Louisiana Believes

Distance Learning Support for OpenSciEd Grade 6
Unit 8.4 Earth in Space Field Test Unit

This resource is designed to support teachers in implementing distance learning for OpenSciEd Grade 6 Unit 8.4, Unit 5 on the Louisiana Guide to Piloting OpenSciEd Grade 6. It is intended as a supporting document and should be used in conjunction with the OpenSciEd Unit 8.4 Unit 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 January 12, 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

Lesson Set 1: Lessons 1-4		
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 **Thinking Deeper Documents for each lesson:** Lesson 1 TDD, Lesson 2 TDD, Lesson 3 TDD, Lesson 4 TDD **Additional Documents:** Lesson 1: Systems Modeling Scaffold Lesson 2:*(optional)* Northern Hemisphere and Southern Hemisphere Season Lesson 4: Assessment Modeling the Sun-Moon-Earth	**Teacher Made Resources:** • Discussion Boards: Lessons 1, 3, 4 • Driving Question Board: Lessons 1, 3 • Consensus Model: Lessons 1, 2 • Patterns in the Sky Class Chart: Lesson 1 **Other Materials:** Lesson 2: • Materials for models (styrofoam ball, push-pins, rubber band, wooden dowel, light source) • Materials for investigation (graph paper, flashlight, ruler, pencil, tape, hardcover book) Lesson 3: • Modeling Moon Phases Materials: 4-inch Styrofoam sphere, dowel, block with hole drilled or putty, skewer, thick rubber band, thumbtack, twist tie, 1-inch Styrofoam sphere, bulb socket, bright lightbulb, phone camera or webcam, extension cord with power strip, plastic clamp	**Prior to Lesson**: Lesson 1 • Link to Podcasts • Podcast transcripts (one per student): Annette Lee: As It Is Above, It Is Below, Gerardo Aldana: The Descent of the Feathered Serpent, Jessie Ferrari: Wombat Season, Thebe Medupe: Rebirth of Selemela • Alternate ways for students to contribute ideas to virtual charts/boards Lesson 2: • Stellarium Software - *screen recording* Lesson 3: • Moon Phase Simulation - *screen recording* Lesson 4: • Videos: Lunar eclipse, Solar eclipse 1, Solar Eclipse 2 **After Lesson Completion:** Virtual Class recordings: Lessons: 1, 2, 3 ,4 Consensus Model: Lessons 1, 2 Driving Questions Board: Lessons 1, 3 Discussion Boards: Lessons 1, 3, 4

Students should ideally join VIRTUAL CLASS on the following days:

Days 1 & 3 - Lesson 1	Days 6 & 7 - Lesson 2	Day 9 - Lesson 3	Days 11 & 12 – Lesson 4

Formative and Summative Assessment Opportunities:

Lesson 1: Initial Model
Lesson 2: Supporting/Refuting Explanation Day 2 Virtual Class Post-Work, Consensus Discussion for understanding seasonal patterns Day 3
Lesson 3: Exit Ticket Discussion Board Day 1, Building Understanding Discussion Day 2
Lesson 4: Making Claims Discussion Board & Progress Tracker Day 1; Lesson 4 Assessment Day 2

Lesson Set Overview: Lessons 5, 6, 7, 8

<table>
<tr><th colspan="3">Lesson Set 2: Lessons 5-8</th></tr>
<tr><th>Provided Resources Students Will Need</th><th>Additional Resources Students Will Need</th><th>Additional Materials for Students Without Internet Access</th></tr>
<tr>
<td>Lesson Slideshows for each lesson:

L5, L6, L7, L8

Thinking Deeper Documents for each lesson:

Lesson 5 TDD, Lesson 6 TDD, Lesson 7 TDD, Lesson 8 TDD

Additional Documents:
Lesson 8 Assessment</td>
<td>Teacher Made Resources:

Discussion Boards: Lessons 5, 7, 8
Driving Question Board: Lesson 8

Lesson 6: Virtual Diamond Discussion (shared document for each group - see examples here)
Lesson 7: Things in Orbit chart (from Lesson 6)

Other Materials:

Lesson 8: Thinking Deeper Documents from Lessons 1-7</td>
<td>Prior to Lesson:
Lesson 5: Moon Orbit Simulation – (screen recording)

After Lesson Completion:

Virtual Class recordings: Lessons 6, 8
Consensus Model: Lesson 8
Driving Questions Board: Lesson
Discussion Board: Lessons 5, 6, 7, 8
Lesson 6: Things in Orbit chart</td>
</tr>
<tr><td colspan="3">Students should ideally join VIRTUAL CLASS on the following days:
Day 2 - Lesson 6 Days 5 & 6 - Lesson 8</td></tr>
<tr><td colspan="3">Formative and Summative Assessment Opportunities:
Lesson 5: Building Ideas Discussion Board
Lesson 6: Virtual Diamond Discussion
Lesson 7: Big Ideas Discussion Board
Lesson 8: Lesson 8 Assessment</td></tr>
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Lesson Set Overview: Lessons 9, 10, 11, 12

Lesson Set 3: Lessons 9-12		
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 **Thinking Deeper Documents for each lesson:** Lesson 9 TDD, Lesson 10 TDD, Lesson 11 TDD, Lesson 12 TDD **Additional Documents:** Lesson 12: Individual Assessment	**Teacher Made Resources:** Discussion Boards: Lessons 9 & 11 Driving Question Board: Lesson 9 Exit Ticket Assignments: Lesson 10, 11, 12 Lesson 9: Class poll Lesson 12: "Data We Need to Decide if There are Planets Around Other Stars" virtual poster	**Prior to Lesson:** Lesson 10: One of the following infographics: • Dwarf Planet Infographic • Gas Giants Infographic • Jupiter's Moons Infographic • Mars Infographic • Our Moon Infographic • Saturn's Moons Infographic **After Lesson Completion:** Discussion Board – Lessons 9, 11 Virtual Class recordings – Lessons 10, 12
Students should ideally join VIRTUAL CLASS on the following days: Day 2 - Lesson 10 Days 4 & 5 – Lesson 12		
Formative and Summative Assessment Opportunities: Lesson 10: Exit Ticket Lesson 11: Making Sense Discussion Board, Exit Ticket Lesson 12: Lesson 12 Assessment		

Lesson Set Overview: Lessons 13, 14, 15, 16

<table>
<tr><th colspan="3">Lesson Set 4: Lessons 13-16</th></tr>
<tr><th>Provided Resources Students Will Need</th><th>Additional Resources Students Will Need</th><th>Additional Materials for Students Without Internet Access</th></tr>
<tr>
<td>Lesson Slideshows for each lesson:

L13, L14, L15, L16

Thinking Deeper Documents for each lesson:

Lesson 13 TDD, Lesson 14 TDD, Lesson 15 TDD, Lesson 16 TDD

Additional Documents:

Lesson 13: Model Light Passing Through an Exoplanet Atmosphere assessment</td>
<td>Teacher Made Resources:

Discussion Boards: Lesson 13
Driving Question Board: Lesson 16
Consensus Model: Lesson 15, 16
Exit Ticket Assignment: Lesson 13

Lesson 14:
Project Tracking document
Mechanism for communication between groups
Platform for sharing podcasts
Lesson 15:
Objects that Interact through Gravity poster</td>
<td>Prior to Lesson:
Lesson 13:
Observing Changes in Light Video (from Twitter)
Phet simulation (screencast) or prism
Lesson 14:
alternate way to collaborate with project group members
Lesson 15:
Powers of Ten Video and Transcript
Lesson 16:
Drake Equation Video and Website screencast
After Lesson Completion:

Discussion Boards: Lesson 13
Virtual Class recordings: Lessons 13, 14, 15, 16</td>
</tr>
<tr>
<td colspan="3">Students should ideally join VIRTUAL CLASS on the following days:

Day 3 - Lesson 13 | Days 4 & 6 - Lesson 14 | Day 8 - Lesson 15 | Day 9 - Lesson 16</td>
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Formative and Summative Assessment Opportunities:

Lesson 13: Discussion Boards, Exit Ticket, Model Light Passing Through an Exoplanet Atmosphere assessment
Lesson 14: Self-Assessment, Podcast
Lesson 15: Building Understanding Questions (TDD), Group Models

Lesson 1 (4 days) - Anchoring Phenomenon

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

- Lesson Slideshow
- Thinking Deeper Document
- Podcast transcripts (each student will be assigned one): Annette Lee: As It Is Above, It Is Below, Gerardo Aldana: The Descent of the Feathered Serpent, Jessie Ferrari: Wombat Season, Thebe Medupe: Rebirth of Selemela
- Driving Question Board - *teacher made*
- Investigation Ideas 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
- Link to Podcasts (embedded in slideshow)
- Podcast transcripts (each student will be assigned one): Annette Lee: As It Is Above, It Is Below, Gerardo Aldana: The Descent of the Feathered Serpent, Jessie Ferrari: Wombat Season, Thebe Medupe: Rebirth of Selemela
- Investigation Ideas Discussion Board - *teacher made*
- Alternate ways for students to contribute ideas to virtual charts/boards (ex. texting in responses)
- Virtual Class Recordings - *after completion*
- Patterns in the Sky Chart - *after completion*
- Initial Consensus Model - *after completion*
- Driving Question Board - *after completion*
- Ideas for Future Investigations and Data We Need Chart - *after completion*

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

- Days 1 & 3

Lesson 1 (4 days) - Anchoring Phenomenon

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 1-4 (45 min) NAVIGATION CONNECT THIS PATTERN TO THE SKY NAVIGATION AND HOME LEARNING Slides A-G	**Teachers build in reviewing norms and setting expectations as needed for Virtual Class.** Prior to Virtual Class, the teacher should: 1. Share Lesson Slideshow and Thinking Deeper Document with students. 2. Pre-assign students to partners or groups using a platform of choice. (if this is not possible, students can discuss whole group) 3. Arrange for a virtual class poster for students to share their ideas about Patterns in the Sky at the end of class on the platform of choice. (ex. Jamboard, Pinup, etc.) VIRTUAL CLASS: 1. Introduce the anchor phenomenon and discuss how changes in the sun's rising and setting times affect our lives. 2. Make predictions about changes in day and night over time. 3. Share predictions and evidence in partners or groups. *(Option to conduct the discussion as a whole class if this is not possible.)* 4. Discuss whether the patterns observed would be the same anywhere and share reasons and examples. 5. Share initial explanations about what causes these patterns in partners or groups. *(Option to conduct the discussion as a whole class if this is not possible.)* 6. Students brainstorm other patterns they have experienced or heard about in groups. *(Option to conduct the discussion as a whole class if this is not possible.)* Add ideas on virtual sticky notes to the Patterns in the Sky virtual class chart. 7. Assign Home Learning.	

	VIRTUAL CLASS POST-WORK: 1. Interview family members about patterns noticed in the sky.

Day 2		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 4 (8 min) NAVIGATION AND RETURN TO HOME LEARNING Slides H-I		VIRTUAL CLASS POST-WORK:: 1. Share home learning experiences on the virtual “Patterns in the Sky” class chart.
Part 5 (20 min) PODCAST JIGSAW Slides J-K	1. Assign each student one of the podcasts ensuring several students are assigned to each one.	VIRTUAL CLASS PRE-WORK: 1. Listen to an assigned podcast and read the transcript. 2. Answer questions about the podcast.
Part 6 (14 min) MAKING SENSE OF PODCASTS AS A CLASS Slides K-L		VIRTUAL CLASS PRE-WORK: 1. Post a pattern observation from the podcast to the discussion board.
Part 7 (3 min) NAVIGATION AND PERSONAL REFLECTION Slide M		VIRTUAL CLASS PRE-WORK: 1. Complete personal reflections on TDD.

Day 3		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 8 (45 min) MODEL PATTERNS INDIVIDUALLY BUILD A CONSENSUS MODEL OF SYSTEMS IN SPACE NAVIGATION AND STOP AND JOT Slides N-S	**Teachers build in reviewing norms and setting expectations as needed for Virtual Class.* Prior to Virtual Class, the teacher should: 1. Ensure students have access to the Patterns in the Sky virtual chart created on Day 1. 2. Pre-assign students to virtual groups (navigation) using a platform of choice. (if this is not possible, students can discuss whole group) 3. Prepare for a model Gallery Walk (shared slideshow or other document) and determine how students will submit their models (ex. screenshot or take a photo and copy and paste into the document. - *Option to have students do their models on paper and hold them up to the camera or to do the model digitally and share their screen if your platform allows it. Note that you may need to have students do this one group at a time since they will not be able to share and observe others' models at the same time.* VIRTUAL CLASS: 1. In partner or group break-outs, identify a pattern to model and parts of the systems 2. Individually model a pattern and share in Virtual Gallery Walk. 3. Set-up virtual gallery walk using a platform of choice, in advance. 4. Participate in a virtual gallery walk. 5. Build an initial consensus model of systems in space that can explain patterns that we see. *(The teacher can do this on a poster or share their screen and use an electronic platform. Be sure that students have access to this model when it is complete.)* 6. Begin thinking of questions for the DQB.	

Day 4		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 11 (27 min) BUILD THE DRIVING QUESTION BOARD Slides T-W	1. Create and share the Driving Question Board using a platform of choice.	VIRTUAL CLASS POST-WORK: 1. Write questions they have about patterns in the sky and the systems that cause them. 2. Students will add questions to the virtual DQB. 3. Reflect on what the driving question should be for the unit.
Part 12 (14 min) BRAINSTORM NEXT STEPS Slides X	1. Create and assign a discussion board for students to share investigation ideas.	DISCUSSION BOARD: 1. Brainstorm investigations we want to do and data we think we will need in order to answer the questions on our DQB.
Part 13 (4 min) NAVIGATION AND OPTIONAL HOME LEARNING Slides Y-Z		VIRTUAL CLASS POST-WORK: 1. Reflect on where we should go next. 2. Explore the planetarium software.

Return to Lesson Set Overview

Lesson 2 (3 days) - Investigation

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

- Lesson Slideshow
- Thinking Deeper Document
- Materials for students to create their own models (styrofoam ball, push-pins, rubber band, wooden dowel, light source) - *If this is not an option, the students can observe while the teacher demonstrates.*
- Materials for flashlight investigation (graph paper, flashlight, ruler, pencil, tape, hardcover book) - *If this is not an option, the students can observe while the teacher demonstrates.*

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 students to create their own models (styrofoam ball, push-pins, rubber band, wooden dowel, light source) - *If this is not an option, the students can observe while the teacher demonstrates.*
- Materials for flashlight investigation (graph paper, flashlight, ruler, pencil, tape, hardcover book) - *If this is not an option, the students can observe while the teacher demonstrates.*
- Stellarium Software - *consider providing a screen recording of the software exploration*
- Virtual Class Recordings - *after completion*
- Consensus Model - *after completion*

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

- Days 2 & 3

Lesson 2 (3 days) - Investigation

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 1 (3 min) NAVIGATION Slide A	1. Determine if students will model and investigate on Days 2 & 3 or teacher demo only. (distribute materials if needed) 2. Adapt Lesson Slideshow and Thinking Deeper Document as needed to accommodate delivery decisions. 3. Share slideshow and TDD with students.	VIRTUAL CLASS PRE-WORK: 1. Review patterns we were interested in observing and record patterns observed using the planetarium software.
Part 2 (5min) MAKE PREDICTIONS ABOUT THE SUN Slides B - C		VIRTUAL CLASS PRE-WORK: 1. Make predictions about what we will see the Sun do when we run the planetarium software.
Part 3 (18 min) OBSERVE THE SUN WITH PLANETARIUM SOFTWARE Slide D		VIRTUAL CLASS PRE-WORK: 1. Use planetarium software to make and record observations of the Sun over the course of a year.
Part 4 (15 min) PROCESS PATTERNS OF THE SUN IN THE SKY Slide E		VIRTUAL CLASS PRE-WORK: 1. Answer questions to make sense of the observations.

Part 5 (3 min) NAVIGATION Slide F		VIRTUAL CLASS PRE-WORK: 1. Brainstorm materials to represent the Earth-Sun system to model the patterns we observed.

Day 2		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Parts 6-9 (45 min) NAVIGATION INITIAL CLASS 3-D MODEL OF EARTH-SUN SYSTEM GROUPS MODEL THE EARTH-SUN SYSTEM IN 3-D NAVIGATION AND HOME LEARNING Slides G- N	**Teachers build in reviewing norms and setting expectations as needed for Virtual Class.* Prior to Virtual Class, the teacher should: 1. Set up to demonstrate the 3-D modeling of the Earth-Sun System. (Ensure that materials have been distributed or students have been given time to gather them ahead of time if students will model the system alongside the teacher demonstration.) VIRTUAL CLASS: 1. Recall the patterns we noticed in the motion of the Sun and decide on what the 3-D physical model needs to include. 2. Model the system for students in 3-D at the front of the room. Record the parts and interactions in a model map. Teachers may opt to create a video of this 3D model prior to the virtual lesson. 3. Model the Earth-Sun system using 3-D objects and record changes in the length of the Sun's path in the sky. Keep track of limitations of the model individually and as a class. *If it is not possible for students to conduct this activity, teachers should be prepared to lead a whole group presentation*. 4. Assign home learning. VIRTUAL CLASS POST-WORK: 1. Using evidence from the data, support or refute an explanation about how the distance between Earth and the Sun affects our experience of seasons on Earth. *(Teacher may choose to have students turn in their TDD or submit a separate assignment to use for formative assessment)*	

Day 3		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Parts 10-13 (45 min) NAVIGATION AND RETURN TO HOME LEARNING INVESTIGATE SEASONAL TEMPERATURE VARIATION CONSENSUS DISCUSSION: SEASONS NAVIGATION AND OPTIONAL EXTENSION Slides O-V	**Teachers build in reviewing norms and setting expectations as needed for Virtual Class.* Prior to Virtual Class, the teacher should: 2. Make arrangements for students to discuss the investigation in break-out groups if platform allows. 3. Set up to demonstrate the flashlight investigation. (Ensure that materials have been distributed or students have been given time to gather them ahead of time if students will conduct the investigation at home alongside the teacher demonstration.) VIRTUAL CLASS: 1. Return to home learning from last class by having students signal whether they used evidence to agree or disagree. Share and discuss evidence. 2. Independently explain why it can be cold here in January and how we might use our model to explain the temperature in summer and winter. Share and Discuss. 3. Conduct an investigation using flashlights and graph paper to establish a link between the angle of sunlight, how spread out the sunlight is, and surface temperature. (*If it is not possible for students to conduct this activity, teachers should be prepared to lead a whole group presentation.)* Share and discuss observations. 4. Have students complete the questions about the flashlight investigation in break-out groups. *(Option to have them complete the questions independently then share out to the whole class.)* 5. Consensus Discussion to develop a class consensus model for understanding seasonal patterns in the motion of the Sun and related changes in temperature. *(The teacher can do on a poster or share their screen and use an electronic platform. Ensure students have access to the model once complete.)* 6. Return to the DQB to answer some questions about the Sun and lead a discussion to identify another set of patterns to investigate (the Moon).	

	VIRTUAL CLASS POST-WORK: 1. Assign home learning to observe the shape of the Moon. *(add optional extension reading here if needed)*

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
- Exit Ticket Discussion Board - *teacher made*
- Modeling Moon Phases Materials (option to suggest substitutes for some materials or to demonstrate in Virtual Class if distributing/obtaining materials is not an option): 1 4-inch Styrofoam sphere, 1 ⅜-inch dowel, 1 block with hole drilled or putty, 1 skewer, 1 thick rubber band, 1 thumbtack, 1 twist tie, 1 1-inch Styrofoam sphere, 1 bulb socket, 1 bright lightbulb, 1 phone camera or webcam, 1 extension cord with power strip, 1 plastic clamp
- Driving Question Board - *from Lesson 1*

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
- Exit Ticket Discussion Board - *teacher made*
- Modeling Moon Phases Materials (option to suggest substitutes for some materials or to demonstrate in Virtual Class if distributing/obtaining materials is not an option): 1 4-inch Styrofoam sphere, 1 ⅜-inch dowel, 1 block with hole drilled or putty, 1 skewer, 1 thick rubber band, 1 thumbtack, 1 twist tie, 1 1-inch Styrofoam sphere, 1 bulb socket, 1 bright lightbulb, 1 phone camera or webcam, 1 extension cord with power strip, 1 plastic clamp
- Moon Phase Simulation - *consider providing a screen recording of the simulation exploration*
- Driving Question Board - *from Lesson 1*
- Virtual Class Recordings - *after completion*

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 (10 min) NAVIGATION Slides A-D	1. Share Lesson Slideshow with students. 2. Share Thinking Deeper Document with students.	VIRTUAL CLASS PRE-WORK: 1. Revisit the home learning and look at the current image of the Moon and make predictions about the other shapes of the Moon.
Part 2 (20 min) LOOKING AT PHOTOGRAPHIC DATA OF THE MOON Slides E-G		VIRTUAL CLASS PRE-WORK: 1. Examine photographs of the Moon over a month to look for patterns. 2. Record Notices/Wonders. 3. Reflect on patterns and what they tell us.
Part 3 (5 min) CONNECT TO HUMANS ACROSS CULTURE AND TIME Slides H-I		VIRTUAL CLASS PRE-WORK: 1. View images documenting the Moon from different cultures and timescales. 2. Record connections made with the images and reflect on observations and use of moon phases across cultures.
Part 4 (10 min) NAVIGATION AND EXIT TICKET Slides J-L	1. Create and assign the “Exit Ticket” Discussion Board. 2. Review student responses and provide feedback individually or in the Virtual Class.	DISCUSSION BOARD: 1. Respond to exit ticket questions from slide and post on TDD and Discussion Board.

Day 2		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 5-7 (45 min) GROUPS MODEL LUNAR PHASES IN 3-D BUILDING UNDERSTANDINGS DISCUSSION NAVIGATION Slides M-P	Prior to the Virtual Class, the teacher should: 1. Arrange to distribute materials to students or offer suggestions for substitutes so students may gather the needed materials if possible. If students have the needed materials, option to have them work in break-out groups to model the systems and make observations rather than modeling whole class. 2. Set up to model the Earth-Sun-Moon system live. Pay special attention to the perspective that students will have and ensure camera and model placement offer the best possible perspective for students to observe the changes in apparent shape of the moon in different positions. VIRTUAL CLASS: 1. Model the Earth-Sun-Moon system using 3-D objects and record changes in the apparent shape of the Moon for different locations. *(If students have the needed materials, they can follow along with the teacher to create their own model. If obtaining/distributing materials is not possible, the teacher can demonstrate while students record the changes in shape.)* 2. Facilitate a Building Understandings Discussion to make sense of why we see what we see when the positions of objects in the Earth-Sun-Moon system change. 3. Consider where we should go next and if our model of the Earth-Sun-Moon system could explain other phenomena.	

Return to Lesson Set Overview

Lesson 4 (3 days) - Investigation, Putting Pieces Together

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

- Lesson Slideshow
- Thinking Deeper Document
- Making Claims Discussion Board assignment - *teacher made*
- Lesson 4 Assessment (NOTE: Students will need to make a copy in order to edit, or you can make a copy for each student when assigning if your platform allows.)

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
- Making Claims Discussion Board assignment - *when complete*
- Lesson 4 Assessment (NOTE: Students will need to make a copy in order to edit, or you can make a copy for each student when assigning if your platform allows.)
- Virtual Class Recordings - *after completion*

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

- Days 2 & 3

Lesson 4 (3 days) - Investigation, Putting Pieces Together

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 1 (5 min) NAVIGATION Slide A	1. Share Lesson Slideshow with students. 2. Share Thinking Deeper Document with students.	VIRTUAL CLASS PRE-WORK: 1. Revisit our questions about eclipses (on the driving question board).
Part 2 (15 min) OBSERVE TWO KINDS OF ECLIPSES Slides B-D		VIRTUAL CLASS PRE-WORK: 1. Watch videos of solar and lunar eclipses and record notices and wonders on the TDD.
Part 3 (7 min) MAKE CLAIMS ABOUT WHAT IS CAUSING ECLIPSES Slide E	1. Create and assign the "Making Claims" Discussion Board. 2. Review student responses and facilitate discussion as needed.	DISCUSSION BOARD: 1. Submit an idea about what is happening when we see an eclipse on the Discussion Board. 2. Comment on another student's post.
Part 4 (12 min) COLLECT EVIDENCE FROM ECLIPSES USING AN INTERACTIVE AND PHYSICAL MODELS Slide F	*Teachers will want to provide students with a review on selecting eclipses in the Stellarium interactive. Teachers may also prefer to capture video of the interactive in progress to account for any device limitations.*	VIRTUAL CLASS PRE-WORK: 1. Observe an interactive and create physical models to figure out what interactions are occurring during eclipses.

Part 5 (5 min) ADD TO OUR PROGRESS TRACKER Slide G	*Option for teachers to have students turn in their TDD or submit Progress Tracker ideas on a separate assignment for formative assessment.*	VIRTUAL CLASS PRE-WORK: 1. Record what they figured out on the Progress Tracker section of their TDD.

Day 2		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Parts 6-9 (45 min) NAVIGATION CONSENSUS DISCUSSION TO DEVELOP KEY MODEL IDEAS PROBLEMATIZE WHY THERE AREN'T ECLIPSES EACH MONTH ADD NEW KEY MODEL IDEAS Slides H-K	**Teachers build in reviewing norms and setting expectations as needed for Virtual Class.* Prior to Virtual Class, the teacher should: 1. Make arrangements for students to work in groups. (Group work can be performed in break-out rooms in Zoom or Meet, if available. Whiteboard apps like Jamboard or shared Google docs also can be used to allow sharing among groups.) VIRTUAL CLASS: 1. Reflect on entries in the Progress Tracker and consider how the information they figured out last time helps prepare them to come to consensus on key model ideas so far. 2. Gather students in a Scientists Circle to build consensus around key model ideas we will need to explain patterns in the appearance of the Moon on paper. 3. Facilitate a problematizing discussion to poke holes in the model and see if any key model ideas are missing. Use physical modeling supplies to try to figure out why eclipses are not seen with every new Moon. 4. Watch a video to see what ideas we already have in our model and if any new ideas need to be added.	

Day 3		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Parts 10-12 (45 min) EXPLAIN LUNAR PHENOMENA IN SMALL GROUPS PEER FEEDBACK ASSESSMENT INDIVIDUAL ASSESSMENT Slides L- N	**Teachers build in reviewing norms and setting expectations as needed for Virtual Class.* Prior to Virtual Class, the teacher should: 1. Make arrangements for students to work in groups. (Group work can be performed in break-out rooms in Zoom or Meet, if available. Whiteboard apps like Jamboard or shared Google docs also can be used to allow sharing among groups.) VIRTUAL CLASS: 1. Create a video (or oral presentation) to communicate and explain key model ideas from the Earth-Moon-Sun system about why the appearance of the Moon is what it is at certain times. 2. Provide and receive feedback about *Peer-Feedback Rubric for Explanation Using a Physical Model* with another group. 3. Teacher assigns individual assessment and Home Learning - Students can complete the assessment during the Virtual session or as Post-Work. VIRTUAL CLASS POST-WORK: 1. “Making stars disappear and reappear” reading	

Return to Lesson Set Overview

Lesson 5 (1 day) - Investigation

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

- Lesson Slideshow
- Thinking Deeper Document
- Building Understandings Discussion Board 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
- Moon Orbit Simulation - *consider providing a screen recording of the simulation exploration*
- Building Understandings Discussion Board assignment - *teacher made*
- Discussion Board - *when complete*

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

- None

Lesson 5 (1 day) – Investigation

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 1 (14 min) NAVIGATION Slides A-F	1. Share Lesson Slideshow with students. 2. Share Thinking Deeper Document with students.	VIRTUAL CLASS PRE-WORK: 1. Reconsider the orbit of the Moon around Earth and answer questions about the moon and gravity.
Part 2 (5 min) PREVIEW THE INTERACTIVE AND MAKE PREDICTIONS Slides G-K	*Teachers may consider screencasting instructions for the simulation to share with students for additional support.*	VIRTUAL CLASS PRE-WORK: 1. Explore the simulation and make predictions about how the moon's mass, distance from Earth, or speed will affect its motion.
Part 3 (15 min) USE INTERACTIVE TO INVESTIGATE FACTORS THAT AFFECT THE ORBIT OF THE MOON Slide L		VIRTUAL CLASS PRE-WORK: 1. Collect data from interactive using the simulation data sheet.
Part 4 (7 min) BUILDING UNDERSTANDINGS DISCUSSION ABOUT THE RESULTS OF THE SIMULATION Slide M	1. Create and assign the "Building Understandings" Discussion Board. 2. Review student responses and facilitate discussion as needed.	VIRTUAL CLASS PRE-WORK: 1. Participate in Building Understandings Discussion Board to process the key take-aways from the simulation.

Part 5 (4 min) NAVIGATION AND OPTIONAL HOME LEARNING Slide N		VIRTUAL CLASS PRE-WORK: 1. Reflect on how to get a rock into orbit in order to motivate the activity of the next lesson.

Return to Lesson Set Overview

Lesson 6 (1 day) - Investigation

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

- Lesson Slideshow
- Thinking Deeper Document
- Virtual Diamond Discussion (shared document for each group - see examples 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
- Thinking Deeper Document
- Virtual Diamond Discussion (shared document for each group - see examples here)
- Things in Orbit chart - *after completion*
- Virtual Class Recording - *after completion*

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

- Day 1

Lesson 6 (1 day) - Investigation

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 1- 4 (45 min) NAVIGATION GUIDED READING: NEWTON'S THOUGHT EXPERIMENT COMPLETE A GROUP DISCUSSION DIAMOND NAVIGATION Slides A - K	**Teachers build in reviewing norms and setting expectations as needed for Virtual Class.** Prior to Virtual Class, the teacher should: 1. The option for Home Learning is included in the lesson. Students may complete the penny flick activity while reading. Students may also listen to the Wow podcast after the lesson. Choose the Slide J at the end of the slideshow that reflects your instructional needs. 2. Pre-assign students to partners or groups using a platform of choice. (if this is not possible, students can discuss whole group) 3. Arrange for students to use a shared document for the Virtual Diamond Discussion. (If you use a different structure for the shared document, insert a picture in Slide H.) 4. Share Lesson Slideshow and Thinking Deeper Document with students. VIRTUAL CLASS: 1. Revisit discussion points from the previous lesson a) The Moon and gravity b) Simulation questions c) What we need to change about a normal rock to get it to behave like the Moon 2. Recall the factors that affect the Moon's orbit and to record thinking about how to get a rock in orbit. 3. Facilitate the guided reading activity with Newton's apples and orbits (*Although this activity is designed for small groups, this reading could also be read aloud by alternating students to the whole class, with breaks for group discussion where indicated in the reading. Or, students could complete*	

	the reading individually, recording their thinking in their notebook at each section labeled "Stop and Chat".) 4. Conduct the Newton's Apple Cannon Experiment, supporting the development of orbital motion for higher-speed cannonball apples. *Students may need you to sketch an example trajectory of a low-speed cannonball apple for them.* 5. Facilitate the Virtual Discussion Diamond activity on placing objects in orbit. 6. Summarize ideas about orbits and gravity, discuss man-made satellites, and anticipate exploration of other natural orbits in the solar system. Record ideas on a "Things in Orbit" chart.

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
- Things in Orbit chart - *from Lesson 6*
- Big Ideas Discussion Board 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
- Things in Orbit chart - *from Lesson 6*
- Big Ideas Discussion Board assignment - *teacher made*
- Discussion Board - *after completion*

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

- None

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 1 (15 min) NAVIGATION AND OBSERVING THE SOLAR SYSTEM Slide A	1. Share Lesson Slideshow with students. 2. Share Thinking Deeper Document with students.	VIRTUAL CLASS PRE-WORK: 1. Observe the solar system with a computer interactive.
Part 2 (22 min) INVESTIGATE THE FORMATION OF THE SOLAR SYSTEM Slides B-F		VIRTUAL CLASS PRE-WORK: 1. Observe a visualization of the origin of the solar system 2. Develop the idea that some objects in the solar system had the right balance between mass and gravity to begin to orbit the Sun and are the planets we see today.
Part 3 (8 min) NAVIGATION AND INDIVIDUAL PROGRESS TRACKERS Slides G-H	1. Create and assign the "Big Ideas" Discussion Board. 2. Review student responses and facilitate discussion as needed.	DISCUSSION BOARD: 1. Summarize the big ideas from today and assign home learning. HOME LEARNING: 1. Complete reading on *Small Solar System Objects.*

Return to Lesson Set Overview

Lesson 8 (3 days) - Investigation

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

- Lesson Slideshow
- Thinking Deeper Document
- Thinking Deeper Documents from Lessons 1-7
- Driving Question Board - *from Lesson 1*
- Stars Discussion Board assignment - *teacher made*
- 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 Lessons 1-7
- Driving Question Board - *from Lesson 1*
- Stars Discussion Board assignment - *teacher made*
- Discussion Board - after completion
- Constellation Consensus Model - *after completion*
- Virtual Class Recordings - *after completion*
- Lesson 8 Assessment

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

- Days 2 & 3

Lesson 8 (3 days) - Investigation

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 1 (7 min) NAVIGATION Slides A-B	1. Share Lesson Slideshow with students. 2. Share Thinking Deeper Document with students. 3. Provide access to the Driving Question Board.	VIRTUAL CLASS PRE-WORK: 1. Consider what we have figured out so far about how systems in space can produce patterns in the sky and identify a set of patterns we have not yet answered all our questions about.
Part 2 (18 min) ZOOMING OUT TO SEE THE SUN AS ONE OF MANY STARS Slides C-O	1. Create and assign the "Stars" Discussion Board. 2. Review student responses and facilitate discussion as needed.	VIRTUAL CLASS PRE-WORK: 1. Use data on *Star Data* as evidence to decide that it makes sense to think of stars as part of a larger system than our solar system, and we may need two perspectives to model them accurately on paper.
Part 3 (12 min) ZOOMING IN ON OUR SOLAR SYSTEM Slides P-R		VIRTUAL CLASS PRE-WORK: 1. Consider the scale of our solar system, and how we might zoom in and out on various subsystems of our solar system to create more accurate representations.

Day 2		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 4-8 (53 min) CONSENSUS MODEL FOR CONSTELLATIONS NAVIGATION CONSIDERING SEASONAL STAR PATTERNS PHYSICAL MODELING NAVIGATION AND SELF-ASSESSMENT Slides S-BB	**Teachers build in reviewing norms and setting expectations as needed for Virtual Class. Teachers build in reviewing norms and setting expectations as needed for Virtual Class.* Prior to Virtual Class, the teacher should: 1. Pre-assign students to partners or groups using a platform of choice. (if this is not possible, students can discuss whole group) 2. Prepare to facilitate the movement between groups required by the 2 Stay, 2 Go activity. VIRTUAL CLASS: 1. Create a class consensus model for explaining constellations using our new conventions for zooming between scale and perspective. 2. Take stock of the star patterns that we have explained so far and highlight what we have yet to figure out. 3. Notice the patterns in stars we see in the Ojibwe constellations over a year. 4. Make a physical model in small groups to explain seasonal constellations, using *Observing a Physical Model of Seasonal Constellations* as a guide. VIRTUAL CLASS POST-WORK: 1. Assign home learning where students reflect on the peer feedback from their physical models.	

Day 3		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Parts 9-11 (45 min) ASSESSMENT: MODEL THE STAR PATTERNS INDIVIDUALLY TAKING STOCK NAVIGATION AND SHIFTING GEARS Slides CC-GG	**Teachers build in reviewing norms and setting expectations as needed for Virtual Class. Teachers build in reviewing norms and setting expectations as needed for Virtual Class.* Prior to Virtual Class, the teacher should: 1. Pre-assign students to partners or groups using a platform of choice. (if this is not possible, students can discuss whole group). Arrange for students to interact with the virtual DQB to identify questions that we can answer and to answer them in groups. 2. Prepare a classroom poll on the existence of life in space using the platform of your choice. VIRTUAL CLASS: 1. Use the Model *of Star Patterns Assessment* to develop a model individually as an assessment to explain patterns we see in the stars. 2. Go back to the DQB to take stock of what patterns we have explained by modeling systems in space. VIRTUAL CLASS POST-WORK: 1. Navigate into the next lesson set by shifting gears and getting students thinking about the potential for life in space. Send students home to collect pop culture references to life in space.	

Return to Lesson Set Overview

Lesson 9 (1 day) - Problematizing

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

- Lesson Slideshow
- Thinking Deeper Document
- Life in Space Discussion Board - *teacher made*
- Driving Question Board - *from lesson 1*
- Class poll - *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
- Life in Space Discussion Board - *teacher made*
- Driving Question Board - *from lesson 1*
- Class poll - *teacher made*
- Discussion Board - *after completion*

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

- None

Lesson 9 (1 day) -Problematizing

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 1 (10 min) NAVIGATION Slides A-C	1. Share Lesson Slideshow with students. 2. Share Thinking Deeper Document with students. 3. Create and assign a Discussion Board for students to share their thoughts about extraterrestrial life. 4. Review submissions and facilitate discussion as needed.	DISCUSSION BOARD: 1. Share ideas about extraterrestrials on discussion board and respond to two other students 2. Make list of what we need to find life in other places
Part 2 (15 min) READ ABOUT EXTREMOPHILES Slide D		VIRTUAL CLASS PRE-WORK: 1. Obtain information from the article on Extremophiles to better understand the conditions that support life.
Part 3 (5 min) RETURN TO THE DQB Slide E	1. Provide access to the Driving Question Board.	VIRTUAL CLASS PRE-WORK: 1. Add any new questions related to life in space to the driving question board.
Part 4 (2 min) EXIT TICKET Slide F		VIRTUAL CLASS PRE-WORK: 1. Reflect on new DQB questions and identify which ones were most compelling/motivating.

Part 5 (5 min) MAKE AN INITIAL ARGUMENT Slide G	1. Create and share a poll for the class using your platform of choice.	VIRTUAL CLASS PRE-WORK: 1. Answer the questions on the class poll about the existence of extraterrestrial life.
Part 6 (5 min) DATA TO ANSWER OUR QUESTIONS ABOUT LIFE Slide H		VIRTUAL CLASS PRE-WORK: 1. Answer our questions about data needed to support an argument related to life in space.
Part 7 (2 min) NAVIGATION Slide I		VIRTUAL CLASS PRE-WORK: 1. Record ideas about where to look for life.

Return to Lesson Set Overview

Lesson 10 (1 day) – Investigation

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

- Lesson Slideshow
- Thinking Deeper Document
- 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
- One of the following infographics: Dwarf Planet Infographic, Gas Giants Infographic, Jupiter's Moons Infographic, Mars Infographic, Our Moon Infographic, Saturn's Moons Infographic
- Exit ticket assignment - *teacher made*
- Virtual Class Recordings - *after completion*

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

- Day 1

Lesson 10 (1 day) - Investigation

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Parts 1 - 5 (50 min) NAVIGATION SOLAR SYSTEM JIGSAW STUDENTS REPORT OUT NAVIGATION EXIT TICKET Slides A-G	**Teachers build in reviewing norms and setting expectations as needed for Virtual Class.* Prior to Virtual Class, the teacher should: 1. Pre-assign students to partners or groups using a platform of choice. (if this is not possible, students can discuss whole group) 2. Share Lesson Slideshow and Thinking Deeper Document with students. 3. Create an exit ticket assignment to share at the end of class. VIRTUAL CLASS: 1. Share results of the class poll about the existence of extraterrestrial life and discuss as a class and facilitate a discussion on where in the Solar System we should look for life. 2. Small groups will Close Read (using the strategies on slide C) their assigned infographics and discuss information. The pictures on the slide show have hyperlinked PDFs of the infographics. 3. Share out what they have learned to the other groups and record information on the Life in Our Solar System chart in the Thinking Deeper Document. 4. Facilitate a quick share-out of whether or not there is intelligent life out in space. 5. Assign Exit Ticket. VIRTUAL CLASS POST-WORK: 1. Complete and submit the exit ticket.	

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
- Making Sense Discussion Board - *teacher made*
- 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
- Making Sense Discussion Board - *teacher made*
- Exit Ticket Assignment - *teacher made*
- Discussion Board - *after completion*

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

- None

Lesson 11 (1 day) - Investigation

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 1 (10 min) NAVIGATION Slides A-C	1. Share Lesson Slideshow with students. 2. Share Thinking Deeper Document with students.	VIRTUAL CLASS PRE-WORK: 1. Use the picture on Slide A to answer the questions on slides A-C about what is beyond our solar system.
Part 2 (20 min) OBSERVING STARS READING Slide D		VIRTUAL CLASS PRE-WORK: 1. Obtain information from the reading "Observing Stars".
Part 3 (10 min) MAKING SENSE OF THE READING TOGETHER Slides E-F	1. Create and assign a Discussion Board for students to share ideas from the reading reflection questions. 2. Review responses and facilitate discussion as needed.	VIRTUAL CLASS PRE-WORK/DISCUSSION BOARD: 1. Answer the reading reflection questions to better understand that light is a wave and that it is difficult to completely understand stars. 2. Add understandings to the Progress Tracker for lesson 11
Part 4 (3 min) NAVIGATION AND EXIT TICKET Slides G-H	1. Create and assign the exit ticket assignment.	VIRTUAL CLASS PRE-WORK: 1. Complete a reflection question about what this means for the possibility of planets around other stars. 2. Answer and submit an exit ticket.

Return to Lesson Set Overview

Lesson 12 (3 days) - Investigation, Putting Pieces Together

NOTE: The investigation requires the use of a light meter and more than one person to conduct. Because of these constraints, the teacher should prepare ahead of time to model during the Virtual Class or record it prior to the Virtual class meeting.

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

- Lesson Slideshow
- Thinking Deeper Document
- "Data We Need to Decide if There are Planets Around Other Stars" virtual poster - *teacher made during Virtual Class*
- Exit Ticket assignment day 2 - *teacher made*
- Lesson 12 Assessment (NOTE: Students will need to make a copy in order to edit, or you can make a copy for each student when assigning if your platform allows.)

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 We Need to Decide if There are Planets Around Other Stars" virtual poster - *after completion*
- Exit Ticket assignment day 2 - *teacher made*
- Virtual Class Recordings - *after completion*
- Lesson 12 Assessment (NOTE: Students will need to make a copy in order to edit, or you can make a copy for each student when assigning if your platform allows.)

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

- Days 1 & 2

Lesson 12 (3 days) - Investigation, Putting Pieces Together

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 1 (40 min) NAVIGATION PREPARE TO MODEL SYSTEM COLLECT DATA FROM THE MODEL NAVIGATION Slides A - I	**Teachers build in reviewing norms and setting expectations as needed for Virtual Class.* Prior to Virtual Class, the teacher should: 1. Pre-assign students to partners or groups using a platform of choice for "Turn and Talks". *(if this is not possible, students can discuss whole group)* 2. Prepare to create a Virtual space on a preferred platform for "Data We Need to Decide if There are Planets Around Other Stars" that students will reference throughout the lesson. 3. Prepare to model the light meter investigation or record the investigation ahead of time to present to students. *(video can be linked on Slide H in the slideshow)* 4. Share Lesson Slideshow and Thinking Deeper Document with students. VIRTUAL CLASS: 1. Facilitate a review of learning from the last class to identify what the students understand to this point. 2. Lead students through a comparison of two differing interpretations of the photograph from the last lesson. 3. Facilitate a discussion on other data we can collect from light, and how we could model our system to predict patterns that would indicate the presence of a planet. *(Create a shared space for these ideas "Data We Need to Decide if There are Planets Around Other Stars" that students will reference later - this may be a good opportunity to model how to create a graph with a virtual drawing tool since students will need to do this in their predictions and with investigation data - students may also create their graphs on paper and take photos to insert into their TDD)*	

	4. Make predictions about patterns in light data due to the presence of planets around a star. (use the graph created on "Data We Need to Decide if There are Planets Around Other Stars" shared space to sketch predictions. 5. Model our system and collect data from a distance with light meters to establish a pattern we could look for to indicate a planet. *(Teachers may choose to create a video of the lab and provide data to the class.)* 6. Engage students in summarizing what we are trying to figure out using the model.

Day 2		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Parts 5 - 9 (50 min) NAVIGATION GRAPH OUR DATA BUILDING UNDERSTANDING OF LIGHT CURVES ANALYZE LIGHT CURVES FROM OTHER STARS NAVIGATION AND EXIT TICKET Slides J - R	Prior to Virtual Class, the teacher should: 1. Pre-assign students to groups using a platform of choice for analyzing light curve data from other stars. *(if this is not possible, students can discuss whole group)* VIRTUAL CLASS: 1. Review information gathered on TDD from Pre-Work 2. Facilitate students graphing the data that they collected from the model, both when there was a planet and when there was not. 3. Facilitate a Building Understandings Discussion to describe a pattern that will indicate the presence of a planet or planets around a star. 4. Analyze light curve data to determine if planet systems exist around stars that are outside of our solar system. 5. Look at how many planets Kepler discovered, and complete an exit ticket to consider the limitations of the light curve analysis method.	

Day 3		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 10 (5 min) LIMITATIONS Slide S		VIRTUAL CLASS POST-WORK: 1. Make predictions on how what we discovered last class will affect future discoveries.
Part 11 (20 min) ASSESSMENT Slides T-U	1. Assign the Lesson 12 Assessment.	VIRTUAL CLASS POST-WORK: 1. Complete Individual Student Assessment and submit.
Part 12 (5 min) PROGRESS TRACKER Slide V		VIRTUAL CLASS POST-WORK: 1. Update the progress tracker for Lesson 12.
Part 13 (10 min) NAVIGATION Slides X-Y	1. Teachers may choose to assign this Optional Reading already included on TDD.	VIRTUAL CLASS POST-WORK: 1. Reflect on changes in our Sun other than the amount of light. 2. Complete Optional Reading if assigned.

Return to Lesson Set Overview

Lesson 13 (3 days) - Investigation

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

- Lesson Slideshow
- Thinking Deeper Document
- Changes in Sunlight Discussion Board - *teacher made*
- Making Sense Discussion Board - *teacher made*
- Exit Ticket assignment - *teacher made*
- Model Light Passing Through an Exoplanet Atmosphere 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
- Observing Changes in Light Video (from Twitter)
- Changes in Sunlight Discussion Board - *teacher made*
- Phet simulation – *consider screencasting or supplying students with prisms and instructions to investigate at home (review safety information)*
- Making Sense Discussion Board - *teacher made*
- Discussion Boards - *after completion*
- Exit Ticket assignment - *after completion*
- Model Light Passing Through an Exoplanet Atmosphere assessment
- Virtual Class Recordings - *after completion*

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

- Day 3

Lesson 13 (3 days) - Investigation

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 1 (10 min) NAVIGATION: SUNSET FROM SPACE Slides A-C	1. Share Lesson Slideshow with students. 2. Share Thinking Deeper Document with students. 3. Create and assign a Discussion Board for students to share ideas about what causes changes in sunlight. 4. Review responses and facilitate discussion as needed.	VIRTUAL CLASS PRE-WORK/DISCUSSION BOARD: 1. Share experiences seeing sunlight change. 2. Use the Discussion Board to share ideas about what caused those changes.
Part 2 (20 min) PRISM INVESTIGATION LAB Slides D-G		VIRTUAL CLASS PRE-WORK: 1. Investigate how to split light into different colors using a prism. 2. Develop initial models to explain why light is split into colors in a characteristic way.
Part 3 (5 min) CONSIDER EXOPLANETS Slide H		VIRTUAL CLASS PRE-WORK: 1. Think about similar phenomena.

Day 2		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 4 (20 min) READ ABOUT EXOPLANET ATMOSPHERE Slide I		VIRTUAL CLASS PRE-WORK: 1. Use the Close reading strategy to read "How do we use spectra to determine what exoplanets are made of?" in the TDD.
Part 5 (7 min) MAKING SENSE OF READING Slides J-K	1. Create and assign a Discussion Board for students to share ideas to make sense of the reading. 2. Review responses and facilitate discussion as needed.	VIRTUAL CLASS PRE-WORK: 1. Answer the questions to reflect on the reading. 2. Share ideas on the Discussion Board.
Part 6 (3 min) PROGRESS TRACKER Slide L		VIRTUAL CLASS PRE-WORK: 1. Add the Lesson 13 question and sources of evidence to the Progress Tracker.
Part 7 (5 min) EXIT TICKET Slide M	1. Create an assignment for students to submit their exit ticket.	VIRTUAL CLASS PRE-WORK: 1. Complete the exit ticket and submit to the teacher.

Day 3		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 8 (45 min) MODEL LIGHT PASSING THROUGH AN EXOPLANET ATMOSPHERE DEVELOP CLASS CONSENSUS MODEL OF COLORS OF LIGHT NAVIGATION Slide N - Q	**Teachers build in reviewing norms and setting expectations as needed for Virtual Class.* Prior to Virtual Class, the teacher should: 1. Pre-assign students to partners or groups using a platform of choice. 2. Provide students with the Model Light Passing Through an Exoplanet Atmosphere VIRTUAL CLASS: 1. Examine light data to develop an explanation and create an explanatory model in small groups. 2. Come to consensus on how to model light moving through the atmosphere of a planet. 3. Discuss what we have figured out about how scientists can determine what exoplanets are made of. 4. Discuss what can help us figure out about extraterrestrial life.	

Return to Lesson Set Overview

Lesson 14 (3 days) - Investigation

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

- Lesson Slideshow
- Thinking Deeper Document
- Project Tracking document - *teacher made*
- Mechanism for communication between groups - *teacher made*
- Platform for sharing podcasts - *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
- Project Tracking document - *teacher made*
- Mechanism for communication between groups - *teacher made*
- Platform for sharing podcasts - *teacher made*
- Virtual Class Recordings - *after completion*

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

- Days 1 & 3

Lesson 14 (3 days) - Investigation

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 1 (45 min) ASSIGN THE PODCASTS RESEARCH EXOPLANETS Slides A -I	**Teachers build in reviewing norms and setting expectations as needed for Virtual Class.* Prior to Virtual Class, the teacher should: 1. Pre-assign students to partners or groups using a platform of choice. 2. Create a platform (shareable document, etc.) for groups to track project information, such as exoplanet choice, and daily progress. 3. Create a mechanism to facilitate communication to and from groups in order to answer questions or clarify project directions. This may be a shareable document, class social media feed, or Classroom forum. 4. Create a podcast sharing location using a platform of choice. 5. Share Lesson Slideshow and Thinking Deeper Document with students. VIRTUAL CLASS: 1. Orient students to where we are and decide to do research on specific exoplanets. 2. Assign the podcasts and go over the rubric as a class. 3. Groups of students work together to obtain and synthesize information from multiple sources about an exoplanet, with a focus on the potential for that exoplanet to support life. 4. Close out the class with a review of expectations for the next class sessions. Orient students to the teacher-created mechanism that will be used to clarify project directions and answer student questions.	

Day 2		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 3 (5 min) NAVIGATION Slide J		VIRTUAL CLASS POST-WORK: 1. Students complete a self-assessment to reflect on their personal contributions to group work.
Part 4 (40 min) PRODUCE PODCASTS Slide K	1. Teachers should prepare a platform to support groups in the podcast production process. This may be a Frequently Asked Questions document that can be built as groups work through the project or a social media feed.	VIRTUAL CLASS POST-WORK: 1. Groups produce a podcast to Communicate Information about the characteristics of exoplanets that might signify potential for extraterrestrial life.

Day 3		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 5 (40 min) PODCAST EXHIBITIONS MAKE SENSE OF THE EXHIBITIONS NAVIGATION Slides L-O	Prior to Virtual Class, the teacher should: 1. Ensure that students can share podcasts to the platform of choice. VIRTUAL CLASS: 1. Groups showcase their podcasts to determine if evidence shows whether or not there could be life on certain exoplanets. 2. Whole-class discussion to build an understanding that there are many exoplanets out there, and several appear to have the potential to support extraterrestrial life. 3. Reflect upon new information and identify possible directions for investigation.	

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
- Objects that Interact through Gravity poster - *teacher made*
- Classroom Consensus Model for the Universe poster - *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
- Objects that Interact through Gravity poster - *after completion*
- Classroom Consensus Model for the Universe poster - *after completion*
- Powers of Ten Video and Transcript
- Virtual Class Recordings - *after completion*

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 (5 min) LOOKING BEYOND THE STARS Slides A-B	1. Share Lesson Slideshow with students. 2. Share Thinking Deeper Document with students.	VIRTUAL CLASS PRE-WORK: 1. Recall that in the previous lesson we wanted to see what was beyond the stars with a telescope. 2. Notice and wonder about the Hubble Deep Field photo.
Part 2 (10 min) THE GREAT DEBATE IN ASTRONOMY Slides C-D		VIRTUAL CLASS PRE-WORK: 1. Read the Great Debate article and answer questions in order to understand the place of galaxies in the Universe.
Part 3 (15 min) WATCH POWERS OF TEN Slides E-H		VIRTUAL CLASS PRE-WORK: 1. Watch the movie *Powers of Ten* and respond to a series of Stop and Think About It prompts.
Part 4 (15 min) BUILDING UNDERSTANDING DISCUSSION Slide J		VIRTUAL CLASS PRE-WORK: 1. Answer the questions that help develop the idea that Earth and its solar system are part of the Milky Way galaxy, which is one of many galaxies in the universe and be prepared to share at the next class

Day 2		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 5 - 6 (23 min) MODELING THE UNIVERSE IN GROUPS NAVIGATION Slides K - Q	**Teachers build in reviewing norms and setting expectations as needed for Virtual Class.* Prior to Virtual Class, the teacher should: 1. Pre-assign students to partners or groups using a platform of choice. (if this is not possible, students can create posters independently then discuss whole group) 2. Establish a shared space on a platform of choice for groups to work on posters and display them during the Gallery Walk (ex. Shared slideshow, Jamboard, etc.) VIRTUAL CLASS: 1. Facilitate a discussion to orient the class to where they are and to create the "Objects that Interact through Gravity" poster. 2. Work in groups to develop a model of how space systems fit together using the platform of choice. 3. Facilitate a virtual gallery walk of models. *Teachers may choose to bypass the gallery walk and reference the groups' posters during the consensus model creation.* 4. Create a Classroom "Consensus Model for the Universe" poster with the goal of establishing gravity's role in the structure. 5. Add to Progress Tracker 6. Facilitate a discussion about life in the Universe using quotes from scientists. 7. Using the class model, brainstorm what we need to figure out the probability of life.	

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Lesson 16 (1 day) - Investigation, Putting Pieces Together

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

- Lesson Slideshow
- Thinking Deeper Document
- Classroom Consensus Model for the Universe poster - *from lesson 15*
- Driving Question Board

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
- Drake Equation Video and Website – *consider screencasting website exploration*
- Classroom Consensus Model for the Universe poster - *from lesson 15*
- Driving Question Board
- Virtual Class Recordings - *after completion*

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

- Day 1

Lesson 16 (1 day) - Investigation, Putting Pieces Together

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 1- 4 (50 min) NAVIGATION THE DRAKE EQUATION EVALUATE OUR DQB QUESTIONS REFLECTION OF THE BLUE DOT Slides A - H	**Teachers build in reviewing norms and setting expectations as needed for Virtual Class.* Prior to Virtual Class, the teacher should: 1. Pre-assign students to partners or groups using a platform of choice. (if this is not possible, students can discuss whole group) 2. Share Lesson Slideshow and Thinking Deeper Document with students. VIRTUAL CLASS: 1. Brainstorm what we need to figure out the probability of life. 2. Consider what we would need to know to figure out the probability of life in space and then watch a video about Frank Drake and the Drake equation. 3. In pairs, students evaluate our list of DQB questions and indicate the progress they think we have made on each. Then students place sticky dots on the questions they think we have made progress on. 4. Revisit the DQB with the whole class and take stock of all the questions that can be answered. 5. Assign reading about the Pale Blue Dot and reflect on our place in the universe. *If time does not allow, this can be used as Home Learning.*	

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