

LS-HHMI Outreach Curriculum Project Information

Title	Game Cards, Teacher’s Guide, Teenage Mutant Ninja Turtles Lab, Turtle Cards, Turtle Dice, Turtle Islands		
Resource Type	Lesson Plan <input type="checkbox"/> Classroom Activity <input type="checkbox"/> Laboratory Activity <input type="checkbox"/> Homework Assignment <input type="checkbox"/> Bioinformatics <input type="checkbox"/> Other <input type="checkbox"/> <Specify>		
Description	This activity investigates the relationship between the level of genetic diversity in a population and its likelihood of survival. It also reviews factors that may affect biodiversity. The game reinforces the relationship between genotype and phenotype, principles of meiosis and natural selection, and can be modified to show advanced biology concepts such as Hardy-Weinberg equilibrium.		
Author(s)	Amanda Tsoi		
Author Institution(s)	Somerville High School		
Objective	<p>Students will be able to:</p> <ul style="list-style-type: none"> • Write phenotypes when given genotypes, pattern of inheritance, and dominant allele. • Describe a genetically diverse or genetically similar population • Predict the likelihood of producing two identical offspring • Analyze why certain populations of turtles are going extinct (or did go extinct in their simulation) • Predict what would happen to turtles undergoing a bottleneck effect • Explain why a genetically diverse population is more stable • Relate an organism’s DNA to its chances of survival • Describe why “good” traits are dependent on the environment in which that organism lives • List ways that humans impact biodiversity negatively • List ways that humans could impact biodiversity positively 		
Key Concepts	<ul style="list-style-type: none"> • Natural selection changes the genetic make-up of a population (gene pool) • Certain traits aren’t “better” than others, just better suited to that particular environment • Particular genetic traits are passed from parent to offspring by chance, but certain traits may help or harm an organism’s chance of living and reproducing, depending on their environment. • Having a more genetically diverse population better ensures its survival • Humans effect biodiversity in many negative ways, but have potential to effect biodiversity in positive ways. 		
Student Prep	Students should know the basics of genetics: alleles, phenotype, genotype, and how DNA is passed from parent to offspring.		
Materials	Colored popsicle sticks, copies of worksheets attached, scissors and tape for one part of lab preparation.		
Grade and Level(s)	10 th grade general biology; can be modified for more advanced courses, such as AP Biology.		
Teacher Prep Time	30 minutes to prepare a class set of materials for the first time, 5 minutes to set up for any following classes	Class Time	60 minutes

<p>National Standards</p>	<p>EVOLUTION AND EQUILIBRIUM Evolution is a series of changes, some gradual and some sporadic, that accounts for the present form and function of objects, organisms, and natural and designed systems. The general idea of evolution is that the present arises from materials and forms of the past.</p> <p>THE MOLECULAR BASIS OF HEREDITY Changes in DNA (mutations) occur spontaneously at low rates. Some of these changes make no difference to the organism, whereas others can change cells and organisms. Only mutations in germ cells can create the variation that changes an organism's offspring.</p> <p>BIOLOGICAL EVOLUTION Species evolve over time. Evolution is the consequence of the interactions of (1) the potential for a species to increase its numbers, (2) the genetic variability of offspring due to mutation and recombination of genes, (3) a finite supply of the resources required for life, and (4) the ensuring selection by the environment of those offspring better able to survive and leave offspring.</p> <p>THE INTERDEPENDENCE OF ORGANISMS Human beings live within the world's ecosystems. Increasingly, humans modify ecosystems as a result of population growth, technology, and consumption. Human destruction of habitats through direct harvesting, pollution, atmospheric changes, and other factors is threatening current global stability, and if not addressed, ecosystems will be irreversibly affected.</p>
<p>State Standards</p>	<p>Genetics</p> <p>3.3 Explain how mutations in the DNA sequence of a gene may or may not result in phenotypic change in an organism. Explain how mutations in gametes may result in phenotypic changes in offspring.</p> <p>3.4 Distinguish among observed inheritance patterns caused by several types of genetic traits (dominant, recessive, codominant, sex-linked, polygenic, incomplete dominance, multiple alleles).</p> <p>3.5 Describe how Mendel's laws of segregation and independent assortment can be observed through patterns of inheritance (e.g., dihybrid crosses).</p> <p>Evolution and Biodiversity</p> <p>5.3 Explain how evolution through natural selection can result in changes in biodiversity through the increase or decrease of genetic diversity within a population.</p> <p>Ecology</p> <p>6.2 Analyze changes in population size and biodiversity (speciation and extinction) that result from the following: natural causes, changes in climate, human activity, and the introduction of invasive, non-native species.</p>
<p>Sources</p>	<ul style="list-style-type: none"> • Animation of the impact of global warming on gender ratios of turtles: http://www.panda.org/what_we_do/angered_species/marine_turtles/lac_marine_turtle_programme/projects/climate_turtles/ • Animation of the impact of uncontrolled pet dogs on turtle populations: http://www.tourdeturtles.org/flash/PredationNestsAndHatchlings.swf • Animation of baby sea turtles hatching and going out to sea: http://kids.nationalgeographic.com/kids/animals/creaturefeature/loggerhead/ • Video with Jeff Corwin investigating the impact of global warming on sea turtles: http://www.defenders.org/includes/factsheets/video_player.php?type=seaturtles • Great footage of sea turtles in action: http://www.oceanfootage.com/stockfootage/Sea_Turtle • Video with Jeff Corwin investigating the impact of the gulf oil spill on sea turtles:

	http://animal.discovery.com/videos/gulf-oil-spill/
References	
Assessment	Grade Lab Report and incorporate concepts from the lab into future quizzes or exams.