



First Grade STEAM Program

February 2022



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Overview

The following pages contain an overview and instructions on the activities planned for the first-grade STEAM outreach program at Netherwood Knoll Elementary School.

Format:

- Intro (10 minutes): Quick interactive presentation on what engineers do, asking the kids key questions to get them thinking.
- Bridge Building Activity (20-25 minutes): Break into three classes in small gym. Introduce the bridge activity where they need to build a bridge over different sizes of water streams. Break into smaller groups to build the bridges and test out.
- Traffic Safety/Engineering Activity (15 minutes): Introduce the activity to each of the three classes in the small gym. Walk through the different traffic/pedestrian safety considerations.
- Wrap-up (2 minutes): Ask the kids what they got out of the activities for the day.

Intro Presentation (~10 minutes)

Meghan Stiklestad will kick off the session. The following provides a general overview of what will be covered.

Good morning, first graders! Today we are going to learn about a special type of person called an engineer.

How many of you know what an engineer is? <pause while raise hands>

An engineer is a community helper. They are someone who uses their imagination, creativity, and knowledge to solve problems and make things better for people. Just like how you use your imagination to build with your blocks or draw pictures, engineers use their imagination to build and design things that make our lives easier and more fun.

Does anyone have an example of something that engineers build or design? <call on a few students>

These are great examples! There are a lot of different types of engineers in the world like:

*There are **electrical engineers** that make electricity run so you can turn on lights and charge your video games.*

*There are **environmental engineers** that make sure our world is clean and healthy for people and animals. They make sure the air we breathe is clean and the water we drink is safe. This helps to make sure we can do all the fun outside activities like play at the park.*

*There are **mechanical engineers** who help make things move and work. They build things like toys and cars and robots.*

*There are **structural engineers** who make sure tall buildings and bridges are safe and strong.*

*And, there are **civil engineers** who make sure we have clean water and who make sure we have roads to drive on and that they're safe.*

What types of classes do you think engineers take? <call on a few students>

Engineers use math and science to help them solve problems and build things.

Engineers are very important people who use their creativity and knowledge to make our lives better.

Who do you think can be an engineer? <call on a few students>

Everyone!

How many of you want to be an engineer? <ask to raise hands>

Great because today, we're all going to be engineers! We're going to learn about how engineers help keep our roads safe and how we can build safe bridges. Today, you're going to be an engineer and build bridges that cross over a river. We're going to see how strong we can make them. After that, we're going

to learn a little bit more about how engineers make our roads safe with what we call traffic control devices.

Now let's break into your classes and follow your teachers to your activity station.

Happy Engineering, all!

Bridge Building Activity (~20-25 minutes)

- This [video](#) gives the basis for this bridge building activity.
- **Give instructions to the class as a whole before breaking into teams of four.**
- **Kick off the activity by asking questions:**
 - ***How many of you know what a bridge is?***
 - ***What is a bridge and why do we need them?***

Bridges connect two places separated by water like a river or lake, a valley, a road, or something else that would make it difficult to cross. Bridges allow us to cross from one side to the other so we can get to where we are going quickly and safely.
 - ***What types of materials do you think engineers use to build bridges?***

Engineers use a variety of materials to build bridges, including steel, concrete, and wood. They determine the material based on where it's located, what weight it needs to hold, and what types of environmental items it needs to hold up to like rain, wind, earthquakes, and more.
 - ***What types of classes do you think engineers would need to take to help them learn how to build a bridge?***

Math, science, engineering, technology

- **Explain how engineers design and build bridges (sample below).**

Engineers are like builders who use their brains to create structures like bridges. To design a bridge, they have to think about things like how tall the bridge needs to be, how far it needs to stretch, and how much weight it needs to hold. They use a lot of math to determine these types of items.

Engineers use different shapes to make the bridge strong. They use triangles a lot because they're one of the strongest shapes. They also use materials like steel/concrete that can hold a lot of weight.

After they have a plan for the bridge, the engineers use computers to help them test their design. They make sure the bridge can hold up to things like wind, rain, and earthquakes. They also make sure the bridge is safe for people and cars to cross. When the engineers are finished designing the bridge, they give their plans to builders who construct it. The engineers also check the bridge when it's finished to make sure it is safe for everyone to use.

By working together and using their brains, engineers help make sure that bridges are strong and safe for everyone to use.

- **Kick off the exercise.**
 - Let the kids know they will be building a bridge out of LEGOs in teams.
 - Show example bridge provided.
 - The bridge will need to cross the river (blue construction paper that will be handed out).
 - The bridge cannot touch the water—either on the sides of the river or in the middle of it.
 - Let kids know their bridges will be tested with weights after they're built.
 - Break class into teams of four students
- **Give them about 15 minutes to design the bridges.**
- **In the last five minutes, have them test it out with the weight provided.**
- **Ask them why they think the bridge held the weight or what could be done differently in their design to hold the weight.**

Traffic Safety/Engineering Activity (~15 minutes)

- **Ask the following questions.**
 - How do you think cars know what to do on the road? How do they know when to turn, when to stop, and when to go?
 - How do the people know when to walk across the road?
 - What do you think would happen if we didn't have stop signs?
 - What would happen if we didn't have stop lights?
- **Explain what traffic control devices are.**
 - Traffic control devices are signs, signals, paint markings, and other items on the roadway that provide information to drivers, bicyclists, and people walking. These traffic control devices tell people:
 - What they can and can't do on the roadway (i.e., regulatory),
 - What they need to watch out for (i.e., warning)
 - What the safe and correct path forward is (i.e., guidance)
- **Classes are broken into the three main classrooms.** This activity will be performed as the larger class.
- **Explain that engineers help keep people safe in many different ways. One way is making sure that people are safe on the road—both drivers and people walking or riding their bikes.**
- **What do you think engineers consider when choosing the right traffic control devices for different road situations?**
 - Speed of traffic
 - How much traffic there is
 - The location and type of road
 - Whether or not people are walking or biking
- **Show the students the different types of traffic control devices outlined below. We will provide printouts of each of these TCDs.**
 - Ask what each one is.
 - Ask how they keep people safe.
 - In your subsequent explanations, give some descriptors as to what to look for on the sign and then their purpose.
 - **Stop Sign**

The stop sign is a big red, octagon with the word "STOP" written on it. When you see this sign, it means you need to stop your bike, car, or any other vehicle you are driving, and make sure no one else is coming. You need to wait until it's safe to go.
 - **Traffic Lights**

Traffic lights are used to control the flow of traffic at intersections. They consist of lights that are red, yellow, and green. The lights signal drivers and pedestrians when it is safe to proceed, when they need to stop, or when they need to prepare to stop. The red light means "stop," the yellow light means "slow down because the light is about to turn red," and the green light means "go." Traffic lights help keep the flow of traffic moving smoothly and safely, and they help prevent accidents and collisions at intersections.

- **Pedestrian Crossing**

A pedestrian sign typically has a picture of a person walking. In fact, the word pedestrian means “a person walking along a road.” Pedestrian signs let people know where it is safe to walk across the road. It lets drivers and pedestrians know that they should be extra careful in this area, and that they need to watch out for people walking or crossing the street. The sign lets drivers know that they need to slow down, look both ways, and be prepared to stop if someone is crossing the road.

Pedestrian signs are an important part of road safety, and they help protect pedestrians from accidents and injuries. By following the instructions on these signs, drivers can help make the roads safer for everyone.

- **Bicycle Crossing**

A bicycle crossing sign is a lot like a pedestrian sign. It's a yellow sign with a bicycle on it that helps bikers know where it's safe to cross the road and drivers know when bicyclists may be present. This helps keep the bikers safe.

- **Yield Sign**

The yield sign is a triangle shaped sign with the word "Yield" on it. When you see this sign, it means you need to slow down to see if there are other cars or pedestrians there. If someone else is already in the intersection, you need to stop and wait until they are done crossing before you can go. If there are no other cars or people in the intersection, the driver may proceed with caution.

The yield sign is used in situations where there is not a stop sign or a stop light, but where drivers still need to be cautious and aware of other traffic. The yield sign helps keep traffic moving smoothly and reduces the risk of accidents.

- **Do Not Enter Sign**

The Do Not Enter sign is a square white sign that contains a red circle and a white line through it; it also has the words, “DO NOT ENTER.” When you see this sign, it means you can't go in that direction. This helps cars from going down a street in the wrong direction and keeps them out of areas that are restricted and could be dangerous. When you see this sign, you need to find another way to get where you're going. This sign helps cars from getting into accidents.

- **Railroad Crossing Sign**

The railroad crossing sign can be a yellow circle with two “R's” and a black “X” going through it. When you see this sign, it means there is a train track crossing the road ahead. When you see this sign, you need to slow down and look both ways to make sure a train is not coming before you cross the tracks. Sometimes, there are also other warning signs, such as flashing lights, bells, and gates that come down, to alert drivers and pedestrians that a train is coming. This helps prevent accidents for both cars and pedestrians.

- **Once you've gone through the different signs, show the pictures of the intersections that will be provided. You will also have little wooden TCD signs similar to these for the interactive piece of this exercise.**

- Have kids raise their hands to answer questions about the intersection:
 - Ask students to identify the traffic control devices in each.

- Ask them to explain what the traffic control device does.
- Let the child who answers put the wooden sign onto the intersection printout where they think the TCD goes.
- As mentioned earlier, intersections will include all of the above listed signs.

If you need any additional references for the activity, the original ITE PDF included in Meghan Stiklestad's email is what was used as a basis for this exercise.

Wrap-up (2 minutes)

- Ask the kids what they learned.
- Ask them what their favorite activities were.
- Ask them if they think engineers are community helpers. Reinforce this message with another brief explanation of how engineers keep our communities safe and improve our daily lives.
- Ask them who wants to be an engineer!