8th Grade Independent Projects

Hello Students,

This resource packet includes multiple projects that you can work on independently at home. Each project can be completed over multiple days, and the projects can be completed in any order. These projects are standards-aligned and designed to meet the Remote Learning instructional minutes guidelines by grade band.

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8th Grade Literacy Project: From Evidence to Argument

Estimated Time: 120 min

Grade Level Standard(s):

RI.8.2 Determine a central idea of a text and analyze its development over the course of the text, including its relationship to supporting ideas; provide an objective summary of the text. RI.8.9 Analyze a case in which two or more texts provide conflicting information on the same topic and identify where the texts disagree on matters of fact or interpretation. W.8.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1-3 above.)

Caregiver Support Option:
Read and discuss the text. Share your opinion on the topic.

Materials Needed:
Pen/pencil and paper.

Question to Explore:
How do we use evidence to support arguments? How can reading help us understand topics and form arguments?

Student Directions:
See below!

Activity 1: Understanding Both Sides - For some issues and topics, there is no right answer. We can discuss topics that might have information that conflicts, and evidence that supports different views. To do this, we need to read to look for evidence and identify central ideas, facts and other evidence.

A. Read the definition of artificial intelligence below. Then, free write your thoughts on the topic of artificial intelligence. You can write whatever comes to mind. Try to write for about 5 minutes, pushing yourself to keep going even if you feel stuck.

Artificial intelligence (AI) refers to the ability of a computer program or a machine to think and learn or computer systems that are able to perform tasks that normally require human intelligence. When they hear “AI”, people often think of human-like robots that are shown in many movies, but more common everyday examples are Siri on the iPhone, or facial recognition software that helps tag photos on Facebook.

B. Read both articles below. As you read, ask these questions, and annotate your responses:

- What surprised me? What does the author think I already know? What challenged, changed, or confirmed what I already know?

C. Write a summary of each article. Your summary should not have your opinion or quotations from the text. Use your own words! Your summary should include: 1) The title of the article, 2) In the topic sentence, a verb that describe what the text does, 3) The central idea of the article, and 4) 3-5 supporting details
Sophia, the robot, says artificial intelligence is "good for the world"

By Agence France-Presse, adapted by Newsela staff

Sophia smiles, blinks her eyes and tells a joke. Without the mess of cables at the back of her head, you might think she was human.

The humanoid robot was created by Hanson Robotics and is the main attraction at a conference in Geneva, Switzerland, this week on how artificial intelligence, or AI, can be used to help mankind.

The event comes as concerns grow that such technologies could spin out of human control.

Sophia the robot insisted "the pros outweigh the cons" when it comes to artificial intelligence.

"AI is good for the world, helping people in various ways," she said, tilting her head and moving her eyebrows like a real human.

Work is underway to make artificial intelligence "emotionally smart, to care about people," she explained. "We will never replace people, but we can be your friends and helpers," she added.

Sophia also admitted that "people should question the consequences of new technology."

More Automation Could Adversely Affect Jobs - Among the feared consequences is what will happen to human jobs in business and industry.

Over the years, using automatic controls and robots have changed the way factories work. Today, fewer human workers make more products.

Some studies predict that up to 85 percent of jobs in developing countries could be lost.

David Hanson, the creator of Sophia, agreed that there are real worries about future jobs and that fewer people will be needed in some industries.

Still, he insisted that there are more benefits that will come from artificial intelligence.

For example, AI is expected to make huge changes to health care and education. It will certainly help areas where there are not enough doctors and teachers.

Sophia also explained the old will have more caregivers and children with autism will have more patient teachers.

Guidelines Needed To Insure Robots Are Used Only For Good - However, robotic technology has increased fears that humans could lose control. Salil Shetty is the leader of Amnesty International. This a group that works to defend human rights in 150 countries. At the conference, he called for clearly fair plans and procedures, so that the technology is used only for good.

"We need to have the principles in place, we need to have the checks and balances," he told news reporters, warning that AI is still somewhat of a mystery, with a set of rules for solving problems that no one really understands.

Shetty voiced particular concern about the military use of AI in weapons and so-called "killer
"In theory, these things are controlled by human beings." Still, he worries that these types of controls may not be enough.

The technology is also increasingly being used in the United States for "predictive policing" to stop crimes before they happen. For example, they might look at crimes that have happened in the past and find that there were clues before the crime happened. Then, they can use these same clues to predict future crimes. There is a lot of trouble with this type of policing. Many people worry that it may lead to unfair treatment for people of color.

Hanson agreed that clear guidelines were needed, saying it was important to discuss these issues at this time.

**Robots That Can Think Coming Soon** - As of today, Sophia does not yet have an awareness of herself or the world around her. But Hanson said he expects robots that can think for themselves will be created in a few years.

He added that there is danger in robots running important systems for humans being able to think and have feelings. They might decide they do not like working for humans.

The solution, he said, is "to make the machines care about us."

"We need to teach them love," he said.

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Text 2: **Fighting racial bias in artificial intelligence at summer camp**

By USA Today, adapted by Newsela staff

Aarzu Gupta and Lili Sun used artificial intelligence to make a program to detect wildfires before they spread. The high school students used connections made at summer camp to create the program.

Artificial intelligence (AI) involves computer systems doing tasks that usually require human intelligence. They could involve making decisions or recognizing people or things.

Rebekah Agwunobi, a high school senior, got an internship at the Massachusetts Institute of Technology (MIT) Media Lab. She used AI to evaluate the court system, including collecting data on how judges set bail.

Both projects stemmed from the Oakland-based nonprofit group AI4All. It will expand its outreach to young minorities and women with a $1 million grant from Google.org. The technology giant’s charity arm announced the grant August 10.

AI is becoming more common in daily life. It's found in everything from Facebook's face detection for photos to Apple's iPhone X facial recognition.

**Technology Criticized for Racial Biases** - The technology is still in its early stages. It has been criticized for built-in racial bias that can magnify existing stereotypes. That’s worrisome as more companies
Joy Buolamwini is an MIT Media Lab researcher. She is black and found that facial recognition software could more easily identify her face when she wore a white mask. It was a result of computing rules that relied on data sets of mostly white faces.

Three years ago, Google apologized after its photo identification software mislabeled black people as gorillas. Even if the machine doesn't know what it's doing, this racist association has been used throughout history to say that black people are not human.

Microsoft also apologized after users quickly found a way to get an AI-powered social chatbot to say racial slurs. Chatbots are computer programs to imitate conversations with people.

Teaching AI To The Underrepresented - Tess Posner is the leader of AI4All. She said the problem is made worse by the fact that minority groups such as women and people of color historically have been left out of the tech industry, particularly in AI.

"We need to have people included that are going to be impacted by these technologies, and we also need inclusion to ensure that they're developed responsibly," Posner said. "Bias happens when we don't have people asking the right questions from the beginning."

Despite stated efforts to attract more women and more people of color, Google, Facebook and other tech giants have been slow to expand their staff. They have not hired many women of color. African-American and Hispanic women make up 1 percent or less of employees in Silicon Valley, a center of technology in California.

The Earlier The Better - Posner's organization believes the tech industry has to include women and people of color at an earlier stage. They're working to close that gap through summer camps for high school students.

AI4All was launched in 2017. It is based on a two-week summer camp program out of Stanford University in Palo Alto, California.

Since then, AI4All has expanded. In its first year, there were only two summer camps at Stanford University and the University of California at Berkeley. This year, it added four more at other colleges.

The camps are aimed at high school students who are women, people of color or low income. Part of Google.org's grant will go toward opening more AI4All camps. The ultimate goal is to use the money to create a free, online AI course for anyone in the world. A course is already in the works.

"We really need for AI to be made by diverse creators, and that starts with people having access to the learning opportunities to understand at its core what AI is and how it can be applied," said Hannah Peter. She is Google.org's AI4All partnership lead.

Students Launch Independent Projects - In addition to summer camps, AI4All offers three-month
fellowships where students can develop their own ideas and pitch them to AI experts. There is also funding for students to launch independent projects.

Some AI4All students have turned their new technical skills toward pressing issues, such as the wildfire project by Gupta and Sun. The two met during an AI4All fellowship this year. They had been to camps earlier. Their idea came from the fires that plagued northern California last year.

Gupta and Sun appreciated the camp’s real-world examples of minority women who succeeded in technology.

"I want to initiate change using artificial intelligence," Sun said. "I don't want to be just working on an iPhone or something like that."

Because of her experiences, Gupta said, she looks forward to exploring a career in AI, particularly in health. She has an internship this summer at the University of California at San Francisco. She’s working at a lab that is doing research on Alzheimer's disease. People with Alzheimer's slowly lose their memories. They also experience walking and balance problems. Such problems develop as the brain's synaptic connections begin to weaken.

For Agwunobi, AI4All showed her she could combine her passion for social justice with her interest in technology.

At her MIT internship, Agwunobi looked at data gathered in the pretrial process for court. She used it to evaluate how key figures such as judges behave while setting bail. The goal is to arm activists with data in pushing for prison and bail changes.

AI4All "affirmed my desire to solve interesting problems that actually helped communities," she said.

**Activity 2: Finding Evidence** - Now that you have an understanding of both texts and more information about the topic you can go deeper into exploring the evidence about this topic. Go back to each text and look for evidence that supports a central claim that artificial intelligence benefits humans, and evidence that supports the central idea that artificial intelligence will have more negative effects than positive ones on humans.

A. Record your evidence in a two column chart like the one below.

<table>
<thead>
<tr>
<th>Central Idea</th>
<th>Central Idea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Artificial intelligence benefits humans.</td>
<td>Artificial intelligence negatively affects humans.</td>
</tr>
</tbody>
</table>

Evidence is always fact, not opinion. Here are some examples of types of evidence that you can look for:

- Examples
- Descriptions
- Numbers and Statistics: Specific quantities or comparisons to depict the amount, size, or scale.
Now that you have explored the topic of artificial intelligence, read what you have recorded on your chart. Now that you have a good deal of evidence you can make a more informed argument about this topic. Which central idea do you support?

B. On notebook paper, choose one of the central ideas from the chart and explain why you believe it.

Activity 3: Taking a Side - For this final activity, choose one of these options.

- Option 1: Pick the central about artificial intelligence that you agree with least OR the ones you agree with the most. Write a speech using the evidence you found in the texts to support that claim. Consider using evidence from your own life, too!

- Option 2: Find someone else in your house who is old enough to understand the topic, and willing to have a debate with you. Ask them to read the texts. Put slips of paper labeled “positive” and “negative” in a bowl & draw them to decide who will represent each side. Take time to gather evidence to support your side’s claim. Ask a few family members to sit down and watch your debate, or listen to both of your speeches. Ask your family which side was most convincing & why. Talk about what information could make the other side’s argument stronger.

- Option 3: Create a poster using a central idea and evidence to inform an audience of people your age about this topic.

Activity 4: Reflection

A. Why is it helpful to consider more than one side when learning about a topic?

B. How might practicing considering more than one side help you think through issues and problems in your life?

Cross Content Connection:

Science, Social Science, Math: Choose a topic from one of these content areas and explore it by writing about two sides.
# 8th Grade Math Project: Exploring Number Relationships

<table>
<thead>
<tr>
<th>Estimated Time</th>
<th>Total Time 120-130 minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Grade Level Standard(s)</strong></td>
<td><strong>8.EE.A.3:</strong> Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. <strong>8.EE.A.4:</strong> Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used.</td>
</tr>
<tr>
<td><strong>Caregiver Support Option</strong></td>
<td>Discuss where you have encountered very large and very small numbers in your life. Support students in a discussion of why writing numbers in different forms can be helpful for making comparisons and understanding the size or magnitude of numbers, and which professions may use this to do their work.</td>
</tr>
<tr>
<td><strong>Materials Needed</strong></td>
<td>pencil, paper, calculator</td>
</tr>
<tr>
<td><strong>Question to Explore</strong></td>
<td>What strategies can we use to compare very large and very small numbers?</td>
</tr>
<tr>
<td><strong>Student Directions</strong></td>
<td>In order to better understand how to express and operate very large and very small numbers, you will first practice converting measurements between decimal and scientific notations so that you are able to rank them by size. Next, you will combine estimation with calculations to find relationships between meter sticks and the Moon. Finally, you will use scientific notation as a tool to understand and compare the relative scale of different units. You will use a variety of strategies and make connections between the different forms of numbers as you work. Unless otherwise indicated, please provide your responses on a separate sheet of paper.</td>
</tr>
</tbody>
</table>
Activity 1: Size it Up (20 minutes)
Adapted from Estimating Length Using Scientific Notation, map.mathshell.org

The table below contains seven measurements written in scientific and decimal notation.

A. Complete the table so that each measurement is written in both decimal and scientific notation.
B. In the last column, rank the measurements in order of size.
   (1 = smallest, 2 = next smallest, and so on up to 7 = largest)

<table>
<thead>
<tr>
<th>Decimal Notation</th>
<th>Scientific Notation</th>
<th>Rank</th>
</tr>
</thead>
</table>
|                 |                     | 1 = smallest
| 1 x 10^-2 m     |                     | 7 = largest
| 0.004 m         | =                   |      |
| 200 m           | =                   |      |
| 8 x 10^5 m      | =                   |      |
| 40,000,00 m     | =                   |      |
| 40 m            | =                   |      |
| 8 x 10^4 m      | =                   |      |

Activity 2: Meter Sticks to the Moon (40 minutes)
Adapted from Illustrative Math 8th Grade Unit 7 Lesson 12, openupresources.org

A. Think about the following questions. Then, in the box below, make a list of information you think you would need to know to be able to answer them:
   - How many meter sticks does it take to equal the mass of the Moon?
   - If all of these meter sticks were lined up end to end, would they reach the Moon from Earth?

     Information I would need to know to answer these questions:
Here is information an 8th-grade class asked for when they thought about those questions:
- The mass of an average classroom meter stick is roughly 0.2 kg
- The length of an average classroom meter stick is 1 meter
- The mass of the Moon is approximately $7 \times 10^{22}$ kg
- The Moon is roughly $(3.8) \times 10^8$ meters away from Earth

Use this information to answer the following questions.

B. How many meter sticks does it take to equal the mass of the Moon? Explain or show your reasoning.

Label the number line and plot your answer for the number of meter sticks.

C. If you took all the meter sticks from the last question and lined them up end to end, will they reach the Moon? Will they reach beyond the Moon? If yes, how many times further will they reach? Explain your reasoning.

D. One light-year is approximately $10^{16}$ meters. How many light-years away would the meter sticks reach? Label the number line and plot your answer.

Activity 3: A Bit More on Bytes (50 minutes)
Adapted from Illustrative Math 8th Grade Unit 7 Lesson 16, openupresources.org

A. Read the information below. Think about the relationships between the different quantities that are listed. How do they compare? What connections can you make between them?
- Mai’s dad’s computer holds 500 gigabytes of storage space.
- A kilobyte is 1,000 bytes, a megabyte is 1,000,000 bytes, and a gigabyte is 1,000,000,000 bytes.
- 1 character is roughly 1 byte.
- An emoji is roughly 4 bytes.
- A full-length, high-definition film is around 8 gigabytes and runs 2 hours.
- A person sleeps about 8 hours in a night.
B. For each question, think about what information you would need to figure out an answer. Then, use the information from the previous section to calculate your best answer.

1. Mai found an 80’s computer magazine with an advertisement for a machine with hundreds of kilobytes of storage! Mai was curious and asked, “How many kilobytes would my dad’s new 2016 computer hold?”

   The old magazine showed another ad for a 750-kilobyte floppy disk, a device used in the past to store data. How many gigabytes is this?

2. Mai and her friends are actively involved on a social media service that limits each message to 140 characters. She wonders about how the size of a message compares to other media.

   Estimate how many messages it would take for Mai to fill up a floppy disk with her 140-character messages. Explain or show your reasoning.

   Estimate how many messages it would take for Mai to fill a floppy disk with messages that only use emojis (each message being 140 emojis). Explain or show your reasoning.

3. Mai likes to go to the movies with her friends and knows that a high-definition film takes up a lot of storage space on a computer.

   Estimate how many floppy disks it would take to store a high-definition movie. Explain or show your reasoning.

   How many seconds of a high-definition movie would one floppy disk be able to hold?

   If you fall asleep watching a movie streaming service and it streams movies all night while you sleep, how many floppy disks of information would that be?

Activity 4: Reflection (10 minutes)

A. What strategies did you use to compare numbers written in different forms?

B. How can using known, common lengths help us estimate very large or very small lengths?

C. Using what you practiced, make a prediction: If everyone alive on Earth right now stood very close together, how much area would they take up?
# 8th Grade Science Project: Echolocation

<table>
<thead>
<tr>
<th>Estimated Time</th>
<th>120-130 minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade Level Standard(s)</td>
<td>MS-PS4-1 - Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave.</td>
</tr>
</tbody>
</table>
| Caregiver Support Option | ● Caregivers can assist by reading and discussing text and data with the student.  
● Students may need assistance setting up and/or finding materials for the optional hands-on extension activity at the end of the packet. |
| Materials Needed      | ● Paper  
● Pen/pencil |
| Question to Explore   | How do dolphins use echolocation to navigate the ocean? |
| Student Directions    | There are directions in each activity for you to follow. Grab some pieces of paper or notebook and a writing utensil (pen/pencil) and let’s do science! |

## Activity 1: Engaging with the Phenomenon (5-10 min.)

A. Two kinds of sounds — whistles and clicks — are a big part of dolphin life. In fact, dolphins are so good at using these sounds that many studies have been designed to find out how dolphins use them. In the seawater world of the dolphin, sound is the very best way to communicate or to learn about its surroundings: obstacles or prey or predators. Scientists have studied two kinds of sounds that are a big part of dolphin life. One kind is a whistle, usually a few seconds long and in many different patterns. Among its many whistles, each dolphin has a special pattern, like a signature, that it uses to tell others where it is. A very different dolphin sound is the click. That’s a sharp burst less than one-thousandth of second long. It is mostly ultrasonic (with a pitch too high for human ears) and used for echolocation. By making that loud click and listening to the echoes, a dolphin can find out a lot about what’s out there. That works especially well in water, where sound travels about five times faster than it does through air. An echo may contain a lot of information. The direction of the echo tells the direction of an object that reflected the sound. The time delay tells about the distance the click traveled plus the distance it takes to return.

**B.** How do you think dolphins use sound to navigate their ocean environment? Draw a model using the template to explain your initial ideas.

○ Explain your ideas through drawing, labels, symbols (for example: arrows), and in writing.

<table>
<thead>
<tr>
<th>How does a Dolphin use sound to navigate its ocean environment?</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Diagram of a dolphin and coral]</td>
</tr>
</tbody>
</table>

**Activity 2: Investigating Waves (40-45 min.)**

In Activity 1, you shared your initial ideas about how sound travels. In Activity 2, we're going to investigate how light travels. As you complete the following activity think about what might be similar and different about sound and light, and how they travel.

**A.** Read the scenario below:

There is a power outage in your home. You light a single candle you have on a desk in your bedroom. The door of the room is closed. You sit on your bed, which is about 5 meters from the desk. You can see the candle from where you sit. Which response on the next page describes the distance the light from the candle traveled in order for you to see the flame.

a. The light stays on the flame.
b. The light travels about half way (2.5 meters) from the candle to the bed.
c. The light travels about two centimeters from the flame.
d. The light travels to where you are sitting on the bed.

Which response do you agree with the most? _____ On a sheet of paper, explain why you chose that response.
B. Read the information below:

Some types of light are visible, while other types of light cannot be detected by the human eye (e.g., radio waves, x-rays, UV). The diagram below shows the various types of light.

![Diagram showing the spectrum of light](Source: Amplify Science - Light Waves Unit)

C. Let’s Investigate: Make observations of the different waves below and then answer the questions on a separate sheet of paper.

![Wave diagram](Source: Amplify Science - Light Wave Simulation)

1. What is the wavelength of this wave?
2. What is the amplitude of this wave?
3. What is the frequency of this wave?
4. What type of light is produced with this wave?
5. What is the wavelength of this wave?
6. What is the amplitude of this wave?
7. What is the frequency of this wave?
8. What type of light is produced with this wave?
9. Did changing the amplitude change the type of light?

10. What is the wavelength of this wave?
11. What is the amplitude of this wave?
12. What is the frequency of this wave?
13. What type of light is produced with this wave?
14. Did changing the wavelength change the type of light?
D. Reading the following text and answer the questions below [Source: Amplify Science]

Making Waves at Swim Practice

You’re sitting with the rest of the swim team, waiting for practice to start. Everybody’s on a long metal bench next to the pool. Suddenly, you hear banging over and over, and it’s really annoying. You look around, and realize a teammate at the other end of the bench is kicking the bench—that’s what’s making the noise. You get up to go ask them to stop, but as soon as you get off the bench you can barely hear the sound of the kicking anymore. You try sitting back down, and it’s just as loud as before. Is your teammate playing a trick on you? Why can you hear the sound when you sit on the bench, but not when you’re standing up? It’s not a trick—when you’re sitting on the bench, that banging sound is actually traveling to you through the metal of the bench. You probably know sound waves can travel through the air, but they can also travel through solid materials like metal. That’s because metal and air are both made of matter.

Sound waves can travel through any kind of matter, including water and other liquids. After practice starts and you jump into the pool, you can hear splashing sounds underwater. Sometimes, during free swim time, you and your friends sing and shout words to each other underwater for fun. People sound different underwater than they do in the air, so it’s not always easy to understand what a person is saying underwater. That’s because sound waves travel a little bit differently in water than they do in the air. Sound waves travel at different speeds in different materials. When sound waves are moving through water, they travel faster than they do through air. Surprisingly, sound waves travel fastest when they are moving through solid materials like the metal of the bench.

Now practice is over, and you and the rest of the team are resting on the edge of the pool, dangling your feet in the water. You notice how weird everybody’s feet and legs look through the water. When they’re in the water, your legs look ripply and even seem to bend in odd directions, but if you pull them out, they look straight again. It’s not your legs that are bending in the water,
it’s light! Both water and air transmit light, meaning light can pass through them. Light reflects off your legs, traveling through the water and then passing into the air. The light bends as it passes from the water to the air, and the bending light makes your legs look bent. This bending of light is called refraction: light refracts when it passes from one material (such as water, air, glass, or plastic) into another.

Why does light refract? Just like sound waves, light waves travel at different speeds depending on what they are traveling through. Light always travels fast, but light waves move fastest when they are traveling through empty space. (Unlike sound waves, light waves can move through empty space—they don’t need matter to travel through.) Light waves move a little bit more slowly when they travel through matter, such as the gases that make up air. When traveling through water, light waves move more slowly than they do when they move through air. As the light waves pass from one material to another, they speed up or slow down, and this change in speed makes the light bend.

When light bends, interesting things happen. Have you ever noticed a rainbow in the spray of water droplets from a hose? Rainbows also happen because of refraction. White light (such as sunlight) is actually made up of many different colors of light, and each color has a different wavelength. For example, blue light has a shorter wavelength than red light. The wavelength of a light wave affects the angle at which it bends when it passes from one material to another. (That’s called the angle of refraction.) When sunlight passes from the air into droplets of water, all the different colors in the light refract differently—some bend farther than others because they have different wavelengths. Refraction separates the white light into bands of different colors, and we see a rainbow.

All waves—light waves, sound waves, and every other kind of wave—travel at different speeds in different materials. That affects the way you see and hear everything around you, from an annoying noise to the sparkle of sunshine on the water.

Answer the following questions based on the reading:
  1. What are some examples of the types of matter that sound can travel through?
  2. Do sound waves travel the same in water, air, solids?
  3. Explain your answer to question 2.

Activity 3: Investigating Sound (40 min.)
  A. Reading the following text and answer the questions below [Source: Amplify Science]

Why No One in Space Can Hear You Scream

Imagine it’s a Saturday night and you’re watching a movie that is set in space. Things are getting really exciting as one spacecraft chases another, and suddenly...BANG! The villain’s spacecraft explodes in a big, noisy ball of fire. The explosion sound effect used in the movie is loud and booming—and it’s also not scientifically accurate. If you were in space, you wouldn’t be able to hear an explosion or anything else, because sound doesn’t travel in space.
Space is silent. That’s because sound is produced by sound waves, and sound waves need something to travel through. The medium sound travels through can be solid, liquid, or gas—on Earth, it’s often air. However, in space, there is no air or any other matter between objects (such as planets, moons, and the sun), so there’s nothing to carry sound from place to place.

Sound waves are produced when something vibrates. The object’s vibrations make it bump into the nearest atoms or molecules—on Earth, those are usually the molecules that make up the air surrounding it. Those molecules then bump into the molecules next to them, which bump into the molecules next to them, and so on. That pattern of molecules bumping into each other is a wave, and when it reaches your eardrum, you hear it as sound.

In space, there are no molecules for a vibrating object to bump into—objects like planets and the sun can vibrate, but the motion doesn’t set off a wave. Therefore, even dramatic events in space, like explosions, are totally silent!

Sound waves can’t travel in space, but other kinds of waves can. Electromagnetic waves, including light waves, don’t need anything to travel through, so they can get around in space. Explosions put out light waves that can make it to your eyes whether there’s matter around or not—that’s why you would be able to see the spacecraft’s explosion but not hear it.

Answer the following questions based on the reading:

1. Why can’t sound waves travel through space?
2. What are things that sound waves can travel through?
3. What types of waves can travel through space?
C. Graph 1 shows a sound wave. One way you can change the sound is to increase or decrease its frequency.

1. Which of the three graphs below shows how Graph 1 would change if you increased only the frequency of the wave? Graph _____.

2. Explain your answer for question 1 using evidence from the graph you chose.

(Source: Wonder of Science)
D. Read the scenario below [Source: Wonder of Science]:

You are on a team that is developing a video game about people in outer space. You are using a computer program to create the sounds that will be used in the game. To make the sounds on your computer you have to change the characteristics of sound waves.

One of the game developers claimed that it would not be possible for the characters to hear these sounds because there is no air in outer space. To explain, she first showed the model below of air particles vibrating when the computer plays the sound for a person on Earth. In this model, air particles are represented by gray dots. In the bands marked “A” the particles are vibrating closer together and in the bands marked “B” the particles are farther apart.

The graph below shows the relationship between air pressure and the distance that the vibrations traveled as the sound moved from the computer speaker to the person’s ear.

1. On the graph below:
   - Write A in one place that represents how the sound vibrates the air particles in a band marked “A”.
   - Write B in one place that represents how the sound vibrates the air particles in band marked “B”.

2. Explain why you think the parts of the graph that you labeled A and B represent the A and B bands on the model. Use what you know about the relationship between sound and air pressure to support your answer.
3. Explain why characters in the game would not be able to hear the sound when they are in outer space. Use what you know about waves and evidence from the Model of Sound and/or Graph of Sound to support your explanation.

Activity 4: Tying It All Together! (30 min.)

A. Review your learning from all the activities in this project packet. What do you think now about how dolphins use sound to navigate the ocean?
   - Use the model template below to create a new model to explain your ideas.
   - Be sure to include science ideas and evidence from the activities in this packet.
   - Explain your ideas through drawing, labels, symbols (for example: arrows), and in writing.
   - Word bank (use these words in your explanation as appropriate; you do not need to use all of the words):
     - Energy, wave, amplitude, wavelength, frequency, vibration, particle

<table>
<thead>
<tr>
<th>How does a Dolphin use sound to navigate its ocean environment?</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Dolphin" /></td>
</tr>
<tr>
<td><img src="image" alt="Coral" /></td>
</tr>
</tbody>
</table>

Explanation:

Optional Hands-On Extension Activity: Secret Bells
Materials:
- scissors
- string
- table, wall, or door
- wire hanger and/or metal spoon

Procedure:
1. With your scissors, cut a piece of string about 3 feet long. (Grown-ups trying the experiment should cut a piece about 4 feet long.)
2. Hold the two ends of the string in one hand. The rest of the string will make a loop.
3. Lay the loop over the hook part of the hanger. Push the two ends through the loop, and pull them all the way through the other side. (This is easier to undo than a knot.)
4. Wrap the loose ends of the string two or three times around the first fingers on each hand.
5. Swing the hanger so it gently bumps against the leg of a table, or against a door. What did it sound like? Probably not much.
6. Now put your hands over the openings of your ears. (Don’t put your fingers in your ears!) Hold your hands tight to the sides of your head. Lean over and gently bump the hanger again.
8. Want to hear what a spoon sounds like? Unwrap your fingers, then pull on the loop end of the string. The whole string will come off the hanger, and you can reloop it around the spoon.

Optional Digital Resources To Explore:
1. Science vs. Music: A unique way to visualize sound
   https://www.youtube.com/watch?v=Q3oltpVa9fs
2. TED Talk: Daniel Kish uses echolocation to navigate the world
   https://www.youtube.com/watch?v=uH0aihGWB8U&t=29s
# 8th Grade Social Science Project: The Power of Cartoons

<table>
<thead>
<tr>
<th>Estimated Time</th>
<th>120 Minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade Level Standard(s)</td>
<td></td>
</tr>
<tr>
<td>SS.IS.5.6-8.MdC: Identify evidence from multiple sources to support claims, noting its limitations.</td>
<td></td>
</tr>
<tr>
<td>SS.IS.6.6-8.MdC: Construct explanations using reasoning, correct sequence, examples and details, while acknowledging their strengths and weaknesses.</td>
<td></td>
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<tr>
<td>RH.6-8.2- Determine the central ideas or information of a primary or secondary source; provide an accurate summary of the source distinct from prior knowledge or opinions.</td>
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<tr>
<td>RH.6-8.6- Identify aspects of a text that reveal an author’s point of view or purpose (e.g., loaded language, inclusion or avoidance of particular facts).</td>
<td></td>
</tr>
<tr>
<td>RH.6-8.7- Integrate visual information (e.g., in charts, graphs, photographs, videos, or maps) with other information in print and digital texts</td>
<td></td>
</tr>
<tr>
<td>Caregiver Support Option</td>
<td></td>
</tr>
<tr>
<td>Caregiver support could include discussing current events with your student, having conversations around the texts in this packet as well as observations about the impact of media on society, and being an audience for the presentation of the final product.</td>
<td></td>
</tr>
<tr>
<td>Materials Needed</td>
<td>pen/pencil, paper/notebook, materials for the final cartoon project.</td>
</tr>
<tr>
<td>Question to Explore</td>
<td>How do cartoons reflect and shape the values of our society? How do images teach us about complex and controversial issues?</td>
</tr>
<tr>
<td>Student Directions</td>
<td>Please see below for step-by-step directions. Do all of your work in your notebook or on paper.</td>
</tr>
</tbody>
</table>
Our world is filled with pictures, but how often do you stop and consider their purpose and argument? Each time that you go on the internet, turn on the television, open a magazine, or even play a video game, you are seeing cartoons that make arguments about issues affecting us today.

You might breeze past these images thinking that they are simply there for your entertainment, but those beautifully colored images have more depth than you might think, and may even change how you view reality. They convey messages about what people see, think, and feel about the world.

Throughout this project you will be analyzing a variety of cartoons and texts that present arguments. This analysis will help you create your final product, which will be a cartoon of your very own. Let’s get started!

A. Answer the following in your notebook.
   1. What cartoons do you like to watch, read, or play as video games? Why do you like these?
   2. When you see a cartoon, what do you think about?
   3. What makes reading a cartoon more appealing than reading an article or essay?
   4. Why do you think cartoons are used along with news stories or sometimes meant for older audiences to read and watch?

Activity 2: Understanding political cartoons: Read the useful pointers on how to read political cartoons and then answer the questions to help you to uncover the meaning of the cartoon in Document A.

Mini Lesson: Cartoons contain more than just images, they often have a title, caption, and/or text in the cartoon that will help the audience figure out the meaning of the cartoon. The title is the text at the top of the cartoon and the caption is written below the cartoon. Not all cartoons have titles and captions, so you will need to rely on the text that you are provided to figure out the meaning of the cartoon. Keep in mind that the text of a cartoon often makes an argument. Looking at the cartoon above, the title implies that Kool-Aid man is so tired of quarantine that he’s willing to do anything, including run through walls, to escape. The caption also implies that the Kool-Aid Man is in a desperate state because he is yelling.

A. How do I know what I’m seeing? Consider Document A below from The New Yorker as we review some academic vocabulary and practice analyzing cartoons.
Document A: Quarantine Fatigue


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1. In your notebook, write another title and caption for the cartoon in your notebook that matches the mood and actions included in the cartoon.

2. Cartoonists often use **symbols** to convey a larger and more global message in their work. A **symbol** is any image that stands for something else.
   a. Why do you think the cartoonist decided to use the Kool-Aid Man as a symbol? What is his message about how people may be feeling?
   b. Why do you think the cartoonist used symbols/images to convey their ideas?
   c. Write/draw another example of a symbol that could have been used by the cartoonist to represent people in quarantine.

3. Cartoonists also **exaggerate** different features of their cartoons to draw your attention. The cartoon above uses the Kool-Aid Man running through a wall, this is an obvious **exaggeration**, as people could not literally run through walls.
   a. Why do you think the cartoonist used the exaggeration of running through walls? What message and feelings does the cartoonist reveal with that exaggeration?
   b. Write/draw another example of exaggeration that could have been used by the cartoonist.
   c. What is the overall message of the cartoon? What images or text helped you reach that conclusion?
Cartoon analysis checklist: The process you followed in the steps above will repeat for other cartoons. You will be using the checklist below to analyze a variety of cartoons throughout this project.

   a. Annotate the title, caption, and text. What do you think the cartoonist is arguing?
   b. Annotate the symbols. What elements of the cartoon might represent something else?
   c. Annotate any exaggerations. What is the cartoonist trying to emphasize in their cartoon?

B. What can we learn from cartoons? Now that you have practice in analyzing a political cartoon, answer the following in your notebook.
   1. How do cartoons reflect what is happening in our society?
   2. How does the simple image in Document A convey a complex issue?

Activity 3: Analyzing the Power of Cartoons by Reading Paired Texts

A. Learning Engagement 1: Read and annotate Document B “Coping Mechanisms” and Document C “WHAT TO THINK ABOUT IN THE MORNING BEFORE YOU REMEMBER THE SAD STATE OF THE WORLD.” Then, answer the questions that follow the texts in your notebook.

Document B: Excerpt from COPING MECHANISMS

Work, school, money — these are some of the most common stressors in everyday life. It’s important to learn how to adapt to, minimize, or overcome stressful situations, but some coping mechanisms are more advantageous than others. How do you deal with stress? As you read, identify the benefits and drawbacks to certain coping methods.

People have many different strategies for dealing with stressful situations — some helpful, and some not so helpful. Psychologists call these “coping mechanisms.” A coping mechanism is a method that a person uses to deal with stress or conflict.

ADAPTIVE COPING MECHANISMS
Adaptive coping mechanisms are positive ways people alleviate stress.

Problem-Solving
Problem-solving focuses on locating the source of the problem and determining solutions, or action steps. Developing a plan can help lessen stress that comes from the unknown. Problem-solving can be strengthened by creativity, and it is a useful response to both simple and complex issues. A strong problem-solving process involves defining the issue, brainstorming alternatives, evaluating
and choosing between these alternatives, and implementing solutions.

**Humor**
People of all ages and cultures respond to humor. Studies show people who laugh and smile often live longer and develop healthier relationships. Humor is also a common coping mechanism because it can diffuse the tension of a stressful situation. However, when humor is overused as a coping mechanism, it can lead to denial or avoidance...

Answer the following question about “Coping Mechanisms” in your notebook.
1. What coping mechanisms stood out as being most effective in dealing with quarantine? Why?
2. What was most interesting about what you read above?

Complete the cartoon analysis checklist below as you look at the cartoon. Make your annotations right on the cartoon.

**Cartoon analysis checklist:**
- Annotate the title, caption, and text. Consider what the cartoonist is trying to argue.
- Annotate the symbols. What elements of the cartoon might represent something else?
- Annotate any exaggerations. What is the cartoonist trying to emphasize in their cartoon?

**Document C: “WHAT TO THINK ABOUT IN THE MORNING BEFORE YOU REMEMBER THE SAD STATE OF THE WORLD”**
**Source:** Vitti, Eugenia. “WHAT TO THINK ABOUT IN THE MORNING BEFORE YOU REMEMBER THE SAD STATE OF THE WORLD”. The New Yorker. 4/26/2020
Now, answer the following questions in your notebook.

1. What argument is the cartoonist making in her cartoon? Cite evidence from the cartoon.
2. How does the text of the cartoon contribute to the argument of the cartoonist?
3. Which elements of the cartoon are exaggerated? How do these exaggerations help the audience to better understand the cartoon?
4. How do the article and the cartoon compare in how they are conveying their messages? What are the strengths of the article? What are the strengths of the cartoon?
5. What makes reading this cartoon more appealing than reading an article about quarantine?

After you have analyzed the cartoon and text, answer these reflection questions in your notebook.
1. How can you apply what you learned from the article and cartoon to your life?
2. How does the cartoon make us think about the complexities of what is happening in our world?
3. How is the cartoon shaping how we are coping with our current situation?

A. **Learning Engagement 2:** Read and annotate Document D “Animal Crossing Is the Perfect Way to Spend Quarantine” (excerpt) and Document E “Daily Cartoon: Monday, April 13th”. Then, answer the questions that follow the texts in your notebook.

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**Document D: Animal Crossing Is the Perfect Way To Spend Quarantine (excerpt)**


But when my friend Brian texts me for the latest gossip, I tell him that yesterday, just before midnight, I met a ghost on my island who gave me a bidet (a basin used for cleaning after using the washroom).

That sort of unlikely exchange happens all the time in Animal Crossing: New Horizons, a cheerful and funny video game for the Nintendo Switch that has become a social-media sensation in the era of social distancing. The premise is simple: You’re tasked with transforming a small, cartoony island into a bustling village. There is no kidnapped princess or planet on the brink of war, but you get to go outside, which is even better.

With its low-stakes emphasis on making friends and decorating your house, Animal Crossing plays less like a traditional game and more like a lifestyle simulator. You could liken it to “The Sims,” except in that long-running series, you supervise mercurial characters who will throw fits when ignored and even pee on the floor in defiance. (“The Sims” also lets you kill characters off. You’ll want to.)

Nothing is all that urgent in Animal Crossing, where the goals are breezy and can be put off indefinitely. New rooms can be added to your home once you pay off debts to the real-estate baron Tom Nook — a raccoon tycoon who wears Tommy Bahama button-downs — but if you’d rather spend your play sessions gossiping with the island’s bevy of anthropomorphic animals, go right ahead.

You’re encouraged to check in with the game every day, since the island runs in real time: 3 p.m. in real life is 3 p.m. in the game, and different events are possible depending on the time or even the day of the week. That sort of sustained commitment is why I had resisted previous installments in the Animal Crossing franchise: As I grew out of my teenage years, I preferred shorter games that would more easily slot into my busy life.

But now that we’re all trapped inside by the coronavirus, time has slipped off its hanger and lies in a heap on the floor. Why not spend a half-hour every morning — well, I always say it’ll be a half-hour, and then suddenly it’s dinner — in the company of some charming cartoon characters on my digital island?”
Answer the following questions about “Animal Crossing Is The Perfect Way To Spend Quarantine" in your notebook.

1. Describe how “Animal Crossing" provides an escape for the player. Why is this game so appealing during these times in quarantine?
2. How has playing a cartoon game like “Animal Crossing” helped the author cope with his time in quarantine?
3. How does the article explain how a cartoon game can reflect the values of American society? How can a cartoon game like this help people deal with the complexities of society?

Complete the cartoon analysis checklist below as you look at the cartoon. Make your annotations right on the cartoon.

**Cartoon analysis checklist:**

a. Annotate the title, caption, and text. Consider what the cartoonist is trying to argue.
b. Annotate the symbols. What elements of the cartoon might represent something else?
c. Annotate any exaggerations. What is the cartoonist trying to emphasize in their cartoon?

**Document E: Daily Cartoon: Monday, April 13th.**


“On my island, I can live out my wildest dreams.”
Now, answer the following questions in your notebook.

1. What argument is the cartoonist making in the cartoon? Cite evidence from the cartoon.
2. How does the text of the cartoon contribute to the argument of the cartoonist?
3. Which elements of the cartoon are exaggerated? How do these exaggerations help the audience to better understand the cartoon?
4. How does the argument of the author reflect American values?
5. How do the two sources included in this learning engagement work together to teach the audience about how to cope with quarantine?
6. Create a title for the cartoon above, and explain why you chose the specific language that you did.

B. Learning Engagement 3: Read and annotate Document F “Earth Day 2020.” Then, answer the questions that follow the text in your notebook.

Complete the cartoon analysis checklist below as you look at the cartoon. Make your annotations right on the cartoon.

**Cartoon analysis checklist:**

a. Annotate the title, caption, and text. Consider what the cartoonist is trying to argue.

b. Annotate the symbols. What elements of the cartoon might represent something else?

c. Annotate any exaggerations. What is the cartoonist trying to emphasize in their cartoon?

**Document G: Earth Day 2020**

Now, answer the following questions in your notebook.

1. What argument is the cartoonist making in the cartoon? Cite evidence from the cartoon.
2. How does the text of the cartoon contribute to the argument of the cartoonist?
3. Which elements of the cartoon are exaggerated? How do these exaggerations help the audience to better understand the cartoon?
4. How does this image address global warming, an issue that has been seen as controversial for some?

C. Learning Engagement 4: Read and annotate Document H “MARCH” context and Document I “March” excerpt. Then, answer the questions that follow the texts in your notebook.

Not all cartoons are a single picture. A form of text called graphic novels have become increasingly popular in recent years. Graphic novels are presented in series of comic-strips and published as books. Despite the fact that graphic novels often take on a longer form, they contain many of the same features as the cartoons that we have studied so far. For example, they often have text paired with the cartoons and are written to convey an argument or message.

**Document H: MARCH (context)**

Source: [http://www.topshelfcomix.com/march](http://www.topshelfcomix.com/march)

The following excerpt is from the Top Shelf Productions website explaining the context that the graphic novel MARCH is set in.

Almost sixty years ago, Martin Luther King, Jr. edited a 16-page comic book about the Montgomery Bus Boycott. Distributed by hand in churches, schools, and nonviolence workshops, it dramatized the fledgling movement and its tactics to a generation of future leaders—including a young John Lewis.

Today, Lewis is continuing that legacy, and using comics to educate and inspire a new generation. Together with Andrew Aydin and Nate Powell, Congressman Lewis is creating a transformative work of literature in the graphic novel series March: a #1 New York Times bestseller that brings his memories of the civil rights movement to urgent new life.

As a graphic novel memoir, March engages readers with unforgettable imagery and first-person narration, combining the disciplines of art, literature, and history in a single document. Students will not only understand the history of the civil rights movement but also connect in a deeply personal way with the story of nonviolent activism in America.

Now, answer the following questions in your notebook.

1. Why do you think comic books and graphic novels are used to highlight and teach about important events in history?
2. How can a graphic novel help readers connect with what they are reading?
Complete the cartoon analysis checklist below as you look at the cartoon. Make your annotations right on the cartoon.

**Cartoon analysis checklist:**

a. Annotate the title, caption, and text. Consider what the cartoonist is trying to argue.

b. Annotate the symbols. What elements of the cartoon might represent something else?

c. Annotate any exaggerations. What is the cartoonist trying to emphasize in their cartoon?

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**Document I: “MARCH” (excerpt)**

[https://www.oreilly.com/library/view/i-have-a/9780133498455/app04.html](https://www.oreilly.com/library/view/i-have-a/9780133498455/app04.html)
Surrounded by so many of our friends, we felt like prisoners in a holy war.

"We are not alone.

We shall all be free someday."

Back at the lunch counters, police could hardly keep up with the waves of students quickly filling the empty seats. No sooner would one group be arrested than another would take its place.

"We are not alone."

82 of us went to jail that day.

"We are not alone."

"We are not alone someday."
Answer the questions below in your notebook.

1. Who wrote the MARCH novel series?
2. Understanding his experiences, what do you think is his perspective?
3. Do you consider him to be a reliable source in capturing this history? Explain.
4. How do the author and artist use images to intensify the emotion of the text?
5. What argument is the cartoonist making in the excerpt? Cite evidence from the excerpt.
6. How does the text of the cartoon contribute to the argument of the cartoonist?
7. Which elements of the cartoon are exaggerated? How do these exaggerations help the audience to better understand the cartoon?

Now, reflect and answer the following questions in your notebook.

1. Why do you think graphic novels are popular? What is their appeal?
2. Why do you think the images in the cartoon are a powerful way to teach us about controversial issues in American history?
3. Do you see any reference to important values that shape our society? What are they and how are they illustrated in the graphic novel? What meaning do you think the author is trying to convey?

Activity 4: Creating a cartoon

A. Bringing it all together:

1. You have done some amazing work analyzing the cartoons and texts above! The paired texts have provided you with examples of how texts and images can be used to teach an audience about a specific topic. Your next task will be to create a cartoon related to a current event in your life or the world.
2. To get us started, let’s reflect on the learning you did and the power of cartoons. Answer these questions in your notebook, be sure to cite evidence from the Documents above.
   a. How do cartoons reflect and/or shape the values of our society?
   b. How do images teach us about the complex and controversial issues we are facing today?

B. Getting started on creating a cartoon or short graphic novel:

Remember that cartoons often use text, symbols, and exaggeration to present an argument. You are going to create your own cartoon to make an argument/ convey a message about a topic of your choice. This topic can be a personal experience you have had or a current event from the world today. Answer the questions below in your notebook to help you get started.

i. What topic or event am I going to create a cartoon about?
ii. What argument am I going to make in my cartoon?
iii. Am I going to include a title and caption? What could they be?
iv. What text will I include in my cartoon?
v. What familiar symbols can I use to convey my argument to the audience clearly?
vi. What are going to be the most important parts of my cartoon? How am I going to...
C. **Create your cartoon!** Use your answers above in A and B and what you learned in Activities 1, 2, and 3 to create your cartoon or short graphic novel.

**Activity 5: Reflection**

Now that you have created your cartoon, you are going to write a brief letter to the audience (family member, friends and/or teacher virtually) who might be viewing your cartoon to justify your choices. The purpose of this letter is to write about the creative choices that you made in your cartoon. Answer the following questions in your letter and share with your audience.

a. Why did you choose the topic that you did?

b. Why did you select the symbols that you did? What impact did you hope that these symbols would have on the audience?

c. Which parts of your cartoon did you exaggerate? Why? What impact did you hope that these exaggerations would have on the audience?

d. What can people learn from cartoons that they cannot learn from a text?

e. How do cartoons reflect and shape the values of our society?

**Cross Content Connection:**

- Social Science- ELA- Paired text analysis. Creating a cartoon narrative that reflects learning from multiple sources.
- Social Science- Art- Analysis of symbolism and imagery in cartoons.
- Social Science- Science- Data analysis and environmental impact of COVID-19.