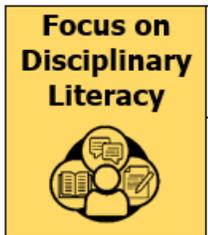


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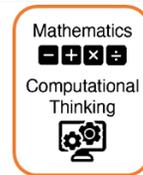
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UNIT NARRATIVE

This unit is designed to guide students through foundational concepts in biology, including the inheritance of traits of organisms. In lesson 1, students will explore the concept of inherited traits and how they relate to cells and genes. In lesson 2 students will model and predict the inheritance of traits using Punnett squares. Students will learn the principles of natural selection and how it affects populations in lessons 3 and 4. In lessons 4-5, students will evaluate the impact of variation and adaptations in organisms on species survival. Lesson 7 will provide the students the opportunity to explore the concept of artificial selection and its implications. Finally, in lesson 8, students will compare and contrast asexual and sexual reproduction.



In science, disciplinary literacy is synonymous with the science and engineering practices. The SEPs are the context through which all science concepts should be taught. In the lessons, you will find the Science and Engineering practices icons when the SEPs are being explicitly used by students.



CONTENT STANDARDS

Below are the standards **taught** and **assessed** in this unit.

Readiness Standards

8.13C Describe how variations of traits within a population lead to structural, behavioral, and physiological adaptations that influence the likelihood of survival and reproductive success of a species over generations.

Supporting Standards

8.13B Describe the function of genes within chromosomes in determining inherited traits of offspring.

7.13C compare the results of asexual and sexual reproduction of plants and animals in relation to the diversity of offspring and the changes in the population over time

7.13D describe and give examples of how natural and artificial selection change the occurrence of traits in a population over generations.

UNDERSTANDINGS AND QUESTIONS

Important big ideas and processes for the unit.

Enduring Understandings

- Dominant and recessive traits can be identified by looking at patterns of inheritance, allowing us to predict how traits are passed from parents to offspring.
- Genes, which are segments of DNA, are responsible for determining inherited traits. DNA is organized into structures called chromosomes, which are found in the nucleus of cells.
- Punnett squares can be used to model the probability of different traits being passed down from parents while the pedigree can be used to show patterns in how traits are passed down between generations
- Genes provide the instructions for traits; chromosomes organize and pass the genes on to future generations. Within a population there is genetic variation or diversity in phenotypes. Natural selection determines which traits become more common over generations.
- A variation is a slight difference in an inherited trait among individual members of a species. When the difference helps the organism survive and reproduce, the population develops an adaptation that makes them better suited for their environment. These adaptations develop over generations because of natural selection. There are three types of adaptations: structural, behavioral, and physiological.

Essential Questions

- What are inherited traits?
- How do traits get passed from one generation to the next?
- Where are the instructions for inherited traits located?
- How are inherited traits passed to offspring?
- How can a Punnett square and a pedigree be used to model the role of genes in passing down traits from parent to offspring?
- What role do genes and chromosomes play in the variation of traits within a population?

- How does natural selection cause populations to change over time?
- What role does natural selection play in the development of adaptations?
- What are the types of adaptations?

Common Misconceptions

- Thinking that that one gene is stronger, that one parent contributes more genes than the other, or that there are more genes for one variation of a trait than the other.
- Thinking that each gene is responsible for only one specific trait
- Thinking that acquired traits can be directly inherited
- Thinking that genes for certain traits are always the same in everyone
- Thinking that a dominant allele is always more common or advantageous
- Thinking that adaptations occur with a specific end goal in mind or that organisms develop traits intentionally to enhance their survival
- Thinking that organisms can pass on traits acquired during their lifetime to their offspring
- Thinking that traits develop because they are needed in an organism's environment
- Thinking that all adaptations are beneficial
- Assuming that all variations within a population are adaptations
- Thinking that asexual reproduction generates offspring with high genetic diversity
- Thinking that sexual reproduction always leads to high genetic diversity
- Equating changes in population size with offspring diversity
- Thinking that sexual reproduction is always superior and downplaying the advantages of asexual reproduction
- Generalizing asexual reproduction as a form of cloning
- Thinking that natural selection always leads to more complex organisms
- Thinking that artificial selection is a natural process that occurs in the wild
- Thinking that natural selection is purposeful and that organisms evolve with a specific goal in mind
- Thinking traits are acquired during an organism's lifetime and passed on to offspring
- Generalizing that all traits are influenced solely by genetics
- Assuming natural selection always leads to the extinction of weaker traits

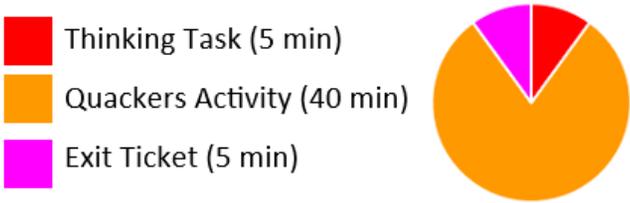
ROADMAP

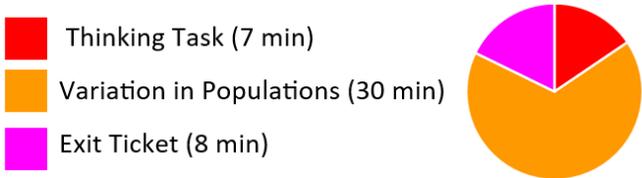
ROADMAP AT A Glance: Unit #09 Traits of Organisms				
Day	Date	TEKS	Lesson	Lesson Title
There are two flex days built into this unit to use as needed. Flex days can be used for lessons that take longer than one day or for reteaching material the students may not have gotten during tier 1 instruction.				
1		8.13B	1	Inherited Traits
2		8.13B	2	Determining Inheritance
3		8.13B	3	Modeling Inheritance
4		7.13D	4	Natural Selection
5		8.13C	5	Variation and Adaptations Part 1
6		8.13C	6	Variation and Adaptations Part 2
7		7.13D	7	Artificial Selection
8		7.13C	8	Asexual and Sexual Reproduction
	Optional		Unit Quiz	TX_SCI_8thScience_S26_UE9

Lesson #01: Inherited Traits		Date:	
Objective	Instructional Notes	Lesson Look Fors	
SWBAT distinguish between dominant and recessive inherited traits by observing patterns and analyzing and interpreting data.	<ul style="list-style-type: none"> Students will observe the frequency of and collect and record data on inheritable traits physical traits in themselves and compare them to classmates. Students will collect and record data. Students will engage in a reading to learn to examine Gregor Mendel's experiments on inheritance of traits in pea plants, including his discoveries about dominant and recessive traits. Students will complete graphic organizers to represent Mendel's basic P1 and F1 crosses. Students will distinguish between dominant and recessive inherited traits by observing patterns and analyzing and interpreting data 	Look for teachers to: <ul style="list-style-type: none"> Engage students in ABC. (Activity before content) The teacher should stamp key points AFTER students have had the time to engage in the content (productive struggle) and discuss. Promote the use of partners and whole class discussion. Engage students in a reading to learn. Look for students to: <ul style="list-style-type: none"> Engage in discourse and productive struggle Justify their reasoning and support their ideas with evidence. Observe patterns of inheritance to determine dominant and recessive traits. 	
Standards		Students Do and Know	
TEKS 8.13B Describe the function of genes within chromosomes in determining inherited traits of offspring.		<ul style="list-style-type: none"> Thinking Task (10 min) Examining & Tracking your Traits (10 min) Reading to Learn (25 min) Mendel's Results (10 min) Exit Ticket (10 min) 	<ul style="list-style-type: none"> Students will distinguish between dominant and recessive inherited traits by observing patterns and analyzing and interpreting data. Dominant and recessive traits can be identified by looking at patterns of inheritance, allowing us to predict how traits are passed from parents to offspring.
Vocabulary			
Dominant Trait Genetics Heredity Inheritance Recessive Trait Trait			
Science Practices			
2. Developing and using models 4. Analyzing and interpreting data 8. Obtaining, evaluating, and communicating information			
Recurring Themes and Concepts			
A. Patterns			

Lesson #02: Determining Inheritance		Date:
Objective	<ul style="list-style-type: none"> Students will engage in a modeling activity to create a representational model of genes → DNA → chromosomes → nucleus → cell Students will participate in a Reading to Learn activity to deepen their understanding of the concepts. Students will engage in a computer simulation to determine patterns of inheritance. Students will explain that genes are sections of DNA, found on chromosomes and contain instructions for inherited traits. 	Lesson Look Fors
SWBAT identify that genes are segments of DNA and are responsible for determining the inherited traits of offspring		Look for teachers to:
Standards		<input type="checkbox"/> Engage students in ABC. (Activity before content) The teacher should stamp key points AFTER students have had the time to engage in the content (productive struggle) and discuss. <input type="checkbox"/> Promote the use of partners and whole class discussion.
TEKS 8.13B Describe the function of genes within chromosomes in determining inherited traits of offspring.		Look for students to:
Vocabulary		<input type="checkbox"/> Engage in discourse and productive struggle <input type="checkbox"/> Justify their reasoning and support their ideas with evidence. <input type="checkbox"/> Engage in Reading to Learn and modeling activities
Allele Chromosome DNA Gene		Students Do and Know
Science Practices		 <ul style="list-style-type: none"> Students will engage in a modeling activity to create a representational model of genes → DNA → chromosomes → nucleus → cell
2. Developing and using models		 <ul style="list-style-type: none"> Students will engage in a computer simulation to determine patterns of inheritance. Genes, which are segments of DNA, are responsible for determining inherited traits. DNA is organized into structures called chromosomes, which are found in the nucleus of cells.
Recurring Themes and Concepts		
F. Structure and Function		

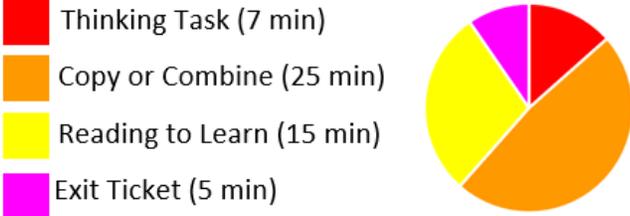
Lesson #03: Modeling Inheritance		Date:	
Objective	Instructional Notes	Lesson Look Fors	
<p>SWBAT predict the genotypes and phenotypes of offspring and observe the inheritance of traits in related organisms by modeling using Punnett squares and pedigree charts.</p>	<ul style="list-style-type: none"> Students will engage in an online simulation to see how Punnett squares can be used to model the passing of inherited traits from parents to offspring. Students will engage in a “Reading to Learn” activity to deepen their understanding of the concepts of Punnett squares and pedigree charts. Students will engage in hands-on minds-on-activity to practice using Punnett squares and pedigree charts to predict the genotypes and phenotypes of offspring. Students will complete Punnett square to predict the genotypes and phenotypes of offspring. <div style="display: flex; align-items: center; margin-top: 20px;"> <div style="margin-right: 20px;"> <p>■ Thinking Task (7 min)</p> <p>■ Gizmo Part C (15 min)</p> <p>■ Reading: Modeling Inheritance (15 min)</p> <p>■ Modeling Inheritance Practice (15 min)</p> <p>■ Exit Ticket (10 min)</p> </div>  </div>	<p>Look for teachers to:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Engage students in ABC. (Activity before content) The teacher should stamp key points AFTER students have had the time to engage in the content (productive struggle) and discuss. <input type="checkbox"/> Promote the use of partners and whole class discussion. <p>Look for students to:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Engage in discourse and productive struggle <input type="checkbox"/> Justify their reasoning and support their ideas with evidence. 	
Standards			
<p>TEKS 8.13B Describe the function of genes within chromosomes in determining inherited traits of offspring.</p>			
Vocabulary			
<p>Genotype Heterozygous Homozygous Hybrid Pedigree Phenotype Punnett Squares</p>			
Science Practices		Students Do and Know	
<p>2. Developing and using models 8. Obtaining, evaluating, and communicating information</p>		<p>Do</p>  <ul style="list-style-type: none"> Engage in an online simulation to see how Punnett squares can be used to model the passing of inherited traits from parents to offspring. Complete Punnett square to predict the genotypes and phenotypes of offspring. <p>Know</p>  <ul style="list-style-type: none"> Punnett squares can be used to model the probability of different traits being passed down from parents while the pedigree can be used to show patterns in how traits are passed down between generations. Both Punnett squares and pedigrees are tools that show the roles of genes, found on chromosomes, in passing down traits from parent to offspring. 	
Recurring Themes and Concepts			
A. Patterns			

Lesson #04: Natural Selection Part 2		Date:
Objective	Instructional Notes	Lesson Look Fors
SWBAT Investigate how a population evolves over time due to random mutations and environmental pressures.	<ul style="list-style-type: none"> Analyze collected data on a population of “quackers.” Create visual representations of data. 	Look for teachers to: <ul style="list-style-type: none"> Engage students in ABC. (Activity before content) The teacher should stamp key points AFTER students have had the time to engage in the content (productive struggle) and discuss. Promote the use of partners and whole class discussion.
Standards	 <ul style="list-style-type: none"> Thinking Task (5 min) Quackers Activity (40 min) Exit Ticket (5 min) 	Look for students to: <ul style="list-style-type: none"> Engage in discourse and productive struggle Justify their reasoning and support their ideas with evidence.
TEKS 7.13D describe and give examples of how natural and artificial selection change the occurrence of traits in a population over generations.		
Vocabulary		Students Do and Know
adaptation fitness natural selection population adaptation environmental resources fitness inherited variation natural selection reproductive success		 <ul style="list-style-type: none"> They are simulating the natural selection of a species with two phenotypes, and they are graphing the frequency of those phenotypes over several generations.
Science Practices		 <ul style="list-style-type: none"> An adaptation is a trait that an individual is born with that either gives it an advantage or disadvantage in an environment. Evolution is a change in gene frequencies in a population over time. Natural selection is a type of evolution where certain traits (adaptations) give some populations reproductive success. Fitness is the ability to produce children. A population is a group of individuals of the same species.
Recurring Themes and Concepts		
A. Patterns		

Lesson #05: Variation and Adaptations Part 1		Date:
Objective	Instructional Notes	Lesson Look Fors
SWBAT will engage in argument from evidence to explain the role of genes, chromosomes, and natural selection play in the variation of traits within a population by modeling	<ul style="list-style-type: none"> Students will conduct an investigation to model natural selection by simulating a population of bunnies that have variation in their fur. Students will collect data on the change in allele frequency over 10 generations. Students will engage in argument from evidence to explain the role of role of genes, chromosomes, and natural selection play in the variation of traits within a population. Students will use evidence from the investigation and model using a Punnett Square to support their claim. 	Look for teachers to: <ul style="list-style-type: none"> <input type="checkbox"/> Engage students in ABC. (Activity before content) The teacher should stamp key points AFTER students have had the time to engage in the content (productive struggle) and discuss. <input type="checkbox"/> Promote the use of partners and whole class discussion. Look for students to: <ul style="list-style-type: none"> <input type="checkbox"/> Engage in discourse and productive struggle <input type="checkbox"/> Justify their reasoning and support their ideas with evidence.
Standards		
TEKS 8.13C Describe how variations of traits within a population lead to structural, behavioral, and physiological adaptations that influence the likelihood of survival and reproductive success of a species over generations.		
Vocabulary		
No new vocabulary		
Science Practices		
<ol style="list-style-type: none"> Asking questions and defining problems Developing and using models Planning and carrying out investigations Analyzing and interpreting data Using mathematics and computational thinking Engaging in argument from evidence 	 <ul style="list-style-type: none"> Thinking Task (7 min) Variation in Populations (30 min) Exit Ticket (8 min) 	
Recurring Themes and Concepts		
<ol style="list-style-type: none"> Patterns Systems and System Models Stability and Change 		
		Students Do and Know <ul style="list-style-type: none">  <ul style="list-style-type: none"> Students will conduct an investigation to model natural selection by simulating a population of bunnies that have variation in their fur. Students will collect data on the change in allele frequency over 10 generations.  <ul style="list-style-type: none"> Genes provide the instructions for traits; chromosomes organize and pass the genes on to future generations. Within a population there is genetic variation or diversity in phenotypes. Natural selection determines which traits become more common over generations.

Lesson #06: Variation and Adaptations Part 2		Date:
Objective	Instructional Notes	Lesson Look Fors
<p>SWBAT describe how structural, behavioral, and physiological adaptations lead to the likelihood of survival and reproductive success of a species</p>	<ul style="list-style-type: none"> Students will engage in a reading to learn to deepen their understanding of adaptations. Students will communicate their understanding of the three types of adaptations and examples of each type by completing a graphic organizer. Students will practice categorizing adaptations into the three categories by completing a card sort. Students will describe how structural, behavioral, and physiological adaptations lead to the likelihood of survival and reproductive success of a species. <div style="display: flex; align-items: center; margin-top: 20px;"> <div style="margin-right: 20px;"> <p>■ Thinking Task (10 min)</p> <p>■ Reading: Variation and Adaptations (30 min)</p> <p>■ Adaptations Card Sort (10 min)</p> <p>■ Exit Ticket (7 min)</p> </div>  </div>	<p>Look for teachers to:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Engage students in ABC. (Activity before content) The teacher should stamp key points AFTER students have had the time to engage in the content (productive struggle) and discuss. <input type="checkbox"/> Promote the use of partners and whole class discussion. <p>Look for students to:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Engage in discourse and productive struggle <input type="checkbox"/> Justify their reasoning and support their ideas with evidence.
Standards		
<p>TEKS 8.13C Describe how variations of traits within a population lead to structural, behavioral, and physiological adaptations that influence the likelihood of survival and reproductive success of a species over generations.</p>		
Vocabulary		
<p>Adaptation Behavioral adaptation Structural adaptation Physiological adaptation</p>		
Science Practices		
8. Obtaining, evaluating, and communicating information		
Recurring Themes and Concepts		
<p>F. Structure and Function G. Stability and Change</p>		<p>Students Do and Know</p> <div style="margin-top: 20px;">  <ul style="list-style-type: none"> Students will describe how structural, behavioral, and physiological adaptations lead to the likelihood of survival and reproductive success of a species. </div> <div style="margin-top: 20px;">  <ul style="list-style-type: none"> A variation is a slight difference in an inherited trait among individual members of a species. When the difference helps the organism survive and reproduce, the population develops an adaptation that makes them better suited for their environment. These adaptations develop over generations because of natural selection. There are three types of adaptations: structural, behavioral, and physiological. </div>

Lesson #07: Artificial Selection		Date:	
Objective	Instructional Notes	Lesson Look Fors	
<p>SWBAT Model how artificial selection changes allele frequencies in a population over time.</p>	<ul style="list-style-type: none"> Analyze data and identify trends. Collaborate with peers to discuss similarities and differences in conclusions that were made. <div style="display: flex; align-items: center; justify-content: center; margin-top: 20px;"> <div style="display: flex; flex-direction: column; gap: 10px;"> <div style="display: flex; align-items: center;"> <div style="width: 15px; height: 15px; background-color: red; margin-right: 5px;"></div> Thinking Task (7 min) </div> <div style="display: flex; align-items: center;"> <div style="width: 15px; height: 15px; background-color: orange; margin-right: 5px;"></div> Artificial Selection Gizmo (40 min) </div> <div style="display: flex; align-items: center;"> <div style="width: 15px; height: 15px; background-color: magenta; margin-right: 5px;"></div> Exit Ticket (5 min) </div> </div> <div style="margin-left: 20px;">  </div> </div>	<p>Look for teachers to:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Engage students in ABC. (Activity before content) The teacher should stamp key points AFTER students have had the time to engage in the content (productive struggle) and discuss. <input type="checkbox"/> Promote the use of partners and whole class discussion. <p>Look for students to:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Engage in discourse and productive struggle <input type="checkbox"/> Justify their reasoning and support their ideas with evidence. 	
<p>Standards</p>			
<p>TEKS 7.13D describe and give examples of how natural and artificial selection change the occurrence of traits in a population over generations.</p>			
<p>Vocabulary</p> <p>Natural Selection Artificial Selection Chromosome Evolution Fitness Genotype Phenotype Mutation</p>			
<p>Science Practices</p> <ul style="list-style-type: none"> Developing and Using Models Engaging in Argument from Evidence Analyzing and Interpreting Data 			
<p>Recurring Themes and Concepts</p> <p>A. Patterns</p>			
			<p>Students Do and Know</p> <div style="display: flex; flex-direction: column; gap: 20px;"> <div style="display: flex; align-items: center;">  <div style="margin-left: 10px;"> <ul style="list-style-type: none"> Students are using artificial selection to develop a new variety of insects, distinguishing between the processes of natural and artificial selection, and comparing the rates at which natural and artificial selection occur. </div> </div> <div style="display: flex; align-items: center;">  <div style="margin-left: 10px;"> <ul style="list-style-type: none"> Evolution is a change in gene frequencies in a population over time. Natural selection is a type of evolution where certain traits (adaptations) give some populations reproductive success. Fitness is the ability to produce children. A mutation is change in the nucleotide sequence in DNA that may or may not produce a new trait. Phenotype is the physical appearance of a trait. Genotype is the makeup of the alleles that code for the phenotype. </div> </div> </div>

Lesson #08: Asexual and Sexual Reproduction		Date:
Objective	Instructional Notes	Lesson Look Fors
SWBAT Compare and contrast the results of asexual and sexual reproduction and explain how genetic diversity, or lack of, affects the survival of the population over time.	<ul style="list-style-type: none"> Students will analyze patterns in diagrams composed of figures and shapes and describe what is happening in each step of the diagrams. (These are simplified steps of sexual and asexual reproduction.) Students will participate in an exploratory activity where some represent organisms that reproduce sexually, and some reproduce asexually. Through this whole class activity students will learn about the advantages and disadvantages of both types of reproduction. Students will complete a Reading to Learn to acquire more about sexual and asexual reproduction. Students will complete a Venn diagram to explain asexual and sexual reproduction. 	Look for teachers to: <ul style="list-style-type: none"> <input type="checkbox"/> Engage students in ABC. (Activity before content) The teacher should stamp key points AFTER students have had the time to engage in the content (productive struggle) and discuss. <input type="checkbox"/> Promote the use of partners and whole class discussion. Look for students to: <ul style="list-style-type: none"> <input type="checkbox"/> Engage in discourse and productive struggle <input type="checkbox"/> Justify their reasoning and support their ideas with evidence.
Standards		
TEKS 7.13C compare the results of asexual and sexual reproduction of plants and animals in relation to the diversity of offspring and the changes in the population over time		
Vocabulary		
Asexual Reproduction Sexual Reproduction		
Science Practices		
1. Asking questions and defining problems 2. Developing and using models 7. Engaging in argument from evidence	 <ul style="list-style-type: none"> Thinking Task (7 min) Copy or Combine (25 min) Reading to Learn (15 min) Exit Ticket (5 min) 	
Recurring Themes and Concepts		
A. Patterns		Students Do and Know <ul style="list-style-type: none"> Students will complete a Venn diagram to explain asexual and sexual reproduction. Asexual reproduction and sexual reproduction have significant differences in terms of the diversity of offspring and changes in the population over time. Sexual reproduction tends to result in greater genetic diversity and adaptability within a population, which can increase the chances of survival and reproductive success over time. Asexual reproduction tends to produce offspring that are genetically identical to the parent, which can limit genetic diversity and make populations less adaptable to changing environments.

UNPACKED STANDARDS

Focus standards for this unit.

Standard:		8.13B Describe the function of genes within chromosomes in determining inherited traits of offspring.		
Specificity		Content Builder		
<p>Cognition: Describe Content: function of genes within chromosomes Including but not limited to:</p> <ul style="list-style-type: none"> • Cells contain genetic material in the nucleus. • Chromosomes - DNA packaged by proteins for storage in the nucleus • DNA - long, continuous molecule that contains genetic information • Gene - section of DNA that contains the information to influence one inherited trait <ul style="list-style-type: none"> ○ Inherited traits of organisms are passed from parents to their offspring through genes. ○ Genes determine traits. ○ Genes are composed of DNA. 		<p>Genes, segments of DNA found within chromosomes, are crucial in determining an individual's inherited traits. Each gene holds specific instructions for building and regulating essential proteins, influencing various physical and biochemical characteristics ranging from eye color and hair texture to blood type and disease susceptibility. Offspring inherit these traits from their parents through the combination of genes during reproduction. Students may struggle to comprehend how genetic information translates into physical traits. Students are not expected to learn about Punnett squares, which are introduced in Biology.</p>		
		Instructional Implications		
		<p>When you teach this concept, remember to:</p> <ul style="list-style-type: none"> • Use visual aids, diagrams, and models to illustrate the structure of genes, chromosomes, and their interactions. • Engage students in interactive activities (e.g., genetic simulations, Punnett squares) to demonstrate how genes are inherited and how different alleles combine to produce specific traits. • Incorporate real-life examples of inherited traits in humans and other organisms. • Discuss recent advances in genetics and how they impact our understanding of inherited traits. Show how genetics is relevant to various fields (e.g., medicine, agriculture, and forensics). 		
Student Misconceptions		Vocabulary		
<ul style="list-style-type: none"> • Thinking that each gene is responsible for only one specific trait • Thinking that acquired traits can be directly inherited • Thinking that genes for certain traits are always the same in everyone • Thinking that a dominant allele is always more common or advantageous 		allele	genome	phenotype
		chromosome	genotype	protein
		dominant	heredity	recessive
gene	inherited	reproduction		
genetic trait	offspring	trait		
		Possible STAAR Stimuli		
		Investigation	Chart/Table	Visual/Image/ Illustration
		Model	Informational Text/List	

Standard:	8.13C Describe how variations of traits within a population lead to structural, behavioral, and physiological adaptations that influence the likelihood of survival and reproductive success of a species over generations.
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Specificity	Content Builder
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Cognition: Describe
 Content: how variations of traits within a population lead to structural, behavioral, and physiological adaptations that influence the likelihood of survival and reproductive success of a species over generations.
 Including but not limited to:

- Natural selection - process by which gene frequencies in a population change through certain individuals producing more offspring than others because they are more capable of surviving and reproducing organisms better suited to their environment
- Adaptations - a change in structure or habits (behavior), often hereditary, by which an organism improves its condition in relationship to its environment
 - Structural adaptations - structures of living organisms
 - Animal examples:
 - Appendages, Mouth structures, Color. Beak shape
 - Plant examples:
 - Roots - shallow vs. deep, Leaves - large vs. small, needles, Stems - woody or herbaceous, thorns, Reproductive structures - seeds, flowers, and cones
 - Behavioral adaptations - response to stimuli
 - Animal examples of variations:
 - Mating rituals, hibernation, migration, building nests, building webs
 - Plant examples of variations:
 - Dormancy, tropisms
 - Physiological adaptations - functions of living organisms
 - Animal examples:
 - Pupil dilation, regulating body temperature (panting / sweating, pores, shedding), fever or vomiting, Hunger / thirst, defense mechanisms, fight or flight (amount of adrenaline released determines response), puffer fish puffs up, octopus ink sacs release ink
 - Plant examples:
 - Storage of food in a bulb, seed dispersal, attraction of pollinators, turgor pressure (relate to vacuole structure / function)

Variations of traits within a population create diversity among individuals. Some of these traits may offer advantages in specific environments, leading to better survival and reproductive success for those individuals. Over generations, natural selection favors those with advantageous traits, resulting in structural, behavioral, and physiological adaptations that enhance the species' likelihood of survival and successful reproduction in their specific habitats. Students may struggle understanding how natural selection operates or the significance of genetic variation in the adaptation process.

Instructional Implications

When you teach this concept, remember to:

- Use models, diagrams, illustrations, and animations to visually represent the concepts of variation, natural selection, and the different types of adaptations.
- Provide real-life examples of species adaptations in different environments. Show how variations in traits lead to advantageous adaptations that enhance survival and reproductive success.
- Engage students in interactive activities (e.g., simulations or role-playing games) to demonstrate the process of natural selection and how variations contribute to adaptations.
- Explore scientific case studies and research papers on species adaptations. Analyzing real scientific data can deepen students' understanding of how natural selection operates.
- Provide opportunities for students to describe verbally and in writing how trait variations affect survival and reproduction success.
- Help students see the Recurring Theme and Concept of structure and function in this standard.

Vocabulary		
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behavioral adaptation generation natural selection	physiological adaptation population species	structural adaptation trait variation
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Possible STAAR Stimuli		
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Investigation	Chart/Table	Diagram
Visual/Image/ Illustration	Model	Informational Text/List
Map		

Student Misconceptions

- Thinking that adaptations occur with a specific end goal in mind or that organisms develop traits intentionally to enhance their survival
- Thinking that organisms can pass on traits acquired during their lifetime to their offspring

- Thinking that traits develop because they are needed in an organism’s environment
- Thinking that all adaptations are beneficial
- Assuming that all variations within a population are adaptations

Standard:	7.13C compare the results of asexual and sexual reproduction of plants and animals in relation to the diversity of offspring and the changes in the population over time		
Specificity		Content Builder	
Cognition: Compare Content: the results of asexual and sexual reproduction of plants and animals Including but not limited to: <ul style="list-style-type: none"> • Asexual reproduction <ul style="list-style-type: none"> ○ Genetic material is donated from only one parent. ○ Offspring are identical to the parent and each other. ○ Lack of diversity decreases the chances of survival of the species. • Sexual reproduction <ul style="list-style-type: none"> ○ Offspring receive genetic material from both parents. ○ Organisms vary because they have different inherited traits. ○ Offspring differ from each parent and each other. ○ Genetic variability increases a species' chances of survival. 		When comparing asexual and sexual reproduction in plants and animals, we observe that they have different effects on offspring diversity and population changes over time. Asexual reproduction produces genetically identical offspring, while sexual reproduction leads to genetic diversity by combining genetic material from two parents. This diversity enhances population adaptability and evolutionary potential. By exploring these differences, students gain insights into how reproductive strategies shape genetic makeup and influence an organism’s ability to adapt to a changing environment. Students may struggle to see how the diversity resulting from sexual reproduction can contribute to population adaptation and evolutionary processes over time.	
Student Misconceptions		Instructional Implications	
<ul style="list-style-type: none"> • Thinking that asexual reproduction generates offspring with high genetic diversity • Thinking that sexual reproduction always leads to high genetic diversity • Equating changes in population size with offspring diversity • Thinking that sexual reproduction is always superior and downplaying the advantages of asexual reproduction • Generalizing asexual reproduction as a form of cloning 		When you teach this concept, remember to: <ul style="list-style-type: none"> • Use diagrams or charts to visually compare the outcomes of asexual and sexual reproduction. • Incorporate examples from both plants and animals to demonstrate how asexual and sexual reproduction occur in different organisms. • Have students research the long-term effects of asexual and sexual reproduction on population changes over time. • Use real-life examples (e.g., well-known organisms or specific case studies) to highlight the differences in offspring diversity and population changes between asexual and sexual reproduction. 	
Possible STAAR Stimuli		Vocabulary	
Chart/Table	Diagram	Visual/Image/ Illustration	
Informational Text/List		asexual reproduction diverse offspring gene pool genetic diversity	genetic variation genetically identical inherited
			offspring sexual reproduction uniform offspring

Standard:		7.13D describe and give examples of how natural and artificial selection change the occurrence of traits in a population over generations.		
Specificity		Content Builder		
<p>Cognition: Describe</p> <p>Content: how natural and artificial selection change the occurrence of traits in a population over generations</p> <p>Including but not limited to:</p> <ul style="list-style-type: none"> • Natural selection <ul style="list-style-type: none"> ○ Mechanisms: <ul style="list-style-type: none"> ▪ Fitness - ability to survive and reproduce ▪ Variation - Individuals in a population are different in some ways. ▪ Inheritance - Offspring get their traits from their parents. ▪ Selection - breeding ▪ Time - evolution ▪ Adaptation - change ▪ Mutation - change in the structure of molecules that make up genes, called DNA ○ Examples: <ul style="list-style-type: none"> ▪ Long neck of a giraffe ▪ Beaks of birds • Artificial selection <ul style="list-style-type: none"> ○ Mechanisms: <ul style="list-style-type: none"> ▪ Selective breeding - breeding controlled by humans ○ Examples: <ul style="list-style-type: none"> ▪ Pigeons - fancy feathers and acrobatic flight ▪ Breeding dogs ▪ Broccoli ▪ Cabbage ▪ Cauliflower ▪ Wheat 		<p>Natural selection and artificial selection both influence the occurrence of traits in populations over generations. Natural selection is driven by environmental factors, favoring advantageous traits that enhance survival and reproduction. Natural selection doesn't always result in greater complexity or advancement; it simply favors traits that are advantageous in a specific environment. Artificial selection, on the other hand, involves human intervention, selectively breeding individuals with desired traits. Both processes contribute to the diversification and adaptation of species, shaping the characteristics we observe in populations today. It is important for students to understand how genetic variation contributes to both natural and artificial selection.</p>		
		Instructional Implications		
		<p>When you teach this concept, remember to:</p> <ul style="list-style-type: none"> • Have students research and explain natural and artificial selection, emphasizing their distinct processes and outcomes. • Present a wide range of examples to illustrate how natural and artificial selection change trait occurrence in populations over time. • Use diagrams, flowcharts, and animations to represent the mechanisms of selection and how they influence trait occurrence. • Provide opportunities for students to observe natural selection in populations. • Provide opportunities for students to observe deliberate crosses of plants and selective breeding in domestic animals for desired characteristics (e.g., sweet corn, Meyer lemons, dog breeding, and cattle breeding). 		
Student Misconceptions		Vocabulary		
<ul style="list-style-type: none"> • Thinking that natural selection always leads to more complex organisms • Thinking that artificial selection is a natural process that occurs in the wild • Thinking that natural selection is purposeful and that organisms evolve with a specific goal in mind • Thinking traits are acquired during an organism's lifetime and passed on to offspring • Generalizing that all traits are influenced solely by genetics • Assuming natural selection always leads to the extinction of weaker traits 		adaptation artificial selection domestic animal dominant species generation	habitat hybrid plant mutation natural selection offspring	population selective breeding species trait
		Possible STAAR Stimuli		
		Investigation	Chart/Table	Visual/Image/ Illustration
		Model	Informational Text/List	

VERTICAL STANDARDS

This section details the **progression** of key student expectations/standards** in the courses **before** and **after** this course. This will help you understand what **prior knowledge skills to build upon** and guide you in knowing what **skills you are preparing your students** for in the subsequent course.

6 th Grade	7 th Grade	8 th Grade
	7.13C compare the results of asexual and sexual reproduction of plants and animals in relation to the diversity of offspring and the changes in the population over time	8.13B describe the function of genes within chromosomes in determining inherited traits of offspring
6.13C describe how variations within a population can be an advantage or disadvantage to the survival of a population as environments change.	7.13D describe and give examples of how natural and artificial selection change the occurrence of traits in a population over generations.	8.13C describe how variations of traits within a population lead to structural, behavioral, and physiological adaptations that influence the likelihood of survival and reproductive success of a species over generations.

VOCABULARY GLOSSARY

Domain-specific words and definitions for this unit.

Key Content Vocabulary
<p>List and define key vocabulary terms</p> <p>Allele – the different forms of a gene.</p> <p>Chromosome –a thread-like structure found in the nucleus of a cell. It is made up of DNA and proteins and carries genetic information in the form of genes.</p> <p>DNA (Deoxyribonucleic Acid) –the molecule that contains the instructions for all living things. DNA is found in the nucleus of cells and is responsible for passing traits from parents to offspring.</p> <p>Gene –a section of DNA that controls a specific trait or function in an organism. Each gene has a specific location on a chromosome and comes in different forms, called alleles.</p> <p>Genotype – The genetic makeup of an organism. For example, if a plant has genes for tallness and shortness, its genotype tells us what combination it has.</p> <p>Dominant Trait: a characteristic that is always expressed, or visible, when at least one dominant allele is present. It can mask or hide a recessive trait.</p> <p>Genetics: the study of how traits are passed from parents to offspring through genes.</p> <p>Heredity: the process by which traits and characteristics are passed from parents to their offspring through genes.</p> <p>Heterozygous – When an organism has two different alleles of a gene.</p> <p>Homozygous – When an organism has two of the same alleles for a trait, like two genes for blue eyes.</p> <p>Hybrid – Another word for heterozygous, meaning the organism has two different alleles for a trait.</p> <p>Inheritance: the passing of genetic information from parents to their offspring, determining their traits and characteristics.</p> <p>Pedigree – A family tree that shows how traits are passed down through generations.</p> <p>Phenotype – The physical traits you can see, like eye color or height.</p>

Punnett Squares – A chart that helps predict the chances of offspring inheriting certain traits from its parents.

Recessive Trait: a characteristic that is only expressed, or visible, when two recessive alleles are present. It is hidden or masked when a dominant allele is present.

Trait: a specific characteristic of an organism, such as eye color, hair type, or height, which can be passed from parents to offspring.

Consumable Materials and Lab Supplies for Unit #9 (1 per group of 4 students unless noted)

Lesson	Commercial Vendor		Lab Supplies (Science Vendor)
Lesson 01: Inherited Traits and Cells	None		None
Lesson 02: Determining Inheritance	<u>Per student:</u> 20 pony beads 2 pipe cleaners Small container for beads <u>Per group:</u> Sandwich size plastic bag Quart or gallon size plastic bag		Computer with internet access
Lesson 03: Modeling Inheritance	None		Computer with internet access
Lesson 04: Natural Selection	Each Group <ul style="list-style-type: none"> • plate, paper • bag with white and yellow Cheez-It® 	Teacher <ul style="list-style-type: none"> • bags, zipper-lock, quart • Cheez-It®, white • Cheez-It®, yellow 	None
Lesson 05: Variation and Adaptations Part 1	<u>Per Group</u> 50 dry brown beans (such as pinto) 50 dry white beans (such as navy beans) 2 plastic cups Colored pencils		None
Lesson 06: Variation and Adaptations Part 2	No consumable or lab materials needed for this lesson. For card sort you will need to print, cut and laminate cards and place in bags. You will need a set for each pair of students.		

Lesson 07: Artificial Selection	None	Computer with internet access
Lesson 08: Asexual and Sexual Reproduction	You will need markers for the copy and combine activity. It is suggested to use 1" x 1" squares of colored paper, but you can use any type of marker such as colored chips or beads.	None