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| Subject: Science | Grade: 7 | Unit ID:  |
| Unit 1: Organisms and Adaptations | Length:  |
| Stage 1: Desired Results |
| Standards:**Content Standards:****7.MS-LS1-4.** Construct an explanation, based on evidence for how characteristic animal behaviors and specialized plant structures increase the probability of successful reproduction of animals and plants. [Clarification Statement: Examples of animal behaviors that affect the probability of animal reproduction could include nest building to protect young from cold, herding of animals to protect young from predators, and vocalization of animals and colorful plumage to attract mates for breeding. Examples of animal behaviors that affect the probability of plant reproduction could include transferring pollen or seeds; and, creating conditions for seed germination and growth. Examples of plant structures that affect the probability of plant reproduction could include bright flowers attracting butterflies that transfer pollen, flower nectar and odors that attract insects that transfer pollen, and hard shells on nuts that squirrels bury.] [Assessment Boundary: Assessment does not include natural selection.]**7.MS-LS2-4.** Analyze data to provide evidence that disruptions (natural or human-made) to any physical or biological component of an ecosystem can lead to shifts in all its populations. [Clarification Statement: Focus should be on ecosystems characteristics varying over time, including disruptions such as hurricanes, floods, wildfires, oil spills, and construction.] (also included in unit 5)**7.MS-LS2-5.** Evaluate competing design solutions for protecting an ecosystem. Discuss benefits and limitations of each design.\* [Clarification Statement: Examples of design solutions could include water, land, and species protection, and the prevention of soil erosion. Examples of design solution constraints could include scientific, economic, and social considerations.] (also included in unit 5)**7.MS-LS2-6.** Explain how changes to the biodiversity of an ecosystem—the variety of species found in the ecosystem—may limit the availability of resources humans use. [Clarification Statement: Examples of resources can include food, energy, medicine, and clean water.] (also included in unit 5)**Practice Standards/Concepts & Skills:**1. Asking questions (for science) and defining problems (for engineering). 2. Developing and using models. 3. Planning and carrying out investigations. 4. Analyzing and interpreting data. 5. Using mathematics and computational thinking. 6. Constructing explanations (for science) and designing solutions (for engineering). 7. Engaging in argument from evidence. 8. Obtaining, evaluating, and communicating information |
| Overview:[***Guide***: *This is a brief description of the unit. It explains the unit's focus and/or theme and provides a summary of what students will learn. - delete*]**FOCUS LANGUAGE GOALS:**[Guide: [creating Focus Language Goals](http://www.doe.mass.edu/ell/curriculum/ResourceGuide.pdf#page=66) - delete] |
| Understandings***Students will understand that…**** Animals have developed specific behaviors and adaptations that increase their odds of reproducing in their lifetimes.
* Plants reproduce using a variety of strategies including specialized structures and interdependence with animals.
* Biodiversity arises in species as a result of random changes in individuals that increase the likelihood they will mate and pass that change to new generations.
* As human consumption of natural resources increase, so do the negative impacts on Earth.
* Energy and matter are recycled through ecosystems
* Humans can mitigate their impact on ecosystems
 | Essential Questions***Students will keep considering..*.*** Why are variations within a population important for the species continued survival?
* How have plants and animals influenced each other's’ adaptations over time?
* How does a disruption affect an ecosystem?
* What are the possible impacts of humans on ecosystems and what can be done to mitigate harmful effects?
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| **Knowledge:** **Content:*****Students will know…**** the terms biodiversity and adaptation
* examples of animal behaviors that affect the probability of animal reproduction, such as nest building, herding of animals, vocalizations, and colorful plumage
* examples of animal behaviors that affect the probability of plant reproduction, such as transferring pollen or seeds; and, creating conditions for seed germination and growth
* examples of plant structures that affect the probability of plant reproduction, such as bright flowers, flower nectar and odors that attract insects that transfer pollen, and hard shells on nuts that squirrels bury

**Language:**Students will become familiar with a variety of different text types in the four skills (reading, writing, listening and speaking) for such purposes as:* Describing animal behavior and plant structures that help organisms to survive

Vocabulary: [(see definition of CCSS tiered vocabulary)](https://drive.google.com/open?id=0B1oO5U3iU008Q1ZGaEpFeFpLVnc)

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| **Tier 1** | **Tier 2** | **Tier 3** |
| StemRootsLeaves | ParentOffspringFertilizationReproduction | Sexual reproductionAsexual reproductionSeed dispersalPistilsStamensPetalsSepals |

 | **Skills**: *Students can ...***Content:*****Students will be skilled at…*** * determining factors that affect the probability of reproduction (7.MS-LS1-4)
* analyzing and using the evidence from examples to develop an argument of how animal behaviors and specialized plant structures affect the probability of reproduction (7.MS-LS1-4)
* making inferences based on data to construct an argument that human activities and technologies can be engineered to mitigate the negative impact of increases in human population and per capita consumption of natural resources on the environment (7.MS-ESS3-4.)
* evaluating design solutions for protecting an ecosystem (7.MS-LS2-5.)
* calculating the change in the growth and population size of a species (including humans) by analyzing and interpreting data with abundance and scarcity of resources (7.MS-LS2-1.)

**Language:*** I can identify factors that influence the probability of reproduction
* I can develop an argument with evidence to explain how animal behaviors and specialized plant structures affect the probability of reproduction impacts an ecosystem
* I can make an inference on how humans positively and/or negatively impact an ecosystem
* I can analyze and interpret data to calculate change in population growth
* I can evaluate design solutions to protect an ecosystem
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| Stage 2: Assessments |
| Assessments administered in this unit* Traditional computer based or paper and pencil teacher generated assessment
* Common district assessment questions (pending)
* Potential Performance Activity from Pearson: [Seed disposal Argument](https://drive.google.com/file/d/1nzsuOUYPh1QRTt1BcBhGyfDu3-lyNnY8/view?usp=sharing)
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| Stage 3: Learning Plan |
| Summary of Key Learning Events and Instructions:**Engage students in activities that will provide evidence for how characteristic animal behaviors and specialized plant structures increase the probability of their successful reproduction**. (**7.MS-LS1-4**)**Specialized plant structures** Introduce students to specialized plant structures, and then focus on examples of plant characteristics that increase the probability of plant reproduction, such as bright flowers, flower nectar, and odors that attract insects that transfer pollen, and hard shells on nuts that squirrels bury. (**7.MS-LS1-4**)* Introduce key vocabulary
* Plant structure variation (color, odor, nectar availability, size, number etc.)

Possible resources for lesson * Pearson Textbook Ch 7, Lesson 3 and Lesson 4
* [Flower Parts](https://askabiologist.asu.edu/sites/default/files/resources/coloring_pages/pdf/AAB_flower_anatomy_activity.pdf)
* [Reproduction in Common Milkweed](https://docs.google.com/document/d/1TM8_xH8XuuVKLcfSA9oY0GXo7DJs8gkk-OimTsna6us/edit?usp=sharing)
* [life plants](https://archive.org/details/LifeBBCDocumentry2009720pH264) episode 9 has several short segments detailing different plant reproduction strategies
* [Flower Dissection Lab](http://drive.google.com/open?id=0B0yJPM1mVR-iV2ExZk5QWm5Va00)
* [Flower and fruit lab](http://w3.marietta.edu/~biol/introlab/Flowers%20and%20Fruits.pdf)
* [Plant Life Cycle](http://www.pbslearningmedia.org/resource/lsps07.sci.life.stru.seedplant/life-cycle-of-a-seed-plant/) interactive with provided discussion questions

**Animals can influence plant reproduction** Explore examples in which animal behavior influences plant reproduction, such as transferring pollen or seeds and creating conditions for seed germination and growth (**7.MS-LS1-4**)Possible resources for Lesson * [Plant/animal bellringer](https://docs.google.com/document/d/1vL2HK2XdHtPxfFIseoNGgZoExJho_GhOtCosVDvXisw/copy?usp=sharing) and discussion (copy in drive)
* [Discussion Questions](https://docs.google.com/document/d/1rWe0xJbo7mF9qm5qiZo7WHIS2DZtXsdhFMieosL8vIo/copy) (copy in drive)
* [Article on 5 most important groups](https://www.thedodo.com/community/benkerns/fellows-pitch-6-animals-the-wo-678471442.html)

**Animal behaviors that influence species survival** Involve students in lessons and activities that demonstrate examples of how animals survive in order to successfully reproduce and continue as a species. Examples could include adaptations that allow animals to survive in specific environments, exploit a particular food source, survive in large groups, or protect and raise offspring. (**7.MS-LS1-4)**Possible Resources for lesson * + - Pearson Textbook Ch 7: Lesson 1 and Lesson 2
		- [BBC Nature Adaptations](http://www.bbc.co.uk/nature/adaptations)
		- Bird Body Type Adaptation simulator and associated worksheet: allows students to observe how random changes in the species and/or the environment determine how likely an animal is to live long enough to reproduce and to reproduce successfully. Lesson can be done over the course of 2 periods with discussions of findings. Links to simulation and worksheet below:
			* Guide: <http://sepuplhs.org/sgi/evolution/sgi_evolution_ss_11_1.pdf>
			* Simulator: <http://sepuplhs.org/high/sgi/teachers/evolution_act11_sim.html>
	+ Additional examples could include nest building, herding of animals, vocalization and appearance.Possible resources for lesson
		- [Nest Building Activity](http://www.prbo.org/cms/docs/edu/activity4.pdf)

**Shifts in populations** **(7.MS-LS2-4)*** + Introduce students to the idea that disruptions to an ecosystem causes shifts in a population, which will cause populations to then adapt
		- Ex. peppered moths
	+ Give students various real world examples of events that cause shifts in population, have students analyze how these events could casue different animals to adapt
		- Examples of events that could cause shifts would be introduction of new animals, catastrophic events (earthquakes, tsunamis etc.)
	+ Introduce the students to the idea that humans can also impact ecosystems, give examples and ahve students identify ways in which animals adapt.

**Use current, relevant examples in lessons and activities that will demonstrate to students that human activity impacts all ecosystems directly or indirectly and that as humans consume resources there can be negative impacts to all ecosystems.**  **(7.MS-LS2-4) (7.MS-LS2-6(MA))*** **Human Interaction** **(7.MS-LS2-4, 7.MS-LS2-6(MA))**
	+ Introduce examples of human impact. See below for possible examples:
		- CNN Article - Banning Microbeads <http://www.cnn.com/2015/12/30/health/obama-bans-microbeads/>
		- National Geographic - Pacific Garbage Patch <http://nationalgeographic.org/encyclopedia/great-pacific-garbage-patch/>
		- Newcastle Herald - Decimation of the Pacific Ocean [The Ocean is Broken](http://www.theherald.com.au/story/1848433/the-ocean-is-broken/)
		- Student activity - [Our Different Carbon Footprints](http://www.nationalgeographic.org/media/our-different-carbon-footprints/) (Video)
		- [Human Footprint Interactive](http://www.nationalgeographic.org/interactive/human-footprint-interactive/)
		- encroaching urbanization using the website:<http://mapmaker.nationalgeographic.org/#/> with the land cover transparent layer
		- Video on non-point source pollution - <https://www.natureworkseverywhere.org/resources/urban-runoff/>
		- Student interactive on non-point source pollution <https://www.epa.gov/nps/students-activity-nonpoint-source-pollution-awareness>
		- Student activity for understanding how non-point source pollution can occur <http://www.rivanna-stormwater.org/groundwater.pdf>
		- Resource for researching invasive species <https://www.invasivespeciesinfo.gov/index.shtml>
		- Resource for researching Massachusetts list of endangered, threatened and special concern species <http://www.mass.gov/eea/agencies/dfg/dfw/natural-heritage/species-information-and-conservation/mesa-list/list-of-rare-species-in-massachusetts.html>
		- Resource for data on Massachusetts water quality <https://waterwatch.usgs.gov/wqwatch/map?state=ma&pcode=00010>

**Using local and global examples engage students in activities, lessons and problems that show how humans can mitigate the impact of their activities on different ecosystems.** **(7.MS-LS2-45, 7.MS-LS2-6(MA))****Mitigating human impac**t **(7.MS-ESS3-4) (7.MS-LS2-5)*** + - Ocean Clean Up - <http://www.theoceancleanup.com/>
		- Huffington Post Inventions - <http://www.huffingtonpost.com/entry/boyan-slat-ocean-clean-up-prototype-test-north-sea_us_5756fc1fe4b0b60682df0c90>
		- <http://www.rivanna-stormwater.org/wetlands.pdf>
	+ How are specific plant / animal populations affected by various types of human activity
		- <http://ed.ted.com/lessons/can-wildlife-adapt-to-climate-change-erin-eastwood>
	+ Interactives - <http://has.concord.org/index.html#interactives>
	+ A hands-on, inquiry based activity that helps older youth learn about water quality issues surrounding small watersheds and the decision making processes that go into improving those water quality issues <http://extension.psu.edu/4-h/leaders/resources/publications/rain-to-drain-slow-the-flow>
	+ Article on how students can be involved in mitigation <https://www.epa.gov/sites/production/files/2016-01/documents/join_article.pdf>
	+ Massachusetts Wildlife Climate Action Tool to access information on climate change impacts and vulnerability of species and habitats, as well as to explore adaptation strategies and actions based on your location and interests to help maintain healthy, resilient natural resources and communities <https://climateactiontool.org/content/user-guide>
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| Instructional Notes:**Sociocultural implications*** The tier 2 vocabulary words in this unit can be misleading and cause confusion with many students. Pre-teaching or calling attention to these words and how they may be used in everyday language vs. science class may be helpful

**Connections to Prior Knowledge*** Ecosystems unit must come before this unit
* Changes of life forms throughout the history of Earth
* Evolutionary relationships using anatomical structures among and between fossil organisms and modern organisms (grade 6)

**Connections to Future Knowledge**(Source: MA STE 2016 Frameworks, [Appendix III Disciplinary Core Idea Progression Matrix](http://www.doe.mass.edu/frameworks/scitech/2016-04/AppendixIII.pdf))* In multicellular organisms, the processes of mitosis and differentiation drive an organism’s growth and development.
* If a biological or physical disturbance to an ecosystem occurs, including one induced by human activity, the ecosystem may return to its more or less original state or become a very different ecosystem, depending on the complex interactions within the ecosystem. The ability of an ecosystem to both resist and recover from change is a measure of its overall health.
* Evolution by natural selection occurs when there is competition for resources and variation in traits that lead to differential ability of individuals to survive, reproduce, and pass on genes

**Common Misconceptions*** Animal reproduction is exclusively sexual
* Plant reproduction is exclusively asexual
* Humans are separate from the ecosystem and do not influence it

**Instructional Strategies*** Actively monitor for understanding of organisms and adaptations
* Utilize frequent check-ins/checkpoints with students to encourage good documentation in the notebook/notes. Students should be using specific content vocabulary and technical writing
* Support students in checking and refining their writing of their process. Actively encourage revision of their writing so that they develop a clear technical description of their process.
* Consider peer review. Other students should be able to read their process and be able to follow it. Not every student will have the same process as it depends on how they go about their design and testing.
* Allow students may make minor adjustments and/or retest their designs
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| Resources:**Texts:*** Pearson Textbook

**Websites:*** CDSM Curriculum Documents : [CDSM G7 U7](https://docs.google.com/document/d/1cl7PiCIWm8fP0YDyEiRCNprVgx_EgcJ-rkdUIUXu-B8/edit?usp=sharing) Organisms and Adaptations

**Anchoring Phenomenon:*** [Attack of the Killer Fungi](https://thewonderofscience.com/phenomenon/2018/5/14/attack-of-the-killer-fungo)
* [Why Do Sunflowers Follow the Sun?](https://thewonderofscience.com/phenomenon/2018/6/15/why-do-sunflowers-follow-the-sun)
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