

# HUMAN SCIENCE Lesson Plan

## Day 1: Natural Selection



### Outcomes for Today

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8. Evolution is the result of genetic changes that occur in constantly changing environments. As a basis for understanding this concept
  - A. Students know how natural selection determines the differential survival of groups of organisms.

### PREPARE

#### 1. Background Background knowledge to engage the content

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**What are two possible outcomes for species that must adapt to changes in the environment?**

Those species that cannot adapt may die before being able to pass on their genetic traits to the next generation. Those species that are better suited to survive these changes adapt and realign their genetic traits through the process of natural selection.

#### 2. Wordwall vocabulary words to teach and add to the Word Wall.

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<b>Corals:</b>	A large group of marine animals related to jellyfish
<b>Habitat:</b>	A place in which an organism or animal lives
<b>Aggressive:</b>	Active, energetic, pushy, and ready to attack
<b>Larva:</b>	An active, immature stage of an animal
<b>Density:</b>	Having parts very close together; compactness; thickness
<b>Eugenics:</b>	A science that deals with the improvement (by control of human mating) of hereditary qualities of a race or breed
<b>Evolution:</b>	A theory that the various types of animals and plants have their origin in other preexisting types and that the distinguishable differences are due to modifications in successive generations

**Natural selection:** A natural process that results in the survival and reproductive success of individuals or groups best adjusted to their environment and that leads to the perpetuation of genetic qualities best suited to that particular environment

**Mutate:** To change

## READ

### 3. Read/View

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Article:

Go to: [www.calepa.ca.gov/Education/EEI//Curriculum/Biology/Default.htm](http://www.calepa.ca.gov/Education/EEI//Curriculum/Biology/Default.htm)

Search: Differential Survival of Organisms, Supporting Materials.

Locate: Case Study: Great Barrier Reef, Australia

Read: As a class

Video:

Go to: [www.discoveryeducation.com](http://www.discoveryeducation.com)

Search: Natural Selection

Locate: Great Books: The Origin of Species (approximate run time 51:00)

## RESPOND

### 4. Visual Process.

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#### Process Grid

Directions: Use the information provided in the **Great Barrier Reef Case Study, Australia** to complete the following process grid. Address two natural factors and one human activity as you complete this chart.

<b>Cause: Natural Factors or Human Activity</b>	<b>Changes in the Environment</b>	<b>Effects on Species</b>

## EXPLORE

### 5. Activity

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Explore more deeply with a visual or oral language activity.

#### Class Discussion:

Using the video and article ask the students the following questions for a class discussion on natural selection.

- What is the difference between artificial and natural selection?
- How have humans encouraged the evolution of resistance?
- What was wrong with early theories about differences between species?

**6. Discussion** Ask discussion questions that engage at many levels

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**Key Questions**

- What natural factors have affected the survival of the population of coral in the Great Barrier Reef?
- How have these natural factors affected the coral?
- What human factors have affected the survival of the population of coral in the Great Barrier Reef?
- How have these human factors affected the coral?
- What would be the long-term environmental effects if a large population of crown-of-thorns sea stars continued to eat the coral?
- What adaptations might allow coral to survive and avoid local extinction?

**EXTEND**

**7. Write, Draw or Speak.**

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Directions: Draw or sketch at least 5 items/images/concepts from the reading. Label these. Then write a short paragraph explaining the relationship between these 5 elements and why they are important to the lesson.

**8. Close** Close by extending today's lesson to what you can do in your life and the world.

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<i>Change I can make</i>	
Habit I can build	

# HUMAN SCIENCE Lesson Plan

## Day 1: Diversity among species



### Outcomes for Today

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8. Evolution is the result of genetic changes that occur in constantly changing environments. As a basis for understanding this concept:
- 8B. Students know that a great diversity of species increases the chance that at least some organisms survive major changes in the environment.

### PREPARE

#### 1. Background Background knowledge to engage the content

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##### Why is maintaining biological diversity a key focus of conservationists?

The more diverse an ecosystem, the more species it can support. When environments change due to natural or human causes, ecosystems with higher biological diversity are more likely to survive these changes.

#### 2. Wordwall vocabulary words to teach and add to the Word Wall.

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**Aquatic:** growing, living in, or taking place in or on water.

**Urbanized:** an area of land that becomes a town or city.

**Detritus:** disintegrated material; debris; remains

**Anaerobic:** living, growing, or taking place where there is no free oxygen

**Dredging:** to clean out, to deepen.

### READ

#### 3. View

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##### Article:

Go to: [www.calepa.ca.gov/Education/EEI/Curriculum/Biology/Default.htm](http://www.calepa.ca.gov/Education/EEI/Curriculum/Biology/Default.htm)

Search: Biological Diversity: The World's Riches, Supporting Materials

Locate: Coastal Wetlands, Treasures of Diversity

Read: As a class

##### Video:

Go to: [www.discoveryeducation.com](http://www.discoveryeducation.com)

Search: Diversity, species and evolution

Locate: Understanding Biodiversity (approximate run time 17:00)

## RESPOND

### 4. Visual Process:

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#### Three Column Chart Activity Chart:

Directions: Create a three column chart. In the first column, list as many geographic features (water and land) that you can find in the Coastal Wetlands article. In the second column, list as many different types of biological life (animals, insects, organisms, fish, fowl, etc.) that you can find. In the third column, list as many different types of plant life. See the example below.

Geographic Features	Biological Life	Plant Life

## EXPLORE

**5. Activity** Explore more deeply with a visual or oral language activity.

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Have a class discussion on the importance of biodiversity and species.

**6. Discussion** Ask discussion questions that engage at many levels

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#### **Key Questions**

- What is a coastal wetland?
- What past human activities have harmed much of California's wetlands?
- What ecosystem goods and services from the wetlands do people rely on?
- Why are California's coastal wetlands high in biodiversity?
- Why do California's coastal wetlands have high primary productivity?
- How does primary productivity support species diversity?

## EXTEND

### 7. Write, Draw or Speak.

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#### Writing Prompt

Directions: Go back to your three column chart and choose one item from two of the columns, making sure they are interrelated. Now write a short paragraph that explains their relationship and how they affect each other in an ecosystem.

**8. Close** Close by extending today's lesson to what you can do in your life and the world.

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<i>Change I can make</i>	
Habit I can build	

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# HUMAN SCIENCE Lesson Plan

## Day



### Outcomes for Today

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8. Evolution is the result of genetic changes that occur in constantly changing environments. As a basis for understanding this concept:

8C. Students know the effects of genetic drift on the diversity of organisms in a population.

### PREPARE

#### 1. Background Background knowledge to engage the content

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##### What is genetic drift?

Genetic drift is a mechanism of evolution that occurs by random chance rather than natural selection. Genetic drift is the term used in population genetics to refer to the statistical drift over time of gene frequencies in a population due to random sampling effects in the formation of successive generations.

In a narrower sense, genetic drift refers to the expected population dynamics of neutral alleles (those defined as having no positive or negative impact on reproductive fitness), which are predicted to eventually become fixed at zero or 100% frequency in the absence of other mechanisms affecting allele distributions.

[www.sciencedaily.com](http://www.sciencedaily.com)

#### 2. Wordwall vocabulary words to teach and add to the Word Wall.

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**Genetic drift:** A population experiences a change in the frequency of a given allele, prompted by random luck rather than a need for adaptation.

**Natural selection:** In which allelic frequency is altered based on the fittest genes surviving to reproduce and the weaker genes dying off.

**Allele:** Is a component of a gene that produces a certain trait

**Bottleneck effect:** Occurs when a population suddenly undergoes a dip in size

**Founder effect:** Occurs when a small portion of a population becomes isolated from the rest of the group and evolves separately.

**Gene Flow:** Is the movement of alleles from one population to another.

**Mutations:** Mechanism of producing genetic variation within populations.

**Migration:** Is a pattern of seasonal movement of an animal, such as when



birds migrate south for the winter.

## READ

### 3. View

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Article:

Go to: <http://www.wisegeek.com/what-is-genetic-drift.htm>

Locate: What is genetic drift?

Read: As a class

Article:

Go to: <http://www.talkorigins.org/faqs/genetic-drift.html>

Locate: Random Genetic Drift

Read: As a class

Simulation:

Go to: <http://www.biology.arizona.edu/evolution/act/drift/drift.html>

Search: Genetic Drift

Locate: Genetic Drift (The Biology Project)

Video:

Go to: [www.youtube.com](http://www.youtube.com)

Search: Genetic drift

Locate: <http://www.youtube.com/watch?v=crPqTiCPY7c> (approximate run time 07:11)

## RESPOND

### 4. Visual Process.

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Venn diagram

Compare and Contrast the difference between natural selection and genetic drift based upon the article just read.

## EXPLORE

### 5. Activity

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Explore more deeply with a visual or oral language activity.

- 1-Lab  
<http://scripts.mit.edu/~aidanc/popgen/drift.php>

### 6. Discussion

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Ask discussion questions that engage at many levels

#### Key Questions

- Explain genetic drift in your own words.
- What are the basic mechanisms of evolution?
- What are the effects of genetic drift?

- Give one example of bottleneck and founder effect.

## EXTEND

### 7. Write, Draw or Speak.

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Science Journal:

In your science journal explain the role of genetic drift and gene flow as it relates to the humans and animals.

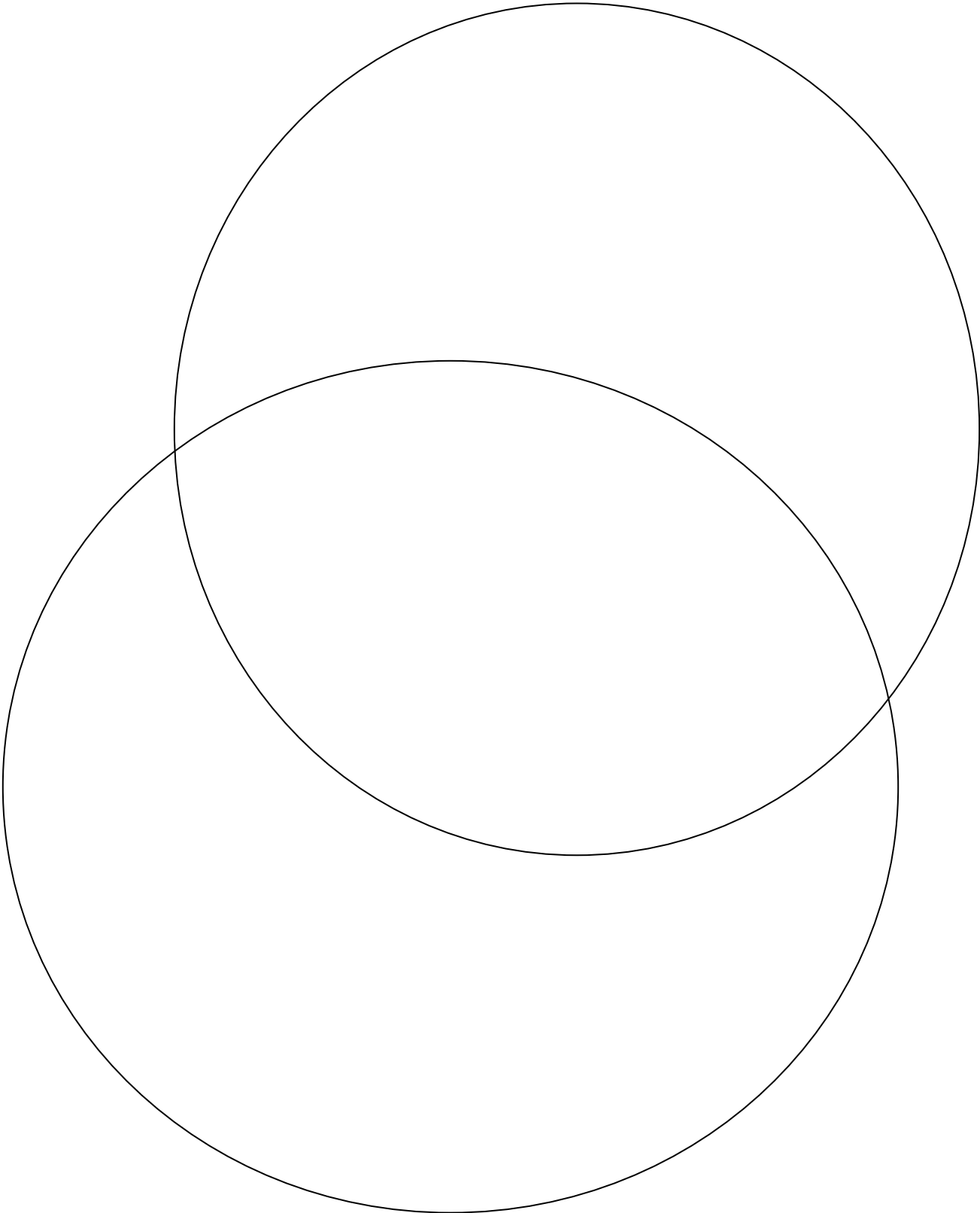
### 8. Close

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Close by extending today's lesson to what you can do in your life and the world.

<i>Change I can make</i>	
Habit I can build	

# 6g6 Venn diagram Chart



# HUMAN SCIENCE Lesson Plan

## Day 1: geographic isolation affects on speciation



### Outcomes for Today

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8. Evolution is the result of genetic changes that occur in constantly changing environments. As a basis for understanding this concept:
- D. Students know reproductive or geographic isolation affects speciation.

### PREPARE

#### 1. Background Background knowledge to engage the content

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##### How does speciation occur?

The fossil record tells us that new species have evolved from pre-existing ones. The process of speciation has been difficult to observe, however, and there is still a great deal of controversy about the mechanisms of speciation. No one doubts that it occurs frequently, at least on a geological time-scale. No one has seen a new species form in ecological time, although some cases come very close (see below). You would expect, then, that the geological record, which is so much longer and more incomplete, would hardly ever sample speciation events. We need to include that fact in any theory of speciation. In fact, then, both biologists and paleontologists must infer what happens, and it is very difficult to sort out where fact ends and where interpretation begins. Possibly the term "speciation" may cover a broad spectrum of events: we already know that some species differ by as few as three genes from others, a difference that would be less than brother-sister differences in other organisms.

<http://mygeologypage.ucdavis.edu/cowen/historyoflife/speciationmode.html>

#### 2. Wordwall vocabulary words to teach and add to the Word Wall.

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**Speciation:** The process in which new genetically distinct species evolve usually as a result of genetic isolation from the main population.

**Species:** A species is an actually or potentially interbreeding population that does not interbreed with other such populations when there is opportunity to do so.

**Sympatric speciation:** A speciation in which new species evolve from a single ancestral species while inhabiting the same geographic region.

- Allopatric speciation:** A speciation in which biological populations are physically isolated by an extrinsic barrier and evolve intrinsic (genetic) reproductive isolation, such that if the barrier breaks down, individuals of the population can no longer interbreed.
- Polypoidy:** an organism or cell having more than twice the haploid number of chromosomes. Of a cell or organism having more than twice the haploid number of chromosomes; *a polyploid cell; a polyploid species*. Organisms that possess two sets of each chromosome. For instance, a human has twenty three pairs of chromosomes, the pair meaning that humans are diploid. This doubles our chromosome compliment to forty six
- Allopatric speciation:** A speciation in which biological populations are physically isolated by an extrinsic barrier and evolve intrinsic (genetic) reproductive isolation, such that if the barrier breaks down, individuals of the population can no longer interbreed.
- Genetic drift:** A population experiences a change in the frequency of a given allele, prompted by random luck rather than a need for adaptation.
- Natural selection:** In which allelic frequency is altered based on the fittest genes surviving to reproduce and the weaker genes dying off.

## READ

### 3. View

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Article:

Go to: [www.utm.edu/departments/cens/biology/rirwin/391/391Speciation.htm](http://www.utm.edu/departments/cens/biology/rirwin/391/391Speciation.htm)

Search: Models of Speciation

Locate: Models of Speciation

Read: As a class

Article:

Go to: [www.users.rcn.com/~kimball.ma.ultranet/BiologyPages/S/Speciation.html](http://www.users.rcn.com/~kimball.ma.ultranet/BiologyPages/S/Speciation.html)

Locate: Speciation

Read: As a class

Video:

Go to: [www.discoveryeducation.com](http://www.discoveryeducation.com)

Search: Geographic isolation and speciation

Locate: Biologix: Gene Frequencies, Natural Selection, and Speciation  
(approximate run time 29:00)

## RESPOND

### 4. Visual Process.

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#### Venn Diagram

- Contrast gradualism and punctuated equilibrium.

## EXPLORE

### 5. Activity

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Explore more deeply with a visual or oral language activity.

#### Matching:

*Match each of the examples above to the type of prezygotic or postzygotic barrier below.*

- A. offspring die young when two species of salamanders mate – they do not make it to maturity
- B. two different species of birds have different mating calls so they cannot recognize each other as mates
- C. one type of spotted skunk breeds in the spring while another breeds in the fall
- D. an elephant penis cannot fit into a frog vagina
- E. garter snakes that live in water and one on land cannot mate although they live in the same geographic area
- F. mules are produced by mating a horse and a donkey, but mules are sterile and cannot breed
- G. if gametes of red and purple sea urchins do not fuse, there will be no zygote produced
- H. although some strains of cultivated rice can be cross-mated, after a few generations, sterile offspring are created

- \_\_\_\_\_ 1. mechanical isolation
- \_\_\_\_\_ 2. reduced hybrid fertility
- \_\_\_\_\_ 3. habitat isolation
- \_\_\_\_\_ 4. temporal isolation
- \_\_\_\_\_ 5. reduced hybrid viability
- \_\_\_\_\_ 6. gametic isolation
- \_\_\_\_\_ 7. behavioral isolation
- \_\_\_\_\_ 8. hybrid breakdown

**6. Discussion** Ask discussion questions that engage at many levels

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**Key Questions**

- How do new species form?
- What is speciation?
- What are the 5 factors that contribute to the gene pool?
- What is the difference between gradualism and Punctuated Equilibrium theory?
- Thinking in terms of natural selection, which isolating mechanism, prezygotic or postzygotic, which you expect to be most common in nature and why?

**EXTEND**

**7. Write, Draw or Speak.**

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Word Search

Directions: using the words from today's word wall complete the word search.

**8. Close** Close by extending today's lesson to what you can do in your life and the world.

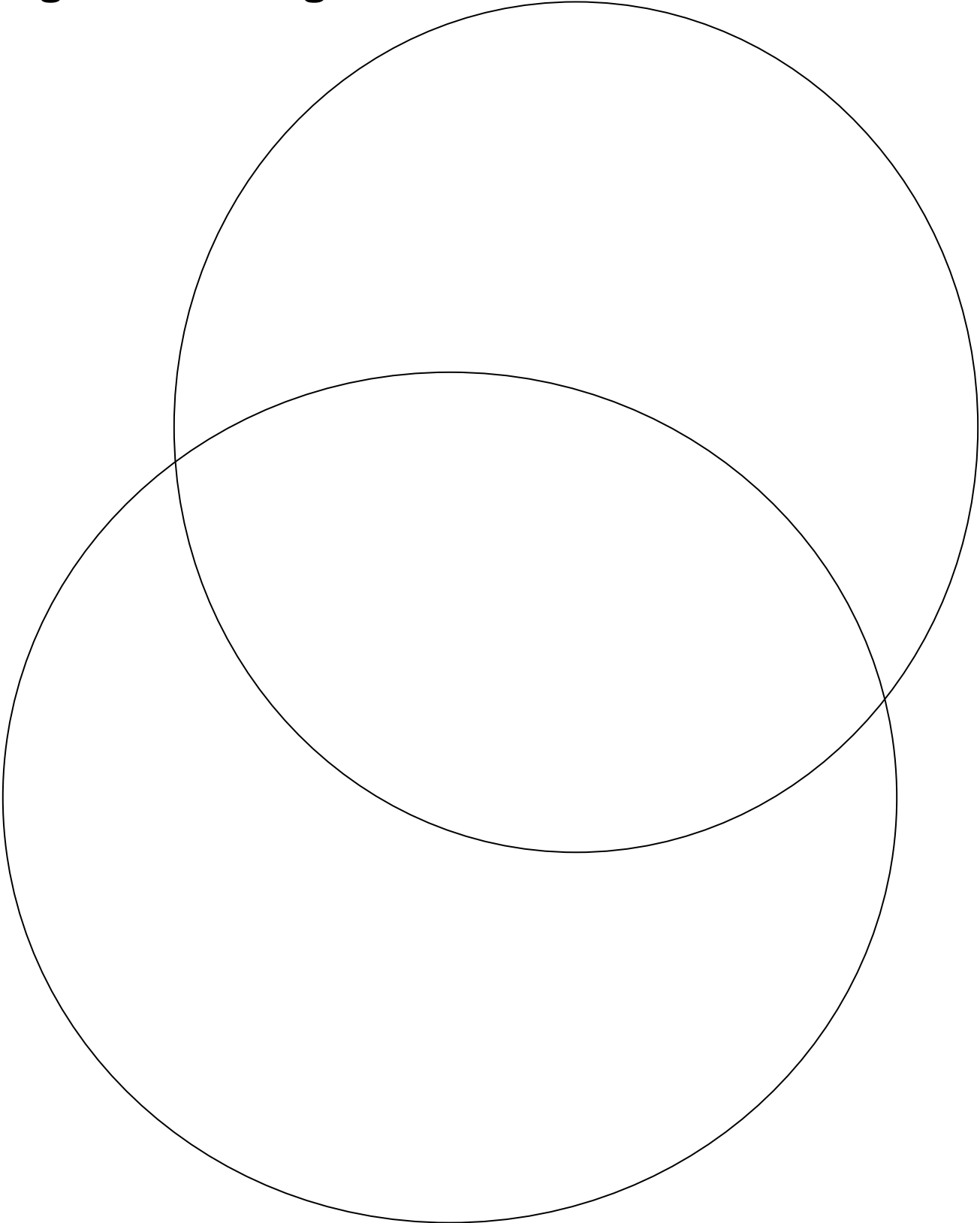
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Students should complete the chart below based on their learning from the day. They should fill in the chart with one change and one habit per day.

- *Change I can make = decreasing bad habits and bad choices;*
- *Habit I can build = Increasing healthy habits and choices*

<i>Change I can make</i>	
Habit I can build	

# 6g6 Venn Diagram Chart





# Speciation Word Search

N J C W L A P H V F H V K V L R L O B J O R L D W G N X B L  
T O X Y G J N C G L E S Y S P C A E M V Y J D O A O M A K K  
J F I G R A D U A L I S M L T D T M R G T R Y L P A J Y H Z  
V W T T X G T Z C T P N P F N N C Y Y B L G P V C R F I T J  
J I N A C V E Q Z F O I S O Z M X G X K F B I V I D C T H J  
L W J Y M E S K K L Z M I Q P K V B G P V M B I O R J X L O  
G W A P F C L E E T T T K R R B T J X R H W N X O N C R Y N  
C F D R P Q D E B O A X L H T Y I M P J Q K R U L R X F L M  
R V C E M S P Q S I S M I L L F L J A R Y L G T M V M E D G  
J M R M F E W J C L Q F D P B S L I Z X N T Q A H B G Q D O  
V U E D E Y P E P T A I E Z S A O S B S F F W G L D Y W E I  
G K O V L D P O E E D R R N M L L M F G W I G B P C S G N K  
Z E V F M S Y T Z U O N U E E V C L U Q C R P Q H R L M T F  
C Z B H A X N O R X A U Y T F Q L Y O W H D F Q T U G F O E  
Z I G D A U M V K O O U Z S A Q J L F P T C Y I Y S S X P T  
F W Q I T O S V K K Z S M Y A N X A W H A I B T H O X T Y Y  
D X Z S E I C E P S H T J M X X D C N U I T V P H Z Y P N V  
Z S M F F D G F I L L M Q P R T X I Y F Z E R C A C B X T P  
Z F S I D C K L J Y L T M A J Y G A A P S N V I G I T M J U  
M U I R B I L I U Q E D E T A U T C N U P E W O C T W E I T  
I U O Z Z A T C U K M M L R I A G H P G U G B J X E I N S A  
Z Z I R A K Y I L E T V R I R Z H Z P U P L I T A P F A N P  
F M G J E X E E G M B U V C U O G Q X O T O O X O T E Q X J  
V P P V Y C Y L L W F J Q N R A E U L N O G N P V G F R J L  
R R S X A M Z A V Q W U S T L Q W Y N Q M C W X Z Y H V B K  
K L O F C H M D K H B B A I H L P Z N V Y L J V O X L K P P  
F A J A C E R Z U Q X Q W N F O Y N Y X G U R E F U G C Y I  
B W I P D A U N S M B W I G I M V Z R E A V Z V K V Y P Q S  
R E R L D G R M H Z W U B D E D P A F K Y W M O X Q Z N S Q  
K N I D Z S C V D B C B Y X H W T C H N E D S X E Q T H U A

ALLOPATRIC  
GENETICDRIFT  
GRADUALISM  
NATURALSELECTION  
POLYPOIDY  
PUNCTUATEDEQUILIBRIUM  
SPECIATION  
SPECIES  
SYMPATRIC

# HUMAN SCIENCE Lesson Plan

## Day 1: Evolution



### Outcomes for Today

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- 8. Evolution is the result of genetic changes that occur in constantly changing environments. As a basis for understanding this concept:
- 8E. Students know how to analyze fossil evidence with regard to biological diversity, episodic speciation and mass extinction.
- 8G. Students know how several independent molecular clocks, calibrated against each other and combined with evidence from fossil record can help to estimate how long ago various groups of organisms diverged evolutionarily from one other.

### PREPARE

#### 1. Background Background knowledge to engage the content

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##### What do you know about Evolution?

Using a KWL chart ask the students what they know about evolution and what they want to learn about evolution. Write down the facts about evolution on the board. After the video has concluded have students add more facts to the board.

#### 2. Wordwall vocabulary words to teach and add to the Word Wall.

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- Adaptation:** To change or adapt to the environment
- Big Bang Theory:** The theory that 15 billion years ago all material in the universe was condensed into a small place and then exploded
- Extinction:** The elimination of a species
- Fossils:** Hardened remains of plant or animal
- Hominids:** The first human like characters that appeared about 5 million years ago
- Homo sapiens:** The human species
- Mammals:** Any vertebrate of the class Mammalia, having the body more or less covered with hair, nourishing the young with milk from the mammary glands, and, with the exception of the egg-laying monotremes, giving birth to live young.

**Natural selection:** Theory proposed by Charles Darwin that species changes as the result of adaptation to their environment

**Primates:** Group of animals including humans, apes, and monkeys

**Proteins:** One of the most fundamental building substance of living organism.

## READ

### 3. View

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Video:

Go to: [www.discoveryeducation.com](http://www.discoveryeducation.com)

Search: Evolution and extinction

Locate: Elements of Biology: Biological Evolution (approximate run time 56:00)

## RESPOND

### 4. Visual Process.

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Note taking:

- Write important details from the video in the second column;
- After you write your notes, return to the first column and add phrases, words and questions related to the details. A sketch or picture may also be helpful.

Title:

Date:

Column 1: Phrases, words, questions or a sketch related to the details in column	Column 2: Important Details

**5. Close** Close by extending today's lesson to what you can do in your life and the world.

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Students should complete the chart below based on their learning from the day. They should fill in the chart with one change and one habit per day.

- *Change I can make = decreasing bad habits and bad choices;*
- *Habit I can build = Increasing healthy habits and choices*

<i>Change I can make</i>	
Habit I can build	

Name:

## KWL Chart

<b>What We Know</b>	<b>What We Want To Find Out</b>	<b>What We Learned</b>