

Louisiana Believes

Distance Learning Support for OpenSciEd Grade 8 Unit 7.2 Chemical Reactions and Energy Field Test Unit

This resource is designed to support teachers in implementing distance learning for OpenSciEd Grade 7 Unit 7.2, Unit 4 in the [Louisiana Guide to Piloting OpenSciEd Grade 8](#). It is intended as a supporting document and should be used in conjunction with the [OpenSciEd Unit 7.2 Teacher Edition](#). 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 November 30, 2020



| 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 |
| <p>Lesson Slideshows for each lesson:</p> <p>L1, L2, L3, L4</p> <p>Thinking Deeper Documents for each lesson:</p> <p>Lesson 1 TDD, Lesson 2 TDD, Lesson 3 TDD, Lesson 4 TDD</p> <p>Additional Documents:</p> <p>Reading 1, Reading 2, Reading 3 (Lesson 4 - linked within slideshow and TDD)</p> | <p>Teacher-Made Resources:</p> <p>Lesson 1: Notice/Wonder Assignment Ideas for Investigations Assignment Design Question Board</p> <p>Lesson 4: Updating the Model Discussion Board</p> | <p>Prior to Lesson:</p> <p>Lesson 1: Video of MRE, Video of Eating an MRE</p> <p>Lesson 2: (videos) Cutting open a flameless heater, Experiment 1: Salt and Water, Experiment 2: Iron and Water, Experiment 3: Magnesium and Water</p> <p>Lesson 4: Reading 1, Reading 2, Reading 3</p> <p>After Lesson Completion:</p> <p>Design Question Board (Lesson 1) Virtual Class recordings (Lessons 1, 3) Discussion Board (Lesson 4)</p> |
| <p>Students should ideally join VIRTUAL CLASS on the following days:</p> <p style="text-align: center;">Day 2 & 4 - Lesson 1</p> <p style="text-align: center;">Day 7 & 8 - Lesson 3</p> | | |
| <p>Formative and Summative Assessment Opportunities:</p> <p>Lesson 1: Initial Model (on TDD)</p> <p>Lesson 2: Data tables and Building Understandings Questions (on TDD)</p> <p>Lesson 3: Individually constructed LOL model for a 5.0g sample</p> | | |

Lesson Set Overview: Lessons [9](#), [10](#)

| Lesson Set 3: Lessons 9-10 | | |
|--|---|---|
| Provided Resources Students Will Need | Additional Resources Students Will Need | Additional Materials for Students Without Internet Access |
| <p>Lesson Slideshows for each lesson:</p> <p>L9, L10</p> <p>Thinking Deeper Documents for each lesson:</p> <p>Lesson 9 TDD, Lesson 10 TDD</p> <p>Additional Documents:</p> <p>Sea Turtle Assessment LOL Models for Assessment Design Testing Matrix</p> | <p>Teacher-Made Resources:</p> <p>Lesson 9: Team Model Design platform (Jamboard, Google Slides, etc.) Polling assignment to rank team designs</p> <p>Lesson 10: Graffiti Board Assignment</p> | <p>Prior to Lesson:</p> <p>After Lesson Completion:</p> <p>Virtual Class recordings (Lessons 9 & 10) Model Designs and Discussions (Lesson 9)</p> |
| <p>Students should ideally join VIRTUAL CLASS on the following days:</p> <p style="text-align: center;">Day 1 & 3 - Lesson 9 Day 4 - Lesson 10</p> | | |
| <p>Formative and Summative Assessment Opportunities:</p> <p>Lesson 9: Team Design Revisions Lesson 10: Assessment</p> | | |

Lesson 1 (4 days) - Anchoring Phenomenon

NOTE: This lesson was originally done over three days. Day 3 allows a day between virtual classes and the activities account for about half as much time as the other days. If time allows, the teacher may choose to have students complete Day 3 activities after the Virtual Class on Day 2 rather than including an additional day in the schedule.

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

- [Lesson Slideshow](#)
- [Thinking Deeper Document](#)
- Notice/Wonder Assignment - *teacher-made*
- Ideas for Investigations Assignment - *teacher made*
- Design Question Board - *teacher-made*
- Initial Model 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:

- Anchor Phenomenon Videos: [Video of MRE](#), [Video of Eating an MRE](#)
- [Lesson Slideshow](#)
- [Thinking Deeper Document](#)
- Notice/Wonder Assignment - *teacher-made*
- Design Question Board - *teacher-made*
- Ideas for Investigations 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 2
- Day 4

Lesson 1 (4 days) - Anchoring Phenomenon

| Day 1 | | |
|--|---|---|
| Lesson Components | Distance Learning Plan | |
| | Teacher | Student |
| <p>Part 1 &2 (25 min)</p> <p>INTRODUCE AN INTERESTING PHENOMENON AND DEMONSTRATE ITS USE</p> <p>Slides A-H</p> | <ol style="list-style-type: none"> 1. Decide how norms review and reflection will be built into the Virtual Classes and make adjustments to the slideshow as needed using the editable slides at the end of the slideshow. 2. Share Lesson Slideshow & Thinking Deeper Document with students. 3. Create an assignment for students to submit 1 Notice and 1 Wonder (ex: google form). 4. Review Notice/Wonder responses from students in preparation to facilitate virtual class discussion. | <p>VIRTUAL CLASS PRE-WORK:</p> <ol style="list-style-type: none"> 1. Watch 2 videos and record notices and wonderings on the chart. Video of MRE, Video of Eating an MRE 2. Turn in individual Notice/Wonder assignments to teacher |
| <p>Part 3 (20 min)</p> <p>DEVELOP AN INITIAL MODEL</p> <p>Slide I</p> | <ol style="list-style-type: none"> 1. Create assignments for students to submit their initial models. (ex: google slides) NOTE: Students may need explicit instructions to upload their models to the assignment. 2. Collect and compile models to share during virtual class. (ex. Add all models to one slideshow or shared document) | <p>VIRTUAL CLASS PRE-WORK:</p> <ol style="list-style-type: none"> 1. Create an initial model (either digital or on paper then upload a photo) and attach to the initial model assignment to be used during the virtual class. |

| Day 2 | | |
|---|---|---------|
| Lesson Components | Distance Learning Plan | |
| | Teacher | Student |
| Parts 4-9 (45 min) COMPARE INITIAL MODELS REVIEW NORMS DEVELOP A CONSENSUS MODEL NOTICE/WONDER ABOUT SITUATIONS MREs USED DEFINE PROBLEM AND PROPOSE SOLUTION PROGRESS TRACKER Slides J-X | VIRTUAL CLASS 1. Discuss and review initial models - direct students to review several and record similarities and differences on the TDDs. 2. As a group discuss overall similarities and differences between models 3. Develop an Initial Consensus Model (The teacher may choose to draw the model electronically and screen share or to draw on a poster - Ensure students have access to the completed model.) 4. Record and share new questions about MRE's and flameless heaters. 5. Stop and Jot about why MREs include a heater. 6. Brainstorm and discuss problems using MREs with flameless heaters. 7. Record possible solutions for the problems discussed in Virtual Class and discuss. 8. Reflect on what we just did as engineers: defining problems, proposing solutions | |

| Day 3 | | |
|--|------------------------|---|
| Lesson Components | Distance Learning Plan | |
| | Teacher | Student |
| Part 10 (5 min) BRAINSTORM RELATED PHENOMENA Slide Y | | VIRTUAL CLASS PRE-WORK: 1. Record related phenomena on the TDD |
| Part 11 (5 min) DISCUSS CRITERIA AND CONSTRAINTS Slide Z | | VIRTUAL CLASS PRE-WORK: 1. Recall the meaning of “criteria” and “constraints” and record some possible criteria and constraints for a homemade flameless heater. |
| Part 12 (10 min) DEVELOP AN INITIAL DESIGN SOLUTION Slides AA, BB | | VIRTUAL CLASS PRE-WORK: 1. Individually plan and design a homemade flameless heater. |

| Day 4 | | |
|---|---|---|
| Lesson Components | Distance Learning Plan | |
| | Teacher | Student |
| Part 13-16 (40 min) COMPARE INITIAL DESIGN SOLUTIONS COMPARE AND REFLECT ON INITIAL DESIGNS GENERATE DESIGN QUESTIONS BUILD A DESIGN QUESTION BOARD Slides CC-GG | VIRTUAL CLASS: 1. Debrief on last time’s design work, including challenges and collect ideas for how we can improve 2. Reflect on other students’ initial designs recording other ideas that could be used moving forward 3. Generate design questions by considering all of the experiences in class so far and recording questions that will help us continue to the next step. 4. Teacher begins to build the Design Question Board using the platform of their choice (ex. Google Jamboard, Pinup, etc.) | |
| Part 17 & 18 (10 min) GENERATE & SHARE IDEAS FOR INVESTIGATION Slides HH | 1. Create assignments for students to submit their investigation ideas (ex: google slides) | VIRTUAL CLASS POST-WORK: 1. Brainstorm and record on their TDD at least one investigation that could answer a design question from the DQB. Submit one idea for investigation to the assignment created by the teacher. |
| Part 19 REFLECTING ON NORMS | <i>Reflecting on norms - Build out as needed for virtual learning and address during the Virtual Class (Note: Editable slides are provided at the end of the Lesson 1 Slides, revise to fit your classroom procedures and protocols.)</i> | |

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Lesson 2 (1 day) – 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](#)
- [Cutting open a flameless heater](#) Video
- [Experiment 1: Salt and Water](#) Video
- [Experiment 2: Iron and Water](#) Video
- [Experiment 3: Magnesium and Water](#) Video

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

- None

Lesson 2 (1 day) - Investigations

| Day 1 | | |
|---|--|---|
| Lesson Components | Distance Learning Plan | |
| | Teacher | Student |
| Part 1 (5 min) NAVIGATION Slides A, B | 1. Ensure students can view videos and record and insert new videos if needed. 2. Share Lesson Slideshow with students. 3. Share Thinking Deeper Document with students. | VIRTUAL CLASS PRE-WORK: 1. Review their TDD from Lesson 1. 2. Determine the first investigation we will conduct will be to find out what's in an MRE's flameless heater. |
| Part 2 (5 min) ANALYZE INGREDIENTS OF THE MRE HEATER PACK Slides C-G | | VIRTUAL CLASS PRE-WORK: 1. Watch the video Cutting open a flameless heater and observe images of what's inside a flameless heater. 2. Analyze the ingredient list and make predictions about which substance might be causing them to get warm. |
| Part 3 (7min) PLAN AN INVESTIGATION TO DETERMINE WHAT IS CAUSING THE MRE HEATER TO GET WARM Slides H | | VIRTUAL CLASS PRE-WORK: 1. Brainstorm what type of data should be collected and how much to collect in their TDD |

| | | |
|--|--|--|
| <p>Part 4 & 5 (18 min)</p> <p>WHOLE CLASS DEMONSTRATIONS OF INVESTIGATIONS</p> <p>Slides I-K</p> | | <p>VIRTUAL CLASS PRE-WORK:</p> <ol style="list-style-type: none"> 1. Watch Experiment 1: Salt and Water, Experiment 2: Iron and Water, Experiment 3: Magnesium and Water and record data. |
| <p>Part 6 & 7 (10 min)</p> <p>BUILDING UNDERSTANDINGS AND NAVIGATION</p> <p>Slides L</p> | | <p>VIRTUAL CLASS PRE-WORK:</p> <ol style="list-style-type: none"> 1. Use the data they collected to answer questions that result in understanding that a chemical reaction is happening in the heater, and that magnesium is the critical substance. 2. They consider based on today's work what should be investigated in the future. |

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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
- Day 2

Lesson 3 (2 days) - Investigation

| Day 1 | | |
|---|---|--|
| Lesson Components | Distance Learning Plan | |
| | Teacher | Student |
| Part 1 (5 min) NAVIGATION Slide A | <ol style="list-style-type: none"> 1. Share Lesson Slideshow with students. 2. Share Thinking Deeper Document with students. | VIRTUAL CLASS PRE-WORK <ol style="list-style-type: none"> 1. Consider questions that were brought up at the end of Lesson 2 and revisit our ideas for investigations. |
| Parts 2-3 (35 min) PREPARE TO INVESTIGATE WHICH PROCESSES INCREASE, DECREASE OR DO NO CHANGE TEMPERATURE INVESTIGATION OF CHEMICAL COMBINATIONS Slides B-O | VIRTUAL CLASS: Part A - <ol style="list-style-type: none"> 1. Review questions from Slide A. 2. Prepare to investigate other materials and the revised materials that will be used. 3. Observe a revised materials list and record notices and wonderings about the materials. 4. Discuss and make a prediction about what happens when more or less reactants are used. Part B - <ol style="list-style-type: none"> 1. Discuss the procedure used for the Chemical Combinations Lab. Demonstrate the procedure for at least one group to students during the virtual class. If time allows, demonstrate other groups as well. 2. Review Data collected on slides L - O, explaining to students what the data means and differences in each table. Model how to record the maximum temperature change on TDD for at least the first data set or two. 3. Review assignments to be completed before the next day's virtual class. | |
| Part 4 (5min) FIND PATTERNS IN THE DATA FROM THE INVESTIGATION Slide P | | VIRTUAL CLASS POST-WORK: <ol style="list-style-type: none"> 1. Use the data collected during Virtual Class to find patterns in the temperature changes in the different investigations by answering sensemaking questions. |

| Day 2 | | |
|--|---|--|
| Lesson Components | Distance Learning Plan | |
| | Teacher | Student |
| Parts 5 & 6 (30 min) BUILDING UNDERSTANDINGS BUILDING UNDERSTANDINGS CO-CONSTRUCT LOL MODELS Slides Q - BB | VIRTUAL CLASS: 1. Review what was figured out during the previous class. 2. Define the terms Endothermic and Exothermic on TDD. 3. Identify and record what we have done as engineers on the TDD. 4. Revisit and review what was learned in the Bath Bomb unit. 5. Breakdown and review chemical formulas and equations. 6. Review what we figured out in yesterday's lesson. 7. Co-construct LOL Energy Model to track energy transfer for a 1.0g sample. 8. Compare a 1.0g sample LOL Energy Model to a 3.0g LOL Energy Model. 9. Explain why more reactants lead to a greater temperature change. | |
| Part 8 & 9 (20 min) CREATE LOL MODEL FOR MORE REACTANTS Slide CC | <i>(Teacher may wish to be available virtually to assist students with independently creating the LOL model and discuss questions)</i> | VIRTUAL CLASS POST-WORK 1. Create a LOL Energy Model for a 5.0g sample of reactants on the TDD. |

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Lesson 4 (1 day) - Putting Pieces Together/Investigation

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

- [Lesson Slideshow](#)
- [Thinking Deeper Document](#)
- Updating Model Discussion Board - *teacher made*

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

- [Lesson Slideshow](#)
- [Thinking Deeper Document](#)
- Updating Model Discussion Board - *teacher made*
- Discussion Board - *after completion*
- [Reading 1](#)
- [Reading 2](#)
- [Reading 3](#)

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

- None

Lesson 4 (1 day) - Putting Pieces Together/Investigation

| Day 1 | | |
|--|---|---|
| Lesson Components | Distance Learning Plan | |
| | Teacher | Student |
| Part 1 (2 min) NAVIGATION Slides A, B | <ol style="list-style-type: none"> 1. Insert images of class models on Slide E and page 1 of the TDD. 2. Share Lesson Slideshow Slides A-G only (make a copy and delete the rest of the slides before sharing) - It will work best if students have a shared, uneditable copy. 3. Share Thinking Deeper Document with students. | VIRTUAL CLASS POST-WORK <ol style="list-style-type: none"> 1. Reflect on what we've figured out in Lesson 3 and consider how this can be integrated in our design. 2. Identify what we did as engineers and what this helps us figure out. |
| Part 2 (5 min) IDENTIFY STAKEHOLDERS Slides C,D | | VIRTUAL CLASS PRE-WORK <ol style="list-style-type: none"> 1. Think about who will be using the homemade heaters and record who those stakeholders are in the TDD. |
| Part 3 (10 min) ADDING ENERGY TRANSFER TO OUR EXISTING MODEL Slides E-I | <ol style="list-style-type: none"> 1. Create a discussion board (question thread, shared document, etc.) for students to share proposed changes to the consensus model. 2. Facilitate discussion board as needed (reference the Key Ideas and sample discussion on Pages 9 & 10 of the Lesson 4 Teacher Edition for support). 3. Share the rest of the slideshow with updates to the homemade heater model. - If the slideshow is a view-only copy and a shared document, copy and paste the slides back in after the Discussion to update for all students. | VIRTUAL CLASS PRE-WORK/DISCUSSION BOARD: <ol style="list-style-type: none"> 1. Brainstorm and share ideas for updating the consensus model and share on the discussion board. 2. Update the class consensus model to show the energy flow in the system. |

| Day 2 | | |
|---|--|---|
| Lesson Components | Distance Learning Plan | |
| | Teacher | Student |
| <p>Part 5 (20 min)</p> <p>OBTAIN INFORMATION FROM VARIOUS SOURCES TO REFINE OUR TEMPERATURE CRITERIA</p> <p>Slide J</p> | <p>1. Identify a program such as Kami to edit readings - students will need explicit instructions for using this if they have not previously done so.</p> <p>NOTE: You may want to split students into groups of three and assign each one an article. In this case, students can use a shared document to add what they learned about each focal question from their reading.</p> | <p>VIRTUAL CLASS PRE-WORK</p> <p>1. Read three articles and use the data to define a target temperature range to help make design decisions.</p> |
| <p>Part 6 (5 min)</p> <p>IDENTIFY OTHER CONSTRAINTS</p> <p>Slides L, M</p> | | <p>VIRTUAL CLASS PRE-WORK</p> <p>1. Consider other constraints, such as cost and weight.</p> <p>2. Complete a notice and wonder chart for the costs of MRE's</p> <p>3. Predict how weight affects a stakeholder</p> |
| <p>Part 7 (3 min)</p> <p>NAVIGATION</p> <p>Slides M</p> | | <p>VIRTUAL CLASS PRE-WORK</p> <p>1. Think about and propose a way to test the design without wasting materials.</p> |

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Lesson 5 (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](#)
- [Procedure for Heating Food](#)
- [Amount of Reactants Investigation Procedure](#)
- [Class Data](#)
- Virtual Class Recordings - *after completion*

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

- Day 1
- Day 2

Lesson 5 (2 days) - Investigation

| Day 1 | | |
|---|--|--|
| Lesson Components | Distance Learning Plan | |
| | Teacher | Student |
| Parts 1-4 (45 min) NAVIGATION ANALYZE DATA FOR DIFFERENT AMOUNTS OF FOOD REVISIT OUR LOL MODEL AND DRAW CONCLUSION ABOUT THE AMOUNT OF FOOD AND ENERGY TRANSFERRED PLAN FOR PROPORTION OF REACTANTS INVESTIGATION Slides A-T | Prior to the Virtual Class, the teacher should: 1. Insert the class LOL model into Slides O & P and the Thinking Deeper Document. 2. Share Lesson Slideshow with students. 2. Share Thinking Deeper Document with students . VIRTUAL CLASS: 1. Discuss, reflect and record the trade-off between how much food versus reactants we should use in our design. Analyze the data of the maximum temperatures that different amounts of food reach when using the same amounts of reactants. 2. Utilize the I2 strategy to make sense of the data. 3. Revisit our LOL Energy Models from Lesson 3 and represent different amounts of food. 4. Conclude that the more food we have the more energy we need to add to the system to heat it up. 5. Discuss connection between the criteria and constraints of the MRE (Lesson 4), the amount of energy needed and released based on amounts of food (Lesson 3) and how those two have to directly impact choices made in our next investigations. We want to maximize energy while staying within all constraints. 6. Discuss the amount of reactants to test and what data to collect. Evaluate and discuss the investigation procedure | |
| Part 4 (5 min) NAVIGATION Slides U | | VIRTUAL CLASS POST-WORK 1. Record on TDD ideas for measuring reactants, collecting temperature data, and examining the liquids after 5 minutes. |

| Day 2 | | |
|--|--|---|
| Lesson Components | Distance Learning Plan | |
| | Teacher | Student |
| Parts 5-7 (40 min) NAVIGATION ANALYZE THE AMOUNT OF REACTANTS INVESTIGATION RESULTS AND BUILDING UNDERSTANDINGS Slides R-U | Prior to Virtual Class, the teacher should: 1. Set up to demonstrate one part of the amount of reactants investigation. VIRTUAL CLASS: 1. Review the Thinking Deeper Document and discuss how our procedure will help us answer our question and what we expect to see for the proportions to work best. 2. Review and record notices and wondering about the procedure used to collect class data. 3. Discuss procedure as a whole group. Teacher demonstrates the procedure for one of the amounts. 4. Analyze the class data and record maximum temperature changes. 5. Determine which combination of reactant are the optimal proportions to create the largest temperature change | |
| Part 8 (5 min) WHAT WE DID AS ENGINEERS Slides U | | VIRTUAL CLASS POST-WORK 1. Record on TDD that we systematically tested parts of our possible solution and figured out the optimal proportion of reactants. |

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Lesson 6 (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](#)
- [Design Model Must-Haves](#)
- Virtual Class Recordings - *after completion*
- Access to Team Model Design (by text, a designated partner to add suggestions, etc.)

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

- Day 2
- Day 3

Lesson 6 (3 days) - Investigation

| Day 1 | | |
|--|---|---|
| Lesson Components | Distance Learning Plan | |
| | Teacher | Student |
| Part 1 (5 min) NAVIGATION Slides A | <ol style="list-style-type: none"> 1. Create a platform for students to post and discuss their final design on Day 3 (Google Jamboard, Google Slides, etc.) and add any additional instructions needed into the slideshow. 2. Share Lesson Slideshow with students. 3. Share Thinking Deeper Document with students. | VIRTUAL CLASS PRE-WORK: <ol style="list-style-type: none"> 1. Review what was done during the last lesson and add what we did as engineers to the TDD. |
| Part 2 (12 min) FIGURING OUT INFORMATION WE STILL NEED Slides B-I | | VIRTUAL CLASS PRE-WORK: <ol style="list-style-type: none"> 1. Revisit the DQB and ideas for investigation to determine what we still need to answer. 2. Figure out we still need mass, cost, instructions, time and a substitute for food. |
| Part 3 (5 min) PREPARING FOR TEAMWORK Slides J | | VIRTUAL CLASS PRE-WORK: <ol style="list-style-type: none"> 1. Brainstorm how teamwork will be beneficial for this investigation. |
| Part 4 (23 min) INDIVIDUAL MODEL PROPOSAL Slides K-M | | VIRTUAL CLASS PRE-WORK: <ol style="list-style-type: none"> 1. Consider all available materials to design an initial proposal which will be discussed and evaluated as a group at the Virtual Class. Proposal must be within safety constraints. |

| Day 2 | | |
|--|---|---|
| Lesson Components | Distance Learning Plan | |
| | Teacher | Student |
| Parts 5-6 (35 min) PREPARE TO WORK DESIGN THE PROTOTYPES IN TEAMS Slides N-T | Prior to the Virtual Class, 1. Determine a format for Team discussions and designs (Google Jamboard, Google Slides, etc.) VIRTUAL CLASS: 1. Review Design Model Must-haves as a group. 2. Share individual design ideas. 3. As a team, develop a design and create their step by step directions on how to construct their design. 4. Students submit their work to the teacher for review. | |
| Part 7 (10 min) NAVIGATIONS AND SELF ASSESSMENT Slides U, V | | VIRTUAL CLASS POST-WORK: 1. Reflect on what was completed during the lesson and brainstorm what else needs to be done. 2. Reflect on their teamwork and fill out a Self-Assessment. |

| Day 3 | | |
|--|---|---|
| Lesson Components | Distance Learning Plan | |
| | Teacher | Student |
| <p>Parts 8-9 (32 min)</p> <p>FINISH PLANNING DESIGN</p> <p>SELF-ASSESS ENGINEERING PRACTICES IN TEAMS</p> <p>Slides W, X</p> | <p>VIRTUAL CLASS:</p> <ol style="list-style-type: none"> 1. Students finalize their design and instructions as a team and submit them to be approved by the teacher. 2. Teams work together to assess their work as engineers utilizing a rubric. <p>Following the Virtual Class, the teacher will need to collect and compile the designs to share with students for the next day's peer review.</p> | |
| <p>Part 10 (10 min)</p> <p>RECORD WHAT WE DID AS ENGINEERS</p> <p>Slide Y</p> | | <p>VIRTUAL CLASS POST-WORK:</p> <ol style="list-style-type: none"> 1. Update TDD to include what we have accomplished as engineers during this lesson. |
| <p>Part 11 (3 min)</p> <p>INDIVIDUALLY SELF-ASSESS TEAMWORK</p> <p>Slide Z</p> | | <p>VIRTUAL CLASS POST-WORK:</p> <ol style="list-style-type: none"> 1. Independently rate themselves using the Teamwork Self-Assessment. |

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Lesson 7 (1 day) - Problematizing

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](#)
- Student models to use for peer review

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

- None

Lesson 7 (1 day) - Problematizing

| 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 POST WORK: 1. Review the team's design and identify areas for improvement. |
| Part 2 (25 min) REVIEW OTHER TEAMS DESIGNS AND PROCEDURES Slides B,C | | VIRTUAL CLASS POST WORK: 1. View all other teams' designs and procedures. 2. Identify and record promising designs, questions, as well as suggestions on their TDD |
| Part 3 (10 min) WHAT WE DID AS ENGINEERS Slides D | | VIRTUAL CLASS POST WORK: 1. Identify and record how we compared designs and identified the most promising design characteristics. |
| Part 4 (5 min) NAVIGATION Slides E | | VIRTUAL CLASS POST WORK: 1. Reflect on how taking this new information and discussing it as a team will improve your design |

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Lesson 8 (2 days) - Investigation/Putting Pieces Together

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

- [Lesson Slideshow](#)
- [Thinking Deeper Document](#)
- Ranking Justification Assignment - *adjust as needed for Virtual Class*
- Consequences Chart Assignment - *teacher made*

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

- [Lesson Slideshow](#)
- [Thinking Deeper Document](#)
- Virtual Class recording - *after completion*
- [Ranking Justification Assignment](#) - *adjust as needed for Virtual Class*
- Consequences Chart Assignment - *teacher made*

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

- Day 1

Lesson 8 (2 days) - Investigation/Putting Pieces Together

| Day 1 | | |
|---|--|--|
| Lesson Components | Distance Learning Plan | |
| | Teacher | Student |
| Part 1 (2 min) NAVIGATION Slide A | <ol style="list-style-type: none"> 1. Share Lesson Slideshow with students. 2. Share Thinking Deeper Document with students. 3. Prepare a Ranking Justification Assignment (Google Slides, Google Drawing, etc.). 4. Prepare a Consequences Chart Assignment (Google Slides, Google Drawing, etc.). | VIRTUAL CLASS PRE-WORK: <ol style="list-style-type: none"> 1. Revisit the TDD to reflect on peer designs. |
| Part 2 (8 min) INDIVIDUAL IMPROVEMENT SUGGESTIONS Slide B | | VIRTUAL CLASS PRE-WORK: <ol style="list-style-type: none"> 1. Brainstorm ways to change the design by utilizing the sentence starters in the TDD. |
| Part 3 (13 min) RANKING IMPROVEMENT AS A TEAM CREATING A CASCADING CONSEQUENCES CHART Slides C-H | VIRTUAL CLASS: <ol style="list-style-type: none"> 1. Complete the discussion diamond organizer, discuss rankings and justifications, and as a team determine the two most important changes the team should make to the design. 2. In teams, create a Consequences Chart that incorporates 2-3 changes that the group decided are the most important to improve the design. | |
| Part 4 (2 min) THINKING THROUGH CONSEQUENCES Slide I | | VIRTUAL CLASS POST-WORK: <ol style="list-style-type: none"> 1. Reflect on consequences that have been discovered and how they might use those to help with their design decisions. |

| Day 2 | | |
|---|------------------------|---|
| Lesson Components | Distance Learning Plan | |
| | Teacher | Student |
| Part 5 (5 min) CONSIDERING THE CONSEQUENCES Slide J | | VIRTUAL CLASS POST-WORK: 1. Revisit TDD to think about whether all consequences are equal and how they will influence our design. |
| Part 6 (10 min) REFLECTING ON POSSIBLE CHANGES Slide K | | VIRTUAL CLASS POST-WORK: 1. Think about the interests of the stakeholders. Determine whether negative consequences can be offset by positive components elsewhere. |
| Part 7 (15 min) WHAT WE'VE DONE AS ENGINEERS Slide L | | VIRTUAL CLASS POST-WORK: 1. Record in the TDD everything we have now completed as engineers. |
| Part 8 (19 min) JUSTIFY YOUR PROPOSED CHANGES Slide M | | VIRTUAL CLASS POST-WORK: 1. Look back on the final changes decided upon. For each change record the justification on the TDD. |

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Lesson 9 (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 1-8

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 1-8
- Virtual Class Recordings - *after completion*
- Access to Team Model Design (by text, a designated partner to add suggestions, etc.)

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

- Day 1
- Day 3

Lesson 9 (3 days) - Investigation

| Day 1 | | |
|---|---|---|
| Lesson Components | Distance Learning Plan | |
| | Teacher | Student |
| Part 1 (5 min) NAVIGATION Slides A, B | <ol style="list-style-type: none"> 1. Share Lesson Slideshow with students. 2. Share Thinking Deeper Document with students. 3. Team Model Design platform (Jamboard, Google Slides, etc.) | VIRTUAL CLASS PRE WORK: <ol style="list-style-type: none"> 1. Review how we have tested parts of our design and identify what criteria was modified to optimize the design. |
| Part 2 (40 min) UPDATE DESIGN AND PLAN IN TEAMS Slides C - F | VIRTUAL CLASS: <ol style="list-style-type: none"> 1. View all other team designs and procedures. 2. Identify and record promising designs, questions, as well as suggestions on the TDD. | |

| Day 2 | | |
|--|--|---|
| Lesson Components | Distance Learning Plan | |
| | Teacher | Student |
| Part 3 (25 min) PEER REVIEW OF OTHER TEAM DESIGNS Slide G | | VIRTUAL CLASS POST WORK: 1. Review the team’s design utilizing the “Peer Review Chart” |
| Part 4 (5 min) RANK OTHER TEAM DESIGNS TO DETERMINE WHICH WILL BE DESIGNED Slide H | 1. Create and share a “Poll” for students to rank their peer’s designs. 2. Share the top two designs as determined by the poll and prepare to test the designs in the upcoming Virtual Class. | VIRTUAL CLASS POST WORK: 1. Utilize the final results from the “Peer Review Chart” to identify the top two designs in the class. |
| Part 5 (5 min) TOP TWO DESIGNS Slides I | | VIRTUAL CLASS POST WORK: 1. Identify two strengths and one weakness from each of the top two designs. |

| Day 3 | | |
|--|--|---|
| Lesson Components | Distance Learning Plan | |
| | Teacher | Student |
| Parts 6-8 (45 min) PREPARE FOR TESTING DESIGN TESTING EVALUATE OUR DQB QUESTIONS Slides J-L | VIRTUAL CLASS: 1. Review the purpose of the data table on the Thinking Deeper Document. 2. The teacher will test the top two designs; students will complete the data table as the tests are being conducted. 3. Review original DQB and identify questions that we have and have not yet answered. 4. Review post-work assignments including the Assessment Task. | |
| Part 9 (5 min) REVISIT DQB Slide M | | VIRTUAL CLASS POST WORK: 1. Identify the questions we made progress on, what we have figured out as well as any remaining questions. |

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Lesson 10 (1 day) - Putting Pieces Together

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

- [Lesson Slideshow](#)
- [Thinking Deeper Document](#)
- [Sea Turtle Assessment](#)
- [LOL Models for Assessment](#)
- [Design Testing Matrix](#)

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 Recordings - *after completion*
- [Sea Turtle Assessment](#)
- [LOL Models for Assessment](#)
- [Design Testing Matrix](#)

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

- Day 1

Lesson 10 (1 day) - 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 POST WORK: 1. Identify new ideas and remaining questions |
| Part 2 (30 min) DEMONSTRATE UNDERSTANDING ON AN ASSESSMENT TASK (NO SLIDES) | 1. Share and assign the assessment and supporting resources. <ul style="list-style-type: none"> • Sea Turtle Assessment • LOL Models for Assessment • Design Testing Matrix | VIRTUAL CLASS POST WORK: 1. Students individually demonstrate understanding on an assessment about sea turtle incubators. |
| Part 3 (15 min) PROPOSE OTHER APPLICATIONS FOR DESIGN ON GRAFFITI BOARD Slides B - D | 1. Create and assign virtual “graffiti boards” for students to share their ideas about additional applications for homemade heaters. (Jamboard, Pinup, etc.) | VIRTUAL CLASS POST WORK: 1. Think about other applications that their homemade heaters might have besides heating up food. 2. Share these ideas on “graffiti boards” and comment on other ideas. |

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