

## NGSS Connections

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DNA Extraction

Grade Level: Middle School

<p><b>Performance Expectations:</b> Students’ ability to complete the following performance expectation(s) will be supported by participation in this activity.</p> <p><b>MS-LS1-1:</b> Conduct an investigation to provide evidence that living things are made of cells; either one or many different numbers and types of cells.</p> <p><b>MS-LS1-2:</b> Develop and use a model to describe the function of a cell as a whole and ways the parts of cells contribute to the function.</p>		
Dimension	NGSS Code or citation	Corresponding student task in activity
<p><b>Disciplinary Core Idea</b></p>	<p>LS1.A Structure and Function</p> <ul style="list-style-type: none"> <li>• All living things are made of cells, which is the smallest unit that can be said to be alive. An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular).</li> <li>• Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell.</li> </ul>	<p>Students review cells and cell structure, labeling organelles in plant and animal cells, and identifying the roles of the organelles.</p> <p>Students explore in the pre-laboratory that all living things are made of cells, and that all living things have DNA in their cells.</p> <p>Students identify the regulatory role of the cell membrane and ways that the membrane can be disrupted to gain access to the internal organelles, including the nucleus and ultimately the DNA.</p>
<p><b>Practice</b></p>	<p>Asking Questions and Defining Problems</p> <ul style="list-style-type: none"> <li>• Ask questions that arise from careful observation of phenomena, models, or unexpected results, to clarify and/or seek additional information.</li> <li>• Ask questions that can be investigated within the scope of the classroom, outdoor environment, and museums and other public facilities with available resources and,</li> </ul>	<p>Students ask questions leading to the driving question, “Does food have DNA in it?”</p> <p>Students ask questions to determine the limits learned in the fruit-based investigation and information gained from reading.</p>

	<p>when appropriate, frame a hypothesis based on observations and scientific principles.</p>	<p>Students write a hypothesis to test in the laboratory exercise, predicting if their fruit sample will contain DNA.</p>
	<p>Planning and Carrying out Investigations</p> <ul style="list-style-type: none"> <li>Plan an investigation individually and collaboratively and in the design identify independent and dependent variables and controls, what tools are need to do the gathering, how measurements will be recorded, and how many data are need to support a claim.</li> <li>Collect data to produce data to serve as the basis for evidence to answer scientific questions or test design solutions under a range of conditions.</li> </ul>	<p>Students use reasoning skills to sequence the steps of the protocol to carry out the investigation to answer the driving question, “Does food have DNA in it?”</p> <p>Students identify positive and negative controls, and write their hypotheses for the investigation.</p> <p>Students collect data and share as a class then use the data to answer the question, “Does food have DNA in it?”</p>
	<p>Analyzing and Interpreting Data</p> <ul style="list-style-type: none"> <li>Analyze and interpret data to provide evidence for phenomena.</li> <li>Consider limitations of data analysis (e.g., measurement error), and/or seek to improve precision and accuracy of data with better technological tools and methods (e.g., multiple trials).</li> </ul>	<p>Students analyze and interpret data from individual and class investigations to determine if food contains DNA.</p> <p>Students are asked if, based on the data collected, they can determine that all living things contain DNA and to identify further investigations if necessary.</p>
	<p>Construction Explanations and Designing Solutions</p> <ul style="list-style-type: none"> <li>Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students’ own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.</li> <li>Apply scientific reasoning to show why the data or evidence is adequate for the explanation or conclusion.</li> </ul>	<p>Students construct explanations using data from their investigations to answer the driving question, “Does food have DNA in it?”</p> <p>Students use a Claim-Evidence-Reasoning chart to frame their scientific explanations using data from the lab and answering the driving question.</p>

<b>Crosscutting Concept</b>	<b>Structure and Function</b> <ul style="list-style-type: none"> <li>Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the shapes, composition, and relationships among its parts; therefore, complex natural and designed systems can be analyzed to determine how they function.</li> </ul>	Students construct an explanation that food does have DNA in it because food has cells and all cells have DNA, because DNA gives the directions for the cells and determines the type of cell and organism.
<p><b><u>Nature of Science</u></b></p> <p>Scientific Investigations Use a Variety of Methods</p> <ul style="list-style-type: none"> <li>Science investigations are guided by a set of values to ensure accuracy of measurements, observations, and objectivity of findings.</li> </ul> <p>Scientific Knowledge Assumes an Order and Consistency in Natural Systems</p> <ul style="list-style-type: none"> <li>Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurements and observation.</li> </ul> <p>Scientific Knowledge is Based on Empirical Evidence</p> <ul style="list-style-type: none"> <li>Science knowledge is based upon logical and conceptual connections between evidence and explanations.</li> </ul>		
<p><b>Connections to <u>Common Core State Standards</u></b></p> <p><u>English Language Arts/Literacy</u></p> <p>RST.6-8.3          RST.6-8.10          SL.8.1          W.6-8.1</p>		