Lesson Plan

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Introduction/Abstract to Lesson Plan (max. 100 Words) Include aspects of the lesson that are unique, innovative and relevant to the 5 E Model.	This set of lessons uses the fact that animals eat plants to illustrate and teach concepts of traits, competition, producers, consumers, plant defenses, adaptation, and evolution. In the first section, students learn about the components of leaves and why animals eat them, and draw and label producers and consumers. In the second section, students learn about plant physical defenses, and complete an exercise in measurement using rulers to learn about how physical plant defenses deter either insect or animal consumers. In the third section, students learn about chemical plant defenses by observing leaves (of grocery-store produce or wild-collected leaves), and learning how animals take advantage of these traits (including that many human foods and medicines are based on these defenses). In the fourth section, students apply what they have learned about plant chemical and physical defenses by playing a set of games pitting plant defenses against animal consumers, and if appropriate, calculating frequencies of survival to illustrate the connection between adaptation and the environment.
List of Standards Addressed Common Core, NC Essential Science, Next Gen, etc. (This can be a quick list of standard numbers. Full standards can be included at the end of the lesson plan)	5.L.2.2, 5.L.2.3, 6.L.1.1, 6.L.2.1, 8.L.3.2, Bio 2.1.2, Bio 2.1.3 CCSS.MATH.CONTENT.4.MD.A.1, CCSS.MATH.CONTENT.4.OA.A.2, CCSS.MATH.CONTENT.6.SP.A.1, CCSS.MATH.CONTENT.7.SP.C.6 3-LS3-2, 3-LS4-3, 3-LS4-4, 4-LS1-1, 5-PS3-1, 5-LS1-1, 5-LS2-1
Learning Objectives using Measurable Verbs (what students will be able to do)	Define trait, adaptation, producer, consumer. List plant traits that prevent consumption. Measure plant traits that prevent mammals or bugs from eating plants. Define animal traits that represents adaptations for eating plants. Construct a chart that shows the outcome of each plant/animal interaction. Assess comprehension by playing the plant versus animals game.
Appropriate Grade Levels	**4-8th Grades**
Group Size/# of students activities are designed for	Activities can be scaled from partners to larger groups depending upon the availability of materials.
Setting (e.g. indoors, outdoors, lab, etc.)	**Indoors; if school has access to trees or meadows and season allows, students can collect plant materials themselves (wearing gloves!)**
Approximate Time of Lesson	**Several hours (student assignments could be done as homework or classwork assignments) to a week**
Resources Needed for Students (e.g. scissors, paper, pencils, glue, etc.)	Magnifying glasses Metric rulers Scissors Markers or stamps (stamps would be leaf, caterpillar, deer, beetle)
Resources Needed for Educators (e.g. blackboard, Powerpoint capabilities, etc.)	Blackboard Internet access Projector or computer with sound (if you want to play instructional videos) Dixie paper cups Grocery store list (*with free alternatives that can be collected outdoors*): Black tea, decaffeinated, unsweetened Fresh sage leaves (*magnolia leaves*)—enough that each group gets one leaf One bunch of kale, grapes, or blueberries (also *magnolia or eucalyptus leaves*) Some heads of romaine lettuce or sweet potatoes (*a branch of maple leaves*)—one head per two groups

	Roses with thorns on their stems (*rose or blackberry stems*)
Apps/Websites Needed	**None needed, the following are optional demonstrations:** For a demonstration of how bugs eat plants containing latex: https://www.youtube.com/watch?v=SbB5DnWWqF4 For a great description and video about the adaptations of monarch butterflies, check out this video from milkweed expert Dr. Anurag Agrawal: http://youtu.be/WXHeqxf1kDE HIGHLY RECOMMENDED, a video on the importance of milkweed to monarch butterflies and other pollinators, from Yosemite National Park: https://www.youtube.com/watch?v=V3jpu2th34o General resources for ecology Bugwood, a huge database of plant and insect images, almost all under creative commons copyright and available to download and use for non-profit purposes: http://www.insectimages.org/ ARKive, a huge database of information, images, and videos of endangered and threatened species around the world. Free downloads for educational purposes, several of my video links are from this site: http://www.arkive.org/
Lesson Activity (step by step description of activity) Including steps that address the 5 E's: • Engagement • Exploration • Explanation • Elaboration • Evaluation	**1. Engage: What is in a leaf? Students draw a leaf (grass, herb, or tree leaf), list its ingredients, then draw a bug or animal that needs the same ingredients to survive.** **2. Explore: Students measure and draw thorns and leaf hairs, and compare them to the mouth sizes of deer and beetles, in order to assess what plant defenses protect against which herbivores.** **3. Explanation: Instruction in plant physical and chemical defenses, including pictures and video. Instruction in animal adaptation.** **4. Elaboration: Students interact with leaves, stems, and fruit from the grocery store to experience plant defenses personally.** **5. Students fill out the Animal versus Plant chart. Students play Animals versus Plants Game to assess how well they understand the consequences of plant defenses and animal adaptations for survival.**
Final Product (If there is one, e.g. blog, presentation, etc.)	**Drawings of producer and consumer** **Mathematical Exercise: Big versus Small herbivores drawings and calculations** **Plant versus animals chart** **Students each have a deck of defense-adaptation cards**
Assessment/Evaluation (Evidence of Learning linked directly to learning objectives)	**Students will be able to identify producers and consumers.** **Students will be able to describe physical and chemical plant defense traits, and to give examples of each.** **Students will be able to describe animal traits that are adaptations to plant defenses, and give examples.** **Students will be able to match plant defenses and animal adaptations as an example that an adaptation is a trait that provides an advantage only under particular environmental conditions.** **Students will learn the importance of biodiversity by demonstrating in the game that animals are more likely to survive when plant resources increase.**
NC Essential Science and/or Common Core Math Standards	5.L.2.2, 5.L.2.3, 6.L.1.1, 6.L.2.1, 8.L.3.2, Bio 2.1.2, Bio 2.1.3 CCSS.MATH.CONTENT.4.MD.A.1, CCSS.MATH.CONTENT.4.OA.A.2, CCSS.MATH.CONTENT.6.SP.A.1, CCSS.MATH.CONTENT.7.SP.C.6

(Standards Mapping Grid Optional)	
Optional Next Generation Science Standards	3-LS3-2, 3-LS4-3, 3-LS4-4, 4-LS1-1, 5-PS3-1, 5-LS1-1, 5-LS2-1

Appendices:

Powerpoint slides, can be used in the classroom or as background reading for teacher: PLANTSversusANIMALS.ppt

Exercise 2 worksheet:
Bigversussmall.doc

Animals versus Plants Chart and Game cards:
PlantsversusAnimalsGAME.doc

Resources for Teachers:

Two word files, as well as references therein:
TeacherBackground.doc
GAMETeacherInstructions.doc

Answer Key to Exercises:

BigvSmallandGameKEY.pdf