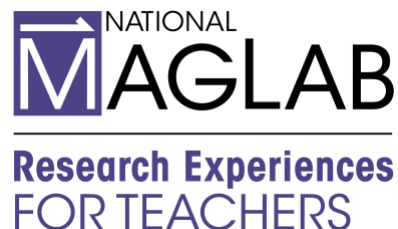


Culturally Responsive STEM Lesson Plan:



What Happened in Texas in February of 2021?

Lesson Objectives:

- Students should be able to think about why electricity is important for survival.
 - Students should be able to generate questions about power on a larger scale.
 - Students should be able to read and summarize information about the winter storm in Texas in 2021 and think critically about what went wrong.
 - Students should be able to communicate their findings in their research to their class and pose questions about what they didn't understand.
-

Next Generation Science Standard:

- HS-ESS3-1 – Resource availability has guided the development of human society.
 - HS-ESS3-2 – All forms of energy production and other resource extraction have associated economic, social, environmental, and geopolitical costs and risks as well as benefits. New technologies and social regulations can change the balance of these factors.
 - HS-ESS3-3 – The sustainability of human societies and the biodiversity that supports them requires responsible management of natural resources.
 - HS-ESS3-4 – Scientists and engineers can make major contributions by developing technologies that produce less pollution and waste and that preclude ecosystem degradation.
 - HSETS1-1 – Humanity faces major global challenges today, such as the need for supplies of clean water and food or for energy sources that minimize pollution, which can be addressed through engineering. These global challenges also may have manifestations in local communities.
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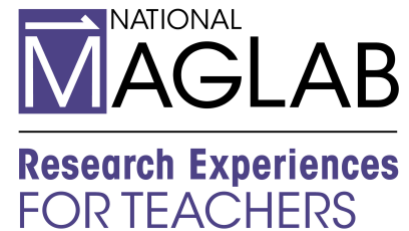
STEM Rationale for Lesson:

This is an introductory lesson to a unit on energy and power production. It helps students start to formulate both questions and understandings about the importance of electricity and sustainable energy production, and the equity of the distribution of power in the United States. Students will be looking at the winter storm in Texas in 2021 and looking at what happened and why it happened, as well as who was most affected by the power outages.

Culturally responsive connection:

This lesson touches on students' lived experiences with power outages and winter storms. It also has them think about how the storm in Texas in February of 2021 did not impact all residents equally. Students will examine the racial disparities between residents in Houston who lost power for many days and those who did not, and how the government agencies did/did not address this inequity. Students will be able to equally access the activities if they are given the opportunity to share their personal experiences with power outages.

Culturally Responsive STEM Lesson Plan:



Materials Needed:

Provided by Teacher:

1. Slide presentation (See Appendix A for language)
2. Create a Collaborative Working Document using the language at the end of this lesson plan: What Happened in Texas?

Activate Prior Knowledge:

1. Students should be able to make observations about graphs
2. Students should be able to read and summarize information
3. Students should have practice formulating questions

Lesson Introduction:

1. Please see Appendix A for details.
 - Students will begin by sharing if they have ever lost power in their home (5 min)
 - Next, students will watch a video about the storm in Texas in 2021 and the power grid failure. After the video, elicit student background knowledge around the storm or other storms that they have experienced (10 min)

Lesson Activity:

1. Please see attached PowerPoint for details.
 - Break students into four or more small groups and use the linked document “What happened in Texas?” (5 min)
 - Each group will be assigned one article to read and will answer the reflection questions in the document (30 min)
 - Each group will share out what they learned from their article about the storm in Texas (10 min)
 - After the share out, walk student groups through the Only Questions protocol, as outlined in the slides. Have students share out their prioritized questions and record these for exploration later in the unit (15 min)
 - As a whole class, go through the research article titled “Frozen Out in Texas: Blackouts and Inequity.” Make notes about the graphs in the article and what they mean. Use interpretations skills to wonder why we see such a blatant disparity due to race in who lost power during the storm. Be clear that students should only speak from lived experiences or research, not assumptions, when they are drawing conclusions (15 min)
 - Exit Ticket: have students reflect on what angle on the Texas storm is most interesting to them (5 min)

Culturally Responsive STEM Lesson Plan:

Lesson Assessment

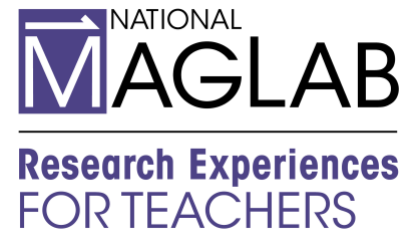
- This lesson is an introductory lesson to frame a unit on energy and power production and doesn't have an explicit assessment. However, there are 3 places where assessment could be created.
 - The "What Happened in Texas?" handout (at the end of this pdf) could be modified to be an individual assignment and evaluate reading comprehension and communication skills.
 - The questions from the "Only Questions Protocol" could be evaluated on a questions rubric, much like the table below.

	No Evidence (50%)	Emerging (65%)	Developing (70%)	Proficient (85%)	Exceeding (100%)
Asking Questions	No evidence of student's proficiency in asking questions.	Student asks questions that seeks observable information or superficial details around a phenomenon or are not relevant to the phenomenon.	Student asks questions that begin to push towards a deeper mechanistic understanding of a phenomenon or related phenomena.	Student asks questions that arise from examining prior learning or a theory to clarify and/or seek additional information or relationships in the model.	Students asks questions that arise from examining prior learning or a theory to clarify and/or seek additional information or relationships in the model. Students refine and evaluate questions based on feedback or reflection.

- The Exit Ticket could be a formative assessment to inform what your class is most interested in and how you should move forward with the unit.

Lesson by: Emily Berman
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Culturally Responsive STEM Lesson Plan:



Appendix A: Language for Power Point

Entrance Ticket

Turn and talk to your table:

1. Have you ever lost power in your home before?
2. What happened?
3. Do you have any emergency tools/ kits for losing power?

Texas, February 2021

Video (<https://time.com/5940232/millions-without-power-texas/>) + Read Aloud

In February of 2021, Texas was in the news a lot for a winter storm. We are going to take some time today to learn (a little) and think (a lot) about why what happened in Texas is important for us to understand.

Learn a Little!

- You have several options for readings about what happened in Texas
- Read and answer the questions in the document “What Happened in Texas?”
- Ways to read:
 1. On your own
 2. Text to speech
 3. With a group

With me!

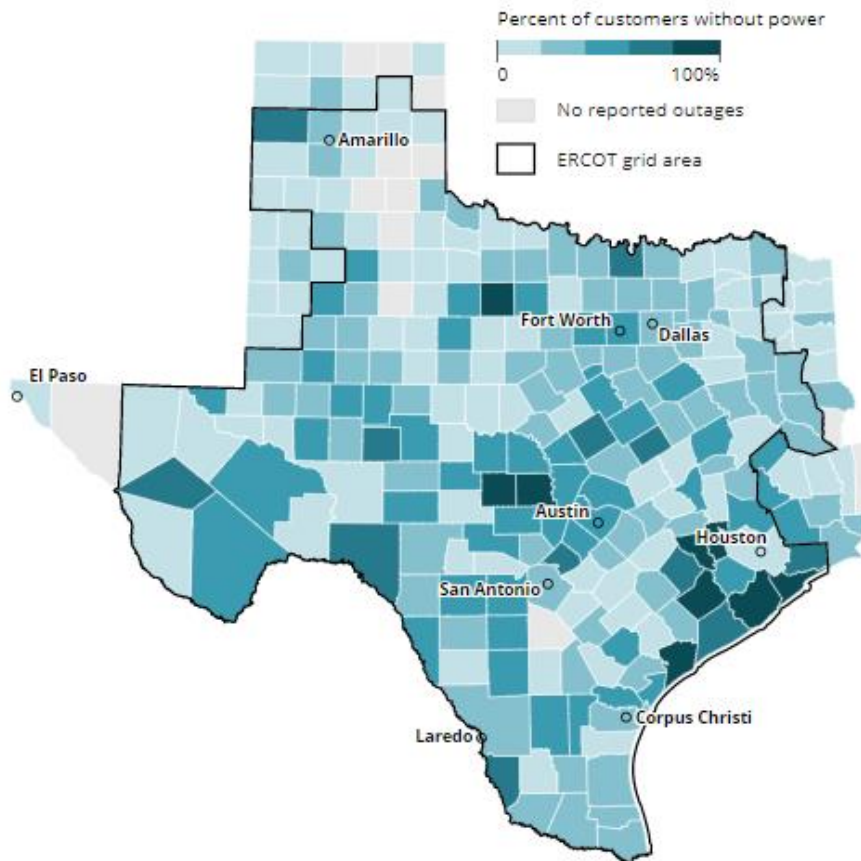
Now, decide with your group what our class needs to know... what's the biggest takeaway from your reading?

1. Choose who will speak
2. Choose what you will say

Culturally Responsive STEM Lesson Plan:

On Feb. 16, at least 4.5 million customers in Texas were without power

The operator of Texas' power grid is under investigation after a massive winter storm caused millions of residents in the state to lose power for days. Here's where Texans were most impacted during the worst of the outages between 10 and 11 a.m. Feb. 16.



<https://www.texastribune.org/2021/02/17/texas-power-grid-failures/>

Question Generation

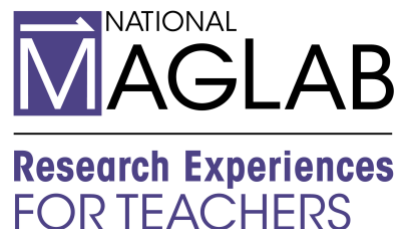
What do **we want to know** about this phenomenon?

What **questions** do we have?

Only Questions: Rules

1. Ask as many questions as you can.
2. Do not stop to answer or discuss the questions.
3. Write down every question exactly as it is stated.

Culturally Responsive STEM Lesson Plan:



4. Change any statements into questions.

Question Categorization

Label each question as either a:

Closed-ended question (C)

Or

Open-ended question (O)

- **Closed-ended questions** can be answered with “yes” or “no” or with one word.
- **Open-ended questions** require an explanation and cannot be answered with “yes” or “no” or with one word.

Question Categorization

Label each question as either a:

Scientific Question (S)

Or

Non-Scientific question (NS)

- **Scientific questions** are Testable/Observable & Objective
- **Non-scientific questions** are subjective (feelings/opinions) and/or cannot be answered with the results of an experiment

Question Revisions

1. **Rewrite** questions that you think can be improved.
2. For example:
 - a. Rewrite one closed-ended question as an open-ended question
 - b. Rewrite a non-scientific question as a scientific one
 - c. Move beyond asking about surface-level ideas or observations.

Question Prioritization

Which **three questions** will be most important in helping us make progress on understanding what happened in Texas?

Be ready to share!

One more article (<https://www.rockefellerfoundation.org/case-study/frozen-out-in-texas-blackouts-and-inequity/>), to practice our graph interpretation skills!

Culturally Responsive STEM Lesson Plan:



More on inequities during this storm...

When we look at graphs, let's use our observation skills...

- What do we notice? (colors, shapes, sizes)
- What do these things represent?
- What more does this tell us about the storm in Texas?
- What do we notice about the source?

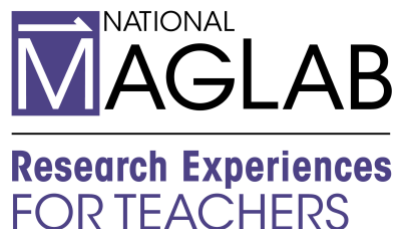
Exit Ticket

Which of the “angles” about the storm in Texas is most interesting to you?

Why?

- Social
- Political
- Physics
- Environmental

Culturally Responsive STEM Lesson Plan:



Handout for Students: What happened in Texas?

Directions:

Once you've been assigned a topic, you will read the article and answer the questions below as a group. Ways you can read the article are:

- On your own
- With your group
- [Text to speech \(https://www.naturalreaders.com/online/\)](https://www.naturalreaders.com/online/)
- With me!

1. [From the NY Times: How Texas' Power Generation Failed During the Storm, in Charts \(https://www.nytimes.com/interactive/2021/02/19/climate/texas-storm-power-generation-charts.html\)](https://www.nytimes.com/interactive/2021/02/19/climate/texas-storm-power-generation-charts.html)

- What information is this article sharing? (summarize the article)
- There are charts in this article. Are the charts easy to understand? How do they help the reader learn more? Explain these charts in your own words.
- This article posed a problem. What solutions can you think of to solve this problem?
- How do you think scientists or engineers could use their skills to solve this problem?
- Is this article a reliable source? How do you know?
- What are you confused about/ what don't you understand yet?

2. [From Bloomberg: Why Texas Broke \(https://www.bloomberg.com/news/features/2021-02-25/texas-blackouts-what-went-wrong-with-ercot-and-state-power-grids\)](https://www.bloomberg.com/news/features/2021-02-25/texas-blackouts-what-went-wrong-with-ercot-and-state-power-grids)

- What information is this article sharing? (summarize the article)
What is ERCOT? Why does a state like Texas need an organization like ERCOT?
- This article posed a problem. What solutions can you think of to solve this problem?
- How do you think scientists or engineers could use their skills to solve this problem?
- Is this article a reliable source? How do you know?
- What are you confused about/ what don't you understand yet?

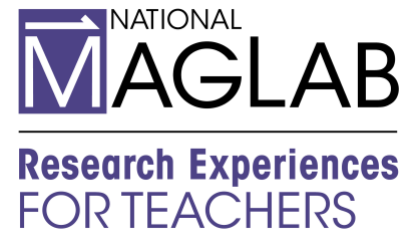
3. [From Reuters: Why a predictable cold snap crippled the Texas Power Grid \(https://www.reuters.com/article/us-usa-weather-texas-power-insight-idUSKBN2AL00N\)](https://www.reuters.com/article/us-usa-weather-texas-power-insight-idUSKBN2AL00N)

- What information is this article sharing? (summarize the article)
- What is ERCOT? Why does a state like Texas need an organization like ERCOT?
- Why did ERCOT purposely turn off power to people living in Texas? Does this article think this could have been avoided?
- How do you think scientists or engineers could use their skills to solve this problem?
- Is this article a reliable source? How do you know?
- What are you confused about/ what don't you understand yet?

4. [From The Guardian: Winter Storm Amplifies Power Grid Inequalities for Disadvantaged Texans \(https://www.theguardian.com/us-news/2021/feb/17/texas-winter-storm-power-outages\)](https://www.theguardian.com/us-news/2021/feb/17/texas-winter-storm-power-outages)

- What information is this article sharing? (summarize the article)

Culturally Responsive STEM Lesson Plan:



- What kind of data did this article present to you? What data is missing?
- This article posed a problem. What solutions can you think of to solve this problem?
- How do you think scientists or engineers could use their skills to solve this problem?
- Is this article a reliable source? How do you know?
- What are you confused about/ what don't you understand yet?