Louisiana Believes

Distance Learning Support for OpenSciEd Grade 8
Unit 8.5 Genetics Field Test Unit

This resource is designed to support teachers in implementing distance learning for OpenSciEd Grade 8 Unit 8.5, Unit 6 in the Louisiana Guide to Piloting OpenSciEd Grade 8. It is intended as a supporting document and should be used in conjunction with the OpenSciEd Unit 8.5 Lesson Resources. The resources contained in this document have been adapted from OpenSciEd with permission under Creative Commons 4.0 licensing.

The OpenSciEd Remote Learning Resources linked below contain detailed information about adapting specific routines to a remote learning environment and a wide variety of options including those for students who do not have internet access:

- Fostering Productive Norms
- Anchor Phenomenon Routine
- Navigation Routine
- Supporting Discourse
- Problematizing Routine

This guidance document is considered a "living" document as we believe that teachers and other educators will find ways to improve the document as they use it. Please send feedback to STEM@la.gov so that we may use your input when updating this guide.

Updated April 19, 2021

DEPARTMENT of EDUCATION
Louisiana Believes

Norming Language	
Term	**Description**
Virtual Class Pre-Work	Assignments that students should do prior to virtual class meetings in order to be prepared to engage in discussions, there may be multiple assignments throughout a given lesson
Virtual Class Post-Work	Assignments designed for students to apply learning from virtual class meetings, there may be multiple assignments throughout a given lesson
Virtual Class	Live sessions with students through any digital conferencing platform, teachers may choose to allow students without internet to call in during these sessions and record virtual class sessions to share with those who cannot join
Thinking Deeper Documents	Progress trackers for students to use throughout each lesson to record and revise their thinking about science concepts related to the phenomenon; contain assignments for students to complete before, during, and after virtual classes, discussion boards, and home investigations
Lesson Slideshows	Lesson progression specific to each lesson used to guide student work; used during pre-work, post-work, virtual classes, home investigations, and discussion boards; can be shared with students in their entirety at the beginning of the lesson or broken into small portions and shared as needed
Discussion Boards	Assignments designed for students to share ideas and engage in discussion with one another over time rather than a live environment; students will use their Thinking Deeper Documents to brainstorm prior to submitting; teachers may choose to allow students without internet to text in responses and may screenshot/download and share portions of or full discussions via text (ex. through apps like Remind)
Home Investigations	Investigations with readily available materials designed for students to perform at home; teachers may choose to substitute videos or photos of data collection for students who cannot complete investigations at home

Lesson Set Overview: Lessons 1, 2, 3, 4, 5, 6, 7, 8

Lesson Set 1: Lessons 1-8		
Provided Resources Students Will Need	**Additional Resources Students Will Need**	**Additional Materials for Students Without Internet Access**
Lesson Slideshows for each lesson: L1, L2, L3, L4, L5, L6, L7, L8 **Thinking Deeper Documents for each lesson:** Lesson 1 TDD, Lesson 2 TDD, Lesson 3 TDD, Lesson 4 TDD, Lesson 5 TDD, Lesson 6 TDD, Lesson 7 TDD, Lesson 8 TDD **Additional Documents:** Lesson 2: Model student handout (optional if students will turn in a separate assignment rather than their TDD for model) Lessons 5 & 6: Family Cards Lesson 8 Assessment: Revise Your Model	Lesson 1: • Discussion Board, DQB Assignment, Completed DQB Lesson 2: • Optional: Separate Assignment for turning in models Lesson 3: • Discussion Board; Optional: Progress Tracker Assignment Lesson 4: • Thinking Deeper Documents from previous lessons, Initial Model from Lesson 1, DQB Assignment (if students do not have access to a shared document for the DQB) Lesson 5: • Thinking Deeper Document from Lesson 4 Lesson 6: • Thinking Deeper Document from Lesson 5, Initial Model Assignment or Shared Document for Gallery Walk, Optional: Progress Tracker Assignment Lesson 7: • Thinking Deeper Document from Lesson 6, Consensus Model, Discussion Board Lesson 8: • Thinking Deeper Documents from previous lessons, Consensus Model	**Prior to Lesson**: Lesson 2: Videos 1 & 2 on the Student-Facing Unit Page Lesson 3: Audio of "Ask a Farmer: Diet" on the Student-Facing Unit Page Lesson 4: Audio recording "Ask a Farmer: Exercise Habits" on the and Video 3 on the Student-Facing Unit Page Lesson 6 Video on Student-Facing Unit Page **After Lesson Completion:** Virtual Class recordings (Lessons 1, 2, 3, 5, 6, 8) Discussion Boards (Lessons 1, 3, 7)

Students should ideally join VIRTUAL CLASS on the following days:

Day 2 - Lesson 1 | Day 4 - Lesson 2 | Day 6 - Lesson 3 | Days 8 & 9 - Lesson 5

Day 11 - Lesson 6 | Day 13 - Lesson 8

Formative and Summative Assessment Opportunities:

Lesson 1: Initial Model Pre-Assessment
Lesson 2: Model Revisions
Lesson 3: Building Understanding Discussion Board, Progress Tracker (on TDD)
Lesson 5: Patterns in Karyotypes discussion (option to have students turn in TDD after the lesson for further review)
Lesson 6: Initial Model, Optional: Progress Tracker Assignment
Lesson 8 Assessment: Revise Your Model

Lesson Set Overview: Lessons 9, 10, 11, 12, 13, 14, 15, 16

Lesson Set 2: Lessons 9-16		
Provided Resources Students Will Need	**Additional Resources Students Will Need**	**Additional Materials for Students Without Internet Access**
Lesson Slideshows for each lesson: L9, L10, L11, L12, L13, L14, L15, L16 **Thinking Deeper Documents for each lesson:** Lesson 9 TDD, Lesson 10 TDD, Lesson 11 TDD, Lesson 12 TDD, Lesson 13 TDD, Lesson 14 TDD, Lesson 15 TDD, Lesson 16 TDD **Additional Documents (not linked within slideshows or TDDS):** Collaborative Slideshow on shared platform – Lesson 12 Summative Assessment – Lesson 16	Lesson 9: • Link to Class Data • Optional: Exit Ticket Assignment Lesson 11: • Shared platform for Initial Ideas about Location of Chromosomes Lesson 13: • Model Discussion Board Lesson 14: • Materials for data collection: sunflower seeds, tape measure/ruler • Google Spreadsheet for Seed Data Lesson 15: • Classroom Consensus Model Lesson 16: • Driving Question Board Lessons 10, 11, 12, 14, 15, 16 • Optional: Progress Tracker Assignments (for ease of review and feedback rather than turning in TDDs)	**Prior to Lesson**: Lesson 10: Instructions for NetLogo Bird Breeder Simulation Lesson 13: Data Sheets handout, one of the following: Pigeon Crest, Cat Allergies, Sunflower Seed Length, Duchenne Muscular Dystrophy Lesson 14: Generating Histograms handout Lesson 15: Video of Planaria, Recordings of Happy Birthday Song *(teacher made)* **After Lesson Completion:** Class Data – Lesson 9 Initial Ideas Document – Lesson 11 Planarian Observation and Bisection Video still frames & Collaborative Slideshow – Lesson 12 Google Spreadsheet of Seed Data, Histogram images – Lesson 14 Discussion Board – Lesson 13 Virtual Class recordings (Lessons 9, 10, 11, 12, 14, 15)

Students should ideally join VIRTUAL CLASS on the following days:

Day 2 – Lesson 9 | Day 4 - Lesson 10 | Day 6 - Lesson 11 | Day 8 – Lesson 12

Day 10 – Lesson 14 | Day 12 – Lesson 15 | Day 15 – Lesson 16

Formative and Summative Assessment Opportunities:

Lesson 9: Exit Ticket
Lesson 10: Progress Tracker (on TDD)
Lesson 11: Progress Tracker (on TDD)
Lesson 12: Progress Tracker (on TDD)
Lesson 13: Model Discussion Board
Lesson 14: Progress Tracker (on TDD)
Lesson 15: Progress Tracker (on TDD)
Lesson 16: Progress Tracker (on TDD); Summative Assessment

Lesson 1 (3 days) - Anchoring Phenomenon

In this **Lesson**, students will need the following materials to appropriately engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Notice and Wonder Discussion Board - *teacher made*
- DQB Assignment - *teacher made*
- Completed DQB

In this **Lesson**, students who don't have home internet need the following print-outs or files to best engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Notice and Wonder Discussion Board - *teacher made*
- Discussion Board - *after completion*
- DQB Assignment - *teacher made*
- Completed DQB

In this **Lesson**, students should join virtual classes on the following days to engage in learning:

- Day 2

Lesson 1 (3 days) - Anchoring Phenomenon

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 1 (15 min) OBSERVE PHOTOS OF CATTLE WITH SIGNIFICANTLY DIFFERENT MUSCULATURE Slides A-D	1. Share Lesson Slideshow with students. 2. Share Thinking Deeper Document with students. 3. Create a discussion board for students to share their notices and wonders.	VIRTUAL CLASS PRE-WORK: 1. Record noticings and wonderings while observing photos of a pair of bulls (one with typical musculature and the other with extra-big muscles. 2. Share one notice and one wonder on the discussion board and record class ideas on TDD.
Part 2 (10 min) MAKE OBSERVATIONS ABOUT OTHER ANIMALS THAT HAVE BIG MUSCLES Slides E-K		VIRTUAL CLASS PRE-WORK: 1. View other examples of animals with this significant difference in musculature. 2. Write short observations on the table in the TDD. 3. Describe patterns seen with all animals.
Part 3 (15 min) CREATE INITIAL MODELS Slides L-M	1. Develop a way for students to share models in the Virtual Class. (ex. Screenshot and add to a shared document) 2. Give students instructions for submitting their completed models.	VIRTUAL CLASS PRE-WORK: 1. Individually develop a model to explain how one of these animals might have gotten its extra-big muscles, and what the muscles would look like upon “zooming in.”

Day 2		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Parts 4-8 (55 min) COMPARE AND CONTRAST INITIAL MODELS CONSENSUS MODEL DISCUSSION OBSERVE MORE PHOTOS OF GROUPS SHOWING A RANGE OF VARIATIONS LIST RELATED PHENOMENA SHARE RELATED PHENOMENA ASSIGN HOME LEARNING Slides N-W	Prior to the Virtual Class: 1. Compile and organize models to share with students for the Virtual Gallery Walk. 2. Make arrangements for assigning photo groups for wide range of variation within groups of organisms discussion. 3. Decide how students will share their Home Learning and prepare to relay this information to students at the end of the class meeting. VIRTUAL CLASS: 1. Virtual Gallery Walk to identify similarities and differences between initial models. 2. Record similarities and differences between models. 3. Co-construct an initial model as a whole class, finding points of agreement and disagreement about how and why these animals could be different. (**TEACHER POST CONSENSUS MODEL FOR CLASS TO REFERENCE.**) 4. Consider a collection of cattle photos that includes a range of different musculature, and then work to observe sets of other organisms with varying features. 5. Discuss the wide range of variation within groups of organisms that might have seemed the same. (**TEACHER ASSIGN DIFFERENT PHOTO GROUPS TO EACH STUDENT**) Record findings on TDD. 6. Individually list examples of variations among otherwise-similar organisms on TDD. 7. Share examples listed during class and/or from home learning of other living things that have variations in a characteristic or trait. Create a class list of related phenomena, and begin to discuss possible causes. 8. Assign Home Learning: Go into the community and find an example of a living thing that has a range of differences in a feature or characteristic.	

Day 3		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 10 (5 min) GENERATE INITIAL QUESTIONS Slide X		VIRTUAL CLASS POST-WORK: 1. Consider all the experiences in class so far and write questions we have to eventually form a Driving Question Board. 2. Record on TDD.
Part 11 (15 min) CREATE OUR DRIVING QUESTIONS BOARD Slide Y	1. Create an assignment for students to submit DQB questions and assign. 2. Review, arrange, and post DQB from student submitted questions.	VIRTUAL CLASS POST-WORK: 1. Submit questions to your teacher.
Part 12 (10 min) CONSIDER IDEAS FOR INVESTIGATION Slide Z		VIRTUAL CLASS POST-WORK: 1. Generate ideas for future investigations and consider what data we would want to find or collect to help us answer some of the questions on our DQB.

Return to Lesson Set Overview

Lesson 2 (1 day) - Investigation

In this **Lesson**, students will need the following materials to appropriately engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Optional: Separate Assignment for turning in models - *teacher made*

In this **Lesson**, students who don't have home internet need the following print-outs or files to best engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Videos 1 & 2 on the Student-Facing Unit Page
- Optional: Separate Assignment for turning in models - *teacher made*

In this **Lesson**, students should join virtual classes on the following days to engage in learning:

- Day 1

Lesson 2 (1 day) - Investigation

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Parts 1-5 (40 min) OBSERVE AND DISCUSS MUSCLES WATCH A VIDEO AND LOOK AT IMAGES OF HOW MUSCLES WORK BEGIN PROGRESS TRACKERS GALLERY WALK TO COMPARE LARGE AND SMALL MUSCLE CELL IMAGES BUILDING UNDERSTANDINGS ABOUT MUSCLE COMPARISON Slides A-L	Prior to the Virtual Class, the teacher should: 1. Determine how students will turn in their model revisions for post-work (ex. Turn in the TDD; create a separate assignment using the student handout and remove this from the TDD; have students screenshot their models and turn in) and edit the TDD and slideshow as needed to include directions. 2. Share Lesson Slideshow and Thinking Deeper Document with students. VIRTUAL CLASS: 1. Answer the navigation questions and discuss. 2. Observe photos of muscles, and explain how muscle tissue can be described. 3. Watch videos of animations that zoom in from muscle tissue to individual cell fibers and record what muscle structures look like up close. Share and discuss main ideas. 4. Evaluate still images and text to further understand and discuss how the proteins myosin and actin function to make muscles move. 5. Set up and use a Progress Tracker in TDD to record what we've figured out so far about muscles. 6. Integrate information from photos and data sets to compare the cells in typical muscle tissue cells to extra-big muscled ones. 7. Process findings from the gallery walk in a Building Understandings discussion. 8. Assign post-work.	

Part 6 (5 min) INDIVIDUALLY REVISE INITIAL MODELS Slides M-N	1. Review model revisions and provide feedback as needed.	VIRTUAL CLASS POST-WORK: 1. Independently complete a model to show today's new learning about how big muscles compare to typical ones and turn in. 2. Answer navigation questions.

Return to Lesson Set Overview

Lesson 3 (2 days) - Investigation

In this **Lesson**, students will need the following materials to appropriately engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Building Understanding Discussion Board - *teacher made*
- Optional: Progress Tracker Assignment - *teacher made*

In this **Lesson**, students who don't have home internet need the following print-outs or files to best engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Audio of “Ask a Farmer: Diet” on the Student-Facing Unit Page
- Building Understanding Discussion Board - *teacher made*
- Discussion Board - *after completion*
- Optional: Progress Tracker Assignment - *teacher made*

In this **Lesson**, students should join virtual classes on the following days to engage in learning:

- Day 2

Lesson 3 (2 days) - Investigation

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 1 (2 min) NAVIGATION Slide A	1. Share Lesson Slideshow with students. 2. Share Thinking Deeper Document with students.	VIRTUAL CLASS PRE-WORK: 1. Students look back at their Progress Trackers from the previous lesson and think about how diet and exercise can affect muscle size.
Part 2 (5 min) LIST POSSIBLE WAYS ANIMALS COULD EXERCISE Slide B		VIRTUAL CLASS PRE-WORK: 1. Brainstorm a list of the different ways animals might exercise in order to get larger muscles.
Part 3 (15 min) READ ARTICLES ABOUT MUSCLE SIZE IN TENNIS PLAYERS Slides C-E		VIRTUAL CLASS PRE-WORK: 1. Read an article and examine images about how tennis players' serving arms are much larger than their non-serving arms.
Part 4 (10 min) READ TWO ARTICLES ABOUT HOW WE BUILD MUSCLES Slide F		VIRTUAL CLASS PRE-WORK: 1. Read two articles (one more reliable than the other) about how we build muscles, and identify claims made in each.

Part 5 (13 min) BUILDING UNDERSTANDINGS DISCUSSION ABOUT MUSCLE Slides G-H	1. Create and assign a discussion for students to share ideas about the articles they read about muscles. (Use the questions in the chart on the students TDD.) 2. Review student responses and facilitate discussion as needed.	DISCUSSION BOARD: 1. Participate in a Building Understandings Discussion Board about the articles. Evaluate the reliability of the two sources and figure out how exercise leads to increased muscle growth. 2. Record consensus answers on chart in TDD.

Day 2		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Parts 6-10 (40 min) ANALYZE DATA OF DIET AND EXERCISE IN HUMANS ANALYZE NUTRITIONAL INFORMATION FOR CATTLE EXAMINE IMAGES OF ANIMALS BUILDING UNDERSTANDINGS DISCUSSION ABOUT PROTEIN, EXERCISE, AND MUSCLES Slides I-R	Prior to the Virtual Class, the teacher should: 1. Decide how data sets will be assigned to students for the activity at the beginning of class. VIRTUAL CLASS: 1. Examine various data represented in graphs and charts to determine the effect of diet on muscle growth in humans and discuss. 2. Listen to a short audio clip of a farmer interview. 3. Analyze nutritional information of cattle's typical diet. 4. Discuss findings. 5. Examine images of animals with protein deficiencies, and view a list of symptoms animals experience if they don't have adequate amounts of protein in their diets and discuss. 6. Engage in a Building Understandings Discussion based on the information gathered in this lesson. 7. Make a class list of ideas on TDD.	
Part 10 (5 min) UPDATE PROGRESS TRACKER Slide S	1. Teacher may choose to have students turn in their TDD or create a separate assignment for students to submit Progress Tracker ideas for formative assessment.	VIRTUAL CLASS POST-WORK: 2. Students use a Progress Tracker to record what they've figured out so far about muscles.

Return to Lesson Set Overview

Lesson 4 (1 day) - Problematizing

In this **Lesson**, students will need the following materials to appropriately engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Thinking Deeper Documents from previous lessons
- Initial Model from Lesson 1
- DQB Assignment (if students do not have access to a shared document for the DQB) - *teacher made*

In this **Lesson**, students who don't have home internet need the following print-outs or files to best engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Thinking Deeper Documents from previous lessons
- Initial Model from Lesson 1
- Audio recording “Ask a Farmer: Exercise Habits” on the Student-Facing Unit Page
- Video 3 on the Student-Facing Unit Page
- DQB Assignment (if students do not have access to a shared document for the DQB) - *teacher made*

In this **Lesson**, students should join virtual classes on the following days to engage in learning:

- None

Lesson 4 (1 day) - Problematizing

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 1 (15 min) UPDATE CONSENSUS MODEL Slide A	1. Share Lesson Slideshow with students. 2. Share Thinking Deeper Document with students.	VIRTUAL CLASS PRE-WORK: 1. Update the consensus model to include how diet and exercise affect musculature variation.
Part 2 (8 min) UPDATE PROGRESS TRACKER Slide B		VIRTUAL CLASS PRE-WORK: 1. Update Progress Trackers using the 3-box format to include the evidence for what they figured out.
Part 3 (5 min) IDENTIFY THE LIMITATIONS OF OUR MODEL Slide C		VIRTUAL CLASS PRE-WORK: 1. Revisit the model and predict how the extra-big muscled cattle have their large musculature.
Part 4 (8 min) ASK A FARMER Slide D	1. Make sure students know how to access the recording on the Student-Facing Unit Page.	VIRTUAL CLASS PRE-WORK: 1. Listen to an interview of a farmer to better understand the daily life of these heavily muscled cattle. 2. Record notices and wonders.

Part 5 (5 min) OBSERVE VIDEO OF DIFFERENTLY MUSCLED CALVES Slides E & F	1. Make sure students know how to access the videos on the Student-Facing Unit Page. 2. Ensure students have access to the DQB (if on a shared electronic platform) to add questions or create an assignment for them to submit new questions.	VIRTUAL CLASS PRE-WORK: 1. Observe video of muscled calves and record notices and wonders. 2. Submit new questions to the DQB.
Part 6 (3 min) NAVIGATION Slide G	1. Compile and organize new DQB questions.	VIRTUAL CLASS PRE-WORK: 1. Answer questions about the cattle being born like this on TDD.

Return to Lesson Set Overview

Lesson 5 (2 days) - Investigation

In this **Lesson**, students will need the following materials to appropriately engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Thinking Deeper Document from Lesson 4
- Family Cards

In this **Lesson**, students who don't have home internet need the following print-outs or files to best engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Thinking Deeper Document from Lesson 4
- Family Cards

In this **Lesson**, students should join virtual classes on the following days to engage in learning:

- Days 1 & 2

Lesson 5 (2 days) - Investigation

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Parts 1-5 (45 min) NAVIGATION DEVELOP CONVENTIONS FOR FAMILY TREES BUILD FAMILY TREES USING COW FAMILY PHOTOS BUILDING UNDERSTANDING DISCUSSION ABOUT PHENOTYPES IN FAMILIES INVESTIGATE WHAT IS FOUND INSIDE EGG AND SPERM CELLS Slides A-R	Prior to the Virtual Class, the teacher should: 1. Share Lesson Slideshow and Thinking Deeper Document with students. (Since there is a virtual class on Day 2 also, teachers might consider sharing on the slides for Day 1 and sharing Day 2 slides on the following day - if the slideshow is a shared document, the slides can be added after this Virtual Class meeting) 2. Plan for assigning families to each student for "Collecting Observations of Cow Families" VIRTUAL CLASS: 1. Discuss navigation questions from the end of Lesson 4. 2. Observe photos of baby cows with typical muscles and really big muscles. 3. Discuss the best way to represent characteristics of individuals that are part of our cow families and agree to share common symbols to do so. Students can make brief notes during the discussion on their TDD. 4. Work to organize the family trees based on relatedness, and transfer the observations about the phenotype and sex of each individual to a graphic organizer. 5. Discuss patterns the students uncovered while working with their graphic organizers. Using the patterns, make predictions about potential offspring given a set of parents. 6. Develop a more robust model as a class to represent how parents and offspring are related - building from the graphic organizers. 7. Examine the components and types of structures in egg and sperm cells to discover that muscle cells (and parts of muscle cells) are not passed from parents to offspring, but instead chromosomes are passed on from parent to offspring when sperm fertilizes an egg.	

Day 2		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Parts 6-8 (30 min) DISCOVER PATTERNS USING KARYOTYPES MAKE PREDICTIONS ABOUT THE NUMBER OF CHROMOSOMES NAVIGATION Slides S-BB	Prior to the Virtual Class, the teacher should: 1. Share the remaining slides if not shared on the previous day. VIRTUAL CLASS: 1. Make a prediction about what muscle cells will look like if we zoom in. 2. Examine the karyotype (that represents the muscle cell of an individual offspring) and compare the chromosomes organized there to the chromosomes found in the sperm and egg cells of the parents. 3. Make note of any similarities and differences by highlighting, circling, connecting lines, listing patterns etc. on TDD. 4. Make predictions about the number of chromosomes in the muscle and other body cells of Jim and Sparkle and in the sex cells of Lorenc, based on the ideas learned so far. 5. Reflect on new ideas about how phenotypes and inheritance as well as chromosomes are related to the patterns regarding the number of types of chromosomes in different cells. 6. Set up to build on this learning by thinking about what information is needed to dig deeper into understanding chromosomes.	

Return to Lesson Set Overview

Lesson 6 (2 days) - Investigation

In this **Lesson**, students will need the following materials to appropriately engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Thinking Deeper Document from Lesson 5
- Family Cards
- Initial Model Assignment or Shared Document for Gallery Walk - *teacher made*
- Optional: Progress Tracker Assignment – *teacher made*

In this **Lesson**, students who don't have home internet need the following print-outs or files to best engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Lesson 6 Video on Student-Facing Unit Page
- Thinking Deeper Document from Lesson 5
- Family Cards
- Initial Model Assignment or Shared Document for Gallery Walk - *teacher made*
- Optional: Progress Tracker Assignment – *teacher made*

In this **Lesson**, students should join virtual classes on the following days to engage in learning:

- Day 2

Lesson 6 (2 days) - Investigation

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 1 (5 min) WATCH A VIDEO TO HELP UNDERSTAND SCALE Slide A	1. Share Lesson Slideshow with students. 2. Share Thinking Deeper Document with students. 3. Ensure that students know how to access the video on the student page linked in the slideshow.	VIRTUAL CLASS PRE-WORK: 1. View video and answer questions to help grasp the super-small scale of chromosomes.
Part 2 (10 min) USE SYMBOLS TO SUPPORT WORK AT THIS SCALE Slides B-E		VIRTUAL CLASS PRE-WORK: 1. Reflect on the scale of chromosomes and consider how we might be able to investigate something so small, yet so complex. 2. View colors and symbols used to help keep track of patterns on chromosomes.
Part 3 (15 min) REASSEMBLE FAMILY TREES WITH NEW INFORMATION Slides F-H	1. Reshare Family Cow cards from Lesson 5 if needed.	VIRTUAL CLASS PRE-WORK: 1. Identify where myostatin is found and reassemble the family tree from Lesson 5 with new information.

Part 4 (15 min) DEVELOP INITIAL MODELS IN A SMALL GROUP Slide I	1. Determine how students will submit their models (ex. Screenshot and add to a shared document or turn in on a separate assignment) and give them instructions for doing so. 2. Prepare models for sharing in the Virtual Class. (compile, organize/group if needed, etc.)	VIRTUAL CLASS PRE-WORK: 1. Students develop an initial model to show the relationships between chromosome information, proteins, and heavily muscled phenotype.

Day 2		
Lesson Components	Distance Learning Plan	
	Teacher	Student
Part 5 (45 min) GALLERY WALK THROUGH INITIAL MODELS DEVELOP A CONSENSUS MODEL FOR CORRELATIONS READ EVIDENCE SUPPORTING CAUSATION CONSENSUS DISCUSSION ABOUT CAUSES PROGRESS TRACKER Slides J-R	VIRTUAL CLASS: 1. Virtual Gallery Walk to view initial models and record similarities and differences in the models. 2. Work together to develop a consensus model to show the relationships between chromosome information, proteins, and heavily muscled phenotype. (Teacher draws the model then shares with students to reference as needed.) 3. Read Mice Study Summary, students annotate text. 4. Discuss and record new vocabulary. 5. Complete Progress Tracker on TDD. *(Option to have students turn in their TDD or to create a separate assignment for Progress Tracker as formative assessment.)*	

Return to Lesson Set Overview

Lesson 7 (1 day) - Investigation

In this Lesson, students will need the following materials to appropriately engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Thinking Deeper Document from Lesson 6
- Consensus Model
- Building Understanding Discussion Board - *teacher made*

In this Lesson, students who don't have home internet need the following print-outs or files to best engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Thinking Deeper Document from Lesson 6
- Consensus Model
- Building Understanding Discussion Board - *teacher made*
- Discussion Board - *after completion*

In this Lesson, students should join virtual classes on the following days to engage in learning:

- None

Lesson 7 (1 day) - Investigation

Day 1		
Lesson Components	Distance Learning Plan	
	Teacher	Student
Part 1 (8 min) USE PROGRESS TRACKERS TO UPDATE OUR MODEL FOR GENE-PROTEIN-PHENOTYPE Slide A	1. Share Lesson Slideshow with students. 2. Share Thinking Deeper Document with students.	VIRTUAL CLASS PRE-WORK: 1. Use their Progress Tracker entries from last class to update their models to show the causal chain linking gene to protein to phenotype for myostatin and extra-big muscles.
Part 2 (8 min) EVALUATE AN ARTICLE ABOUT THE FUNCTION OF MYOSTATIN Slides B-D		VIRTUAL CLASS PRE-WORK: 1. Use the criteria developed in a previous lesson to evaluate whether the article they will read is a credible source of information.
Part 3 (10 min) READ AN ARTICLE ABOUT THE FUNCTION OF MYOSTATIN Slide E		VIRTUAL CLASS PRE-WORK: 1. Students use a graphic organizer on their TDD to guide their critical reading of an article about how the myostatin protein influences muscle growth.
Part 4 (12 min) BUILDING UNDERSTANDINGS DISCUSSION ABOUT THE FUNCTIONS OF MYOSTATIN Slide F	1. Create and assign a discussion for students to share ideas about how myostatin works. 2. Review student responses and facilitate discussion as needed.	VIRTUAL CLASS PRE-WORK: 1. Participate in a Building Understandings Discussion Board about how myostatin works typically and in heavily muscled animals.

Part 5 (7 min) UPDATE PROGRESS TRACKERS Slides G		VIRTUAL CLASS PRE-WORK: 1. Summarize today's learning about how myostatin works by adding an entry to their Progress Trackers.

Return to Lesson Set Overview

Lesson 8 (1 day) - Putting Pieces Together

In this Lesson, students will need the following materials to appropriately engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Thinking Deeper Documents from previous lessons
- Consensus Model
- Lesson 8 Assessment

In this Lesson, students who don't have home internet need the following print-outs or files to best engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Thinking Deeper Documents from previous lessons
- Consensus Model
- Lesson 8 Assessment

In this Lesson, students should join virtual classes on the following days to engage in learning:

- Day 1

Lesson 8 (1 day) - Putting Pieces Together

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Parts 1-9 (30 min) UPDATE OVERALL CLASSROOM CONSENSUS MODEL BRAINSTORM COMPONENTS FOR OUR GOTTA-HAVE-IT CHECKLIST DEVELOP CLASSROOM CONSENSUS MODEL UPDATE PROGRESS TRACKERS & NAVIGATION ANALYZE NEW FAMILY TREES REVISIT OUR DRIVING QUESTIONS BOARD& NAVIGATION Slides A-L	Prior to the Virtual Class, the teacher should: 1. Share Lesson Slideshow and Thinking Deeper Document with students. 2. Arrange for students to work in pairs on the model checklist if the platform allows. 3. Decide how assessment will be delivered and prepare to assign it at the end of class. VIRTUAL CLASS: 1. Update the overall classroom consensus model to include genotype, and add it to the word wall. 2. Brainstorm a list of components in pairs that will help the class create a model to explain how cattle get extra-big muscles. (Option to have students brainstorm independently if working on pairs is not possible.) 3. Consensus Discussion to develop a model to explain how cattle get extra-big muscles. 4. Preview Lesson 8 Assessment. 5. Discuss mutations and analyze data about how common they are. 6. Complete Progress Trackers to explain how the animals got extra big muscles. 7. Discuss whether all offspring will look like their parents, from whom they get their genetic information. 8. Analyze a family tree of cattle and write down notices and wonders about the variation seen by comparing the siblings to each other and their parents. 9. Connect students' recent questions to other questions on the Driving Question Board to identify the territory for our next investigation - Why don't babies always look like their parents? 10. Answer questions and discuss as a class why babies don't always look like their parents. Refer to the classroom consensus model. 11. Assign Lesson 8 Assessment to be completed after class and turned in.	

Part 3 Continued (20 min) REVISE CLASSROOM CONSENSUS MODEL Slide N		1. Complete Lesson 8 Assessment and turn in.

Return to Lesson Set Overview

Lesson 9 (2 days) - Investigation

In this Lesson, students will need the following materials to appropriately engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Link to Class Data - *teacher made*
- Optional: Exit Ticket Assignment - *teacher made*

In this Lesson, students who don't have home internet need the following print-outs or files to best engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Class Data - *after completion*
- Optional: Exit Ticket Assignment - *teacher made*
- Virtual Class recording – *after completion*

In this Lesson, students should join virtual classes on the following days to engage in learning:

- Day 2

Lesson 9 (2 days) - Investigation

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 1 (5 min) NAVIGATION Slides A, B	1. Share Lesson Slideshow with students. 2. Share Thinking Deeper Document with students.	VIRTUAL CLASS PRE-WORK: 1. Observe photos of siblings and reflect on what we figured out about genes and what information we need to determine why offspring don't look exactly like parents or siblings.
Part 2 (8 min) ORGANIZE NEW SIBLINGS INTO FAMILY TREES Slide C		VIRTUAL CLASS PRE-WORK: 1. Organize the photos of Eva's family including her siblings.
Part 3 (10 min) SIMPLIFY THE PHENOTYPE AND GENOTYPE TRACKER Slides D, E, F, G, H, I, J, K		VIRTUAL CLASS PRE-WORK: 1. Read the review of zooming in on a muscle cell. 2. Explain where the structures in the muscle cell of the offspring come from. 3. Create a pedigree of Eva's family.

Part 4 (10 min) INVESTIGATE FAMILY GENOTYPES AND PHENOTYPES FOR MYOSTATIN Slides L, M, N, O		VIRTUAL CLASS PRE-WORK: 1. Identify the genotype for each member of Eva's family and record patterns, observations, and questions in a Notice/Wonder Chart. 2. Answer the questions about genotype and myostatin.
Part 5 (2 min) NAVIGATION Slide P		VIRTUAL CLASS PRE-WORK: 1. Reflect on the progress made in answering the questions presented at the start of the lesson.

Day 2		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Parts 6-13 (60 min) NAVIGATION AND BUILDING UNDERSTANDINGS DISCUSSION CALCULATE GENOTYPE PROPORTIONS FOR MORE PEDIGREES MAP ALLELES OF INDIVIDUALS BACK TO THE CHROMOSOMES IN THE SEX CELLS OF PARENTS SIMULATE RANDOM SPERM AND EGG COMBINATIONS BUILDING UNDERSTANDINGS DISCUSSION PRACTICE MAKING PREDICTIONS USING PROBABILITY NAVIGATION Slides Q-AS	Prior to the Virtual Class, the teacher should: 1. Arrange for students to work in break-out rooms for small group and partner activities if the platform allows. 2. Option to create a separate assignment for students to copy and paste the Exit Ticket from the TDD and turn in for ease of reviewing and providing feedback VIRTUAL CLASS: 1. Class discussion about patterns noticed in Independent Work and making sense of what that information means. 2. Review how to gather data from a pedigree. 3. Groups use herd book information and family pedigrees to calculate the proportion of offspring with different trait variations. 4. Class discussion about group results. 5. Stop and Jot answers to questions connecting back to sperm and egg cells. 6. Review patterns in sperm and egg chromosome number. 7. With a partner, students collect data from breeding pairs. (Students can use a virtual coin flip if needed) 8. Teacher records the data from each student group onto a shared platform (examples include Google Jamboard, Pinup, etc.). 9. Teacher provides information on how probability of genotypes can be calculated mathematically using Probability Rules and Punnett squares. 10. Students will calculate the probability for two crosses given the genotypes of the parents and corresponding pedigree symbols using their preferred method. 11. Students will calculate the probability of a given cross given the genotypes of the parents without pedigree symbols using their preferred method. 12. Students will reflect on whether the three questions posed at the start of the lesson have been answered.	

Return to Lesson Set Overview

Lesson 10 (3 days) - Investigation

In this Lesson, students will need the following materials to appropriately engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Optional: Progress Tracker Assignment – *teacher made*

In this Lesson, students who don't have home internet need the following print-outs or files to best engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Optional: Progress Tracker Assignment – *teacher made*
- Instructions for NetLogo Bird Breeder Simulation
- Virtual Class Recording – *after completion*

In this Lesson, students should join virtual classes on the following days to engage in learning:

- Day 2

Lesson 10 (3 days) - Investigation

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 1 (7 min) CALCULATE PERCENTAGE OF HEAVILY MUSCLED CATTLE WORLDWIDE Slide A	1. Share Lesson Slideshow with students. 2. Share Thinking Deeper Document with students.	VIRTUAL CLASS PRE-WORK: 1. Use the ratio to calculate the percentage of heavily muscled cattle there are in relation to all cattle worldwide.
Part 2 (5 min) INITIAL IDEAS ABOUT HEAVILY MUSCLED CATTLE Slide B		VIRTUAL CLASS PRE-WORK: 1. Make a prediction about how farmers can have whole herds of heavily muscled cattle if they are so rare throughout the world.
Part 3 (15 min) READ ABOUT SELECTIVE BREEDING IN CATTLE Slide C		VIRTUAL CLASS PRE-WORK: 1. Read two articles about selective breeding. 2. Mark up the texts by adding comments, underlining key words, and highlighting main ideas. 3. Fill in the checklist about each article.
Part 4 (8 min) INVESTIGATE SELECTIVE BREEDING IN OTHER ORGANISMS Slides D, E		VIRTUAL CLASS PRE-WORK: 1. Brainstorm other organisms that are selectively bred. 2. Make predictions about the simulation of the selective breeding of birds.

Day 2		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Parts 5-8 (55 min) BUILDING UNDERSTANDINGS DISCUSSION USE SELECTIVE BREEDING SIMULATION BUILDING UNDERSTANDINGS DISCUSSION UPDATE PROGRESS TRACKERS Slides F-J	VIRTUAL CLASS: 1. Class discussion about the articles students read for their Independent Work. 2. Class discussion to plan the investigation for the selective breeding of birds simulation. 3. Use the NetLogo Simulation to selectively breed birds and record data. 4. Answer questions to make sense of the data they collected. 5. Building understanding discussion around how selective breeding works and how it could be applied to any sexually reproducing organism. 6. Complete Progress Trackers to document what they learned about how farmers influence the traits of their livestock. *(Option to have students turn in their TDD or submit their Progress Tracker in a separate assignment for formative assessment.)*	

Day 3		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 9 (15 min) BRAINSTORM REQUIREMENTS FOR SELECTIVE BREEDING Slide K		VIRTUAL CLASS POST-WORK: 1. Consider what the goals of animal and plant breeders are and what steps breeders would need to follow.
Part 10 (5 min) NAVIGATION Slide L		VIRTUAL CLASS POST-WORK: 1. Consider how asexually reproducing organisms pass on their genetic information.

Return to Lesson Set Overview

Lesson 11 (1 day) - Investigation

In this Lesson, students will need the following materials to appropriately engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Shared platform for Initial Ideas
- Optional: Progress Tracker Assignment – *teacher made*

In this Lesson, students who don't have home internet need the following print-outs or files to best engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Virtual Class recording including demonstration - *after completion*
- Initial Ideas about Location of Chromosomes - *after completion*
- Optional: Progress Tracker Assignment – *teacher made*

In this Lesson, students should join virtual classes on the following days to engage in learning:

- Day 1

Lesson 11 (1 day) - Investigation

Day 1		
Lesson Components	Distance Learning Plan	
	Teacher	Student
Parts 1-6 (45 min) NAVIGATION BRAINSTORM IDEAS FOR HOW TO GET AT THE GENETIC INFO EXAMINE PROTOCOL TO EXTRACT CHROMOSOMES INVESTIGATION DEMONSTRATION CLASS DISCUSSION AND PROGRESS TRACKER DISCUSS NEXT STEPS Slides A- J	Prior to the Virtual Class, the teachers should: 1. Share Lesson Slideshow with students and Thinking Deeper Document with students. 2. Prepare to demonstrate DNA extraction VIRTUAL CLASS: 1. Students record differences between sexually and asexually reproducing plants then share and discuss. 2. Class discusses where chromosomes are found in living things. Teacher captures student ideas on a shared platform (examples include Google Jamboard, Pinup, etc.). 3. Students share ideas for how to get at the genetic material. 4. Watch a video of a scientist extracting genetic information from blood cells and discuss how a similar procedure might be used to see if asexually reproducing organisms also have genetic material. 5. Analyze materials to be used and ask questions about them. 6. Teacher demonstrates extraction of genetic material or plays videos of extraction and students record data. 7. Class discussion about what was observed and what it tells us about asexually reproducing organisms. 8. Teacher provides information about human genetic information and facilitates discussion about why it is so long. 9. Students complete progress tracker to record what they have figured out about asexual organisms and genetic information. *(Option to have students turn in their TDD or submit their Progress Tracker in a separate assignment for formative assessment.)* 10. Students consider next steps about how this genetic information in asexual organisms would get passed on and share ideas with the class.	

Return to Lesson Set Overview

Lesson 12 (2 days) - Investigation

In this Lesson, students will need the following materials to appropriately engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Collaborative Slideshow on shared platform
- Optional: Progress Tracker Assignment – *teacher made*

In this Lesson, students who don't have home internet need the following print-outs or files to best engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Planarian Observation and Bisection Video still frames - *after completion*
- Collaborative Slideshow - *after completion*
- Optional: Progress Tracker Assignment – *teacher made*

In this Lesson, students should join virtual classes on the following days to engage in learning:

- Day 2

Lesson 12 (2 days) - Investigation

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 1 (10 min) NAVIGATION AND DIRECTIONS Slides A, B, C, D, E	1. Share Lesson Slideshow with students. 2. Share Thinking Deeper Document with students.	VIRTUAL CLASS PRE-WORK: 1. Read through the information provided on the slides.
Part 2 (20 min) INDIVIDUAL WORK TO OBTAIN INFORMATION AND PLAN COMMUNICATION Slide E	1. Pre-assign each student an asexual organism to research.	VIRTUAL CLASS PRE-WORK: 1. Complete research on your assigned organism to get information on what it is, where it lives, and how it reproduces.

Day 2		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Parts 3-7 (60 min) GROUP WORK TO CREATE PRESENTATION SHARE ABOUT ASEXUALLY REPRODUCING ORGANISMS BUILDING UNDERSTANDINGS DISCUSSION PLANARIA REGENERATION DEMONSTRATION PROGRESS TRACKER Slides F-M	Prior to the Virtual Class, the teacher should: 1. Arrange for break-out rooms for organism research slide activity if the platform allows. VIRTUAL CLASS: 1. Teacher navigates students to the research that they completed in their Independent Student Work and tells them that they will collaborate with other students who were assigned the same organism to create a presentation on the organism. 2. Teacher shares Collaborative Slideshow on shared platform and students work in collaborative groups to create a slide on their organism. 3. Groups present their slide and the information on their organism. 4. Students record notes on each presentation. 5. Building understanding discussion about how asexual organisms pass on thier genetic information and what that means for the information they are passing on. 6. Record observations and questions about the planaria the teacher shows to the class. Teacher provides information about how the planaria will reproduce; students record in their Asexual Reproduction Notes. 7. Teacher bisects a planarian for demonstration. Students record additional observations and questions and make a prediction for what the planarian will look like in the next class. 8. Record what they have figured out about how asexual organisms pass on their genetic material without sperm or eggs in their progress tracker. *(Option to have students turn in their TDD or submit their Progress Tracker in a separate assignment for formative assessment.)*	

Return to Lesson Set Overview

Lesson 13 (1 day) - Investigation

In this Lesson, students will need the following materials to appropriately engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Model Discussion Board - *teacher made*

In this Lesson, students who don't have home internet need the following print-outs or files to best engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Data Sheets handouts
    - Pigeon Crest
    - Cat Allergies
    - Sunflower Seed Length
    - Duchenne Muscular Dystrophy
- Model Discussion Board - *teacher made*
- Discussion Board - *after completion*

In this Lesson, students should join virtual classes on the following days to engage in learning:

- None

Lesson 13 (1 day) - Investigation

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 1 (5 min) NAVIGATION Slides A, B	1. Reshare Class Consensus Model with students (or add to TDD). 2. Share Lesson Slideshow with students. 3. Share Thinking Deeper Document with students.	VIRTUAL CLASS PRE-WORK: 1. Reflect on any remaining questions about how the model works. 2. Answer the question about traits.
Part 2 (3 min) CONSTRUCT PURPOSE FOR READING/COMMUNICATING Slide C		VIRTUAL CLASS PRE-WORK: 1. Complete the left side of the T-Chart to construct our purpose for reading/communicating.
Part 3 (12 min) OBTAIN INFORMATION ABOUT PATTERNS OF OTHER GENES Slide D	1. Assign data sheets to students. 2. Prep Discussion Board with pages for each trait data sheet. 3. Share link to Discussion Board.	VIRTUAL CLASS PRE-WORK: 1. Read an assigned data sheet. 2. Create a model to show how the trait is inherited in the assigned organism. 3. Publish the model to the corresponding page in the Discussion Board.

Part 4 (15 min) VIEW OTHER MODELS AND PROVIDE FEEDBACK Slides E, F, G		VIRTUAL CLASS PRE-WORK: 1. View the models on the other pages of the Discussion Board. 2. Provide feedback to one model (that does not have a comment from another student already) on each of the other pages. 3. Review feedback and revise the model based on the feedback. 4. View other revised models and record similarities and differences among the models. 5. Complete the feedback Self-Assessment.
Part 5 (7 min) RECORDING OUR UNDERSTANDING Slide H		VIRTUAL CLASS PRE-WORK: 1. Return to the T-Chart from Slide C. Using the questions on Slide H, complete the right side of the chart.
Part 6 (3 min) NAVIGATION Slide I		VIRTUAL CLASS PRE-WORK: 1. Read the bullet points on Slide I. 2. Record new wonderings.

Return to Lesson Set Overview

Lesson 14 (1 day) - Investigation

In this Lesson, students will need the following materials to appropriately engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Materials for data collection: sunflower seeds, tape measure/ruler
- Google Spreadsheet for entering seed data - *teacher created*
- Optional: Progress Tracker Assignment – *teacher made*

In this Lesson, students who don't have home internet need the following print-outs or files to best engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Materials for data collection: sunflower seeds, tape measure/ruler
- Google Spreadsheet of Seed Data - *after completion*
- Generating Histograms handout
- Histogram images - *after completion*
- Optional: Progress Tracker Assignment – *teacher made*

In this Lesson, students should join virtual classes on the following days to engage in learning:

- Day 1

Lesson 14 (1 day) - Investigation

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Parts 1-7 (55 min) NAVIGATION COLLECT, GRAPH, DISCUSS ARM SPAN DATA (OPTIONAL) COLLECT AND GRAPH SUNFLOWER SEED LENGTH DATA DISCUSS SUNFLOWER SEED LENGTH DATA EXPLORE OTHER LOCALLY COLLECTED DATA SETS (IF MORE DATA IS NEEDED) SHARE AND DISCUSS OTHER EXAMPLES OF VARIATION DATA PROGRESS TRACKER Slides A-J	Prior to the Virtual Class, the teacher should: 1. Share Lesson Slideshow and Thinking Deeper Document with students. 2. Create a spreadsheet for students to record their arm span and seed length data onto. 3. Ask students to purchase some sunflower seeds and obtain a ruler or tape measure if they are able. VIRTUAL CLASS: 1. Discussion about what was figured out in the last class and what the class plans to investigate today. 2. Students measure their arm spans and record their measurements into a spreadsheet provided by the teacher. 3. Create a histogram of the arm span data collected and discuss advantages and disadvantages of large data sets. 4. Gather data on sunflower seed length and record their data onto another tab of the spreadsheet shared by the teacher. 5. Teacher reviews directions for using the histogram interactive website in order to generate a histogram about their sunflower seed data. 6. Students create a histogram and adjust intervals to observe what happens. 7. Discussion about the shape of the graph and “typical” sunflower seed length. 8. If needed, students will work in groups to source more local data such as bean or acorn length and use the interactive website to generate histograms for that data as well. 9. Discuss the patterns they notice in the histograms and what the patterns tell them about trait variations. 10. Complete the progress tracker to record what they have figured out about how common other trait variations are. *(Option to have students turn in their TDD or submit their Progress Tracker in a separate assignment for formative assessment.)*	

Return to Lesson Set Overview

Lesson 15 (2 days) - Investigation

In this Lesson, students will need the following materials to appropriately engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Classroom Consensus Model
- Optional: Progress Tracker Assignment – *teacher made*

In this Lesson, students who don't have home internet need the following print-outs or files to best engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Video of Planaria
- Recordings of Happy Birthday Song
- Classroom Consensus Model
- Optional: Progress Tracker Assignment – *teacher made*

In this Lesson, students should join virtual classes on the following days to engage in learning:

- Day 2

Lesson 15 (2 days) - Investigation

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 1 (18 min) PLANARIA REGENERATION CHECK-IN Slide A	1. Create a video of planaria and link into Slide A of slideshow. 2. Create recordings of the Happy Birthday Song and link recordings into Slide B of slideshow. 3. Share Lesson Slideshow and Thinking Deeper Document with students.	VIRTUAL CLASS PRE-WORK: 1. Watch the video of planaria. 2. Make detailed notes about your observations.
Part 2 (5 min) REFLECTION ON PLANARIA OBSERVATIONS Slide A		VIRTUAL CLASS PRE-WORK: 1. Answer the reflection questions about the planaria.
Part 3 (12 min) READ ABOUT AND REFLECT ON SONG ANALOGY Slides B, C		VIRTUAL CLASS PRE-WORK: 1. Listen to the three recordings of the Happy Birthday Song and answer questions. 2. Read the information comparing the sound of the song to phenotypes. 3. Fill in the chart for how the sound of the song would be influenced by each environment listed. 4. Reflect on connections between the environment of the song and the environment of an organism.

Part 4 (10 min) PLAN REVISIONS TO CLASSROOM CONSENSUS MODEL FOR MUSCULATURE Slide D	1. Re-share Classroom Consensus Model.	VIRTUAL CLASS PRE-WORK: 1. Re-visit the Classroom Consensus Model on Musculature. 2. Record ideas for additions or changes to the model based on the new information.

Day 2		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Parts 5-10 (60 min) NAVIGATION AND PLAN FOR READING AND COMMUNICATING READ AND MODEL INDIVIDUALLY SMALL GROUPS MEET (SAME VARIATION) JIGSAW GROUPS MEET (DIFFERENT VARIATIONS) CONSENSUS DISCUSSION PROGRESS TRACKER Slides E-L	Prior to the Virtual Class, the teacher should: 1. Determine article assignments and arrange for break-out rooms for jigsaw activity if the platform allows. VIRTUAL CLASS: 1. Discuss planaria observations and the influences of genes and the environment on trait variation. 2. Update the classroom consensus model for musculature based on discussion. 3. Teacher reviews plan for reading and communicating information for today's activity. 4. Individually read about an assigned trait variation and create a model to explain it. 5. Students with the same assigned trait variation meet in groups to collaborate and practice how they will communicate the information to their Jigsaw groups. 6. Teacher reassigns students to Jigsaw groups. Students communicate the information about their trait variation and then summarize how trait variation is influenced by genes and the environment. 7. Consensus discussion around the influence of genes and the environment on different physical traits of organisms. 8. Complete progress tracker to explain the influence of genes and the environment on trait variations. *(Option to have students turn in their TDD or submit their Progress Tracker in a separate assignment for formative assessment.)*	

Return to Lesson Set Overview

Lesson 16 (2 days) - Putting Pieces Together

In this Lesson, students will need the following materials to appropriately engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Driving Question Board
- Optional: Progress Tracker Assignment – *teacher made*
- Summative Assessment

In this Lesson, students who don't have home internet need the following print-outs or files to best engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Optional: Progress Tracker Assignment – *teacher made*
- Driving Question Board - *after completion*
- Summative Assessment

In this Lesson, students should join virtual classes on the following days to engage in learning:

- Day 1

Lesson 16 (2 days) - Putting Pieces Together

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Parts 1-4 (50 min) NAVIGATION EVALUATE OUR QUESTIONS ON THE DQB REVISIT THE DRIVING QUESTION BOARD UPDATE OUR PROGRESS TRACKERS Slides A-F	Prior to the Virtual Class, the teacher should: 1. Share Lesson Slideshow and Thinking Deeper Document with students. 2. Reshare link to Driving Question Board and provide virtual sticky dots for students to use on the DQB. 3. Arrange for break-out rooms for DQB activity if the platform allows. VIRTUAL CLASS: 1. Stop and jot what we figured out last class and the teacher facilitates discussion then navigates to today's task. 2. Independently review a list of DQB questions *(teacher should create this list in the Thinking Deeper Document prior to sharing)*. 3. Sort the questions into three categories by evaluating the degree to which they have been answered. 4. Identify three questions to provide an answer and evidence for. 5. Meet with a partner in breakout rooms to share the questions they identified answers for. *(If breakout rooms are unavailable, this can also be done by asking students to share whole-group.)* 6. Copy and drag a "sticky dot" to 5 questions on the DQB that they feel the most progress has been made on and be prepared to provide evidence for their choices in the class discussion. 7. Teacher facilitates discussion about which questions have the most "sticky dots", what we've figured out, and any remaining questions. 8. Update their progress trackers to record their understanding of why living things are different from one another. *(Option to have students turn in their TDD or submit their Progress Tracker in a separate assignment for formative assessment.)*	

Day 2		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 5 (37 min) DEMONSTRATE UNDERSTANDING ON AN ASSESSMENT TASK	1. Share Summative Assessment with students.	VIRTUAL CLASS POST-WORK: 1. Complete the Summative Assessment

Return to Lesson Set Overview