Welcome!

NSTA Engage: Spring 21

Science Inquiry During Remote Learning

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Goals for the Session

- Model strategies and routines for inquiry-based STE learning remotely
- Share ideas for performance-based assessments using distance-learning strategies
- Provide a toolkit of distance-learning practices and investigations to enhance students’ use of the Science and Engineering Practices
Agenda

● Creating a work mat
● An inquiry-based investigation
● Reflections
● Overview of tools for remote instruction & assessment
● Reflections and Questions
Creating a Physical Work Space for Learning Remotely

➢ Create a border.

➢ Add a sketch, image, or some other visual aide to help you recall what you learned.

➢ Record new questions or other comments if you’d like.

Sheet of heavy weight paper or cardstock, 11 x 17” or 8.5 x 14”
Inquiry-based STE Remotely

Challenges we face:

- Hands-on requires supplies!
- How do I maximize student engagement?
- How can I keep my students invested in the outcome?
Inquiry-based STE Remotely

Students perform an investigation at home
• Materials and supplies; Online data
• Ensure universal access
• Be mindful of safety

Teacher provides an intentionally flawed design or procedure
Students submit revised designs/procedures for teacher to implement and share virtually

Engineering design competition
Students submit designs; teacher selects “winning designs” and shares them with students virtually
Students perform an investigation at home:
- *Inquiry on Ice* (Today’s breakout room experience)
- *Light and Temperature* (Shared in Toolkit)
- *A Surprising Day at the Beach (Buoy data)* (Shared in Toolkit)

Teacher demonstrates an intentionally flawed design or procedure:
- *Marble Roller Coaster* (Shared in Toolkit)

Engineering design competition:
- *Insulate an Egg* (Shared in Toolkit)
Today’s Investigation - NGSS

Inquiry on Ice

● MS-PS3-3. Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.

● MS-PS3-4. Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample.
Moving to Breakout Rooms

Engaging with Phenomena

Inquiry On Ice

Materials Needed:
- 2 ice cubes of about the same size
- 1 plastic tray
- 1 metal tray
Add to Your Work Mat

➢ Add a sketch, image, or some other visual aide to help you recall the investigation you just did.

➢ Add new questions or other comments if you’d like.
Reflections

● Share a takeaway from the investigation
● Share an insight from others
● Questions? Comments?
Closer Look at Another Investigation

Teacher demonstrates an intentionally flawed design or procedure, and students redesign or revise.

Marble Roller Coaster

- MS-PS3-1. Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object.

- MS-PS3-5. Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.
Marble Roller Coaster

Students watch Flipgrid video of an unsuccessful marble roller coaster.
Marble Roller Coaster

Scale drawing for small group analysis and redesign.

This is a scale drawing of the roller coaster in the video you watched on Flipgrid. Your task is to illustrate and explain your redesign of this roller coaster so that it can successfully meet the design challenge. Be sure to use scientific principles to explain the changes you recommend.

Each square = 10 cm

105 cm
Tools and Strategies for Remote Learning

- Select tools that are appropriate and effective for the desired task.
- Avoid introducing too many remote-learning tools.
- Aim for student effort to be directed at the desired learning rather than toward the use of the tool/strategy.
Tools for Remote Learning

Digital whiteboards

- Instructor-led or student-led sharing of ideas
- Student collaboration
- Formative assessment
Tools and Strategies

Jamboard:
- Brainstorming
- Asking Questions - Collecting questions from individuals and categorizing them (preliminary work before identifying a Driving Question for a unit) Inquiry on Ice

Padlet:
- Individuals sharing their learning or reflections simultaneously
- Developing a group lab report for an investigation
- Many templates to choose from
### SUMMARY TABLE

**DRIVING QUESTION:** This question would be generated after a phenomenon is used.

<table>
<thead>
<tr>
<th>Activity/Investigation</th>
<th>What did we do?</th>
<th>What did we learn?</th>
<th>How does our learning connect to our Driving Question?</th>
<th>What new questions do we have?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Day at the Beach</strong></td>
<td>We compared air temperature and water temperatures at a specific location.</td>
<td>Water is warmer than air temperature during the fall months in Chesapeake Bay.</td>
<td>We have evidence that there is a difference</td>
<td>Will the air be warmer than the water?</td>
</tr>
<tr>
<td></td>
<td>Checked air and water temps at various sites and dates</td>
<td>The difference between Air and Water temp changed over time.</td>
<td></td>
<td>Are there other factors that affect temperature?</td>
</tr>
<tr>
<td></td>
<td>The data was collected from a database online.</td>
<td></td>
<td></td>
<td>Is it true or different in other locations</td>
</tr>
</tbody>
</table>

Why did water temperature differ from air temperature at the beach in the fall?
Padlet Sample - Example using Shelf Template
Tools and Strategies

Flipgrid

● A discussion tool that uses short student-created videos!
● Video - a powerful option for students to communicate their learning.
● Formative and summative assessment possibilities!
Tools and Strategies

Marble Roller Coaster

by Rosemary Rak - February 9, 2021

Upload a video of the marble roller coaster that you have made. These videos should capture an early design that needs a bit more work to be successful. Students, study and analyze the video assigned to you. Think critically about what has gone wrong. Apply your scientific thinking as you collaborate with your teammates to prepare a model of an improved design that will meet the design specifications and get the marble into the cup! Good luck!

3 Responses
14 views - 0 comments - 0.8 hours of engagement
Tools and Strategies

Google slide decks

- For sharing models (and peers can add comments and questions) and end products
- For sharing data
- Virtual Gallery Walk
- Formative assessment
Tools and Strategies

Work Mats

- A tool to help students feel “grounded” and ready to engage in science learning
- Formative assessment

Work Mat Samples
Tools and Strategies

Name: Erin

? = What are the properties of water?
How does the temperature affect the water?

Skills
- Open
- Guided
- Structure

+ Water temp
+ Air temp
Name: Becky Cox

Photo of Work Mat
Tools and Strategies

Name: Beth Brantley
Thank you!

Questions? Comments? Insights?

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