

[MS-PS4-3](#) Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals.



- Indicates opportunities for integrated English language development (reading, writing, listening & speaking).

Lesson 3: Digital vs. Analog

Engage

In-person or online activity:

Introduce Phenomenon

Students are in pairs.

- Write the 5 senses on the whiteboard: **touch, see, smell, hear, taste**. Have students pick one of the senses and keep it to themselves: touched something, smelled a scent, heard a noise, saw a dog, or tasted something sour.
- Have them transmit their information to their partner. They must be SPECIFIC and PRECISE. For example, I saw a dog. What type? As big as what? It felt like what? It smelled like what? It sounded like what?
- **(This part of the activity can be conducted in breakout rooms with partners, or in a collaborative Google Doc, for online learning.** For virtual learning, teachers can pre-assign partners (A & B) and share the list via screen share, so that students know who they are sharing with, as well as spelling of their partner's name for document sharing. Each partner could share their individual document, or both students could collaborate in a single document, with only one partner being responsible for sharing. Copies of two different docs are attached below.
 - [Engage: Digital vs. Analog Senses - single](#)
 - [Engage: Digital vs. Analog Senses - two students](#)
- Teacher can facilitate a brief discussion about some of the descriptions. Were the students specific and precise in the language they used for the descriptions? Did their partners know exactly what each person was referring to?

In person or online activity - Whole Class Discussion

- Using all five senses answer the questions as a class:
 - How does cold water feel?
 - How would you describe what the beach looks like?

- Explain to students that what they are doing is detecting analog information. It is difficult to encode and transmit analog information.
- Have students think of the word ANALOGY. For example the dog sounded like... It smelled like...

Back to Pairs (Breakout rooms or Doc)

- Have pairs transmit information about:
 - length without a ruler
 - weight without a scale
 - temperature without a thermometer
 - time without a clock
 - color without a color wheel.
- List these on a whiteboard. Ask students in their groups to consider how this would be accomplished.

In-person or online activity option - After students have had a chance to discuss in pairs, breakout rooms or virtually through a Doc, one person from each pair can go to this [Jamboard](#) and create sticky notes with their suggestions. Teacher can monitor and discuss the options as a class, if desired.

Explore

In-person or online activity:

Student Explorations

Ask students:

- Why do you have to do things on time?
- Why are there “time zones”?
- What makes standard times?
- Show [this video - Time](#).

Show a Digital Clock. Show an Analog Clock. Ask the Question:
Question: How do they work?

- Visit this site: [Clocks](#)

Answer:

Explain that in the case of the analog clock, the gears inside run continuously and measure continuous time. Many digital clocks, such as the one on your phone, are programmed to change the time once every sixty seconds. It does this by turning on and off the seven parts of the digital display. This is known as the SSD, or seven segment display.

Explain

Additional In-person activity option:

 [Digital vs. Analog Lab](#)

In-person or online activity options:

BrainPOP -

Students can complete any of the following activities to explore the differences between digital and analog signals. The related readings give additional context and history.

[Analog & Digital Recording movie](#) & related activities

[Related Reading - Way Back When](#)

[Related Reading - Gadgets](#)

[Related Reading - Q & A](#)

In-person or online activity:

 [Station Activity](#)


Working in small groups, students will rotate through the stations collecting data about each task.

1. You are a photographer. Study both the analog and digital cameras. Your task is to decide how you will take the photographs, how you will send the photographs to a friend or family member living in another state, and how the quality of two photographs compares.
2. You are the timekeeper of a Pee Wee football game. Each quarter is to be five minutes in length. Use both devices to measure the quarters.
3. You enjoy listening to music. You have many options for purchasing music. Listen to each device and decide for yourself which format is your favorite and why.
4. You are phoning three friends to invite them to a sleepover party you are having this weekend. Using the devices available to you, time how long it would take you to accomplish that task.
5. You are a nurse at Urgent Care. You must weigh each of the patients as they come into the office. Collect that data and report it to the doctor in another part of the building.

[Digital vs. Analog Station Data Sheet](#)


Elaborate

Additional activity options:

 **Achieve 3000** - Have students complete the 5-step lesson. As the teacher, you will facilitate the learning through the lesson, if needed.

["Is Your Tv Ready?"](#)*

*must be logged into Achieve3000 to view.

 **Zingy Learning** - Students can complete the interactive lessons and quizzes as a check for understanding. There are additional questions that can be used in a Google Form or Doc as an outline for note taking during the lessons.

[MS. Subject-Specific. Physical Science. Unit 55. Lessons 1-2.](#)

[Unit 55, Lesson 1 - Analog Signals Short Answer Questions](#)

[Unit 55, Lesson 2 - Digital Signals Short Answer Questions](#)

In-person/Synchronous Activity:

Class Discussion:

- Ask students what devices they use to listen to music and why?
- Ask students if they know how people listened to music in the past.

Teacher Demo:

- Bring an analog and digital device to play music on.
- Show them the following videos
 - [Analog vs. Digital](#)
 - [Analog vs. Digital 1993](#)
- Ask students if they know what Autotune is?
- Are they able to recognize it if they hear it?
- Show them the following video
 - [Autotune waves](#)
- Have students listen to their music and see if they can recognize autotune.

Class Debate:

- Have a class debate on what is better?
 - Song/artist using analog or digital waves
 - Students can pick sides or the teacher can decide

Evaluate

for students.

- Students will need to use their previous knowledge and new learning from the previous phases to gather evidence to support their position.
- To prepare, have each side draw their points on a poster or create a Google slideshow.
- Debate can be conducted during a synchronous or in-person meeting.

Additional in-person or online debate options:

Create a **FlipGrid** for the online debate. The teacher can record and attach a video to start the conversation. Students can prepare their talking points ahead of time and use those to argue their position. Allow students to comment, using their evidence, on at least 2-3 student videos who have opposing views. Teacher does have the option to moderate comments as well, if needed.

Create a **Padlet** for the online debate. If students created presentations or posters, these can be posted on a Padlet, where students can view the presentations and comment, using evidence to support their position.

In-person or online activity options:

Now that students have had the option to debate which type of waves they prefer, students all have to argue that digital waves are more reliable than analog waves. **Students can choose which representation option they would like to utilize.**

Possible choices are:

1. Have them use their previous learning experiences and conduct research. Have them write a short research paper on why digital waves are more reliable than analog waves. You may set the criteria and points for this assignment to fit the needs of your classroom and students.
2. Students can create a video to argue why digital waves are more reliable. They can use their chromebooks and **WeVideo, Screencastify, or FlipGrid** to create their own video. Another option is to allow students to use their own technology and have them upload the video to Google Classroom.

3. Students can give a live demonstration to the classroom during an in-person or Zoom meeting, as to why digital waves are more reliable. They could utilize props, pictures, posters, and provide real world examples that the audience can relate to.