

BABY MAKING ARGUMENT BASED INVESTIGATION

Grade Level Band: Middle School

<p>Next Generation Science Standards:</p> <ul style="list-style-type: none"> MS-LS3-2. Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation. 		
<p>Unit Big Ideas:</p> <ul style="list-style-type: none"> Traits are determined by genetic and environmental factors. There are PATTERNS in the way genetic information is stored, expressed, and passed on. 		
Question(s) Addressed in This Investigation:	How This Investigation Relates to Unit Big Idea(s):	3-D Learning Objective(s)
<p>What does each step we carry out model in the actual process of making a human baby?</p> <p>What are the different types of patterns that exist in the way genetic information is passed from one generation to the next?</p>	<p>The students are creating offspring. During this investigation the students will discover the process of genetics and the role genetics plays during reproduction from parent to an offspring. By going through the genetic process that happens when creating an offspring.</p>	<ul style="list-style-type: none"> SEP: Developing and Using Models - students will create a drawing of their offspring. DCI: Variation of Traits - Based on the parents (the students) genes an offspring will be constructed. CCC: Cause and Effect - Students will experience, analyze, and draw the outcome the parents have on the genetics of the offspring.
<p>SPECIFIC INVESTIGATION CONCEPTUAL OBJECTIVES (As a result of this investigation and related experiences, students will further their understanding of the following conceptual ideas):</p> <ul style="list-style-type: none"> Students will further their understanding of: <ul style="list-style-type: none"> reproduction. dominant and recessive alleles. phenotype and genotype. chromosomes. 		

ASSIST CHARACTERISTIC ENGAGED IN DURING THIS INVESTIGATION						SCIENCE AND ENGINEERING PRACTICES TARGETED DURING THIS INVESTIGATION		CROSSCUTTING CONCEPTS EMERGING OR USED DURING THIS INVESTIGATION	
X	ASSIST Characteristic	X	SEP	X	CCC				
	Developing Testing Procedures		Asking questions (for science) and defining problems (for engineering)		Scale, Proportion, Quantity				
X	Obtaining & Analyzing Data	X	Developing and using models	X	Cause & Effect				
X	Claims & Evidence Development	X	Planning and carrying out investigations	X	Patterns				
	Consult with Experts	X	Analyzing and interpreting data		System & System Models				
X	Reflecting on Learning		Using mathematics and computational thinking		Energy & Matter				
	Using Multimodal Communication		Constructing explanations (for science) and designing solutions (for engineering)	X	Structure & Function				
X	Creating Multimodal Communication	X	Engaging in argument from evidence		Stability & Change				
		X	Obtaining, evaluating, and communicating information						

OVERVIEW OF INVESTIGATION AND HYPOTHETICAL TRAJECTORY OF ACTIVITY	
(What do you plan to have the students engage in during this experience? Include potential timeframes, ways to differentiate instruction, student and teacher activity, anticipated student ideas and responses, and formative checkpoints)	
Activity Progression	Formative Assessments
<p>Before</p> <ul style="list-style-type: none"> ● Introduction <ul style="list-style-type: none"> ○ Catch the students attention by proposing the questions; Have you seen animals whose parents and offspring look similar? Do you look similar to your parent(s)? <ul style="list-style-type: none"> ● Students responses <ul style="list-style-type: none"> ○ Yes ○ I look more like one parent over the other parent. ○ I look like my siblings too. ● This could spark students to ask follow up questions that will be discovered during the activity: <ul style="list-style-type: none"> ○ Why do I look like one parent more than the other? ○ Why do I look like my parent? <ul style="list-style-type: none"> ■ The students will determine that the offspring receives half their chromosomes from each parent 	<ul style="list-style-type: none"> ● Students' questions and answers will help you determine the information and knowledge the student is learning and applying. As well as what questions the students may have

during a process called meiosis. Dominant and recessive genes of the parents also factor into traits of an offspring.

- Today we are going to explore why this may be.
- Overview of Baby Making Activity.
 - Explain to the students the baby making activity.
 - Genotype to Phenotype Simulation Booklet
 - Hand each student a copy
 - Go through the booklet
- Before transitioning to the activity ask the students; What questions do you have?

Baby Making Activity

- Pair each of the students with a partner.
- With the partner the students will go through the Genotype to Phenotype Simulation Booklet following the steps.
 - Individually students will determine their own phenotypes.
 - Students will write this down.
 - (Optional: students could be provided with a mirror or a picture of themselves to help determine their phenotypes.)
 - Students will cut out the chromosomes.
 - Students will randomly mix up the chromosomes.
 - Doing this allows for random pairing.
 - Students will then draw a chromosome.
 - The students will share with each other of their phenotypes.
 - Taking into consideration the dominant and recessive traits.
 - Refer to the booklet.
 - The students (parents) will write down their offspring's genotype which will correspond with a phenotype.

After

- Students will individually draw their offspring that the student and their partner created off of the decided traits during the baby making activity.
 - Use blank paper and coloring utensils
- Allow time to have the students share their offspring drawings with the class.

about content or further questions to explore.

- While the students are working, walk around the classroom observing and listening to the students' conversations. Further prompt the students thinking with questions.
- The offspring of the student and their partner will be used to determine the students' understanding of the genetic reproduction process. This corresponds with the drawing too.

EXPERIENCE CONCLUSION	
<p><i>How will the investigation be concluded and connected to the next activity or investigation?</i></p> <p>For the next class the students will construct an answer to questions that connect to and allow the students to reflect on the baby making activity and concepts.</p>	

MATERIALS NEEDED	PURPOSEFUL PLANNING FOR MANAGEMENT
<ul style="list-style-type: none"> ● Genotype to Phenotype Simulation Booklet ● Mirrors or picture of the students (Optional) ● Partner for the each student ● Scissors ● Piece of blank paper ● Coloring utensils (colored pencils, crayons, markers) 	<ul style="list-style-type: none"> ● Overseeing students are compatible with each other when paired with a partner. ● For talented and gifted students: <ul style="list-style-type: none"> ○ Examine multiple generations of parents and offsprings. ● Have a timer set to keep the students on track to get to a certain step at the end of the time. <ul style="list-style-type: none"> ○ Break the steps into smaller steps.

HELPFUL RESOURCES
<p>For the Teacher</p> <ul style="list-style-type: none"> ● Science and Engineering practices ● Teacher view of inquiry ● Video discussing what an investigation is for elem <p>For the Student</p> <ul style="list-style-type: none"> ● Genetic Counselor ● Doctor ● Library/Books/Internet

MODIFICATIONS FOR YOUNG LEARNERS
<ul style="list-style-type: none"> ● For Kindergarten through second grade students can investigate and examine characteristics of species. These characteristics can include parts on animals and humans. ● For grades 3-5 students can investigate characteristic differences between parents and offspring of the same species.