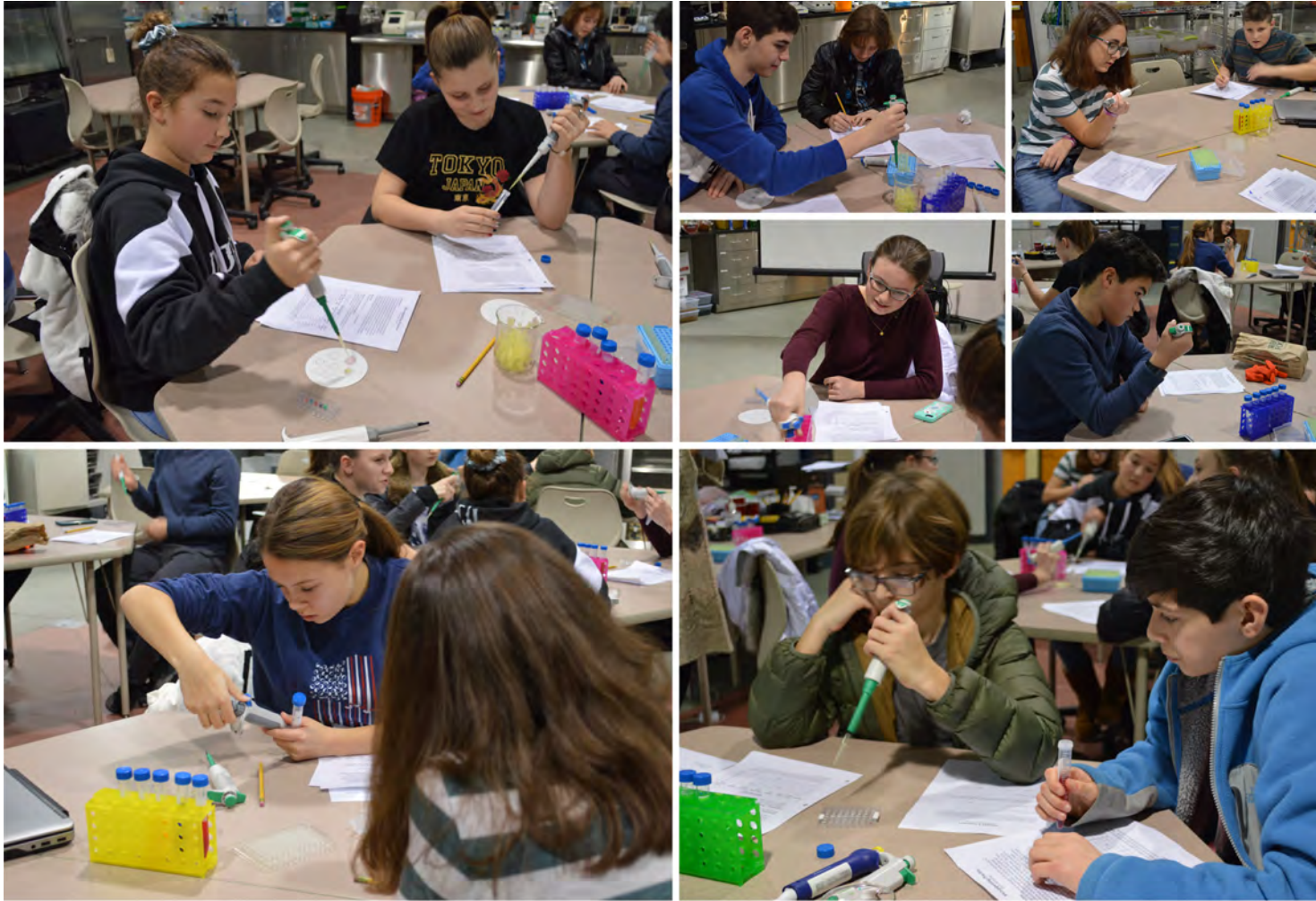
Next, we dove into the world of microbes, which are essential to the study of Biotechnology. We learned basic skills of microbiology, tested the best way to kill microbes, and explored how diseases are spread. We focused on the basic cornerstones of genetic engineering, including restriction enzymes and plasmids that allow us to deliver genes from one species to another. We genetically engineered bacteria to have a trait that it does not normally contain –we added a jellyfish gene to E.coli to make it glow in the dark! Then, we came up with ideas for our own genetically modified organisms that could somehow help humanity.

Our capstone experience combined many of these techniques in an intense laboratory experiment. Samples of food were brought in by students so we could determine if any of the ingredients in some of our favorite foods are genetically modified. We completed this by extracting DNA from our samples, amplifying this DNA using the Polymerase Chain Reaction (PCR), and running a gel electrophoresis to create DNA fingerprints. These DNA fingerprints were then analyzed in order to determine if any of the DNA came from a genetically modified plant.

Biotechnology has the potential to help us discover new ways to approach problems that have existed for many years. I encourage you to share your new knowledge and continue exploring biotechnology!

I had a wonderful time getting to know each of you. I hope you found the class exciting and that it has encouraged you to continue to expand your interest in the sciences. It has been an absolute pleasure to be able to share my passion for biotechnology with all of you!

Dr. Ellsworth



Micropipettes are an essential tool in biotechnology. We are all expert pipettors now!



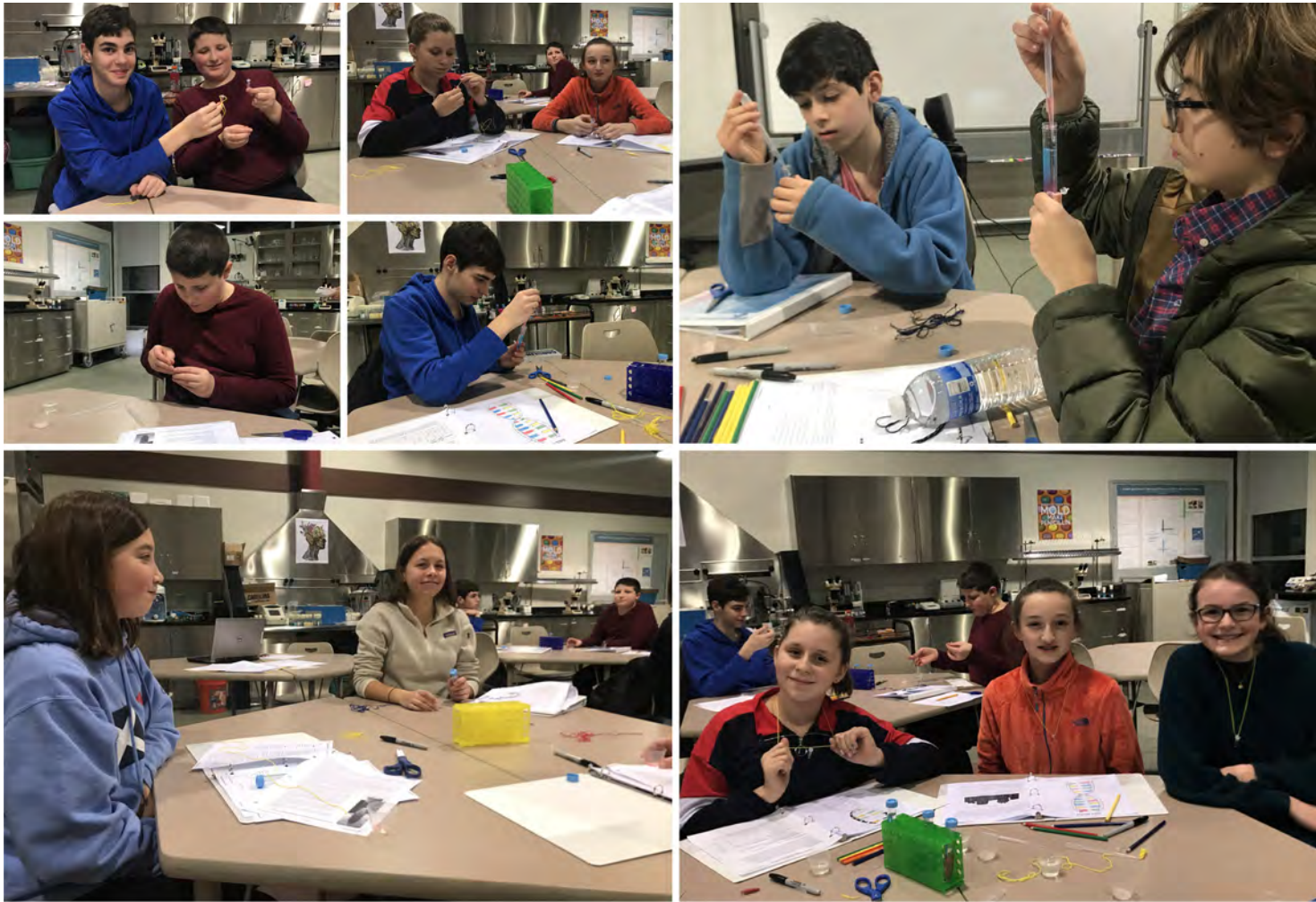
2019 Biotechnology Explorers



We made delicious DNA double helices out of candy and then played with our food to extract DNA from strawberries!



We were surprised that DNA from strawberries was much more slimy than we had predicted!



Next we pulled DNA out of our own cells. We made necklaces so we could show off our double helices outside of our cells!

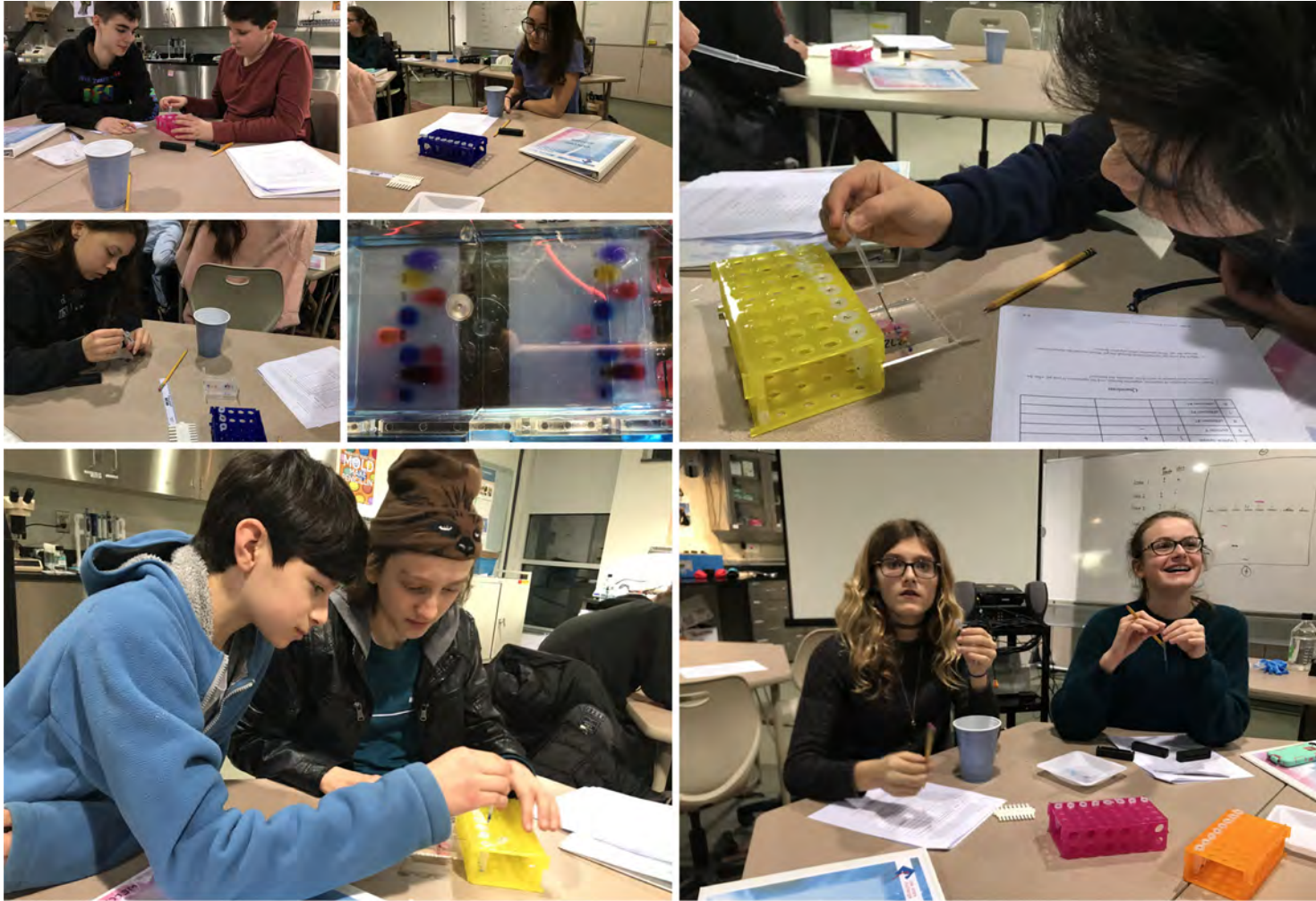


We were surprised to learn that our DNA looked exactly like the DNA we extracted from strawberries!





We made a human model to simulate how DNA and proteins can be separated by their size and electrical charge. We learned that this technique is called gel electrophoresis.



Next, we returned to the lab to practice real gel electrophoresis where we separated colored protein dyes by size and charge and identified the components of three mystery samples.



Finding "Patient 0" in a mock influenza outbreak was made easier in UV light. We used our deductive reasoning skills to find out who spread the flu!



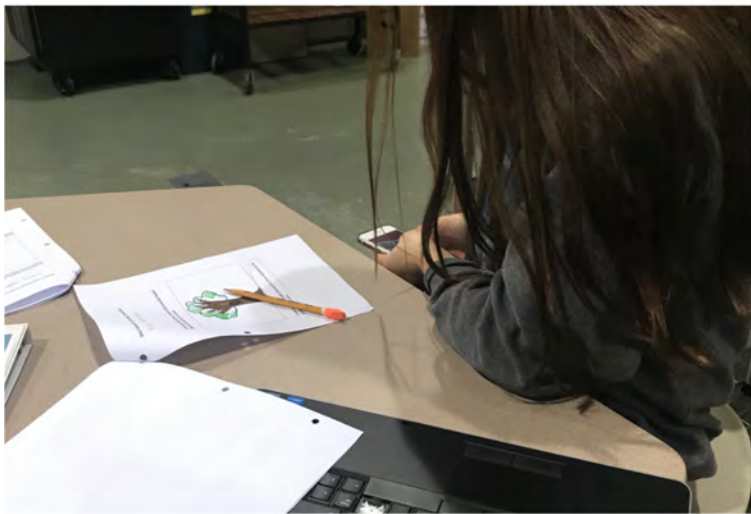
In our further exploration of how viruses are detected we analyzed samples from 3 patients using three different methods of flu testing to see which method gives the most reliable results.



Bacteria can be used to make billions of copies of a protein from another organism. We learned this process is called bacterial transformation and it is used to make important medicines like insulin.



We added a jellyfish gene that produces a green fluorescent protein to *E.coli* bacteria. We also learned how to grow bacteria in a petri dish with special food called LB agar.



We had to wait a week to see our results but, we were rewarded with glow in the dark bacteria!



We learned how genetically modifying plants can make them resistant to insects, reduce the need for using chemical herbicides or pesticides, add more nutrients to a crop, or allow farmers to grow bigger crops.





We used research and our imagination to design our own genetically modified organisms.



Can we trust our food labels? We tested some our favorite foods to see if they had been genetically modified.



