Louisiana Believes

Distance Learning Support for inquiryHub Biology
Unit 3 Bend 2: Ecosystems – Trees

This resource is designed to support teachers in implementing distance learning for iHub Biology Unit 3 Bend 2. 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 March 31, 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. Sample Virtual Class Rules
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 prior to submitting. 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

** **NOTE:** All slideshows and links to readings (including the ones on slideshows) and will allow you to edit your own copy. You will need to be sure to share **your** copy with students once you have made any needed adjustments**

Unit 3 Bend 2	
Resources Students Will Need	**Additional Materials for Students Without Internet Access**
Lesson Slideshows for each lesson: Lesson 11, Lesson 12, Lesson 13, Lesson 14, Lesson 15, Lesson 16, Lesson 17, Lesson 18, Lesson 19, Lesson 20, Lesson 21, Lesson 22, Lesson 24 **Note: Lesson 23 omitted from virtual learning plan* **Additional Documents:** IMT *Linked within slideshows:* Student Reading - Bell Jar (L12) Student Reading: Roots (L14) Lesson 15 Reading #1 & Lesson 15 Reading #2 Lab Procedures (L16) Root Tip Images (L17) SEET (L17) Assessment Slideshow or Document (L20) Optional field work instructions (L21) Evaluation Criteria Sheet & Teacher Developed Rubric (L24)	**Prior to Lessons** (videos and documents): ***Print Copies of Slideshows and SEETs*** Lesson 11: • NASA Video: A Year in the Life of Earth's CO2 • Screenshot of CO2 Level for assigned date and graph • Trees Video Lesson 12: • Class model Lesson 13: • Access to the Computational Model – *teacher may consider providing a screencast of the investigations via flashdrive* Lesson 17: • Time Lapse Video Lesson 21: • Access to i-Tree Design website or screencast video • Printouts or screenshots from the following sites: Denver Digs Trees, National Forest Foundation, The Nature Conservancy Lesson 24: • Printed information or screenshots from links within slideshow: Link 1, Link 2, Link 3, Link 4, Link 5 **After the Lesson: Recordings of Virtual Classes, Access to peer presentations in Lesson 14**

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.

Option to deliver Lessons 18 & 20 completely asynchronously.

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. Specific slide suggestions for formative assessment:
Lesson 11: Initial Model Slide 11 (pre-assessment); Lesson 12: Slides 6 & 9; Lesson 13: 4 & 6; Lesson 14: Slides 25, 26

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
Transfer Tasks (delivery via your assignment platform)

Lesson List

Lesson 11 - How can we reduce the negative impacts of human activity on climate?

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

- Lesson Slideshow
- 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
- IMT
- NASA Video: A Year in the Life of Earth's CO2
- Screenshot of CO2 Level for assigned date and graph
- Trees Video
- Virtual Class recording - *after completion of virtual class, or prepare a video to support students in completing the slides independently*

Note The iHUB teacher guide includes a broken link. We substituted https://climate.nasa.gov/vital-signs/carbon-dioxide/ for students to see recent changes in carbon dioxide levels.

Teacher Key for IMT

Lesson 11 - How can we reduce the negative impacts of human activity on climate?

Lesson Components	Distance Learning Plan	
	Teacher	Student
VIRTUAL CLASS PREWORK (Slides: 1-7) Part 1, 2	1. Make any needed adjustments to Lesson Slideshow (video and graphs embedded) and assign your copy.	1. Complete slides 2-7.
VIRTUAL CLASS (Slides: 8-14) Part 3-6, 10	1. Discuss Prework. 2. Watch new video. 3. Record/Discuss Claims from video. 4. Create initial model and share.	
VIRTUAL CLASS POST-WORK Wrap Up/Exit Ticket (Slides: 16-17) Parts 7-9	1. Modify instructions on slides 14-15 if needed. 2. Collect student questions for DQB.	1. Contribute Qs to DQB. 2. Turn in slides. 3. Transfer IMT to IMT doc (if using).

Return to Lesson List

Lesson 12 - Do trees really change the composition of the atmosphere around us?

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

- Lesson Slideshow
- Individual copy of 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
- Student Reading - Bell Jar
- Individual copy of IMT

Teacher Key for IMT

Lesson 12 - Do trees really change the composition of the atmosphere around us?

Lesson Components	Distance Learning Plan	
	Teacher	**Student**
VIRTUAL CLASS PREWORK (Slides: 1-9) Parts 1-4	1. Deliver DQB from L11 student Qs (add link or image to slide 4). 2. Assign your copy of Lesson Slideshow.	1. View DQB. 2. Complete slides 4-9 including the reading on slide 8 and the 4C analysis tool on slide 9.
VIRTUAL CLASS (Slides 10 -15 Parts 5-9	1. Share and discuss revised models. 2. Building Understandings Discussion of 4Cs. 3. Develop a class model of the experiment from the reading. 4. Discuss new questions and next steps.	
VIRTUAL CLASS POST-WORK (Slides 16-18)	1. Assess student work. 2. Optional - post IMT suggestions.	1. Add to IMT. 2. Turn in slides.

Return to Lesson List

Lesson 13 – How does carbon dioxide get into the tree and what does the tree do with it?

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

- Lesson Slideshow
- Individual copy of 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 copy of IMT
- Access to the Computational Model – *teacher may consider providing a screencast of the investigations via flashdrive*

Teacher Key for IMT

Lesson 13 – How does carbon dioxide get into the tree and what does the tree do with it?

Lesson Components	Distance Learning Plan	
	Teacher	**Student**
VIRTUAL CLASS PREWORK (Slides: 1-11) Parts 1-5	1. Deliver your copy of Lesson Slideshow.	1. Complete Investigation A.
VIRTUAL CLASS (Slides:11-22) Part 6-7	1. Discuss Investigation A. 2. Run Investigation B (teacher shares tab in virtual class or assigns each student to run then report in). 3. Plan and Run Investigation C. 4. Share/Discuss Findings.	
VIRTUAL CLASS POSTWORK (Slides 23-28) Parts 8 -12	1. Post IMT suggestions or have a mini class to discuss with whole group. 2. Assess student work. 3. Optional: Create and deliver Focus Quiz SEET.	1. Complete Investigation D. 2. Turn in Slideshow. 3. Add to IMT.

Return to Lesson List

Lesson 14 - How does a tree get the water it needs for photosynthesis?

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

- Lesson Slideshow
- Individual copy of 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
- Lesson 14 Reading: Roots
- Individual copy of IMT

Teacher Key for IMT

Lesson 14 - How does a tree get the water it needs for photosynthesis?

Lesson Components	Distance Learning Plan	
	Teacher	**Student**
VIRTUAL CLASS PREWORK (Slides 1-10) Parts 1, 2, 4	1. Edit slide with class specific links. 2. Deliver your copy of Lesson Slideshow.	1. Create initial model from images. 2. Read and annotate (if required by teacher) Lesson 14 Reading: Roots. 3. Revise model.
VIRTUAL CLASS (Slides 11-16) Part 5-7	1. Discuss reading. 2. Share student models. 3. Collaborate on class model. 4. Update IMT.	
VIRTUAL CLASS POST-WORK (Slides 17-18)	1. Assess student work.	1. Turn in slides.

Return to Lesson List

Lesson 15 - How does a tree move water and other molecules around?

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

- Lesson Slideshow
- Individual copy of 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
- Lesson 15 Reading #1
- Lesson 15 Reading #2
- Individual copy of IMT

Teacher Key for IMT

Lesson 15 - How does a tree move water and other molecules around?

Lesson Components	Distance Learning Plan	
	Teacher	Student
VIRTUAL CLASS PREWORK (Slides: 1-11) Parts 1-5	1. Edit and deliver slides 2. OPTIONAL: This could be modified to be a "virtual assignment" with a brief meeting to discuss results prior to Lesson 16	1. Complete Investigations 1 and 2 2. Optional: pre-read one of the 2 readings
VIRTUAL CLASS (Slides: 11-15) Parts 6-9	1. Hold Sharing Ideas discussion 2. Break out for reading and rejoin after 15 minutes 3. Share info from readings/Hold Making Sense discussion	
VIRTUAL CLASS POST-WORK (Slides: 1-11) Part 10	1. Assess student written explanation and slides	1. Revise model 2. Develop written explanation

Return to Lesson List

Lesson 16 - How does a tree use glucose?

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

- Lesson Slideshow ** note - you may want to divide this into multiple slideshows, depending on how you decide to deal with section 2*
- Lab Procedures
- Individual copy of 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
- Lab Procedures
- Individual copy of IMT

*note - iHub estimates 150 minutes for this lesson in a traditional setting. This revision will break it down into 3 sections. Section 2 is the “wet lab” portion. If you are all virtual, you may want to simply demonstrate the labs with a self-made video lesson. If you are hybrid, have in-person students run the lab and share results with a virtual partner. This section can be skipped of the teacher or the class decide the lab is impracticable.

Teacher Key for IMT

Lesson 16 - How does a tree use glucose?

Lesson Components Section 1	Distance Learning Plan	
	Teacher	Student
VIRTUAL CLASS PREWORK (Slides: 1-10) Parts 1-3	1. Distributed edited version of slideshow	1. Complete slides 1-10
VIRTUAL CLASS (Slides: 11-15) Part 3	1. Sharing Ideas discussion of slides 4-7: What patterns did you notice? (**see Teacher Guide for anticipated student responses) 2. Building Understandings discussion of reading plus nutrition info: "Now that we know a little more about carbohydrates, let's take a closer look at all the carbohydrates on the nutritional information sheet. What do you notice? What patterns do you see?" Have students share what they notice. Students should see that total carbohydrates do not equal the amount of dietary fiber and sugars combined. (**see Teacher Guide for anticipated student responses and "Additional Guidance") 3. Teacher will present info on how to test for different carbohydrates. Decide as a class (or explain the teacher decision) whether to accept the nutritional information as given or whether to verify with in-class tests. If yes, go to section 2, if no, go to section 3. For either option give postwork instruction to turn in slides	
VIRTUAL CLASS POSTWORK (Slide 16)	1. Evaluate student work	1. Turn in slides

Lesson Components Section 2	Distance Learning Plan	
	Teacher	**Student**
VIRTUAL CLASS or POSTWORK (Slides: 17-26) Parts 4-6	1. Deliver copies of how to test for different carbohydrates. 2. Approve student plans and give permission to begin data collection. 3. Prepare for Section 3.	1. Slides 18-23 2. Follow procedures and collect data 3. Slides 23 - 25 (all students should complete these with data from in-person collection or teacher-made lab video)

Lesson Components Section 3	Distance Learning Plan	
	Teacher	**Student**
VIRTUAL CLASS PREWORK (Slides: 27-37) Part 7	1. Deliver last section of slides (if delivered in separate sections)	1. Examine models of carbohydrates and record things you notice, things you wonder, and explain patterns
VIRTUAL CLASS (Slides: 11-22) Part 8	1. Slides 38-42 - Consensus Building and Making Sense discussions as detailed in slides 2. Discuss postwork summary assignment	
VIRTUAL CLASS POSTWORK (Slides 43-45) Part 9	1. Evaluate student work	1. Slides 43-45 Summarize Findings and turn in slides

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Lesson 17 - What is the role of cellulose in carbon sequestration?

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

- Lesson Slideshow
- Root Tip Images
- SEET
- Individual copy of 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
- Root Tip Images
- Time Lapse Video
- SEET
- Individual copy of IMT

Teacher Key for IMT

Lesson 17 - What is the role of cellulose in carbon sequestration?

Lesson Components	Distance Learning Plan	
	Teacher	Student
VIRTUAL CLASS PREWORK (Slides: 1-9) Parts 1-3	1. Deliver Lesson Slideshow (or your edited version).	1. Complete initial model and focus thinking.
VIRTUAL CLASS (Slides: 10-18) Part 4-6	1. Watch Video and record notices and wonders. 2. Hold initial ideas discussion. 3. Explore Mitosis. 4. Hold making sense discussion.	
VIRTUAL CLASS POSTWORK (Slides 19-22) Parts 7-9	1. Post IMT suggestions or have a mini class to discuss with whole group. 2. Assess student work. 3. Optional: Edit and deliver Focus Quiz SEET	1. Record Making Sense portion. 2. Scientific Writing. 3. SEET.

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Lesson 18 - Where do trees get the other materials they need to grow?

*This lesson includes NPK soil testing. If you are able, include actual test results from your own testing or your Agriscience colleagues. The bulk of this lesson is independent, and could be altered to omit the virtual class where nutrient cycling models are shared.

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

- Lesson Slideshow
- Individual copy of 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 copy of IMT

Teacher Key for IMT

Lesson 18 - Where do trees get the other materials they need to grow?

Lesson Components	Distance Learning Plan	
	Teacher	**Student**
VIRTUAL CLASS PREWORK (Slides: 1-16) Parts 1-6	1. Add NPK test data and instructions (optional). 2. Deliver Lesson Slideshow (or your edited version).	1. React to molecule models. 2. Read for information. 3. Examine Nutrient Cycles and use to create ecosystem model.
VIRTUAL CLASS (Slides:17-22) Parts 7-8	1. Engage in Building Understandings Discussion. 2. Share Models. 3. Revise IMT.	
VIRTUAL CLASS POSTWORK (Slides: 23-28)	1. Assess student work.	1. Turn in slides.

Return to Lesson List

Lesson 19 - Where do trees get the energy to grow?

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

- Lesson Slideshow
- Individual copy of 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 copy of IMT

Teacher Key for IMT

Lesson 19 - Where do trees get the energy to grow?

Lesson Components	Distance Learning Plan	
	Teacher	**Student**
VIRTUAL CLASS PREWORK (Slides: 1-11) Parts 1-3	1. Assign students to Groups A, B, and C. 2. Deliver your version of Lesson Slideshow.	1. Complete reflection. 2. Read assigned slide and answer questions.
VIRTUAL CLASS (Slides: 11-22) Parts 4, 6, 7	1. Share initial ideas and take-ways from the reading jigsaw. 2. Making Sense discussion about the relationship between cellular respiration and photosynthesis. 3. Analyze evidence. 4. Revisit DQB.	
VIRTUAL CLASS POSTWORK (Slides: 23-28) Part 5	1. Evaluate student work.	1. Revise model. 2. Update IMT. 3. Turn in slides.

Return to Lesson List

Lesson 20 - What model can we make to connect everything we have learned so far to explain how trees can reverse climate change?

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

- Lesson Slideshow - Model Planning
- Assessment Slideshow or Assessment Doc

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

- Lesson Slideshow - Model Planning
- Assessment Doc

Teacher Model Exemplar

Lesson 20 - What model can we make to connect everything we have learned so far to explain how trees can reverse climate change?

Lesson Components	Distance Learning Plan	
	Teacher	**Student**
VIRTUAL CLASS PREWORK (Slides: all - Model Planning) Part 1	1. Deliver Lesson Slideshow - Model Planning. 2. Schedule Assessment (available as slides or doc). 3. Schedule Post assessment feedback.	1. Complete Model Planning.
VIRTUAL CLASS (Slides: all - Assessment Slideshow) Part 2	1. If possible, schedule a 45-minute time slot for students to complete the assessment while you are present (virtually). Otherwise, deliver and set due date.	
VIRTUAL CLASS POSTWORK Part 3	1. Schedule time to meet with students to discuss common misunderstandings or opportunities for improvement.	1. Revise or complete remediation as assigned.

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Lesson 21 - Just how much carbon can 1 million trees store?

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

- Lesson Slideshow
- Optional field work instructions

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

- Lesson Slideshow
- Access to i-Tree Design website or screencast video
- Printouts or screenshots from the following sites: Denver Digs Trees, National Forest Foundation, The Nature Conservancy
- Optional field work instructions

*note - this lesson includes measuring actual trees at school. It requires using a database and a reasonable comfort level with math calculations. If you are all virtual, you will have to skip this or provide data to your students to use. We have included the iHub doc with instructions for this field experience, but will substitute the i-Tree online tool in the slides.

Lesson 21 - Just how much carbon can 1 million trees store?

Lesson Components	Distance Learning Plan	
	Teacher	**Student**
VIRTUAL CLASS PREWORK (Slides: 1-5) Parts 1	1. Deliver your version of Lesson Slideshow.	1. Investigate Tree planting programs.
VIRTUAL CLASS (Slides: 6-10) Parts 2-4 (alt version)	1. Sharing Initial Ideas discussion. 2. Introduce i-Tree (optional - explain field procedure then provide alternative). 3. Assign student post-work (optional - must use an actual tree species found at school or home).	
VIRTUAL CLASS POSTWORK (Slides: 11-13) Part 4-5 (alt)	1. Review student work.	1. Complete i-Tree assignment. 2. Turn in slides.

Return to Lesson List

Lesson 22 - Should we plant a million of the same kind of tree?

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

- Lesson Slideshow
- Individual copy of 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
- One of the following readings (linked within slideshow):
    - Reading: Emerald Ash Borer
    - Reading: Dutch Elm Disease
    - Reading: Chestnut Blight
- Individual copy of IMT

Teacher Key for IMT

Lesson 22 - Should we plant a million of the same kind of tree?

Lesson Components	Distance Learning Plan	
	Teacher	Student
PREWORK (Slides: 1-7) Parts 1,2,4	1. Deliver slides (option: deliver docs instead with annotation instructions)	1. Complete reflection. 2. Read, annotate, and record notes about assigned reading.
VIRTUAL CLASS (Slides: 8-12) Part 3, 5-8	1. Discuss Initial ideas. 2. Share info from readings. 3. Hold Consensus Building Discussion. 4. Plan next steps.	
POSTWORK (Slides: 13-14)	1. Assess student work.	1. Update IMT. 2. Turn in slides.

Return to Lesson List

Lesson 24 - How does planting trees compare to other solutions for climate change?

*note - This is the final lesson. There is no prework. The class will meet to decide on criteria for evaluating a solution for climate change. Once the criteria are established, the teacher will edit the sheet to reflect the class consensus. Students will then research and present one idea for a solution to climate change (either individually or in groups). Teachers can adapt this to be as simple or elaborate as needed due to time constraints.

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

- Lesson Slideshow
- Evaluation Criteria Sheet
- Teacher Developed Rubric (for ideas check here)

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

- Lesson Slideshow
- Evaluation Criteria Sheet
- Teacher Developed Rubric (for ideas check here)
- Printed information or screenshots from links within slideshow: Link 1, Link 2, Link 3, Link 4, Link 5
- Access to peer presentations

Lesson 24 - How does planting trees compare to other solutions for climate change?

Lesson Components	Distance Learning Plan	
	Teacher	**Student**
VIRTUAL CLASS (Slides: 1-6) Part	1. Warm-up - Discuss prior knowledge. 2. Establish Criteria. 3. Introduce Project Goals.	
PRESENTATIONS – CAN BE DONE IN A VIRTIAL CLASS SETTING OR ASYNCHRONOUSLY (Slides: 7-8) Parts	1. Deliver instructions/requirements for presentations along with due dates. 2. Deliver Evaluation Criteria Sheet after adding your criteria. (this is intended for students to evaluate 5 peer projects with a 1-10 rating and is set to add the scores for each criterion).	1. Decide on solution. 2. Research solution. 3. Develop slides/brochure/script/etc. 4. Present and share solution. 5. Evaluate up to 5 peer presentations.

Return to Lesson List