

Problem Solvers Activity SE 22: Waking Walter

CHILDREN ARE LEARNING...¹

Science Content:

- The properties of objects are related to how they are used
- To define a simple problem and develop an object or tool to solve it
- To assess the effectiveness of new object/tool designed to solve a problem

CHILDREN ARE DOING...

Science Practices:

- Make observations
- Collect and analyze data
- Explore cause and effect
- Solve problems (designing, constructing, and testing solutions)

SAFETY NOTE: This activity uses materials that can be choking hazards for children. Supervise carefully and store materials out of children's reach when not in use.

MATERIALS NEEDED:

1 hand puppet

2 trays

1 small, empty plastic bottle (no larger than 8 ounces) per child

1 plastic resealable bag per child

3-4 small boxes that close securely (about the size of a jewelry box)

Open Ended Materials—Obtain enough of these materials for children to share:

- Pom-poms
- Cotton swabs
- Dry sponge, cut up into small squares (cut small enough to fit in the bottle opening)
- Dried beans
- Small bells (to fit into bottle opening)
- Dried pasta (to fit in the bottle opening)

1 cupcake/muffin tin

5 spoons

¹ Adapted from the Next Generation Science Standards (kindergarten): <https://www.nextgenscience.org/>

Note: If your program does not allow the use of food items for play/exploration, you may substitute small wooden or plastic beads for the dried beans, and pebbles (from outside or a craft store) for the dried pasta.

Optional—Handout 1: If I Built a House, if you choose to do the literacy extension activity.

PREPARATION:

- **For the ENGAGE activity:** Have the puppet handy.
- **For the EXPAND activity:** Place each open-ended material in its own cup of the muffin tin. Place the muffin tin on a tray.
- **For the EXPLORE activity:** Place the spoons, bottles, bags, and boxes on a tray.

Note: This activity was inspired, in part, by a similar one discussed in the following article: Davis, M. E., Cunningham, C. M., & Lachapelle, C. P. (2017). They can't spell "engineering" but they can do it: Designing an engineering curriculum for the preschool classroom. Zero to Three, 37(5), 4-12.

JUST FOR TEACHERS: THE ENGINEERING DESIGN PROCESS

In this engineering activity, children will work through what is called the *engineering design process*. This process helps to guide the work of student-engineers through a three-step cycle until they have a design that works. This preschool engineering design process was developed by the Museum of Science in Boston, Massachusetts. The three steps include:

1. **Explore:** Find out more.
In this step, children explore materials and observe how they work and what they can do. This is the process of researching and collecting data! Teachers can focus children's observations by reminding them of the **goal** of their exploration.
2. **Create:** Try your idea.
In this step, children will decide **how to achieve the goal** of the activity. It's important not to emphasize the final product in this step. Instead, encourage children to "try an idea" and see if it works. Engineers often try many different approaches that don't work before they are successful.
3. **Improve:** Make it better.
Teachers can help children reflect on what they have observed and learned so far, and then ask them how they could improve their design. Remember that children learn a lot from seeing others' work, so encourage them to observe their peers' designs as well as share their own work. In this step, you may see children utilize elements from their peers' designs. This isn't "cheating." This is how engineers share ideas to enhance their designs. Staying focused on the goal of this step—*making it better*—helps children continue to problem-solve improvements. Focusing on making it better also teaches children that mistakes or failures are simply part of being an engineer.

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Activity Instructions

ENGAGE

Gather a small group of 4 children in a circle on the floor. (Note: Groups of 6 children work well if you are teaching 4-year-olds. Adjust materials as needed.)

EXPLAIN: Today we are going to be Problem Solvers because my friend here, Walter (*show children the puppet*), has a big problem. He has to wake up really early tomorrow morning so he can go on a special trip with his family. But he's afraid he won't wake up in time!

EXPLAIN: Invite the children to share their experiences with how to wake people up:

- Who wakes you up? What do they do to wake you up?
- What helps people wake up?
- Do you know what your grown-ups do to wake up in the morning?
- Has anyone heard of an alarm or an alarm clock? What is that? How does it work?
- Does anyone have a baby sister or brother? Do they ever cry in the middle of the night? Does crying wake up your grown-ups or wake you up? Why?

SUMMARIZE: Summarize children's experiences with waking/being awakened. Restate their experiences with the role of sound/noise in waking people.

EXPLAIN: Engineering is how we use math and science to design and build solutions to problems. You are all Problem Solvers in our class, and today we are going to help Walter solve his problem. We are going to build a noisemaker—a tool that will make noise to wake him up so he can leave for his trip on time.

EXPAND

EXPLAIN: The way that engineers solve problems is by using the engineering design process.

- There are three steps. First, we'll **explore** materials that we can use in our noisemaker. We are going to find out more about what these materials look like, feel like, and sound like.
- Why do we want to listen to the sound they make? What is our goal today? What does our noisemaker have to do? (*Use questions like these to focus children on discovering materials that make noise to wake Walter.*)

DISPLAY: Take out the tray with the muffin tin (filled with the open-ended materials).

EXPLAIN: Wow, Problem Solvers, let's look at these materials. We can use any of these materials to build our noisemaker for Walter. Take a few minutes to explore these and think about which materials might do a good job of waking Walter up. (*Give children about 5 minutes to explore.*)

ASK: Use questions like the ones below to tap into children's observations of the materials:

- Which of these materials made sounds?
- Which of these materials were quiet?
- Which of these materials do you think would be good for a noisemaker? What makes you think that?

REVIEW: Summarize children's discoveries and observations about the different materials.

TRANSITION: Are you ready to be engineers? Let's use our observations to build a noisemaker for Walter!

EXPLORE

EXPLAIN: The next step of the engineering design process is to create, or build, a noisemaker. You already learned a lot about how these different materials work and which ones might make a good noisemaker. Now you can build your own noisemaker to test your ideas.

Take out the tray with spoons, plastic bottles, bags, and boxes.

EXPLAIN:

- To make your noisemaker, first you will choose a container. You can choose a bottle, a bag, or a box.
- Then you will choose a material to put inside. (*Give children time to explore the containers*).
- As you build, think about the goal of our work today: Waking Walter up!

Observe as children work. Give children time to build their noisemaker. Make the connection between their choices and their design: *So your design plan is to use a box as the container for your noisemaker.*

SUPPORT: Some children may need help getting started or organizing themselves. Younger children, in particular, may have difficulty knowing how to start. You can assist by asking guiding questions like the ones below, if needed:

- Tell me about the kind of noisemaker you want to build.
- Can you tell me about your design plan? What container will you start with?
- What materials will you put inside the container?
- What made you choose those materials to put inside the [container]? What makes those materials good for a noisemaker?
- What materials do you think will make the **most** noise inside the container?
- Do some of the containers help the materials make noise? Do any of the containers help the materials to be quieter? What type of container do you think will work best if our goal is to build a noisemaker?

SAFETY NOTE: Carefully supervise during this portion of the activity. Some of these open-ended materials are quite small and could be choking hazards.

REVIEW: When children have completed their noisemaker, ask each child to test (shake) it.

- **Remind children of the problem:** We have to make a noisemaker that is loud enough to wake up Walter so he can get to the beach.
- **Ask children if their design makes noise**—will it help Walter wake up? Encourage them to tell their peers about their design choices.
- **Prompt children to shake their noisemaker.** When each child has their turn, you can use the puppet to let children dramatically “wake up Walter.”

EXPLAIN: The last step of our engineering design process is to see if we can **improve**, or make our design better. Think about: What can I do to improve my noisemaker and make it louder? Did you get any ideas from your friends that you might want to try? (*Give children some time to explore, test, and change their design if desired. Once again, you can use the puppet to let children dramatically “wake up Walter.”*)

REFLECT

To close the activity, use a reflective question/s - like those below - to prompt children's thinking about engineering and design plans.

- What do you remember about our first step today—exploring the materials? What did you do to explore? What did you learn about our materials?
- Tell me about how you created your noisemaker.
- Tell me about how you made your design better.
- What did you enjoy about building a noisemaker for Walter?
- What was tricky about building a noisemaker for Walter?

SUMMARIZE: Engineers try a design and test it to improve it over and over again, until they get one that really works well. Today, we used the engineering design process to build a noisemaker to wake our friend Walter. First, we explored our materials. Then, we created our noisemaker. And finally, we thought about ways to make our noisemaker better. Let's try to wake Walter one more time...

Take out the Walter puppet and lay him down on the table, snoring loudly.

SAY: When I say "go," I want you *all* to shake your noisemakers to see if they can wake Walter up. Ready, set...GO! *(When the children shake their noisemakers, make the Walter puppet jump up and thank the children for being such helpful Problem Solvers.)*

Individualizing the Activity

Make it more challenging:

- Once you have made a noisemaker, ask children to create a "quiet-maker"—a design that is as quiet as possible when you shake it. Offer children the chance to use the same materials to work through the explore/create/improve steps again.
- In the Create step, give children paper/markers/crayons and encourage them to draw their design before building it.

Make it less challenging:

- Reduce the types of materials to 2 quiet and 2 loud or even 1 quiet and 1 loud.
- Create a noisemaker along with the children while narrating your thinking out loud to provide a model for how to approach this goal: *Now I'm going to listen to the dried beans when I pour them out of the spoon. They make a little pat-pat-pat sound. But the bells make a louder RING RING RING sound.*

MAKING CONNECTIONS ACROSS THE DAY:

- Glue or tape the tops of the noisemakers closed and use them as instruments for music activities.
- Glue or tape the tops of the noisemakers closed and make them, along with the Walter puppet, a free play activity for children to re-enact waking Walter up.
- Talk about the steps of the engineering design process when children are playing in the block area—What materials are they using to build? What are they building? What could they do to make their building better or more stable?
- Invite children to come up with solutions to classroom problems. For example, you might observe that there is nowhere to set a book down next to the teacher's chair in the circle area. What could be done to solve this problem? Test out several possible solutions (like placing a cardboard box on its side as a little table) and choose the one that works best.
- Use the idea of “planning before doing” in all classroom activities. For example, as you are gathering art supplies, you might say: “I need a plan. Let me make a list. I need 6 paintbrushes and a pad of paper. Let’s be sure I have everything on my plan.”

Song: *Waking Walter*

Materials Needed: Shoebox or small, clear plastic box, stuffed animal or cotton balls, 3-4 blocks, 3-4 craft bells (or other “noisy” item). Optional: shakers/maracas, one per child.

Directions: Have the materials handy so you can shake the different materials according to the song. If desired, you can provide each child with a shaker to shake along with the chorus.

Intro

Waking Walter, waking Walter	(Press hands together by head)
Walter's sleeping, his eyes are shut.	(Lean head to side as if sleeping; Close eyes)
Waking Walter, waking Walter	
Let's wake Walter up.	(Open eyes; lift head)
Let's explore, create, improve	(Nod head three times)
'Cause that's what engineers will do!	(Lift pointer finger in the air – like an idea has come)
Hey engineers! We've got some materials to explore.	(Show materials at hand)
Gather them all around.	
Which ones will make the loudest noisemaker	(Shrug shoulders like asking a question)
So we can wake Walter up?	

Verse 1

Can something soft make sounds so loud?	(Put a stuffie in the box and shake or allow a child to do so.)
Let's shake a stuffie all around.	
Is this noisemaker loud enough	(Shrug shoulders like asking a question)
To wake our good friend Walter up?	

Chorus

Waking Walter, waking Walter	(Press hands together by head)
Walter's sleeping, his eyes are shut.	(Lean head to side as if sleeping; Close eyes)
Waking Walter, waking Walter	
Let's wake Walter up.	(Open eyes; lift head)

Verse 2

Put something harder in a box	(Put blocks in box and shake, or allow a child to do so.)
Let's shake, shake, shake it all around	
Is this noisemaker loud enough	(Shrug shoulders like asking a question)
To wake our good friend Walter up?	

Chorus

Waking Walter, waking Walter	(Press hands together by head)
Walter's sleeping, his eyes are shut.	(Lean head to side as if sleeping; Close eyes)
Waking Walter, waking Walter	
Let's wake Walter up.	(Open eyes; lift head)

Verse 3

Let's try something harder yet.	(Put bells in box and shake, or allow a child to do so.)
Shake it, shake it, all around	
Is this noisemaker loud enough	(Shrug shoulders like asking a question)
To wake our good friend Walter up?	

Chorus

Waking Walter, waking Walter	(Hands together by head, eyes closed)
Look, the noise is loud enough.	(Open eyes)
Waking Walter, waking Walter	(Look around)
Walter's waking up!	(Stretch arms up)
We did it, engineers!	(Clap and smile!)

Making Literacy Connections

Share the following book with children as an opportunity to deepen their understanding of engineering and design.

Suggested Book: *The Three Little Pigs: An Architectural Tale* by Steven Guarnaccia

Note: Any version of *The Three Little Pigs* folktale will work—simply adjust the questions to reflect your selection. Focus on the theme of choosing appropriate materials to build a strong house..

AS YOU READ:

- The story is about three pigs who are architects. Do children know what an *architect* is? An architect is someone whose job is to be a creative problem-solver who designs plans for all kinds of houses and buildings. Do children think they would enjoy being an architect? Why or why not?
- The story opens with the three pigs saying good-bye to their mother. How do the children feel when they have to say good-bye to their grown-ups?
- The second little pig builds his house of glass. Ask children if they can find a design plan in the illustration. Do they remember what a design plan tells us? (It tells us what the structure will look like and how to build it.)
- When the wolf comes to the door of the first little pig's house, ask children if the wolf looks friendly or scary? What clues in the picture give them this idea? Does the pig look happy or worried?
- When the wolf "huffs, and puffs, and blows the house in," invite children to huff, puff, and blow along with the story.
- When the wolf comes to the door of the second and third houses, you can prompt children to fill in the refrain: *Not by the hair of my _____ (chinny-chin-chin).*
- Ask children why they think the wolf couldn't blow the third house down. (Because it was built of sturdy materials like stone and concrete. It had a strong design!)
- When the wolf invites the pig to see a tomato greenhouse, ask children if they know what a *greenhouse* is. (A greenhouse is a house made of glass where farmers can grow plants even when it's cold out. The sun streams through the windows of the greenhouse, keeps the plants warm, and helps them grow.) Can children find the greenhouse in the illustration? It is shaped like a pyramid.
- When the wolf is about to jump into the chimney, pause and ask children what they predict will happen next.

BUILD ON THE BOOK: IF I BUILT A HOUSE CLASSROOM BOOK

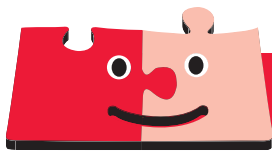
Materials: Handout 1: *If I Built a House* (1 per child), crayons/markers, three-hole punch, small binder

Make one copy of **Handout 1** for each child. Ask children to draw their dream house in the box on the handout, just like the pigs in the story. Then ask each child to tell you about their picture and complete the sentence stem, "If I built a house, it would..." Write down each child's response. Use the three-hole punch to add each page into the binder. Read the classroom version *If I Built a House* book to children during your next story-time and add it to your bookshelf. You can also make photocopies of each page, staple, and share copies of this classroom book with families to read at home.

Handout 1: If I Built a House



If _____ built a house, it would...

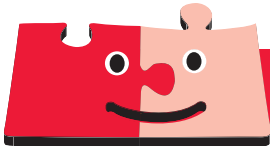


Learning about Engineering

This week, children learned how to use the engineering design process to build something. There are three steps to the engineering design process: 1. Explore, 2. Create, and 3. Improve. You can help children explore engineering at home by trying the activities below.

- **Show your child how things work.** For example, let them press the button for your doorbell and discover that it makes the bell ring inside. Or show them how the toilet roll holder can be removed to put on a new roll. Explain, in child-friendly language, how—for example—a toaster works. Let your child watch (safely) as the toaster browns the bread. While these things are boring to us, they are new and fascinating for your child as they discover how things work.
- **Notice engineering in the world around you.**
Cars are designed by engineers and so are trains, tall buildings, and even things like hair dryers or lawn mowers. Talk about the cars you see while you are out together and ask your child which design they like best and why. Talk about how some cars are designed to go fast (they are smooth, sleek, and low to the ground) and some are designed to hold lots of people (like a minivan or SUV). Delivery trucks are designed to hold many packages, and mail trucks are designed for the mail carrier to reach out the window and deliver letters.





Solo para familias

Aprender sobre ingeniería

Esta semana los niños aprendieron a utilizar el proceso de diseño técnico para construir algo. El proceso de diseño técnico consta de tres pasos: 1. Explorar, 2. Crear y 3. Mejorar. Puede ayudar a los niños a practicar estas habilidades de ingeniería en casa con las actividades que se indican a continuación.

- **Haga que el niño participe en la búsqueda de soluciones a los problemas cotidianos.** Por ejemplo, si le cuesta acordarse de llevar la lonchera de su niño por la mañana, ¿tiene ideas para ayudar a la familia a acordarse? Piensen juntos en estos problemas y decidan qué solución pueden probar. Hablen de si ha funcionado o no, y prueben otra cosa si es necesario.
- **Observen la ingeniería en el mundo que los rodea.** Los automóviles están diseñados por ingenieros, al igual que los trenes, los edificios altos e incluso objetos como las tostadoras o las podadoras de hierba. Explíquele, en un lenguaje adaptado a los niños, cómo funciona, por ejemplo, una tostadora. Deje que el niño observe (de forma segura) cómo la tostadora dora el pan para dejarlo crujiente y caliente.

