Louisiana Believes

Distance Learning Support for OpenSciEd Grade 7
Unit 6.2 Thermal Energy

This resource is designed to support teachers in implementing distance learning for OpenSciEd Unit 6.2, Unit 1 on the Louisiana Guide for Piloting OpenSciEd Grade 7. It is intended as a supporting document and should be used in conjunction with the OpenSciEd Unit 6.2 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.

Last Updated October 14, 2020

DEPARTMENT of EDUCATION
Louisiana Believes

Norming Language	
Term	**Description**
Virtual Class Pre-Work	Assignments that students should do prior to virtual class meetings in order to be prepared to engage in discussions, there may be multiple assignments throughout a given lesson
Virtual Class Post-Work	Assignments designed for students to apply learning from virtual class meetings, there may be multiple assignments throughout a given lesson
Virtual Class	Live sessions with students through any digital conferencing platform, teachers may choose to allow students without internet to call in during these sessions and record virtual class sessions to share with those who cannot join
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 1-6

<table>
<tr><th colspan="3">Lesson Set 1: Lessons 1-6</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:
L1, L2, L3, L4, L5, L6

Thinking Deeper Documents for each lesson:
Lesson 1 TDD, Lesson 2 TDD, Lesson 3 TDD, Lesson 4 TDD, Lesson 5 TDD, Lesson 6 TDD

Additional Documents:
Checkpoint Assessment - Lesson 6
Optional: Sample Parent Letter</td>
<td>Consensus Model (Lesson 1)
Driving Question Board (Lesson 1)
Discussion Board Assignments - teacher made (Lessons 5, 6)

Home Investigation Materials (Lesson 5):
• Plastic Cup with Lid
• Ice
• Water</td>
<td>Prior to Lesson:
Room-Temperature Time Lapse Video - Lesson 4
Hot Water Time Lapse Video - Lesson 4
Checkpoint Assessment - Lesson 6

After Lesson Completion:
Driving Question Board (Lesson 1)
Consensus Model (Lesson 1)
Virtual Class recordings (Lessons 1, 2, 3, 4, 6)
Discussion Board (Lessons 5, 6)</td>
</tr>
<tr><td colspan="3">Students should ideally join VIRTUAL CLASS on the following days:
Day 2 - Lesson 1 Day 4 - Lesson 2 Day 6 - Lesson 3
Day 8 & 10- Lesson 4 Day 12- Lesson 6</td></tr>
<tr><td colspan="3">Formative and Summative Assessment Opportunities:
Lesson 2: What have you figured out? - TDD
Lesson 4: Mass change conclusion questions - TDD
Lesson 5: Cold Lemonade On a Hot Day questions - TDD
Lesson 6: Checkpoint Assessment</td></tr>
</table>

Lesson Set Overview: Lessons 7-14

Lesson Set 2: Lessons 7-14		
Provided Resources Students Will Need	**Additional Resources Students Will Need**	**Additional Materials for Students Without Internet Access**
Lesson Slideshows for each lesson: L7, L8, L9, L10, L11, L12, L13, L14 **Thinking Deeper Documents for each lesson:** Lesson 7 TDD, Lesson 8 TDD, Lesson 9 TDD, Lesson 10 TDD, Lesson 11 TDD, Lesson 12 TDD, Lesson 13 TDD, Lesson 14 TDD **Additional Documents:** Icing Injuries Assessment Explaining Temperature Changes In Each Cup (Lesson 8) Optional: Sample Parent Letter **Other:** Food Coloring Lab video *(if the student does not have materials to perform the lab at home)* (Lesson 10)	**Teacher Made Resources - Assignments:** Discussion Boards (Lessons 7, 8, 10, 13) Exit Tickets (Lessons 9, 10) Class Notice & Wonder Chart (Lesson 11) Flipgrid (Lesson 11) Claim and Evidence (Lesson 11) "What Have We Figured Out" (Lesson 12) "Progress Tracker" (Lesson 12) **Other Teacher Made Resources:** Class Notice & Wonder Chart (Lesson 11) Group Assignments (Lesson 12) Class Chart to display group data - (Lesson 12) **Other Resources:** Home Investigation Materials (Lesson 10): 3 clear cups; measuring cup; hot, cold, and room temperature water, food coloring	**Prior to Lesson**: Simulation Videos: T 1, T2, T3 (Lesson 12) Particle Collision Simulation: Part 1, Part 2 (Lesson 13) Marble Simulation Videos: A 2, A 3, A 4 (Lesson 13) Particles in Solids Simulation: A 5, A 6, A 7, A 8 (Lesson 13) Alternate Assignment for Flipgrid (Lesson 11) **After Lesson Completion:** Virtual Class Recordings (Lessons 7, 8, 9, 10, 12, 13, 14) Discussion Board (Lessons 7, 8, 10, 13) Class Notice & Wonder Chart (Lesson 11) Class Data-Part B (Lesson 12) Effects on Simulation (Lesson 12) DQB (Lesson 14) Consensus Model (Lesson 14)
Students should ideally join VIRTUAL CLASS on the following days: Day 1 - Lesson 7 Day 3 - Lesson 8 Day 4 - Lesson 9 Day 6 - Lesson 10 Day 9 - Lesson 12 Day 11 - Lesson 13 Day 13 - Lesson 14		

Formative and Summative Assessment Opportunities:
Lesson 7: Model & Claim (end of Thinking Deeper Document)
Lesson 8: Exploring Temperature Changes in Each Cup
Lesson 9: Exit Ticket (Hot Tea vs. Iced Tea)
Lesson 10: Exit Ticket
Lesson 11: Claim and Evidence (Food Coloring Lab)
Lesson 12: Progress Tracker
Lesson 14: Icing Injuries Assessment

Lesson Set Overview: Lessons 15-18

Lesson Set 3: Lessons 15-18		
Provided Resources Students Will Need	**Additional Resources Students Will Need**	**Additional Materials for Students Without Internet Access**
Lesson Slideshows for each lesson: L15, L16, L17, L18 **Thinking Deeper Documents for each lesson:** Lesson 15 TDD, Lesson 16 TDD, Lesson 17 TDD, Lesson 18 TDD **Additional Documents:** Articles: How Light Warms Up Matter, How Styrene, Neoprene, and Cardboard Sleeves Work, How Double Walls Work (Lesson 15) Cold Cup Design Challenge (Lessons 16, 17 Reference Sheets for Design Tests: Regular, Light Test, Bright Light Test, Diameter Test, Environmental Impact Test, Price Check Test (Lesson 16) Assessment Task (Lesson 18) Optional: Sample Parent Letter	**Teacher Made Resources:** Discussion Boards (Lessons 15, 16, 17) Criteria/Constraints Assignment (Lesson 15) Examine What Works Assignment (Lesson 15) Class Data Table (Lessons 17, 18) Best Design Poll (Lesson 18) Google slides of top performing cups (Lesson 18) **Other Materials:** Cup Materials if available (students can use whatever they can find to replace any items they don't have)- 2 single walled plastic cups, lids, aluminum foil, plastic wrap, foam sheets, felt, straws, cotton balls, paper towels, cardboard, paper cups, rubber bands, tape, glue) (Lessons 16, 17) Thermometer (if available) (Lesson 17) Ruler (Lesson 17)	**Prior to Lesson**: No Additional Materials Needed **After Lesson Completion:** Discussion Boards (Lessons 15, 16, 17) Virtual Class recordings (Lessons 15, 16, 17, 18) Class Data Table with all data (Lessons 17, 18) Consensus Model (Lesson 18)
Students should ideally join VIRTUAL CLASS on the following days: Day 3- Lesson 15 Day 1- Lesson 16 Day 1- Lesson 17 Day 2 -Lesson 18		
Formative and Summative Assessment Opportunities: Lesson 15: Poster at the end of the Jigsaw activity Lesson 16: First Cup design with explanation of 3 features that should slow energy transfer Lesson 17: Second cup design with reasons for changes and justification Lesson 18: Assessment Task		

Lesson 1 (3 days) - Anchoring Phenomenon

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

- Lesson Slideshow
- Thinking Deeper Document
- DQB assignment - *teacher made*
- Consensus Model - *after completion*
- Driving Question Board - *after completion*

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
- DQB assignment - *teacher made*
- Consensus Model - *after completion*
- Driving Question Board - *after completion*
- Virtual Class Recording - *after completion*

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

- Day 2

Lesson 1 (3 days) - Anchoring Phenomenon

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 1 (5 min) INTRODUCE STUDENTS TO THE REGULAR CUP AND FANCY CUP Slide A	1. Share Lesson Slideshow with students 2. Share Thinking Deeper Document with students	VIRTUAL CLASS PRE-WORK: 1. Compare the regular and fancy cups and answer "think about it" questions.
Part 2 (5 min) BRAINSTORM HOW TO TEST THE TWO CUPS Slide B		VIRTUAL CLASS PRE-WORK: 1. Stop and Jot: Write the claim about fancy vs. regular cups and ideas for investigating it.
Part 3 (20 min) GATHER IN A SCIENTISTS CIRCLE FOR THE COLD CUP TEST Slide C-D		VIRTUAL CLASS PRE-WORK: 1. Record data for the Cold Cup Test and answer reflection questions 2. Answer questions about the parts of the system and how they work together.
Part 4 (12 min) DEVELOP SYSTEMS MODELS FOR THE TWO CUPS Slide E		VIRTUAL CLASS PRE-WORK: 1. Draw system models for the regular and fancy cups
Part 5 (5 min) SHARE INITIAL CONCLUSIONS AND ASSIGN HOME LEARNING	*Addressed in Day 2 Virtual Class.*	

Day 2		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Parts 6-9 (40 min) NAVIGATION REVIEW NORMS AND SET EXPECTATIONS DEVELOP A CONSENSUS MODEL FOR THE TWO CUPS BRAINSTORM RELATED PHENOMENA Slides F-K	**Teachers build in reviewing norms and setting expectations as needed for Virtual Class.* VIRTUAL CLASS: 1. Discuss conclusions from the Cold Water Test data. 2. Share regular and fancy cup system models. 3. Develop a consensus model and record what we all agree on. 4. Post/share consensus model with students to reference throughout the unit. 5. Class discussion of related phenomena, students record ideas on Thinking Deeper Document.	
Part 10 (8 min) NAVIGATION	*Not addressed in distance learning - option for teacher to build in during Virtual Class or Post-Work if time allows.*	

Day 3		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 11 (8 min) CONDUCT A GALLERY WALK TO EXAMINE MODELS	*Addressed in Day 2 Virtual Class.*	
Part 12 (5 min) DEVELOP QUESTIONS FOR THE DRIVING QUESTION BOARD Slides L		VIRTUAL CLASS POST-WORK: 1. Review models for regular and fancy cups. 2. Review related phenomenon questions. 3. Brainstorm how and why questions related to how systems maintain the temperature of things inside.
Part 13 (20 min) DEVELOP THE DRIVING QUESTION BOARD Slides L	1. Create and assign the DQB assignment for students to submit questions. 2. Review submitted questions and create DQB. 3. Post/share DQB with students to reference throughout the unit.	VIRTUAL CLASS POST-WORK: 1. Choose one question and submit it to the teacher.
Part 14 (10 min) PLAN IDEAS FOR INVESTIGATIONS Slides M		VIRTUAL CLASS POST-WORK: 1. Record the kind of investigations we could or would need to perform to collect data to answer the questions from the DQB.
Part 15 (2 min) NAVIGATION	*Addressed in Virtual Class.*	

Return to Lesson Set Overview

Lesson 2 (2 days) - Investigation

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

- Lesson Slideshow
- Thinking Deeper Document

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

- Lesson Slideshow
- Thinking Deeper Document
- Virtual Class Recording - *after completion*

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

- Day 1

Lesson 2 (2 days) - Investigation

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Parts 1-4 (35 min) NAVIGATION SET UP A FAIR TEST PLAN CUP INVESTIGATIONS IN SMALL GROUPS *(not addressed in distance learning)* CARRY OUT CUP INVESTIGATIONS Slides A-E	1. Share Lesson Slideshow with students 2. Share Thinking Deeper Document with students VIRTUAL CLASS: 1. Discuss questions submitted to the DQB 2. Discuss and write answers to probing questions about the cup features. 3. Discuss ideas to investigate. 4. Discuss variables as students record ideas on Thinking Deeper Document. 5. View photos and demonstrate how to read a thermometer. 6. Analyze and discuss results from the cold cup investigation. 7. Review how to create a graph for investigation data.	

Day 2		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 5: ANALYZE CLASS DATA (graph data provided) Slides H-I		VIRTUAL CLASS POST-WORK: 1. Graph data from cold cup investigation. 2. Stop and jot conclusions from data analysis.
Part 6 (8 min) UPDATE INDIVIDUAL PROGRESS TRACKER	*Thinking Deeper Document used to track progress throughout the Unit.*	
Part 7 (8 min) ORDER THE CUPS BY PERFORMANCE Slides J		VIRTUAL CLASS POST-WORK: 1. Order cups from best to worst performers.
Part 8 (2 min) NAVIGATION Slides J		VIRTUAL CLASS POST-WORK: 1. Answer “What have you figured out?” questions about cup features that helped to keep drinks cold and whether they would also keep drinks hot.

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

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

- Lesson Slideshow
- Thinking Deeper Document
- Virtual Class Recording - *after completion*

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

- Day 1

Lesson 3 (2 days) - Investigation

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Parts 1-3 (45 min) NAVIGATION CONDUCT THE HOT WATER TEST ANALYZE HOT WATER TEST DATA Slides A-E	Prior to Virtual Class, the teacher should: 1. Share Lesson Slideshow with students. 2. Share Thinking Deeper Document with students. VIRTUAL CLASS: 1. Display the ranked cups from the previous lesson. 2. Discuss Navigation questions from the post-work in the previous lesson. 3. Discuss planning fair test for investigating hot water in the cups. 4. Discuss variables related to the hot water test. 5. Analyze the hot water investigation data. 6. Discuss patterns in the data and compare the results to the cold water investigation.	

Day 2		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 4 (12 min) SHARE MODELS AND UPDATE PROGRESS TRACKER Slides F, G	*Students will create models, option to have them share asynchronously if time allows.* *Thinking Deeper Document used to track progress throughout the Unit.*	VIRTUAL CLASS POST WORK: 1. Draw a model to explain why one cups keeps drinks hotter and colder than the other cups. 2. Update reflection question about comparing how features of the cups keep things warm/cold on Thinking Deeper Document.
Part 5 (18 min) PLAN AN INVESTIGATION TO TEST THE LID Slides H-I		VIRTUAL CLASS POST WORK: 1. Design an investigation to test how the lid on the cup system works to prevent liquids inside from warming up or cooling down. 2. Restate some of the variables that the class decided were important to keep constant in investigations. 3. Review and make revisions to the independent and dependent variables for this investigation.
Part 6 (15 min) AGREE UPON PROCEDURES FOR OUR INVESTIGATION	*Addressed in next lesson navigation.*	

Return to Lesson Set Overview

Lesson 4 (3 days) - Investigation

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

- Lesson Slideshow
- Thinking Deeper Document

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
- Room-Temperature Time Lapse Video
- Hot Water Time Lapse Video
- Virtual Class Recording - *after completion*

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

- Day 1, Day 3

Lesson 4 (3 days) - Investigation

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Parts 1-4 (35 min) NAVIGATION REVIEW PREPARED DATA TABLE FOR CUP LID LAB 1 & CARRY OUT CUP LID LAB 1 POOL AND ANALYZE THE CLASS DATA *(Not addressed in distance learning)* ARGUING FROM EVIDENCE Slides A-G	Prior to the Virtual Class, teachers should do the following: 1. Share Lesson Slideshow with students 2. Share Thinking Deeper Document with students VIRTUAL CLASS: 1. Discuss the role of lids in keeping liquids from changing temperature and evidence to support conclusions about this. 2. Facilitate whole-group agreement on the variables and procedures from Lesson 3 Investigation plan. 3. View and discuss data collection for Cup Lid Lab 1. 4. Draw models to predict what will happen to hot water in both systems and share models with the class. 5. View data for how a lid versus no lid affects the temperature change of a hot liquid in a cup and calculate temperature change in both systems 6. Choose a claim that best applies to our data. 7. Discuss claims and describe evidence to support them.	

Day 2		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 5 (5 min) NAVIGATION Slides H		VIRTUAL CLASS POSTWORK: 1. Answer reflection questions about what is happening in the cup systems and what weighing each system could help us figure out.

Part 6 (5 min) MAKE PREDICTIONS AND REVIEW SAFETY FOR CUP LID LAB 2 Slides I-K		VIRTUAL CLASS POSTWORK: 1. Develop a new plan for the lid investigations. 2. Make predictions about whether the mass of the two cup systems would change over time and why.
Part 7 (10 min) CARRY OUT CUP LID LAB 2 Slides L		VIRTUAL CLASS POSTWORK: 1. Record collected data for mass change in two cup systems with hot liquid in them.
Part 7 (8 min) POOL AND ANALYZE THE CLASS DATA AND MAKE CLAIMS	*Not addressed in distance learning.*	
Part 8 (7 min) MAKE SENSE OF MASS LOSS DATA Slides M	Review students submitted responses and provide feedback as needed.	VIRTUAL CLASS POSTWORK: 1. *Explanations and Predictions of Lids and Covers:* Answer reflection questions to help make sense of matter leaving the cup system as a way of explaining the mass loss. 2. Submit the Thinking Deeper document for review.
Part 9 (10 min) DEVELOP MODELS AND SHARE PREDICTIONS Slides N		VIRTUAL CLASS POSTWORK: 1. Develop a model to explain why the cup system without a lid lost mass over time. 2. Predict what would happen if an open cup were left outside for a longer time.

Day 3		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Parts 10-12 (35 min) COMPARE THE AMOUNT OF WATER IN THE CUPS OVER TIME MODEL DROPPING WATER LEVELS AND MASS CHANGE OVER TIME USING OUR MODEL IDEAS TO EXPLAIN AND PREDICT Slides O-R	VIRTUAL CLASS: 1. Discuss predictions about what would happen if an open cup were left outside for a longer time and discuss how we could tell without a scale. 2. Watch two videos (one is time-lapse and one is slow-motion) of evaporation with students for analysis and discussion. 3. Facilitate a Building Understandings Discussion about mass loss due to water entering the air. 4. Use manipulatives (e.g., colored paper) to model evaporation in open systems (i.e., cups with no lids) and less open systems (i.e., cups with lids). 5. Construct an explanation for the lidded versus unlidded cup results on *Explanations and Predictions of Lids and Covers.*	

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
- Discussion Board Assignment - *teacher made*
- Home Investigation materials:
    - Plastic cup with lid
    - Ice
    - water

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 Printed copy of discussion board once completed

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 (5 min) NAVIGATION Slides A	1. Share Lesson Slideshow with students 2. Share Thinking Deeper Document with students 3. Check with students to see if any are unable to get a plastic cup with a lid for the home investigation. Provide to those in need.	HOME INVESTIGATION: 1. Observe what happens when a clear plastic cup with ice water and a lid are placed outside and record observations. 2. Explain where the water droplets came from on the outside of the cup.
Part 2 (5 min) PLAN THE WATER DROPLET INVESTIGATION Slide B	1. Set up Discussion Board Assignment (ex. question on platform like Google Classroom, shared google document, etc.)	PRE-WORK: 1. Generate ideas about testing cups to determine the origin of the water droplets that form on the outside of a cold cup system. 2. Post and respond on the discussion board.
Part 3 (20 min) CONDUCT THE WATER DROPLET INVESTIGATION Slides C-F		PRE-WORK: 1. Read the procedure for the investigation and make predictions about what will happen in the investigation if water can/cannot leak from the walls of the cup. 2. View photos of data collection from the conducted investigation.

Part 4 (10 min) OBSERVATIONS AND DATA Slides E-F		PRE-WORK: 1. Record data and observations from the investigation 2. Analyze the data and draw conclusions. 3. Answer Think About It questions to make connections between what we learned and other related phenomena.
Part 5 (5 min) COLD LEMONADE ON A HOT DAY! Slides G	Check Cold Lemonade On A Hot Day responses for understanding.	PRE-WORK: 1. Students choose a claim and support it with evidence to demonstrate understanding of how water droplets form on the outside of a cold container system. 2. Submit Thinking Deeper Document.

Return to Lesson Set Overview

Lesson 6 (2 days) - Putting Pieces Together

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

- Lesson Slideshow
- Thinking Deeper Document
- Checkpoint 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
- Checkpoint Assessment

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

- Day 1

Lesson 6 (2 days) - Putting Pieces Together

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Parts 1-5 (60 min) NAVIGATION MAP THE ELEMENTS OF THE OLD AND NEW MODELS USE THE MARBLE MODEL TO SHOW CHANGES IN MASS USE DIAGRAMS OF PARTICLES TO EXPLAIN MATTER MOVEMENT IN THE CUP SYSTEM UPDATE CLASS PROGRESS TRACKER Slides A- H	Prior to the Virtual Class, teachers should do the following: 1. Share Lesson Slideshow with students 2. Share Thinking Deeper Document with students VIRTUAL CLASS: 1. Connect to what we figured out in prior lessons and the manipulatives we used to represent particles of liquids and solids in a previous activity. 2. Introduce students to the particulate nature of solids and the manipulatives we can use to represent particles in solids, liquids, and gases. 3. Class discussion of molecules in different parts of the cup system and analogy map for modeling the molecules. 4. Teacher models the use of magnetic marbles as water molecules for students. 5. Students draw a model to represent movement of mass into and out of a system. 6. Introduce and use diagrammatic representations of particles in the cup system to explain how liquid particles can move, evaporate, and leave an open system but cannot leave a closed system Students annotate the diagram on their TDD during class discussion. 7. Teacher facilitates a Consensus Discussion on explaining the effects of a lid on what happens to the liquid in the cup over time and students document on their TDD.	

Day 2		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 5 (20 min) UPDATE CLASS PROGRESS TRACKER	*Addressed on Thinking Deeper Document in previous Virtual Class.*	
Part 6 (20 min) EXPLAINING THE EFFECT OF DIFFERENT LID DESIGNS Slides I	Post Checkpoint Assessment for students to access.	VIRTUAL CLASS POST-WORK: 1. Complete Checkpoint Assessment: Demonstrate understanding of content by working individually to plan a hypothetical investigation and construct an explanation for the performance of different lid designs.
Part 3 (5 min) NAVIGATION Slides J	Create and share discussion board assignment with students. (discussion question on digital class platform, shared google doc, etc)	DISCUSSION BOARD: 1. Analyze the results from an airtight system, showing that the temperature of a liquid in a container can change even if no matter enters or exits the system. 2. Brainstorm questions on TDD. 3. Explain how this can happen on the Discussion Board. 4. Respond to 2 other students in the discussion board.

Return to Lesson Set Overview

Lesson 7 (1 day) - Problematizing

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

- Lesson Slideshow
- Thinking Deeper Document
- What Cause Temperature Change 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
- What Cause Temperature Change Discussion Board - *teacher made*
- Discussion Board - *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 7 (1 day) - Problematizing

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 1 (5 min) NAVIGATION AND DQB Slide A	1. Share Lesson Slideshow with students 2. Share Thinking Deeper Document with students	VIRTUAL CLASS PRE WORK: 1. Complete navigation questions related to closed cup systems.
Part 2 (10 min) BRAINSTORM OTHER POSSIBLE CAUSES OF THE TEMPERATURE CHANGE Slide B	1. Create and assign DISCUSSION BOARD assignment. (examples include posing the questions on Google Stream, a Google Document students can edit, Nearpod, etc.)	DISCUSSION BOARD: 1. Share possible causes of change in the temperature of the liquid inside the closed cup. 2. Share ideas about what else could go into, out of, or through the cup walls and/or the lid. 3. Read and respond to at least two other student ideas using talk moves.
Parts 3 & 4 (30 min) USING MODELS TO REPRESENT OUR THINKING NAVIGATION Slides C- E	VIRTUAL CLASS: 1. Discuss how we will model how light and heat and cold mechanisms may cause a temperature change in the liquid inside the closed cup system. 2. Discuss the questions on the left side of Slide D about modeling light interactions with the closed cup system and how that might affect the temperature of the liquid inside. Students record ideas on Thinking Deeper Document. 3. Discuss questions on the right side of Slide D about heat and cold interacting with the closed cup system. Students record ideas on Thinking Deeper Document. 4. Students construct models of light and heat interactions on Thinking Deeper Document (or on paper). Give about 10 minutes. 5. Assign post work on Slide E Students 6. Before leaving the virtual class navigate by saying: *Next, let's explore both of our ideas, starting with light because we seem to have a better understanding of how light interacts with different materials, and we have some prior knowledge in how to investigate light interactions.*	

Part 3 cont. USING MODELS TO REPRESENT OUR THINKING Slide F	1. If you would like for students to submit their models and claims on a separate assignment, create the assignment prior to Virtual Class. 2. Review submissions and provide feedback as needed.	1. Make a claim to accompany each model from the Virtual Class. 2. Submit models and claims to the teacher for feedback.

Return to Lesson Set Overview

Lesson 8 (2 days) - Investigation

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

- Lesson Slideshow
- Thinking Deeper Document
- Explaining Temperature Changes in Each Cup
- Navigation 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
- Explaining Temperature Changes in Each Cup
- Discussion Board *(after completion)*
- Virtual Class Recording *(after completion)*

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

- Day 2

Lesson 8 (2 days) - Investigation

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 1 (10 min) NAVIGATION Slides A & B	1. Share Lesson Slideshow with students 2. Share Thinking Deeper Document with students 3. Create the Discussion Board assignment. 4. Review Discussion Board predictions and give feedback.	VIRTUAL CLASS PRE-WORK/DISCUSSION BOARD: 1. Complete Navigation Questions 2. Make predictions about how light will affect water in the different cups and submit on the Discussion Board. 3. Read and respond to ideas from other other students.
Part 2 (35 min) LIGHT AND TEMPERATURE INVESTIGATION Slides C, D, E, F, G, H, I		VIRTUAL CLASS PRE-WORK: 1. Analyze the set up in the on Slides C, D, and E and the procedure information on the Thinking Deeper Document for the Light and Temperature investigation to make predictions and reflect on the design. 2. Using the data table provided "Water Temperature Over Time", use the I2 Strategy (Identify "What I See" & Interpret "What It Means) to analyze the data on change in water temperature. 3. Repeat Step 3 & 4 using the data table, "Light Measurements" 4. Calculate the percentages of transmitted light and reflected light using the data table, "Light Measurements".

Day 2		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Parts 3 & 4 (25 min) NAVIGATION ANALYZE DATA FROM LIGHT AND TEMPERATURE INVESTIGATION Slides J-P	VIRTUAL CLASS: 1. Discuss prompts. *What was the purpose of testing the cups in the dark? What was the purpose of testing the cups in the light?* 2. Discuss what could we do with the data to help us understand the relationship between the temperature changes in the water and the amounts of reflected and transmitted light. 3. Combine the average temperatures and the percentages of incoming light in the table, "Average Water Temperature Change vs. Light Measurements (% light)". 4. Take 5 minutes for students to complete Notice & Wonder Chart in their Thinking Deeper Document. 5. Engage in a Building Understandings Discussion. Create a digital class Notice & Wonder chart and have students share at least one noticing and wondering from the data. 6. Discuss how students would develop models to explain temperature change.	
Part 5 (15 min) DEVELOP MODELS TO EXPLAIN TEMPERATURE CHANGE Slide P	1. Create assignment & rubric for students to turn in models. (Explaining Temperature Changes in Each Cup) 2. Assess models and give feedback to students.	VIRTUAL CLASS POST-WORK: 1. Develop models to explain temperature change. 2. Submit Explaining Temperature Changes in Each Cup
Part 6 (5 min) UPDATE PROGRESS TRACKER AND NAVIGATION Slide Q	*Students track progress throughout all lessons within Thinking Deeper Documents.*	VIRTUAL CLASS POST-WORK: 1. Answer Progress Tracker question at the end of Thinking Deeper Document.

Return to Lesson Set Overview

Lesson 9 (1 day) - Investigation

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

- Lesson Slideshow
- Thinking Deeper Document
- Exit Ticket - *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
- Exit Ticket - *teacher made*
- Virtual Class Recording - *after completion*

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

- Day 1

Lesson 9 (1 day) - Investigation

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Parts 1-3 (40 min) NAVIGATION INITIAL IDEAS DISCUSSION ABOUT TESTING THE MOVEMENT OF HEAT OR COLD WATER BATH LAB AND DISCUSSION Slides A-H	Prior to the Virtual Class, the teacher should do the following: 1. Share Lesson Slideshow with students 2. Share Thinking Deeper Document with students VIRTUAL CLASS: 1. Summarize the big ideas about light from the previous lesson. 2. Review the Lesson 7 Heat and Cold Models. 3. Hold an initial ideas discussion about testing the movement of heat or cold. 4. Analyze the image on Slide C. Make predictions about whether cold or heat would move and discuss. 5. Preview the lab set up on Slide D. Discuss the investigation question and variables. 6. Make predictions about what will happen in each condition by annotating the image (this could be done digitally and annotations shared if using a program like Nearpod). **Option to demonstrate the lab if time allows* 7. Analyze data from the lab and answer "Making Sense of the Data" questions and facilitate a whole class discussion.	
Part 4 (5 min) NAVIGATION Slides I	1. Create an assignment for students to turn in Exit Tickets. 2. Read Exit Tickets and give feedback.	VIRTUAL CLASS POST-WORK: 1. Complete Exit Ticket (Hot Tea vs. Iced Tea) and submit to teacher.

Return to Lesson Set Overview

Lesson 10 (2 days) - Investigation

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

- Lesson Slideshow
- Thinking Deeper Document
- Home Investigation Materials: 3 clear cups; measuring cup; hot, cold, and room temperature water, food coloring
- Food Coloring Lab Video *(if the student does not have materials to perform the lab at home)*
- Food Coloring Lab Discussion Board - *teacher made*
- Exit Ticket - *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
- Dissolving Candy Video
- Home Investigation Materials: 3 clear cups; measuring cup; hot, cold, and room temperature water, food coloring
- Food Coloring Lab Video *(if the student does not have materials to perform the lab at home)*
- Exit Ticket - *teacher made*
- Discussion Board *(upon completion)*
- Virtual Class Recording *(upon completion)*

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

- Day 2

Lesson 10 (2 days) - Investigation

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 1 (5 min) NAVIGATION Slides A	1. Share Lesson Slideshow with students 2. Share Thinking Deeper Document with students	VIRTUAL CLASS PRE-WORK: 1. Update the Progress Tracker by answering, "What is the difference between hot and cold liquids"?
Part 2 (12 min) INITIAL IDEAS DISCUSSION AND PREDICTIONS Slides B, C, D		VIRTUAL CLASS PRE-WORK: 1. Answer "Think About It" questions. 2. Complete chart to make predictions about how particles in hot and cold liquids over time. 3. Answer Making Predictions Questions under the chart.
Part 3 (12 min) VIDEO DEMONSTRATION OF DISSOLVING CANDY Slide E		VIRTUAL CLASS PRE-WORK: 1. Watch the video demonstration of dissolving candy and complete Notice & Wonder chart.
Part 4 (16 min) MOTIVATE AND CONDUCT THE FOOD COLORING LAB Slides F, G, H, I	1. Create class DISCUSSION BOARD ASSIGNMENT for Food Coloring Lab Observations. 2. Review submissions and provide feedback. **If students do not have access to the HomeInvestigation materials, you can share this video.	HOME INVESTIGATION/DISCUSSION BOARD: 1. Complete the Food Coloring Lab using the directions on the Thinking Deeper Document. 2. Record observations on TDD and share them the DISCUSSION BOARD. 3. Read and respond to at least 2 other students.

Day 2		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Parts 5-6 (45 min) READ ABOUT JAMES JOULE'S EXPERIMENT MAKING SENSES OF MULTIPLE SOURCES OF INFORMATION Slides J-S	VIRTUAL CLASS: 1. Describe the device depicted on Slide J. 2. Model the Close Reading Protocol and guide students through each step as a class. 3. Facilitate a brief discussion about the reading to summarize the idea that the movement in water is directly related to its temperature. 4. Discuss the connections between sources of information. 5. Replay the dissolving candy video and play the video of food coloring in water. 6. Students individually draw what they think is happening to the particles in cold water and room temperature water in their Thinking Deeper Document. 7. Have students hold their drawings in front of the camera and look for similarities and differences between their models and other students' models. 8. Facilitate a brief Building Understandings Discussion to come to consensus on how to represent particle movement (very little movement to moving more). 9. Guide the class toward thinking about energy. 10. Say, "*We just figured out something really important about something we cannot even see! There is a very important difference between cold liquids and hot liquids, and it has to do with the movement of particles and the energy those particles have. Let's summarize some of the key ideas we've figured out.*" 11. Students will layer energy on to their previous drawn models. 12. Assign the Exit Ticket	
Part 7 (5 min) PROBLEMATIZING HOW AND WHY PARTICLE MOVEMENT CHANGES OVER TIME Slide J- T	1. Create an assignment for students to submit their exit ticket. 2. Review Exit Ticket submissions.	VIRTUAL CLASS POST WORK: 1. Complete the Exit Ticket to reflect on why particle movement changes over time.

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
- Digital Class Notice & Wonder Chart - *teacher made*
- Flipgrid Code for Assignment - *teacher made*
- Claim and Evidence 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
- Digital Class Notice & Wonder Chart - *teacher made*
- Alternate Assignment for Flipgrid - *teacher made*
- Claim and Evidence Assignment - *teacher made*
- Digital Class Notice & Wonder Chart *(upon 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 (8 min) NAVIGATION Slide A	1. Share Lesson Slideshow with students . 2. Share Thinking Deeper Document with students.	VIRTUAL CLASS PRE-WORK: 1. Choose where to put evidence for each claim in the chart provided.
Part 2 (10 min) OBSERVE THE HEATING AND COOLING A LIQUID SIMULATION Slides B, C, D	1. Create a class DISCUSSION BOARD Notice & Wonder chart. (Share editing rights to all students in a single document) 2. Read and give feedback on class Notice & Wonder chart. (You may want to make the noticings and wonderings more concise by putting together the noticings and wonderings that are the same.) 3. Create a flipgrid assignment for students to video their answer to the question that follows the simulation. 4. Watch Flipgrids and share link to students so they can watch each other's Flipgrids. (This may be a good time to reach out to students who may have struggled to give an explanation on the Flipgrid and give extra support. **may want to check on your school's media release policy)	VIRTUAL CLASS PRE-WORK/DISCUSSION BOARD: 1. Read through the introduction 2. Complete the simulation by following directions on the TDD. 3. Record noticings and wonderings on the chart provided. 4. Add to the class virtual Notice & Wonder chart. Read and respond to other student Noticings and Wonderings. Add any new observations from other students to individual notice & wonder chart. 5. Record Flipgrid to answer the question: "What can we summarize about the differences between particles in cold liquid and particles in a hot liquid?" 6.

Part 3 (15 min) FACILITATE A BUILDING UNDERSTANDING DISCUSSION ABOUT KINETIC ENERGY Slides E, F, G	1. Add the word kinetic energy to your word wall if you have one.	VIRTUAL CLASS PRE-WORK: 1. Use the definition of Kinetic Energy to identify which particles had the most kinetic energy and which particles had the least. 2. Investigate if gas particles have kinetic energy by completing the perfume task. 3. Update models (Food Coloring Lab) to include kinetic energy.
Part 4 (8 min) EXPLAIN THE FOOD COLORING LAB OBSERVATIONS Slides G, H,	1. Create an online assignment for students to submit their completed Claim and Evidence. 2. Create a rubric to grade Claim and Evidence assignment.	VIRTUAL CLASS PRE-WORK: 1. Construct an explanation by using the Claim and Evidence sentence frame to explain why the food particles moved more in hot water than cold water. 2. Submit explanation to the teacher.
Part 5 (4 min) NAVIGATION Slides I, J		VIRTUAL CLASS PRE-WORK: 1. Revisit the anchoring phenomenon. 2. Problematize where the new energy came from.

Return to Lesson Set Overview

Lesson 12 (2 days) - Investigation

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

- Lesson Slideshow
- Thinking Deeper Document
- Virtual Assignment "What Have We Figured Out" - *teacher made*
- Group Assignments - *teacher made*
- Digital Class Chart to display group data - *teacher made*
- Virtual Assignment "Progress Tracker"- *teacher made*

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

- Lesson Slideshow
- Thinking Deeper Document
- Virtual Assignment "What Have We Figured Out" - *teacher made*
- Group Assignments - *teacher made*
- Digital Class Chart to display group data - *teacher made*
- Virtual Assignment "Progress Tracker"- *teacher made*
- Videos of Simulation Running - Part A: Trial 1, Trial 2, Trial 3
- Class Data - Part B - *after completion*
- Virtual Class Recording - *after completion*
- Copy of Effects on Simulation - *after completion*

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

- Day 2

Lesson 12 (2 days) - Investigation

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 1 (5 min) NAVIGATION Slide A	1. Share Lesson Slideshow (only slides A-J) with students 2. Share Thinking Deeper Document with students	VIRTUAL CLASS PRE-WORK: 1. Record what we figured out about the kinetic energy of the particles in hotter and cooler liquids on the Thinking Deeper Document.
Part 2 (20 min) ORIENT STUDENTS TO THE ONLINE INTERACTIVE SIMULATION Slides C, D, E, F, G		VIRTUAL CLASS PRE-WORK 1. Familiarize themselves to the control panel on the online interactive simulation by moving through slides C-G
Part 3 (20 min) EXPLORE THE INTERACTIVE SIMULATION Slides H, I, J	1. Create assignment for students to record what they figured out (Slide J) 2. Read student responses before the next virtual class to address any misconceptions.	VIRTUAL CLASS PRE-WORK: 1. Explore the online interactive simulation. 2. Run 3 trials and complete the charts on pages 3-5. 3. Complete the notice and wonder chart. 4. Complete the "Effects on the Simulation" portion of chart. 5. Revise models in Lesson 10 Thinking Deeper Document. 6. Record what they have figured out (Slide J) and submit to teacher.

Day 2		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Parts 4-8 (45 min) REVIEW WHAT WE HAVE FIGURED OUT OBSERVE INTERACTIONS AND RECORD DATA USING INTERACTIVE SIMULATION HAVE A BUILDING UNDERSTANDING DISCUSSION IN A SCIENTISTS CIRCLE UPDATE THE PROGRESS TRACKER NAVIGATION Slides K-O	Prior to Virtual Class, the teacher should: 1. Share slides K-O of the Lesson Slideshow VIRTUAL CLASS: 1. Review what we have figured out from the interactive simulation. 2. Assign each student a group letter. Display Slide L so each student can know how to setup their simulation. 2. Observe interactions (relationship between the temperature of a sample of matter and the kinetic energy of the particles that make up the sample) and record data using interactive simulation. 3. Have a building understandings discussion. Look for patterns in the small-group data to figure out the relationship between the temperature of a sample of matter and the kinetic energy of the particles that make up the sample. (You may want to create a document to record group data to be displayed on the screen as you have the discussion). 4. Update the Progress Tracker. **An assignment needs to be created for students to submit virtually if using as a form of assessment. 5. Motivate the need to investigate collisions between the particles of samples of different types of matter.	

Return to Lesson Set Overview

Lesson 13 (2 days) - 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*
- Navigation 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
- Making Sense Discussion Board - *teacher made*
- Navigation Discussion Board - *teacher made*
- Particle Collision Computer Simulation: Activity 1 Part 1, Activity 1 Part 2
- Marble Simulation Videos: Marble Simulation Activity #2, Marble Simulation Activity #3, Marble Simulation Activity #4
- Particles in Solids Computer Simulation: Activity #5, Activity #6, Activity #7, Activity #8
- Copy of Discussion Boards - *after completion*
- Virtual Class Recording - *after completion*

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

- Day 2

Lesson 13 (2 days) - Investigation

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 1 (3 min) NAVIGATION Slide A	1. Share Lesson Slideshow. 2. Share Thinking Deeper Document	VIRTUAL CLASS PRE-WORK: 1. Answer the navigation questions on Thinking Deeper Document. 2.
Part 2 (10 min) ANALYZE THE MOTION OF COLLIDING PARTICLES IN A COMPUTER SIMULATION Slides B, C, D		VIRTUAL CLASS PRE-WORK: 1. Complete simulation 1 and answer the questions that follow. 2. Complete simulation 2 and answer the questions that follow.
Part 3 (10 min) INVESTIGATE CHANGES IN PARTICLE MOTION IN COLLIDING MARBLES Slides E, F	1. Add States of Matter to the class word wall (preferably electronic so it can be shared)	VIRTUAL CLASS PRE-WORK: 1. Watch the video of marble simulation Activity 2. Compare this to the computer simulation of gas particles. 2. Complete the rows titled, Activity 1 and Activity 2 in the "Investigating Particle Collisions in Different States of Matter" chart.
Part 4 (8 min) USE MARBLES TO EXPLORE COLLISIONS IN A GAS AND A LIQUID Slides G, H		VIRTUAL CLASS PRE-WORK: 1. Watch the video of marble simulation 2. Compare this to the computer simulation of gas particles. 2. Complete the row titled, Activity 3 in the chart.

Part 5 (8 min) USE MARBLES TO EXPLORE COLLISIONS BETWEEN PARTICLES IN A GAS, LIQUID, AND SOLID Slides I, J		VIRTUAL CLASS PRE-WORK: 1. Watch the video of marble simulation 3. Compare this to the computer simulation of gas particles. 2. Complete the row titled, Activity 4 in the chart.
Part 6 (5 min) APPLY THESE IDEAS TO THE RESULTS FROM ONE OF OUR CUP EXPERIMENTS Slide K	1. Create a class DISCUSSION BOARD for the Making Sense question at the end of the "Investigating Particle Collisions in Different States of Matter" activity. 2. Read student responses on the Discussion Board before next class period to address misconceptions.	DISCUSSION BOARD: 1. Complete the Making Sense question on the class DISCUSSION BOARD and respond to at least 2 other classmates using talk moves.

Day 2		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 7 (45 min) NAVIGATION ANALYZE THE MOTION OF PARTICLES IN SOLIDS IN A COMPUTER SIMULATION INVESTIGATE PARTICLE MOTION IN SOLIDS AT DIFFERENT TEMPERATURES INVESTIGATE CHANGES IN PARTICLE MOTION BETWEEN TWO SOLIDS IN CONTACT INVESTIGATE THE EFFECT OF MASS ON CHANGES IN PARTICLE MOTION NAVIGATION Slides L-Z	Prior to Virtual Class, teachers should: 1. Create the DISCUSSION BOARD assignment for the navigation questions at the end of Virtual Class. VIRTUAL CLASS: 1. Facilitate a virtual class discussion to answer the navigation questions on slides L and M and address any misconceptions from the previous lesson's Making Sense question. 2. Introduce the next series of activities 3. Have students follow the directions on Slide N. Give students a couple minutes to complete their predictions. 4. Read the text on Slide O to orient students to the control panel available in this simulation. 5. Orient students to the buttons, monitors, and graphs available in this simulation using Slide P. Have students click on the link in their slideshow to open the model (or demo by sharing your screen). 6. Orient students to the directions for the Activity #5 on Slide Q. Assign students to work in small groups. Give students four minutes to complete the investigation and record their observations on *Particle Collisions within and between Solids.* (you may want to tell students to mute their microphones during each simulation). 7. Discuss observations. 8. Repeat this process for Activities (6-8) on Slides R-Y. 9. After all Activities and discussions of observations are complete, students should add answers to the navigation questions to the class DISCUSSION BOARD.	

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
- Icing Injuries 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
- Consensus Model - *after completion*
- Virtual Class Recording - *after completion*
- Icing Injuries Assessment

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

- Day 2

Lesson 14 (3 days) - Investigation

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 1 (5 min) NAVIGATION Slide A	1. Share Lesson Slideshow. 2. Share Thinking Deeper Document.	VIRTUAL CLASS PRE-WORK: 1. Students read and answer the navigation question on Slide A
Part 2 (18 min) EVIDENCE SORTING ACTIVITY Slide B, C		VIRTUAL CLASS PRE-WORK: 1. Complete the Evidence Sorting activity in Thinking Deeper Document.
Part 3 (12 min) BUTTER DEMONSTRATION Slides D, E, F, G		VIRTUAL CLASS PRE-WORK 1. Students make predictions about what will happen in the butter demonstration. 2. Analyze the photos and the data provided and answer questions about it. 3. Re-examine the evidence that we've collected thus far. Think about how we could use what we've figured out previously to help us explain our new observations of the demonstration.
Part 4 (5 min) RE-SORT TO INCLUDE BUTTER DEMONSTRATION EVIDENCE Slide H		VIRTUAL CLASS PRE-WORK: 1. Consider the evidence for today's investigation and where it should be placed in the three claims poster. 2. Record the numbers that correspond with each piece of evidence on the claims poster.

Part 5 (5 min) NAVIGATION AND HOME LEARNING Slide I	1. Read submissions from DQB and make a list of the questions students have shared to revisit in the next class period.	VIRTUAL CLASS PRE-WORK: 1. Revisit the DQB. Submit questions we have answered to the teacher. 2. Complete Home Learning Assignment.

Day 2		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Parts 6-9 (60 min) NAVIGATION REVISE THE CUP SYSTEM MODEL CUP SYSTEM MODEL CONSENSUS DISCUSSION DRIVING QUESTION BOARD AND RELATED PHENOMENA Slides N, O	VIRTUAL CLASS: 1. Share home learning examples. 2. Revisit Driving Question Board. 3. Revise the cup model using the section of Thinking Deeper Document "Modeling What is Happening at the Cup Wall". 4. Allow students about 8 minutes to construct a model. 5. Co-construct a classroom consensus model. 6. Celebrate the new consensus model. 7. Identify questions about heat and cold that can now be answered. 8. Co-construct an explanation of the cup together. "How does the drink warm up inside the cup?" 9. Individual reflection on a related phenomenon. If time, permits allow a few students to share. If time does not permit, you could have students add their reflections to a class discussion board for other students to read.	

Day 3		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 10 (20 min) ICING INJURIES ASSESSMENT Slide P	1. Share Icing Injuries Assessment.	VIRTUAL CLASS POST-WORK: 1. Complete and submit assessment.

Return to Lesson Set Overview

Lesson 15 (3 days) - Investigation

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

- Lesson Slideshow
- Thinking Deeper Document
- Criteria/Constraints Assignment - *teacher made*
- Examine What Work Assignment - *teacher made*
- Articles Assigned By Group: How Light Warms Up Matter, How Styrene, Neoprene, and Cardboard Sleeves Work, How Double Walls Work
- Gaps in What We Know Discussion Board - *teacher made*
- Gallery Walk - *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
- Criteria/Constraints Assignment - *teacher made*
- Examine What Work Assignment - *teacher made*
- Articles Assigned By Group: How Light Warms Up Matter, How Styrene, Neoprene, and Cardboard Sleeves Work, How Double Walls Work
- Gaps in What We Know Discussion Board - *teacher made*
- Gallery Walk - *teacher made*
- Virtual class recordings - *after completion*
- Discussion Board -*after completion*

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

- Day 3

Lesson 15 (3 days) - Investigation

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 1 (10 min) NAVIGATION Slides: A, B, C	1. Share Lesson Slideshow with students 2. Share Thinking Deeper Document with students 3. Create an assignment for students to submit one criteria and one constraint they think should be included in the Cold Cup Challenge.	VIRTUAL CLASS PRE-WORK: 1. Read "Cold Cup Challenge" problem and goal. 2. Create a list of criteria and constraints needed for the Cold Cup Challenge. 3. Submit one criteria and one constraint to the teacher.
Part 2 (30 min) EXAMINE WHAT WORKS Slides: D, E, F	1. Create an assignment for students to submit a cup feature. 2. Create a class table with responses from students.	VIRTUAL CLASS PRE-WORK: 1. Collect and examine samples of different cup designs that they have at home, or use picture on slide D if cup designs are not available. 2. Determine at least one feature you believe can help keep a drink cold in each type of cup. Write responses in the chart on your Thinking Deeper Document. 3. Submit one feature that keeps the drinks cool to the teacher. 4. Respond to reflection questions on Thinking Deeper Document.
Part 3 (5 min) NAVIGATION Slides: G	1. Create and assign DISCUSSION BOARD for Navigation. (examples include question thread on Google Stream or a Google Document that all students in the class can edit.)	DISCUSSION BOARD: 1. Share responses of the things they want to learn more about in the next class.

Day 2		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 4 (5 min) NAVIGATION Slides: H, I, J	1. Create an assignment for students to share ideas about gaps in knowledge for double walls, absorbing light, and materials.	VIRTUAL CLASS PRE-WORK: 1. Answer questions about gaps in our explanations from the slides in the chart on the Thinking Deeper Document. 2. Share one thing we need to learn about double walls, absorbing light, and materials on the Discussion Board.
Part 5 (22 min) JIGSAW THE GAPS IN WHAT WE KNOW Slides: K, L, M, N	1. Divide students into three groups (only for purposes of distributing articles). 2. Assign articles to students by group: • Group 1-How Light Warms Up Matter • Group 2-How Styrene, Neoprene, and Cardboard Sleeves Work • Group 3-How Double Walls Work	VIRTUAL CLASS PRE-WORK: 1. Complete close reading assignment using protocols on slides K and L.
	1. Create DISCUSSION BOARDS for each article for students to input ideas on what they have learned about double walls, absorbing light, and materials. (Consider a shared document with the table so students can type their responses for each category.)	DISCUSSION BOARD: 1. Share what they learned from their article about double walls, absorbing light, and materials. 2. Create a class consensus chart with ideas that your classmates seemed to agree on in the Discussion Board.
Part 6 (15 min) PREPARE POSTERS OF FEATURES THAT SLOW ENERGY TRANSFER Slides: O	*Option to be turned in for a formative assessment.*	VIRTUAL CLASS PRE-WORK: 1. Represent energy transfer on a poster on Thinking Deeper Document. Only represent the concepts in the article read. 2. Submit poster to teacher.
Part 7 (3 min) NAVIGATION & EXIT TICKET Slides: P		VIRTUAL CLASS PRE-WORK: 1. Complete exit ticket question on Thinking Deeper Document.

Day 3		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 8 (5 min) NAVIGATION	*Not addressed in the distance learning since students made their own posters.*	
Part 9 (16 min) GALLERY WALK OF EFFECTIVE DESIGN FEATURES Slides: Q	1. Collect student samples and create a slideshow gallery with like posters grouped. 2. Upload Google Slides of student work. (teacher created)	VIRTUAL CLASS PRE-WORK: 1. Read purposes and procedures for Gallery Walk. 2. Identify agreements and disagreements among like posters and record on Thinking Deeper Document.
Part 10 (22 min) CONSENSUS DISCUSSION IN A SCIENTISTS CIRCLE Slides: R, S, T, U	VIRTUAL CLASS: 1. Direct students to model on Thinking Deeper Document. 2. Co-develop a list of ideas figured out from the jigsaw. Focus students to use ideas from posters. 3. Develop a consensus model for how radiation warms a drink. 4. Develop a consensus model for why air pockets keep a drink cooler longer. 5. Develop a consensus model for why double walls keep a drink cooler for longer. 6. Motivate students for the need to figure out how we will test our new cup designs. Have students share ways to accomplish this task at home with what they have available.	
Part 11 (3 min) NAVIGATION Slides: V	*Addressed at the end of Virtual Class and students follow up with Post-Work.*	VIRTUAL CLASS POST-WORK: 1. Make a plan for cup design and how it will work. Explain whether it will help energy to transfer or will slow down that transfer.

Return to Lesson Set Overview

Lesson 16 (2 days) - Investigation

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

- Lesson Slideshow
- Thinking Deeper Document
- Patterns Across Cups Discussion Board Assignment - *teacher made*
- Cup Materials if available (students can use whatever they can find to replace any items they don't have)
  2 single walled plastic cups, lids, aluminum foil, plastic wrap, foam sheets, felt, straws, cotton balls, paper towels, cardboard, paper cups, rubber bands, tape, glue)
- Cold Cup Design Challenge
- Reference Sheets for Design Tests: Regular Light Test, Bright Light Test, Diameter Test, Environmental Impact Test, Price Check Test

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
- Patterns Across Cups Discussion Board Assignment - *teacher made*
- Virtual class recordings - *after completion*
- Cup Materials if available (students can use whatever they can find to replace any items they don't have)
  2 single walled plastic cups, lids, aluminum foil, plastic wrap, foam sheets, felt, straws, cotton balls, paper towels, cardboard, paper cups, rubber bands, tape, glue)
- Cold Cup Design Challenge
- Reference Sheets for Design Tests: Regular Light Test, Bright Light Test, Diameter Test, Environmental Impact Test, Price Check Test

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

- Day 1

Lesson 16 (2 days) - Investigation

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 1 (5 min) NAVIGATION Slides: A	1. Share Lesson Slideshow with students 2. Share Thinking Deeper Document with students 3. Create and assign DISCUSSION BOARD for Navigation. (examples include question thread on Google Stream or a Google Document that all students in the class can edit.)	DISCUSSION BOARD: 1. Explain your initial design ideas that you believe will help your cup slow energy transfer into the cup. 2. Record responses on Thinking Deeper Document, then share to Discussion Board.
Part 2 (15 min) REVIEW THE DESIGN CHALLENGE Slides: B, C, D, E, F, G, H	VIRTUAL CLASS: 1. Review the problem and goal of the design challenge. 2. Refer students to Part 1 of the Cold Cup Design Challenge design packet. *(not included on TDD, due to needing this document for several lessons).* 3. Ask students, "What are some initial things we need to think about with our designs?" 4. Review the criteria and constraints for the cup design challenge. *(Teacher should focus on constraints and give several options of items around the home that can be used. If nothing is available, give students the option to draw a detailed model.)* 5. Review the tests that students will conduct on their cup designs. *(Since most students will not have access to a thermometer, an option is for students to place a certain number of ice cubes in the cup and make observations of changes in the ice over 15 minutes. Teacher should reinforce the consistency of the shape and quantity of ice cubes.) (Students not building a cup can make a prediction on what aspects of their cup would be successful and what features could cause it to be unsuccessful. They can also conduct the price check test.)* - Students take notes about each test in the space provided on their Thinking Deeper Documents.	

Part 3 (25 min) DESIGN & BUILD CUP DESIGN 1 Slides: I, J	1. Provide feedback to students about their initial cup design. It should target the design features specifically and not necessarily focus on the cup design as a whole. *(This can be completed by the end of Day 2.)*	VIRTUAL CLASS POST-WORK: 1. Refer to Part 2 of design packet. 2. Create a sketch of cup design and label at least 3 features of the cup that should slow energy transfer and explain how they would. 3. Revisit criteria and constraints list to see if the design will likely meet them given the design. 4. Design and/or build the first cup. *(Students that are drawing a model should complete a more detailed model than what was provided in sketch.)* 5. Submit Design packet to teacher for review.

Day 2		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 4 (30 min) TEST FIRST CUP DESIGNS Slides: K		VIRTUAL CLASS POST-WORK: 1. Use resources to conduct tests on cups and record on Part 3 of Cold Cup Design Packet. *Encourage students to complete as much as they can, with what they have available at home. Students who did not build a cup can try these tests with any cup they have at home to practice making observations. They can also complete the Environmental Test and Price Check Test with their design plan.* • Regular Light Test • Bright Light Test • Diameter Test • Environmental Impact Test • Price Check Test
Part 5 (15 min) EVALUATE THE RESULTS OF THE FIRST DESIGN Slides: L. M	1. Create and assign DISCUSSION BOARD for peer review and feedback.	VIRTUAL CLASS POST-WORK: 1. Complete Part 4 of Cold Cup Challenge Packet to evaluate cup design. DISCUSSION BOARD: 1. Post results on discussion board. 2. List the design features that worked well for many of the cup designs in your class and explain why they work on Part 4 of Cold Cup Challenge Packet. 3. Provide peer feedback on a peer's discussion board and record response on Thinking Deeper Document.

Return to Lesson Set Overview

Lesson 17 (2 days) - Investigation

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

- Lesson Slideshow
- Thinking Deeper Document
- Cold Cup Design Challenge
- Class Data Table - *teacher made*
- Reference Sheets for Design Tests: Regular, Light Test, Bright Light Test, Diameter Test, Environmental Impact Test, Price Check Test
- Materials to build cups
- Evaluating Designs 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
- Class Data Table - *teacher made*
- Reference Sheets for Design Tests: Regular, Light Test, Bright Light Test, Diameter Test, Environmental Impact Test, Price Check Test
- Evaluating Designs Discussion Board Assignment - *teacher made*
- Copy of Discussion Boards
- Materials to build cups
- Virtual class recordings-*after completion*
- Class Data Table - *teacher-made, with completed data*

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

- Day 1

Lesson 17 (2 days) - Investigation

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 1 (10 min) NAVIGATION Slides: A	1. Share Lesson Slideshow with students 2. Share Thinking Deeper Document with students.	VIRTUAL CLASS PRE-WORK: 1. Examine patterns across the first set of cups. 2. Record responses on Thinking Deeper Document.
Part 2 (20 min) CLARIFY CRITERIA AND CONSTRAINTS AND TESTS TO CARRY OUT Slides: B, C	VIRTUAL CLASS: 1. Discuss cup designs and determine if they met the criteria. Discuss patterns seen in all designs. 2. Record new ideas in Part 4 of the Challenge Packet. 3. Reflect on the first design cycle to clarify any students' questions. 4. Encourage students to think about what we need to improve upon as we do this engineering work. 5. Customize this discussion for students based on observations during the first design cycle. (clarifying difference between criteria/constraint, upping the challenge, testing procedures) 6. Introduce instructions for Part 5 of Challenge Packet to Redesign and Build Cup Design 2.	
Part 3 (25 min) DESIGN & BUILD CUP DESIGN 2 Slides: C, D	1. Provide feedback to students about their second cup design. It should target the modification to their designs and how it will improve the function of the design. *(This can be completed by the end of Day 2.)*	VIRTUAL CLASS POST-WORK: 1. Refer to Part 5 of the design packet. 2. Create a sketch of cup design 2 and label at least 3 features of the cup that should slow energy transfer and explain how they would. 3. Revisit criteria and constraints list to see if the design will likely meet them given the design. 4. Note 1-2 changes you plan to make to their design, identify the test where they expect their cup to perform better, and explain how the change to their design should improve performance.

		4. Design and/or build the second cup. *(Students that are drawing a model should complete a more detailed model than what was provided in sketch.)* 5. Submit Design packet to teacher for review.

Day 2		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 4 (30 min) TEST SECOND CUP DESIGNS Slides: E	1. Create a class data table to compile results.	VIRTUAL CLASS POST-WORK: 1. Use resources to conduct tests on cups and record on Part 6 of Cold Cup Design Packet. *Encourage students to complete as much as they can, with what they have available at home. Students who did not build a cup can try these tests with any cup they have at home to practice making observations. They can also complete the Environmental Test and Price Check Test with their design plan.* • Regular Light Test • Bright Light Test • Diameter Test • Environmental Impact Test • Price Check Test 2. Submit final data to teacher.
Part 5 (10 min) ADD THE RESULTS TO A CLASS CHART Slides: F	1. Create and assign DISCUSSION BOARD for students to share experiences. (examples include question thread on Google Stream or a Google Document that all students in the class can edit.)	DISCUSSION BOARD: 1. Evaluate second design compared to first design for each test on Part 7: Part A of Challenge Packet. 2. Share thoughts on the Discussion Board.
Part 6 (5 min) NAVIGATION Slides: G		VIRTUAL CLASS POST-WORK: 1. Share ideas for designing a third design in Part 7: Part B of Challenge Packet.

Return to Lesson Set Overview

Lesson 18 (3 days) - Investigation

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

- Lesson Slideshow
- Thinking Deeper Document
- Best Design Poll - *teacher made*
- Class Data Table - *teacher made*
- Google slide of top performing cups - *teacher made*
- Assessment Task

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

- Lesson Slideshow
- Thinking Deeper Document
- Class Data Table - *teacher made*
- Best Design Poll - *teacher made*
- Google slide of top performing cups - *teacher made*
- Consensus Model - *after completion*
- Assessment Task

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

- Day 2

Lesson 18 (3 days) - Investigation

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 1 (5 min) NAVIGATION Slides: A	1. Share Lesson Slideshow with students 2. Share Thinking Deeper Document with students 3. Share Class Data table with data from students (teacher created.)	VIRTUAL CLASS PRE-WORK: 1. Review Class Data table. 2. Create a list of patterns in cups that performed well for all criteria.
Part 2 (10 min) ANALYSIS OF COLD CUP CHALLENGE DATA Slides: B	1. Create poll for students to vote on the best design. (teacher created)	VIRTUAL CLASS PRE-WORK: 1. Choose one cup that you would build and sell to others and justify your reasoning. 2. Vote on the best design in class poll.
Part 3 (20 min) REDESIGN THE ULTIMATE COLD CUP AND UPDATE PROGRESS TRACKER Slides: C	1. Create a Google doc/slides with 2-3 of the best performing cups. Include pictures if possible and share with students. (teacher-created)	VIRTUAL CLASS PRE-WORK 1. Refer to Part 8 of the Challenge Pack. 2. Redesign a final version of the cup using what they have learned from seeing the performance of other cups.
Part 5 (5 min) HOME LEARNING ASSIGNMENT Slides: D	*Completed before part 4 due to virtual class.*	VIRTUAL CLASS PRE-WORK: 1. Complete Home Learning Assignment on Thinking Deeper Document.

Day 2		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Parts 4-6 (25 min) MODIFY THE MODEL TO MAXIMIZE ENERGY TRANSFER APPLY MODELS TO EXPLAIN RELATED PHENOMENA Slide: D, E, F	VIRTUAL CLASS: 1. Facilitate a consensus discussion about features to include in the Ultimate Cold Cup from their responses on Part 8 in Design Packet. 2. Work together to create a visual representation using the top 3-4 features offered by the class on whiteboard, poster, or digital whiteboard. 3. Compare to the initial model. 4. Record the model ideas for slowing energy transfer to develop a model for speeding up energy transfer. 5. Discuss related phenomena in home learning assignments (Teachers can refer back to slide D). 6. Create a final consensus model.	
Part 7 (25 min) DEMONSTRATE UNDERSTANDING ON AN ASSESSMENT TASK Slides: F	1. Share Assessment Task with students.	ASSESSMENT: 1. Complete assessment task.
Part 8 (3 min) NAVIGATION AND HOME LEARNING	*Addressed in Part 10.*	

Day 3		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 9 (5 min) NAVIGATION	*Addressed in Part 10.*	
Part 10 (25 min) REVISIT OUR DRIVING QUESTION BOARD (DQB) Slide: G		VIRTUAL CLASS POST-WORK: 1. Choose three questions from DQB that you can now answer with evidence from a lesson in the unit. Record questions and answers on Thinking Deeper Document.
Part 11 (15 min) QUICK WRITE: REFLECT ON OUR EXPERIENCES Slide: G		VIRTUAL CLASS POST-WORK: 1. Reflect on your experiences with the unit on Thinking Deeper Document.

Return to Lesson Set Overview