Louisiana Believes

Distance Learning Support for inquiryHub Biology

Unit 2 Bend 1: DMD – How can science make our lives better?

This resource is designed to support teachers in implementing distance learning for iHub Biology Unit 2 Bend 1. It is intended as a supporting document and should be used in conjunction with the Inquiry Hub High School Biology Curriculum Resources. The resources contained in this document have been adapted from inquiryHub Biology with permission under Creative Commons 4.0 licensing.

The 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 October 27, 2020

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. Sample Virtual Class Norms
Lesson Slideshows	Lesson progression specific to each lesson that can be shared with students in their entirety at the beginning of the lesson or broken into small portions and shared as needed. They will contain assignments for students to complete before, during, and after virtual classes, discussion boards, and home investigations. They are intended to replace the SAS documents from iHUB. These can be copied and delivered directly to students using google classroom or another platform, modified for use in your platform of choice, or printed and delivered to students without internet access.
Assignment	An assignment should be posted on a virtual platform (Google Classroom, Schoology) that can be accessed and edited by students. Assignments should have the option to “make a copy” for each student so that students can individually complete work and turn in that individual work to the teacher for review, feedback, and assessment.
Discussion Boards	Assignments designed for students to share ideas and engage in discussion with one another over time rather than a live environment. Students should use documents from individual work to plan their public discussion. Usually students will post some original comments into a group discussion and respond to a specified number of others. Ensure that norms are established for appropriate posting behavior, just like you would set norms for your classroom discussion. Teachers may choose to allow students without internet access 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

Unit 1 Bend 2	
Provided Resources Students Will Need	**Additional Materials for Students Without Internet Access**
Lesson Slideshows for each lesson: Lesson 1, Lesson 2, Lesson 3, Lesson 4, Lesson 5, Lesson 6, Lesson 7, Lesson 8, Lesson 9 **Additional Documents:** Lesson 2-8: Incremental Modeling Tracker (IMT) Lesson 5: Investigation Demo or At Home Investigation (depends on delivery) Lesson 8: Unit Assessment or Unit 2 Bend 1 Assessment Form **Additional Materials:** Lesson 5: Optional: At Home Investigation materials kit o Lactase enzyme powder (1 crushed lactaid tablet) o 1 plastic disposable pipette (3mL) o 6 Glucose test strips o Thermometer o 4 pH strips o Non-latex gloves o Safety goggles	**Prior to Lesson**: (videos and documents) ***Print Copies of All Slideshows and SEETs*** Lesson 1: DMD Video Lesson 2: Lesson 2 Student Reading; Story Board Model Guide Lesson 3: Lesson 3 Student Reading Lesson 4: Protein synthesis video **After Lesson Completion:** Virtual Class recordings: Lessons 1, 3, 4 AND Lessons 2, 5, 6, 7, 8, 9 if not converted to asynchronous delivery
While all lessons contain materials to supplement virtual class, they could be modified for asynchronous delivery by requiring submission of work for feedback and converting any group discussion into discussion boards. **Some lessons, however, are BEST suited for live instruction and a VIRTUAL CLASS should be offered for the following lessons:** 1, 3, 4 **Students COULD complete the following lessons asynchronously:** 2, 5, 6, 7, 8, 9	

Formative and Summative Assessment Opportunities:

All Slides where students fill in answers and notes can be used for formative assessment. These are to be turned in to the teacher. Feedback can be delivered through comments and work revised if needed.
All discussions (whether live or on an asynchronous Discussion Board) can be used for formative assessment
IMTs updates for each lesson
SEETs - focus quiz type assessments
Unit Assessment (delivery via your assignment platform)

Lesson List

Lesson 1 - How is life similar/different for the kids in the video?

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

- Lesson Slideshow
- Driving Question Board Question 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
- DMD Video
- Virtual Class recording - *after completion of virtual class, or prepare a video to support students in completing the slides independently*

Lesson 1 - How is life similar/different for the kids in the video?

Lesson Components	Distance Learning Plan	
	Teacher	**Student**
VIRTUAL CLASS PREWORK (Slides: 4-8) Part 1-5	1. Share Lesson Slideshow Note* An online Discussion Board Assignment could be created to allow students to share and interact with questions before virtual class	1. Watch DMD video (linked in slideshow) 2. Complete DMD research, reflection personal experience and write driving question board questions.
VIRTUAL CLASS (Slides: 10-16) Part 3&4 (sharing ideas) Part 6-8	1. Slide 10: Parts 3& 4: Facilitate Sharing initial ideas discussion *Teacher and student prompts/responses are located in iHub teacher docs. Check for student understanding of phenomenon and DMD research 2. Slide 11: Create a driving question board using either Google Slides, Jamboard, Nearpod or another engagement platform. 3. Slide 12-13: Part 6 Allow students to work independently on models. Creating digital models will make sharing easier. Using Zoom or a similar service, assign students to small group/breakout rooms to discuss their models and revise. 4. Slide 15-16: Part 7-8: Facilitate discussion to identify new questions and prioritize driving question board questions. Return to the DQB created during the work on slide 11. Refer to the Lesson 1 teacher materials and Unit 2 storyline to help guide students toward relevant questions	
VIRTUAL CLASS POST-WORK Wrap Up/Exit Ticket (Slides: 17-18)	1. Collect student questions and record in a Driving Question board for future reference.	1. Submit slides.

Return to Lesson List

Lesson 2 - What is happening to the muscles of the kids in the video?

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

- Lesson Slideshow
- Incremental Modeling Tracker (IMT)

Teacher Key to IMT

NOTE: this lesson could be done completely asynchronously with a DISCUSSION BOARD taking place of VIRTUAL CLASS.

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

- Lesson Slideshow
- Lesson 2 Student Reading (linked within slideshow)
- Story Board Model Guide
- Incremental Modeling Tracker (IMT)
- Virtual Class recording - *after completion if lesson is completed in a live session*

Lesson 2 - What is happening to the muscles of the kids in the video?

Lesson Components	Distance Learning Plan	
	Teacher	**Student**
VIRTUAL CLASS PRE-WORK (Slides: 4-6) Part 1-3, 6 20 min	1. Share Lesson Slideshow & Incremental Modeling Tracker (IMT) . 2. Deliver pre-work assignment in your preferred format. Note: This is the first appearance of the IMT for this unit. Ensure students save their file somewhere they can access it easily and direct students to submit their document at regular intervals for review. Use iHub teacher key (linked above) to evaluate student progress.	1. Watch the video and read Lesson 2 Student Reading (linked within slideshow). Complete Notice/Wonder Chart and reflection questions on Slides 4-7.
VIRTUAL CLASS (Slides: 8 - 15) Part 4-5 & 6 (revisited) 30 - 45 minutes	1. Slide 8: Facilitate sharing Ideas discussion. Guide students through sharing what they learned from the video and the reading. Refer to teacher materials for suggested prompts and responses. Part 4-5: 2. Slide 9-11: Using an interactive whiteboard, or other engagement tool, guide students through completion of the story model. Alternatively, send students to breakout rooms to complete the model in small groups. 3. Slide 11: Facilitate student sharing and comparing/contrasting models. Use the Sharing Screen feature to showcase student work. **Alternatively, the teacher could demonstrate the model and assign the model drawing as postwork. The teacher could then give students feedback on their model and assign the model sharing to a discussion board or as prework for the next class** Part 6: 4. Slide 12: Prompt students to discuss next steps or new directions. Refer to iHub Teacher materials Part 6 for suggested prompts and responses.	

VIRTUAL CLASS POST-WORK (Slides 12-14)	1. Students should begin their Unit 2 IMT **Link your IMT document to slide 12**	1. Update IMT, submit slides & IMT

Return to Lesson List

Lesson 3 - Why do healthy people get stronger with exercise, but the people with DMD don't?

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

- Lesson Slideshow
- Individual Incremental Modeling Tracker (IMT)

Teacher Key to IMT

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

- Lesson Slideshow
- Individual Incremental Modeling Tracker (IMT)
- Lesson 3 Student Reading (linked within slideshow)
- Reading 2
- Virtual Class recording - *after completion*

Lesson 3 - Why do healthy people get stronger with exercise, but the people with DMD don't?

Lesson Components	Distance Learning Plan	
	Teacher	**Student**
VIRTUAL CLASS PREWORK (Slides: 4-9) Part 1-7 (10 min)	1. Share Lesson Slideshow 2. Remind students to have their Incremental Modeling Tracker (IMT) for Virtual Class.	1. Complete slides 4-9.
VIRTUAL CLASS (Slides: 11-16) Parts 8-15 (30 min)	1. Slide 11: Facilitate sharing out of learning from prework, ensure students understand the role that dystrophin plays in muscle cell contractions 2. Slide 12-14: Facilitate small group work: using breakout rooms or another method to allow groups to come up with an analogy for dystrophin and share out after. See Teacher guide, part 8-10, for suggested prompts and student responses. 3. Slide 15: Summarize the entire story so far. See part 12 in Teacher materials for suggested prompts and responses. 4. Slide 16: Prompt students to update their IMT and discuss any progress made on answering driving questions.	
VIRTUAL CLASS POST-WORK: (Slide: 17) Part 15-18 (5 min)	1. Share Lesson 3 Student Reading with students, set up a discussion board (and optional poll) for students to engage with the question: "Should children with DMD do physical therapy?"	1. Complete reading, participate in discussion board or respond to prompts assigned by teacher.

Return to Lesson List

Lesson 4 - Why don't people with DMD make dystrophin?

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

- Lesson Slideshow
- Individual Incremental Modeling Tracker (IMT)

Teacher Key to IMT

Note, due to the higher number of prework slides than normal, parts 3-4 in the teacher materials (designing and discussing protein synthesis analogies) was omitted. The teacher could add a discussion board assignment to include these components asynchronously.

This lesson includes a computer simulation. Students with internet access can follow along with the simulation directions in the slides. Students without internet access have screenshots that will allow them to analyze the simulation results.

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

- Lesson Slideshow
- Individual Incremental Modeling Tracker (IMT)
- Protein synthesis video
- Virtual Class recording - *after completion*
- Consensus Model - *after completion*

Lesson 4 - Why don't people with DMD make dystrophin?

Lesson Components	Distance Learning Plan	
	Teacher	**Student**
VIRTUAL CLASS PREWORK Slides 4-17 Parts 1-2, 5-10	1. Share Lesson Slideshow with students. 2. Remind students to have their Incremental Modeling Tracker (IMT) for Virtual Class/Post-Work.	1. Complete slides 4-17.
VIRTUAL CLASS Part 10-12 45 minutes	1. Slide 19-20:Protein Synthesis CFU. 2. Slide 21: Demonstrate how to fill out the table students will use for investigation 2 using the example from the prework. Use this also as a CFU so students can link DNA→ protein, relate changes in DNA to changes in protein, and identify changes in the sequence of a protein to changes in structure and thus function. 3. Slide 22-23: Use a breakout room/small group strategy to allow students to work collaboratively to complete another example using the simulation (for example: put students in groups of four and assign each to complete a different type of mutation/or number of nucleotides affected, have them share within their groups). 4. Slide 24: allow students to share out findings from investigation 2 and include CFUs to verify all students understand the link between DNA sequence and protein structure/function See teacher guide part 11 for suggested prompts and responses. **if time allows, or if necessary, guide students through filling out their IMT before ending virtual class**	
VIRTUAL CLASS POSTWORK (Slides: 26-29)	1. Explain postwork (reading, responses, IMT update if necessary).	1. Complete prompts on slide 27, update IMT. 2. Submit slides and IMT update.

Return to Lesson List

Lesson 5 - What do different proteins do?

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

- Lesson Slideshow
- Individual Incremental Modeling Tracker (IMT)
- Investigation Demo Document (substitute materials below if students are performing the lab at home)
- Optional: At Home Investigation and materials kit:
    - Lactase enzyme powder (1 crushed lactaid tablet)
    - 1 plastic disposable pipette (3mL)
    - 6 Glucose test strips
    - Thermometer
    - 4 pH strips
    - Non-latex gloves
    - Safety goggles

Teacher Key to IMT

This lesson includes an optional at home lab. If students are completing the lab at home, make sure students have access to the materials, schedule a live support session if desired, and stress any relevant safety information provided in the teacher edition. Alternatively, this can be completed asynchronously with a recorded teacher demonstration. If choosing to do this lesson asynchronously, either as a home investigation or with a teacher video, Slide 11 will need to be modified and moved to Pre-Work and a Discussion Board for the questions on Slide 13 will need to be created and assigned.

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

- Lesson Slideshow
- Individual Incremental Modeling Tracker (IMT)
- Investigation Demo Document (substitute materials below if students are performing the lab at home)
- Discussion Board - *after completion*
- Consensus Model - *after completion*

Lesson 5 - What do different proteins do?

Lesson Components	Distance Learning Plan	
	Teacher	Student
VIRTUAL CLASS PREWORK (Slides: 4-10) Parts: 1-5 30 min Or 90 min with at home investigation	1. Make any changes needed to slideshow and create and assign Discussion Board if delivering the lesson asynchronously with a home investigation or recorded demo. 2. Share Lesson Slideshow and Investigation Demo Document (substitute At Home Investigation document if needed)	1. Complete slides 4-9 independently
VIRTUAL CLASS (* could be adapted to asynchronous if students supplied video of demo and Discussion Board replaces in class discussion) (Slides: 11-13) Parts 5(cont) - 8 30 min	1. ***NOTE****Slide 11: Teachers will need to modify this slide depending on whether they are doing the lab live with students. If students will not be doing this lab, add a data table to this slide so students can complete the analysis questions in the handout. Move this slide to prework if students will be completing the investigation asynchronously. 2. Slide 12: Facilitate a building understanding discussion to debrief what students experienced and noticed during the lab activity. 3. Slide 13: Facilitate a consensus building discussion to help students summarize what they learned during the lab, and orient them back to the DMD storyline **note about asynchronous delivery: Have students participate in a discussion board to answer the questions from slide 13	
VIRTUAL CLASS POST-WORK	1. Provide feedback on lab analysis questions	1. Submit lab work

Return to Lesson List

Lesson 6 - How did the boys in the video get the mutation that results in DMD?

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

- Lesson Slideshow
- Individual Incremental Modeling Tracker (IMT)

Teacher Key to IMT

NOTE: Lesson could be done asynchronously by substituting a DISCUSSION BOARD for the VIRTUAL CLASS.

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

- Lesson Slideshow
- Lesson 6 Reading (linked within slideshow)
- Individual Incremental Modeling Tracker (IMT)
- Virtual Class recording - *after completion*

Lesson 6 - How did the boys in the video get the mutation that results in DMD?

Lesson Components	Distance Learning Plan	
	Teacher	Student
VIRTUAL CLASS PREWORK (slides 4-13) Parts: 2-4	1. Make any changes needed to slideshow and create and assign Discussion Board if delivering the lesson asynchronously. 2. Share slide show Lesson Slideshow with students.	1. Create an initial model of where mutations come from. 2. Read Lesson 6 Reading and answer comprehension questions 3. Complete an updated model.
VIRTUAL CLASS (slides 10-12) Parts 1 & 5 30 min	1. Slide 15: Facilitate a Building understanding discussion to guide students through the new information they learned in the reading, and allow students to share their second models. Refer to iHub teacher materials, Part 4, for suggested prompts and responses.	
VIRTUAL CLASS POST WORK (slide 13-14) Part 4	1. Review student summaries on Slide 13.	1. Submit slides, update IMT.

Return to Lesson List

Lesson 7- Why is DMD affecting mostly boys?

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

- Lesson Slideshow
- Individual Incremental Modeling Tracker (IMT)

Note, this lesson could be done completely Asynchronously. Students could be assigned a single case study, and then a discussion board assignment to share and read about other case studies, or assign students to complete all three case studies.

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

- Lesson Slideshow
- Individual Incremental Modeling Tracker (IMT)
- Virtual Class recording - *after completion*

Lesson 7 - Why does DMD affect mostly boys?

Lesson Components	Distance Learning Plan	
	Teacher	**Student**
VIRTUAL CLASS PREWORK (slides 4-17) Parts: 2, 3	1. Make any changes needed to slideshow and create and assign Discussion Board if delivering the lesson asynchronously. 2. Share Lesson Slideshow with students. *NOTE: on Slide 6, students will need to have an assigned case study or be directed to choose one. The cases get progressively difficult.	1. Complete Slides 4-6. 2. Complete one case study to investigate--student's choice, or teacher assigned case study.
VIRTUAL CLASS (slides 19-20) Parts: 3 & 5 30 min	1. Sharing Initial ideas/Building understanding. Students share out their case study findings. 2. Guide students through a consensus building discussion about which pattern of inheritance is seen in DMD	
VIRTUAL CLASS POST WORK (slide21)	1. Assign response Slide 21.	1. Complete Slide 21, submit slides.

Return to Lesson List

Lesson 8 - What is our model to explain what is happening in people with DMD?

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

- Lesson Slideshow
- Individual Incremental Modeling Tracker (IMT)
- Unit 2 Bend 1 Assessment: Google Form OR Assessment Document

NOTE: this lesson could be done completely asynchronously with a DISCUSSION BOARD taking place of VIRTUAL CLASS.

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

- Lesson Slideshow
- Individual Incremental Modeling Tracker (IMT)
- Assessment Document
- Virtual Class recording - *after completion*
- Consensus Model - *after completion*

Lesson 8 - What is our model to explain what is happening in people with DMD?

Lesson Components	Distance Learning Plan	
	Teacher	Student
VIRTUAL CLASS PREWORK (slides 4-6) Parts: 1	1. Make any changes needed to slideshow and create and assign Discussion Board if delivering the lesson asynchronously. 2. Share Lesson Slideshow with students.	1. Complete final explanatory model for DMD.
VIRTUAL CLASS (slides 1-2) Parts: 4-5 30 min	1. Facilitate sharing of completed student models. - Breakout rooms or discussion boards could be used in place of a gallery walk for comparing student models. 2. Facilitate Building Consensus discussion to ensure models contain enough information (see targets below). • We figured out that DMD affects the muscles. • DMD is related to a protein called dystrophin that acts as a binding protein holding together other proteins in a muscle cell. • People with DMD don't make a functional version of the dystrophin protein so overtime, their muscles cells stop working, cannot repair themselves, and atrophy/die off. • DMD is a result of a gene mutation that is passed down from mothers on the X chromosome. The gene mutation means that through transcription and translation a different protein that doesn't work properly is made. • Only boys get DMD because they have one copy of the X chromosome (from mom) and one copy of the Y chromosome (from dad) and therefore they only have 1 DMD gene from which to make the protein. • Guide students through Part C (boldness and CORT graph), slides 8-11, and build understanding of relationship between CORT levels and bold behavior of campus juncos. (10 min)	

	3. Bring the evolution model back into discussion, slide 12. Walk through the components and identify each in the junco story. Ensure students understand that a trait must impact survival/fitness in order to be subjected to the force of natural selection. (10 min)	
VIRTUAL CLASS POST WORK (slide10) Parts: 3	1. Direct students to complete slide 10. 2. Make a copy of this form, Unit 2 Bend 1 Assessment Form or assign students to complete the Assessment on your preferred platform.	1. Complete Unit 2 Bend 1 Assessment and submit the final model.

Return to Lesson List

Lesson 9 - If you were a genetic counselor, what questions would you need to ask a couple hoping to conceive a child?

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

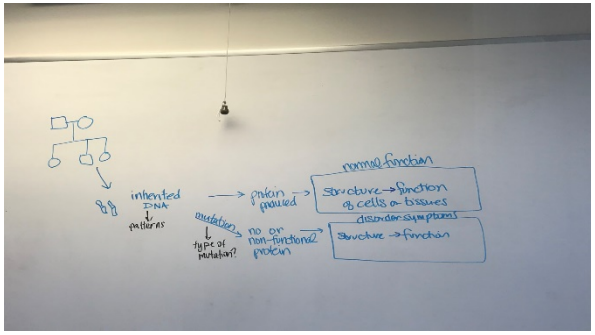
- Lesson Slideshow

This lesson could be delivered Asynchronously, omit slides 11-12 and convert slides 13-15 to a discussion board assignment

Materials for students without internet access:

- Lesson Slideshow
- Virtual Class recording - *after completion*
- Consensus Model - *after completion*

Lesson 9 - If you were a genetic counselor, what questions would you need to ask a couple hoping to conceive a child?

Lesson Components	Distance Learning Plan	
	Teacher	Student
VIRTUAL CLASS PREWORK (slide 4-9) Parts: 2-3	1. Share Lesson Slideshow with students.	1. Explore genetic counselor career. 2. Complete prompts on slides 4-9, develop a written explanation and model for inheritance of genetic disorders
VIRTUAL CLASS (slide 11-15) Parts: 1 and 4	1. Facilitate sharing of student responses to genetic counseling questions and allow students to share their inheritance models 2. Facilitate a sharing ideas discussion around pros-and-cons of types of genetic testing--it may be necessary to incorporate a video or discussion about types of genetic testing that are available if students did not identify any in the prework. 3. Build a final class consensus model for the inheritance of genetic disorders. Sample:  4. Wrap up the Bend--what questions can be answered from the DQB, what are we still wondering? Capture student responses in a virtual whiteboard or other document.	

VIRTUAL CLASS POST WORK		1. Complete slides and submit.

Return to Lesson List