UNC PEMBROKE | MAYNOR HONORS COLLEGE

Biology Enrichment in Native American Students

Senior Project

In partial fulfillment of the requirements for
The Esther G. Maynor Honors College
University of North Carolina at Pembroke

By

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Biology
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Acknowledgements

First, I would like to thank Dr. Joshua Busman for his cooperation and help throughout the course of this project. I would also like to give thanks to my senior project mentor, Dr. Velinda Woriax, chair of the biology department. Dr. Velinda has provided great insight and assistance throughout the semesters of formulating and carrying out my project, and her help has not gone unnoticed.

Abstract

The goal of my Honors project was not simply to teach or explain a biological process, or to instruct students to memorize steps of pathway, but instead, I sought to portray the importance of biology in everyday life and to what degree biology infiltrates and encapsulates everything we are and do. For the purpose of my project, I coordinated with local high school biology instructors and created a gel electrophoresis instruction manual with laboratory demonstrations along with a PowerPoint presentation that I made available to them, to be delivered to local Native American high school students.

Biology Enrichment in Native American Students

Over the course of my collegiate career, I have conducted lysozyme enzyme research, mentored by Dr. Siva Mandjiny, and completed a Course Undergraduate Research Experience (CURE) in a Genetics laboratory course where we extracted DNA from wax myrtle plants to provide information regarding the distribution of this plant by Native Americans during the relocation period. Then, in the summer of 2019, I completed an undergraduate internship in the surgical unit at Southeastern Regional Medical Center (SRCM) where I observed and worked alongside nursing assistants, nurses, nurse anesthetists, anesthesiologists, and surgeons. These research experiences and the internship allowed me to gain valuable experience in prospective fields. I am now even more able to not only attest to the importance of understanding general concepts of biology and the significance of them, but how they are applicable to life and necessary for attaining a career in highly competitive fields such as medicine! For my senior project, I coordinated with high school biology teachers and delivered an instructional

biological tool of information to Native American students in the surrounding community.

The goal of my project was not simply to teach or explain a biological process, or instruct students to memorize steps of a pathway, but instead, to portray the importance of biology in everyday life and to what degree biology infiltrates and encapsulates everything we are and do. To complete this project, I arranged interaction between myself and biology teachers at surrounding high schools to gain insight into what concepts and subject matter/material are covered. Educating in a Native American Community with low income across the region greatly impacts the degree of education received by the children. Coordinating with the teachers illuminated unto me that entry level biology concepts are not even covered in some high school biology laboratory lectures. Knowing this, I decided to formulate my project encompassing the basic concepts regarding gel electrophoresis, a biological tool that is highly covered in BIO 1000, an introductory level collegiate course. I used information provided unto me by the teachers and developed an instructional unit for the students on gel electrophoresis. To complete my project, knowledge, along with resources and research was utilized in constructing my teaching medium. The major tasks in this project were obtaining all relevant information and compiling it into an interactive yet thoughtful and productive model.

For my project, I put together an instructional manual for a teacher which covered what gel electrophoresis is, what it accomplishes, the required materials, the general method/procedure, and what the results of the gel electrophoresis technique shows. This information was compiled into a 3 ring binder and delivered to a teacher that I know from

the local high school. For the students, I put together a PowerPoint presentation which basically included the same information that I included from the binder. I also videoed myself carrying out a gel electrophoresis demonstration which I narrated and explained what I was doing while it was happening and delivered this content to the teacher as well to be shown to the students, giving them a sense of what the laboratory is like including proper safety equipment and clothing and how the technique is carried out.

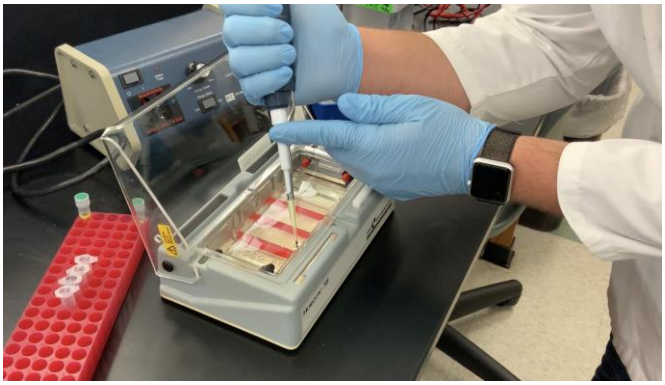
Over the course of my project, my mentor provided assistance regarding ways to strengthen the material of my instruction, ensured my project was up to the necessary academic standards, and helped me choose the best and most effective mode of delivery. Although the final product was simply an additional tool which will be used to further teach the concept of gel electrophoresis and its scientific importance and relevance to the students, I am sure they will be grateful as I would be to receive something that is not covered in many high school biology classes in the area, but are so vital to the understanding of basic biological concepts. I have attached a list of the materials that I used for the demonstration along with the procedure that I utilized in the demonstration. I am hopeful for the impact this project will have on Native American students.

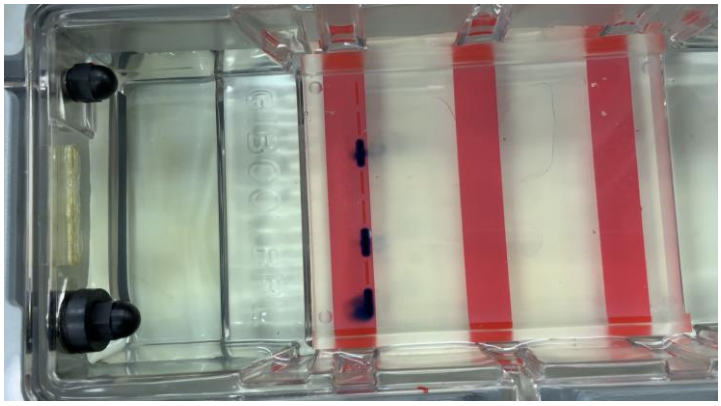
Materials

- Power source
- Apparatus
- DNA, RNA, or Protein Sample
- Buffer
- Gel
- Comb
- Gel tray
- Dye (Ethidium Bromide, Coomassie Blue)
- Power Cables
- Pipette
- Transilluminator

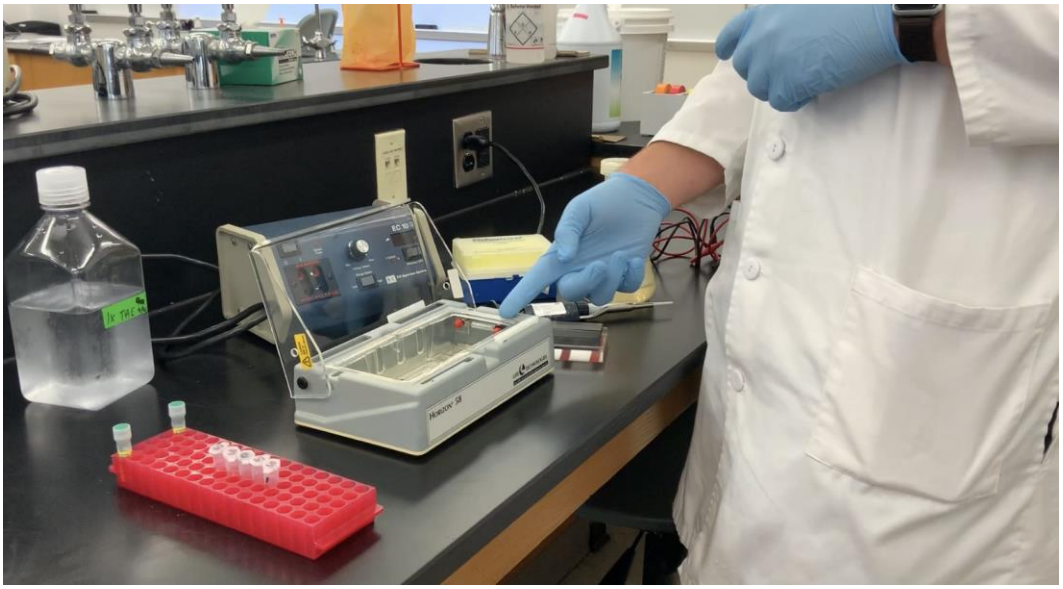
Procedure

1. Place your gel tray into the apparatus.
2. Pour your gel into the gel tray and place the comb in the appropriate place.
3. Allow the gel to solidify and remove the comb to expose the wells, careful not to disturb the gel.
4. Take your pipette and transfer your DNA, RNA or proteins into the wells.
5. Connect the power cables to the power source and the apparatus.
6. Turn on the power source.
7. After the sample has ran, take the gel out and stain with the dye.
8. Use a transilluminator to visualize the bands inside the gel.





Gel Electrophoresis Instructional Manual



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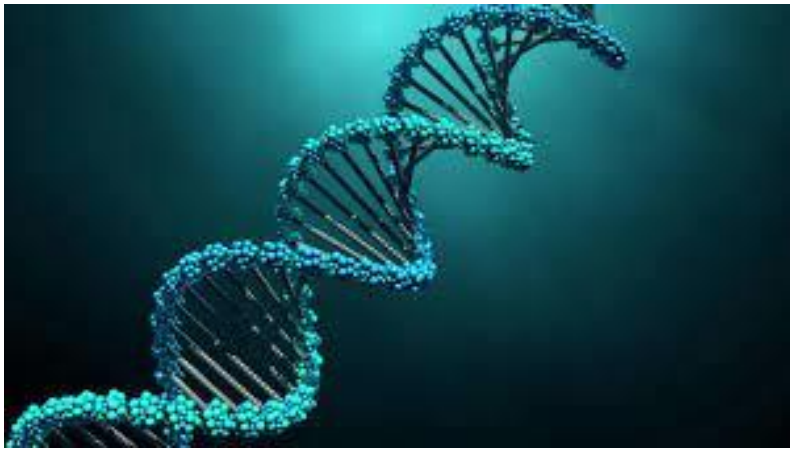
- What is it?
    - Gel electrophoresis is a laboratory technique utilized in separating mixtures of Nucleic acids such as DNA or RNA, or other macromolecules such as proteins according to their size and charge.

- What does it accomplish?



    - Gel electrophoresis is able to show to you how many different types of molecules (DNA, RNA, proteins) are in a specific sample and how they compare to one another when considering size and charge.

- What materials are required?
    - Power Source
    - Apparatus
    - DNA, RNA, or Protein Sample
    - Buffer
    - Gel
    - Comb
    - Gel tray
    - Dye (Ethidium Bromide, Coomassie Blue)
    - Power cables
    - Pipette
    - Transilluminator

- What is the general method/procedure?
    1. Place your gel tray into the apparatus.
    2. Pour your gel into the gel tray and place the comb in the appropriate place.
    3. Allow the gel to solidify and remove the comb to expose the wells, careful not to disturb the gel.

4. Take your pipette and transfer your DNA, RNA or proteins into the wells.
5. Connect the power cables to the power source and the apparatus.
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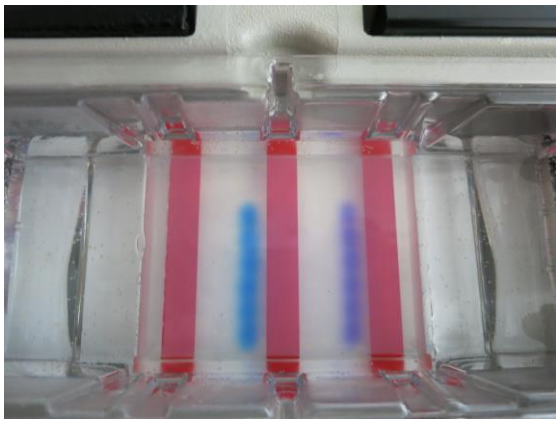
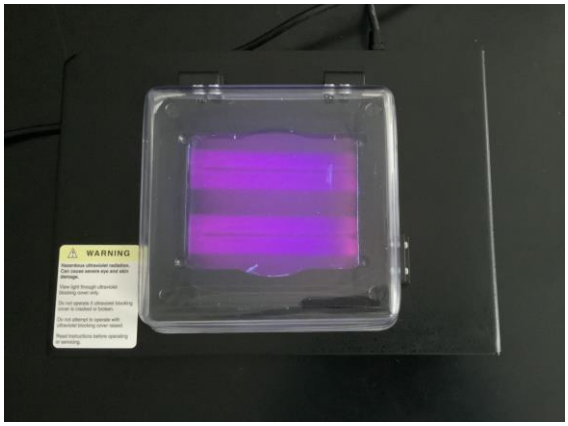
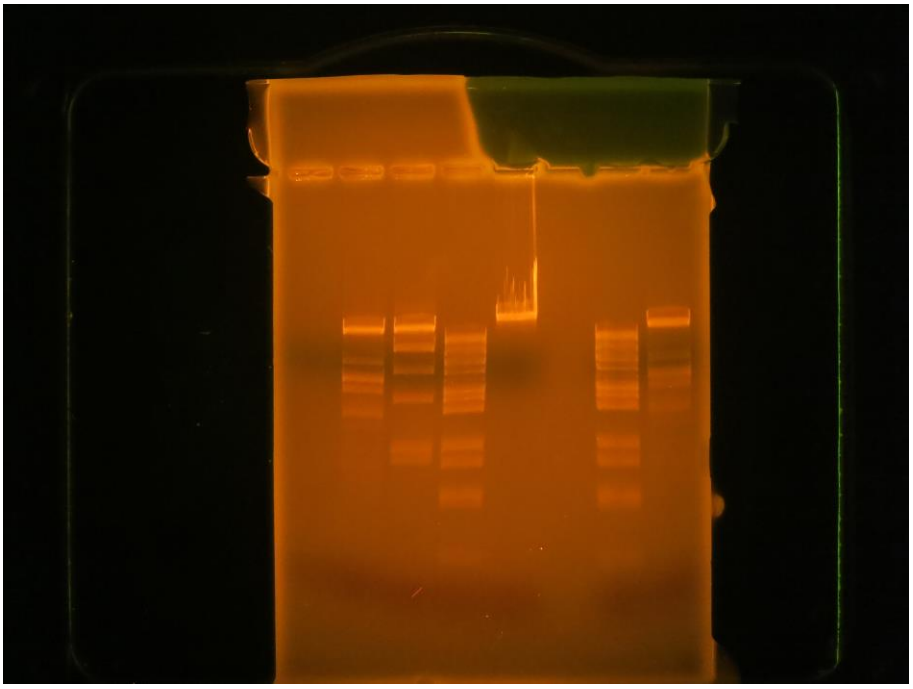




- What do the results show/prove?
    - After the separatory technique has been carried out, if done correctly, you should be able to see the separation of the sample, along with how many different sizes of molecules you have.



*The PowerPoint included the same information as the instructional manual.

*Recommended Sources for Further Information:

- Khan Academy
- Thermo Fisher
- Microbe Online