# Lesson 1: What do engineers do?

Facilitator: Teacher

PREVIOUS LESSON:
This is the first lesson in the unit. There are no previous lessons.

THIS LESSON:
Students will be introduced to the anchoring phenomenon watching engineers solve a problem, discuss their current knowledge of engineering, and identify what they think engineers do.

**Time**: 2 classes, 45 minutes each

NEXT LESSON:
Students will be led through a guided reading of Rosie Revere, Engineer.

Students will revise their initial models and update the Driving Question board with their new knowledge.

## Standards

STEELS
**Technology and Engineering:**
**3.5.3-5.HH** Students will differentiate between the role of scientists, engineers, technologists, and others in creating and maintaining technological systems.

ELA
**CC.1.5.4.A** Engage effectively in a range of collaborative discussions on grade level topics and texts, building on others' ideas and expressing their own clearly.

Career Education and Work
**13.2.5.A** Apply appropriate speaking and listening techniques used in conversation.

**13.2.5.E** Apply to daily activities, the essential workplace skills, such as, but not limited to:

- Commitment
- Communication
- Dependability
- Health/safety
- Personal initiative
- Scheduling/Time management

## Driving Question

What Do Engineers Do?

## Essential Vocabulary

| | | |
|---|---|---|
| Engineer | Notice | Wonder |

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# Instructional Guide - Day 1

## Materials and Preparation

| Materials | Lesson Prep |
|---|---|
| • Notice and Wonder Chart<br>• Engineering Packet<br>• Class Model Chart<br>• Driving Question Board<br>• Writing tools<br>• Post-it Notes<br>• Slideshow | • Post Notice and Wonder Chart at the front of the class.<br>• Ensure students have a copy of the engineering packets or have them available to hand out.<br>• Post a Driving Question Board at the front of the class.<br>• Ensure technology is set up to play the video for the anchoring phenomena. |

## ENGAGE

1. **Briefly explain the unit to the students**

   "*For our next science and engineering exploration, we will be learning about engineers, and what engineers do.*"

   Ask students if anyone knows anything about what an engineer is.

2. **Photo Walk of Engineers - (Slides 2-5)** **(5-10 minutes)**

   "*Write down or draw what you notice and wonder in your engineering packets on page 2.*"
   Slowly go through slides 2-5.

3. **Notice and Wonder Discussion - (Slide 5)** **(10 minutes)**

**Routine:**
Call on students to share a notice. Once they have done so, ask if any other students have similar notices and collect their ideas. Continue until all students have contributed to the Notice section of the board. Repeat for the wonder section of the T-Chart.

Perform the routine with students. Use questioning techniques such as:

| What you want them to do... | Example |
|---|---|
| Say more | *"Can you tell me more?"* |
| Clarify | *"So, what you are saying is..."* |
| Give evidence | *"Why do you think that?"*<br>*"What made you think of that?"* |
| Encourage talking with each other | *"Do you agree with what ____said?"*<br>*"Can anyone add on to what ____ said?"* |

**Note:** It is important to accept all student ideas, and not give anything away.

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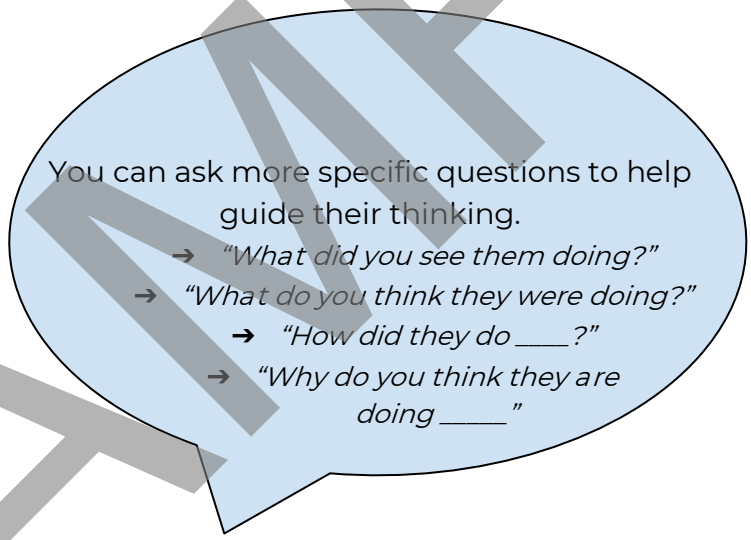
4. **Explain to students that they will be watching a video of engineers working to find out more.**
   Before they watch the video, remind them to think about what they notice and what they wonder/have questions about.

5. **Play the video. (Linked on slide 5)** **(3 minutes)**
   https://www.hourofengineering.com/p/engg_page

6. **Begin a class discussion after viewing the video - (Slide 5)** **(12 minutes)**
   After watching the video, instruct students to write down or draw the things they notice and wonder in their engineering packets. You may play the video again if needed. After students complete their individual writing, have students think, pair, share their new ideas.

   Once the students have shared with their partners, call on a few students to share some of their new notice/wonders.

   *Alternatively, you can have the students share their partner's ideas to increase participation. *




   Guide the discussion with the intent of at least getting the students to understand that "engineers solve problems".

## EXPLAIN

7. **Initial Modeling - (Slide 6 and 7)** **(5 minutes)**
   "*Scientists and engineers often create models of their thinking, and we are going to do that too! Turn to page 3 in your engineering packet and write down what you think so far, about how engineers solve problems.*"

   Display slide 7 and remind students (if they have experience) what components are in models.

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8. **Comparing Models - (Slide 8)** **(5 minutes)**
   After they've finished their individual models, have them compare their work with a partner. Share **slide 10** with the instructions.
   - *Explain your models to each other.*
   - *Put a STAR ⭐ by the parts of your model that are similar.*
   - *Put a question mark ❓ next to the parts of your model that are different.*

9. **Class Model - (Slide 9)** **(10 minutes)**
   After the partners have shared their models, bring the class back together to meet in a Scientist Circle to share the similarities and differences in their models. Display Slide 11. The teacher should draw a class model during this discussion.

   Ask students:
   - ➔ *"What did you and your partner have the same in your models?"*
   - ➔ *"What can we agree on as a class are the most important parts that we can include in our class model to help understand how engineers solve problems?"*

## Instructional Guide – Lesson 1, Part 2

10. **Review, and connecting to their knowledge - (Slide 10)** **(15 minutes)**
    Review the class model with the students, having them verbally answer the question:
    *"What do you think we know so far about how engineers solve problems?"*

    *"Ok, so we have some knowledge about how engineers solve problems. Are there any other jobs or people that you can think of that might do something similar to engineers? I want you to turn and talk with a partner. Be sure to listen to what your partner says and ask for them to repeat or rephrase their idea if you don't understand. We will be coming back together as a class. You will need to share your partner's ideas."*

    Have students turn and talk (**see turn and talk protocol in lesson resources**), discussing where they might find similarities in what other people do, or in other jobs.

    Bring the students back together as a class and have them share their ideas. As they share, ask if anyone had anything similar written down.

11. **What do we still need to know? - (Slide 11)** **(5 minutes)**
    *"We've learned a little bit so far about what engineers do and how they solve problems, but we still don't have all the information we need to really understand. Let's take a moment to record some questions we still have about what engineers do."*

    Have students write these questions down in their engineering packets on page 4.

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12. Driving Question Board - (Slide 12) (15-20 minutes)

*"What I want you to do now, is take a look at your list of questions, and pick between 2 to 3 questions you are the most curious about. I want you to write those questions on a sticky note."*

Distribute post-it notes and have students take about 3 minutes to write. Change to slide 15.

*"We're going to use your questions to try to find out how we can learn more about engineers. We want to put all of our questions together on the board so we can see them and come back to them as we find the answers. Who wants to share their questions first?"*

Call on students, have them read their question, and add it to the Driving Question Board.

*"Thank you! Did anyone else have the same or almost the same question as this one? If so, let's stick them right on top of this question."*

Repeat this pattern until all of the questions are placed on the board. If you are running out of time, have everyone come up and place the rest of their questions into a category they think it might fit. Summarize each category with a heading and write it on the DQB. (Example: Questions about their education might go under what they need to know/schooling)

## SUMMARIZE AND CONNECT

13. Summarize and Next Steps- (Slide 15) (5 minutes)

"Ok, we know that engineers solve problems. Now we have all of these questions. When scientists and engineers have questions, the next step is to figure out how to answer them. Let's brainstorm some things we could look at or find to try to answer these questions!"

Call on students. You are looking for answers such as books, interviewing engineers, the internet, etc., but accept all answers.

"You did a really great job today thinking, asking questions, and communicating what we know so far! Tomorrow, we'll investigate more about engineers to see if we can answer any of our questions!"




End of lesson.

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## Differentiation/Modifications/Adaptations

**Engagement:**

- Pre-assign partners or allow for multiple partners throughout the session depending on your class needs. See partnering routine in lesson resources.
- Review classroom norms on discussion.
- Encourage students to bring forth any ideas.

**Representation:**

- Print out slides for individuals who may need it closer to them
- Play videos several times to allow students extra think time
- Have other students verbally describe the pictures that they are seeing to help learners with visual impairments.
- Provide scaffolding with student models by coming up as a class with at least one example of what engineers do.

**Action and Expression:**

- Allow students to type or use voice to text instead of writing in their engineering packets. They can also use google draw in their packets to draw. Remember, students may engage in sketch noting. See lesson resources for more information.
- Allow students to verbally answer questions from their packet, rather than write it down as long as someone can scribe their answers.

## Assessment

- ➔ Student packets (pages 2-4)
- ➔ Class driving question board

## Rubric/Checklist

- ➔ Student packets (pages 2-4)

- ➔ Review packets and put a star, checkmark, or stamp on pages with the following information:
  - Page 2 - at least 3 notices and 2 wonders
  - Page 3 - students should have 2-3 ideas written
  - Page 4 - at least one question

- ➔ Class driving question board
  - Check that each student has contributed to the DQB. An easy way to do this is to have a checklist of all the student names, and as they come up to put their sticky note on the board, you check their name off the list.

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## Learning Opportunities at Home

**Directions:**

- ➔ Use the Letter Home for Lesson 1-3 template and send it home to families!
  - ◆ 1-3 Letter Home

## Letter Home Template

Dear families,

Today we started talking about engineers and what they do! Your child will learn about engineers by becoming engineers themselves! Engineers build and design things to solve problems. Here is one way you can help your child start to see where engineering has helped solve everyday problems!

I Spy Solutions!

Whether in your home or on the go, have your child try to find as many things as they can that they think were created to solve problems! For example, in the grocery store, you can say "I spy something that helps people carry things out to their car!" (grocery bag).

Other examples:

- I spy something that helps people clean! (vacuum, cleaning solution, sponge)
- I spy something that helps people eat food that is hard to eat with our hands. (fork, spoon)
- I spy something that helps us find things more easily. (Signs in the aisle, labels)
- I spy something that helps keep the store clean. (Marty!)

Happy hunting!

From,

Insert teacher name here

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## Lesson Resources

### Scientist Circle

Students sit in a circle facing the entire class so that they can see and speak directly to each other. This shifts the focus from the teacher and signals that we all need to contribute to make sense. Example routine:

1. One person presents their ideas and evidence (or presents those of their partner or group)
2. Other students agree and add their evidence (I agree because….I want to add on to this….)
3. Other students may also disagree and provide their evidence (I disagree because….)
4. The group discusses the statements and evidence and come to an agreement. If they cannot agree, discuss the reasons why each is convinced of their own positions.

### Turn and Talk Procedures

1. Choose Partners: Decide who will be Partner 1 and who will be Partner 2.
2. Partner 1 Talks: Partner 1 will talk about the topic while Partner 2 listens carefully.
3. Partner 2 Repeats: Partner 2 will repeat or rephrase what Partner 1 said to show they understood.
4. Switch Roles: Now, Partner 2 will talk, and Partner 1 will listen.
5. Partner 1 Repeats: Partner 1 will then repeat or rephrase what Partner 2 said.

Remember, good listening and repeating help us understand each other better!

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