

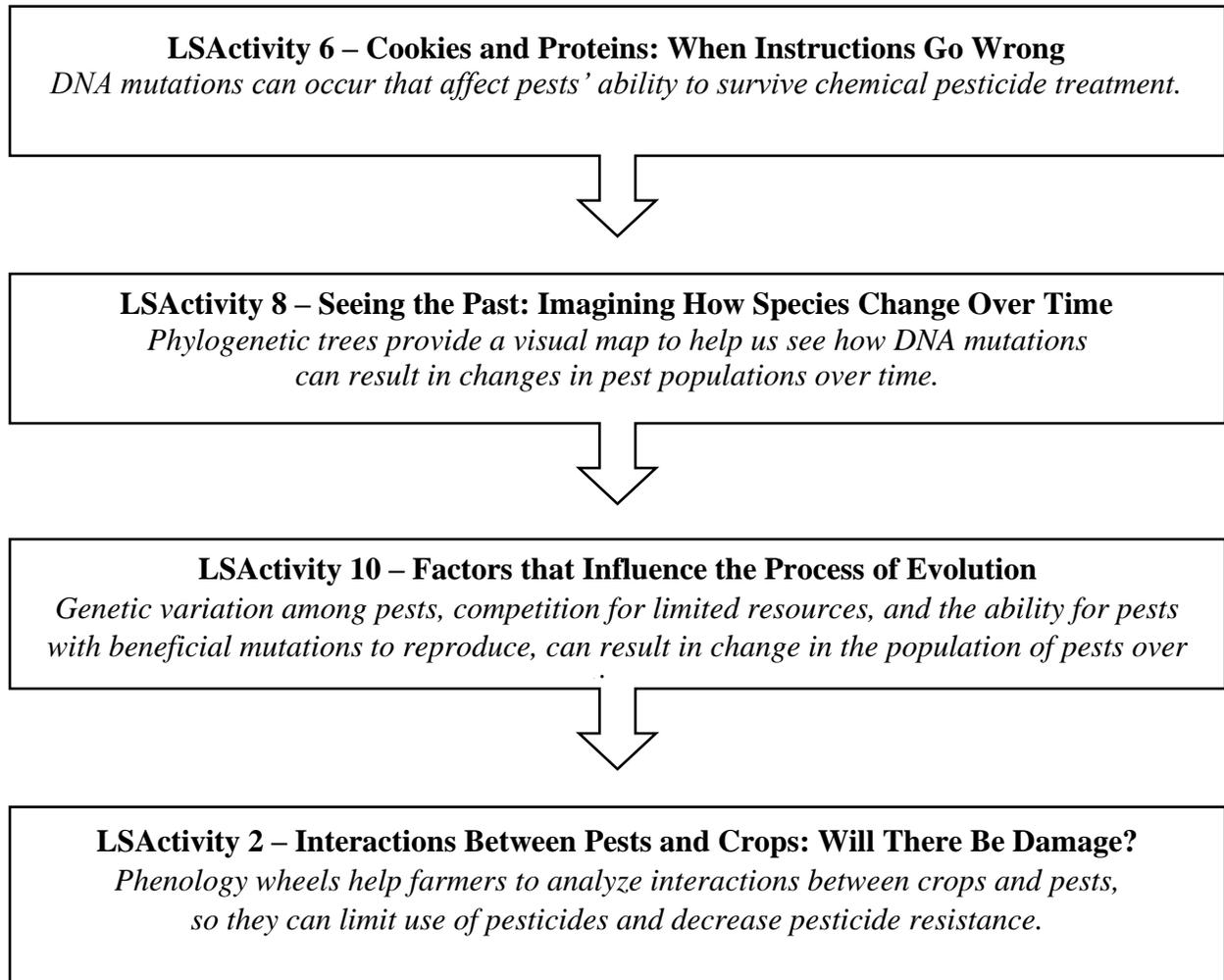
**Anchoring phenomenon:
How using pesticides causes pests
to evolve - and how farmers can
reduce the problem**



When pests damage crops, farmers use chemical pesticides to kill the pests. As time passes, the pesticides become less and less effective. Why? What can farmers do to limit the pesticide resistance?

https://mtvernon.wsu.edu/path_team/DiseaseGallery/corn-earworm-2.htm

POGIL[®] Activities that support the anchoring phenomenon:



POGIL® Activity	NGSS Performance Expectation	Learning Outcomes
LSActivity 6	<p>MS-LS3-1 Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism.</p>	<p>1. I can describe three different ways that DNA mutations can impact the function of protein molecules.</p> <p>2. Using information about the structure and function of an unmutated protein molecule, I can predict how a specific mutation will impact that protein's function.</p>
LSActivity 8	<p>MS-LS4-1 Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past.</p>	<p>1. I can identify which species are extinct and which are still living, based on analysis of various forms of evolutionary trees for the same set of species.</p> <p>2. I can create an accurate evolutionary tree, based on data about the presence/absence of fossil species and living species in layers of sedimentary rock.</p>
LSActivity 10	<p>MS-LS1-4 Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.</p> <p>HS-LS4-2 Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to</p>	<p>1. I can analyze the horns on different types of beetles, identifying positive (beneficial) and negative (detrimental) mutations with respect to fighting ability, flying ability, dung odor detection, and seeing burrows.</p> <p>2. I can identify at least three of the four factors that influence the process of evolution.</p> <p>3. I can construct an explanation based on evidence (from dung beetle research) to support the concept that the process of evolution is affected by competition for limited resources, reproductive success, and beneficial mutations.</p>

	<p>increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.</p>	
<p>LSActivity 2</p>	<p>MS-LS2-2 Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.</p>	<p>1. I can analyze life cycle diagrams and phenology wheels to explore the different stages of an organism’s life.</p> <p>2. Using a phenology wheel, I can predict whether and when the predator-prey relationship will become a problem for farm crops in an agricultural ecosystem</p>

Supplementary videos for use after student teams have completed their explanations of the phenomenon.



<https://www.youtube.com/watch?v=1gGXqwkO4jA>



<https://www.iraac-online.org/about/resistance/management/>



<https://www.iaea.org/newscenter/news/insect-pest-control-management-conference-discusses-new-techniques-and-approaches>