



Professor: Dr. Kendrick Buford

Grade: 6-8

MSCCR Science Standard:

L.6.1 Students will demonstrate an understanding that living things range from simple to complex organisms, are organized hierarchically, and function as whole living systems.

P.7.5A Students will demonstrate an understanding of the physical and chemical properties of matter.

P.7.5B Students will demonstrate an understanding about the effects of temperature and pressure on physical state, molecular motion, and molecular interactions.

L.8.2A.1 Obtain and communicate information about the relationship of genes, chromosomes, and DNA, and construct explanations comparing their relationship to inherited characteristics.

Learning Objectives:

TSW:

Identify the importance of DNA in Mitosis and Meiosis

Categorize the difference uses of DNA in everyday life.

Interpret a protocol to extract DNA from *Drosophila melanogaster*

Students should be placed in groups of 3 – 4.

Engage

“Does everyone remember what DNA is? What are some real world uses of DNA?”

Students will be asked about their knowledge of DNA. This information will be used to judge how much information will need to be reintroduced in the “Explain” section. We will then move on the more modern uses of DNA. I will ask the class what they think we currently use DNA for (fingerprinting, paternity testing, Ancestry).

***Please pass out all supplies while I am going over the Engage.**

Explore

Advanced Preparation: Ensure that students have goggles and gloves if available.

“We are going to do a procedure that scientist do all the time. I am going to take you through the first stage of extracting DNA from a specimen. The creature that we are going to use is a fruit fly. Scientist love to use fruit flies because their DNA is easier to analyze and do experiments with.”

Classroom teacher will monitor the students using their supplies for their safety. You will be working with me to truly convince the students that these are the techniques that are used in a research lab. Results will vary as this is the nature of the protocol. However, each student will see something.

What do you think DNA looks like? Would it be by itself? *Drosophila* is the model organism for this type of research. Extraction is often the first step involved in genetic research. As such, there are many different techniques (called protocols) available to extract DNA.

DNA Extraction Protocol for Middle School Students

- 1) Place 4 – 5 larvae (white insects) or pupa (brown shell) in the Mortar.
- 2) Rinse Flies with water (hot or warm if possible) to rinse off any excess water. You will need to double the number of specimens if hot water is not available.
- 3) Add enough of Tube A to the Mortar to cover the specimen.
- 4) Take the Pestle and mash the larvae into a water paste. This must be done slowly to prevent bubbles.
- 5) Take your pipette and place your flies in the smallest tube available. It can either be an Eppendorf tube or the smaller blue topped tube.
- 6) Students need to use a marker to write their name on the tubes. The tubes can then be placed in the hot water bath for up to 30 minutes.
- 7) Remove from water bath and add an equal amount of Tube B to the sample tube. Close or cap the tube tightly and invert for 2 minutes.
- 8) Let the mixture settle in the fridge, on ice, or at least not in their hands for up to five minutes.
- 9) Students can then take their samples out and use the brown stick to look for DNA. To do this the students will need to slowly insert the stick into only the top layer of liquid.
- 10) When inside, have the student twist the stick slowly, back and forth and then remove it slowly from the liquid.
- 11) Students will be able to see a white, mucus like film on their stick. This is DNA and associated proteins.

Explain

The students will be taken through a PowerPoint of all the steps that were just performed. This will help reinforce proper lab techniques and I want a connection to be made with lab science and “kitchen science.” The students should feel like they don’t have to be limited by their classrooms.

"This is what it looks like in a research lab. What did you notice that was similar to what was done today"

This phase starts at step 6 and ends depending on the time.

Elaborate

The Student Will look at the next steps for DNA extraction. We are only doing the first step in what can be a lengthy process that can go in many different directions depending on the outcome. I will take the students through the different uses for their samples and how this helps biomedical research.

This phase will occur during steps 7 and 8 of the protocol.

Evaluate

“Before I leave, I want to thank you for letting me do this activity with you today. Your teacher is going to let you answer a few questions, so I can find out if you learned something new today.! Remember, stay curious!”