

Extracting DNA

Author(s): Phillip Burnham and Mark Walsh

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Subject: Biology

Grade Level: 7-12

Standards: Next Generation Science Standards (www.nextgenscience.org)

LS1.A Structure and Function – All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins."

LS3.A Inheritance of Traits – "Each chromosome consists of a single very long DNA molecule, and each gene on the chromosome is a particular segment of that DNA. The instructions for forming species' characteristics are carried in DNA."

Schedule: 2-45 minute lessons

CCMR Lending Library Connected Activities:
 Discovering Enzymes



<p><u>Objectives:</u></p> <p>Students will learn about the structure of DNA and the method for how to extract it from the cells of a living organism. They will also learn about the processes the cell uses to replicate DNA and use the code to make proteins,</p>	<p><u>Vocabulary:</u></p> <p>Deoxyribonucleic Acid Nucleotides Double Helix Base Pairs</p>
<p><u>Students Will:</u></p> <ul style="list-style-type: none"> - Understand what DNA is and its role in the cell. - Understand the structure of DNA. - Understand the history of how DNA was discovered. - Be able to extract DNA from a living thing. - Understand the processes (replication, transcription, and translation) the cell uses to make proteins. 	<p><u>Materials:</u></p> <p>For Class</p> <ul style="list-style-type: none"> ___ Table Salt ___ Detergent ___ 70%-90% Ethyl or Isopropyl Alcohol ___ Spoon ___ Meat Tenderizer <p>For Each Group (3-4 students)</p> <ul style="list-style-type: none"> ___ Test Tube ___ Wooden Stick <p>For Each Student</p> <ul style="list-style-type: none"> ___ Base Pair Cutout <p>Teacher Will Need to Provide:</p> <p>Living Organism (split peas and strawberries are good choices) Measuring Cup Blender Strainer Large Container</p>
<p>Safety</p>	<p>There are no safety concerns.</p>



Science Content for the Teacher:

There are many excellent resources for learning DNA for both teacher and students. We have listed some in the *Resources* section. You may also use or adapt the following classroom presentation:

https://docs.google.com/presentation/d/1ES5587DuhO0yEwpOj4CNVfJApjr7EJSLV7Mv4h7eGQU/edit#slide=id.g15fe494b5e_0_13

Classroom Procedure:

Before Class:

Have students read “DNA: Definition, Structure, and Discovery” before the class.

Engage (5-10 minutes):

Explain to students that they are going to extract DNA from living cells.

Discuss where DNA is located in the cell and ask class to explain what DNA is.

Experiment (30 minutes):

Pass out lab sheets and have students review the steps.

Perform steps 1-3 as a class.

While waiting, ask students, “What is DNA?” “Where is DNA located?” Discuss as a class.

Have students, in groups of 2-3 perform the rest of the lab.

Explore (45-60 minutes):

Base Pair Rule:

Give each student a base pair shape. Tell them that they need find someone to match up with to create a rectangle. Ask them to make a rule based on their observations.

Replication:

Give each student a strand of DNA and ask them to follow the steps to replicate it.

Transcription/Translation:

Give example first, then have them create a code for a 8-10 letter word. Give to another person to transcribe and translate into the word.

Optional - Mutations:

Discuss what a mutation is and how it can affect the translation of a protein.



Assessment:

The following rubric can be used to assess students during each part of the activity. The term “expectations” here refers to the content, process and attitudinal goals for this activity. Evidence for understanding may be in the form of oral as well as written communication, both with the teacher as well as observed communication with other students. Specifics are listed in the table below.

- 1= exceeds expectations
- 2= meets expectations consistently
- 3= meets expectations occasionally
- 4= not meeting expectations

	Engage	Explore	Explain
1	Shows leadership in the discussion and activities on DNA. Shows an understanding of the role of DNA in the cell, as well as transcription and translation	Completes work accurately while providing an explanation for what is observed. Works very well with group.	Provides an in depth explanation of findings. Fills out worksheet clearly.
2	Participates in the discussion and activities on DNA. Shows an understanding of the role of DNA in the cell, as well as transcription and translation	Completes work accurately and works cooperatively with group.	Provides clear explanation of findings. Fills out worksheet clearly.
3	Contributes to the discussion, but shows little understanding of the role of DNA in the cell, as well as transcription and translation	Works cooperatively with partner, but makes some mistakes with the procedure.	Provides a limited explanation of findings. Fills out some of the worksheet.
4	Does not participate in discussion. Shows no understanding of the role of DNA in the cell, as well as transcription and translation	Has trouble working with partner. Does little to complete the procedure.	Is not clear in explanation of findings. Does not fill out worksheet.



Resources:

What is DNA?:

"tour What is DNA? - Learn Genetics - University of Utah." 2014. 8 Dec. 2015
 <<http://learn.genetics.utah.edu/content/molecules/dna/>>

Build a DNA Molecule:

"Build a DNA Molecule - Learn Genetics - University of Utah." 2014. 8 Dec. 2015
 <<http://learn.genetics.utah.edu/content/molecules/builddna/>>

What is a Gene?:

"tour What is a Gene? - Learn Genetics - University of Utah." 2014. 8 Dec. 2015
 <<http://learn.genetics.utah.edu/content/molecules/gene/>>

"utah genetics things you may not know about dna - Learn ..." 2014. 8 Dec. 2015
 <<http://learn.genetics.utah.edu/content/molecules/dnathings/>>

DNA Replication Activity:

"High School Science Learning Activity: DNA Replication - Learning ..." 23 Jun. 2016
 <<http://www.learningliftoff.com/high-school-science-dna-replication/>>

"Hands-on Activities for Teaching Biology to High School or ... - Serendip." 2003. 23 Jun. 2016
 <http://serendip.brynmawr.edu/sci_edu/waldron/>

Build a Monster Activity:

"School of Life Sciences | Ask A Biologist." *Learning about DNA*. N.p., n.d. Web. 19 Oct. 2016.
<https://askbiologist.asu.edu/monster-manual>

