

1-5

Engineer

Prep time: ~15 mins
Lesson: ~50 mins



Engineer with Mazie!

Kids will design and test their own invention, using everyday materials, to deliver Doodle's food to his dog bowl.

Materials (per pair)

1. Drawing utensils (pencils, crayons, markers, etc)
2. 1 paper "dog" bowl
3. 1 tbsp of dried beans (or beads, etc) as "dog food"
4. 1 small paper cup
5. 1 piece of paper, 8.5x11
6. Clear tape
7. Masking tape
8. 1 yard of yarn or string
9. 5 paper clips
10. 2 chopsticks or unsharpened pencils
11. Optional: felt & craft foam, scissors, stapler, hole punchers

Prep:

1. Pair up students
2. Place shared materials at a generally accessible materials center, OR divide the materials in advance to be used by each pair

Step-by-step:

1. Read Mazie's Amazing Machines aloud to the class (either connected with this lesson, or prior to this lesson; add 10 minutes for reading)
2. Introduce Mazie's request with the paper puppet:
 1. "Mazie wants your help! She needs a Dog Bowl Filler-Up Machine for her dog, Doodle! Can you make a machine that will move Doodle's dog food from up high to the dog bowl on the floor below? Remember, the Filler-Up Machine should keep all the food inside the bowl—we don't want a big mess!"
3. Remind kids that engineers design inventions to solve problems. Today, they will be engineers to build their own Filler-Up Machine to get Doodle's food to his bowl.
4. Show children the 'dog food' (dried beans in a paper cup) and 'dog bowl' (paper bowl) they will use and ask them to turn on their imaginations: how will they make a Filler-Up Machine that gets the 'food' from the desk or chair into the 'dog bowl' on the floor without making a mess?
 - Review some of Mazie's inventions: p.9 (funnel and tubes), p.12 (ramp), p.15 (pulley)
 - Show students the materials available to them, and pass an example of each material around.

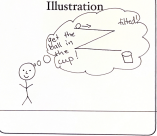
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5. Think, pair, share:
 - What Filler-Up Machine can you design?
 - How will it solve Mazie's problem?
 - How can you use these materials to create a Filler-Up Machine?
 - After some talk time, ask a few students to share their ideas with the class.
6. Tell students that many times inventions don't work on the first try. How might they feel if something doesn't work on the first try? What should they do if their invention doesn't work on the first or second try?
 - Feel: disappointed, upset, frustrated, okay
 - Do: take a deep breath, tell themselves "you can do it," try again, ask partner for help, etc.
7. Show children the Materials Center, or how materials will be organized at their desks.
 - If you are introducing a new tool (hole puncher, stapler, etc), ensure you model the use of the tool prior to releasing students to use it.
8. Give students ~20 minutes to build and test their inventions in pairs. Circulate to support students (What is working well in your invention? What is not working well? What could you change? Notice when students have an appropriate response to failure and try again)

Reflect:

9. Gather children back on the carpet and reinforce the big idea: Engineers use their imagination to design inventions that solve problems.
10. Give students a chance to share their invention with a partner (different from the one with whom they worked).
11. Encourage the other children to ask questions about the invention:
 - What worked well? What was hard? What did you do if your idea didn't work?
12. Bring students back as a group and reinforce the idea that inventions often don't work on the first try. Engineers improve their inventions over time by testing and retesting their designs.
13. Read this closing script:
 - "Hi, engineers! Thank you for helping me feed Doodle. Engineers are always thinking up new, creative ways to solve problems. Maybe you'd like to try making a pet feeder or a stuffed animal feeder at home. What other problems will you solve next?"

Enhancements and Modifications

Name: Jennie	
Word: imagination	
Definition: Thinking up new ideas	Illustration: 

- Vocabulary enhancement/ELL support: explicitly teach a vocabulary word through quick vocabulary mapping (attached), American Sign Language (handspeak.com), or Morning Meeting.
 - Imagination: thinking up new ideas
 - Engineer: a person who solves problems
 - Pulley: a wheel with a rope around it to help move loads
- Create class hand motions
 - Think, Blink
 - Ribble, Scribble
- If a design is successful right away, challenge kids to get the food to Doodle's bowl faster, slower (so he doesn't overeat), across a further distance, etc.
- Use additional recycled materials (paper towel or toilet paper rolls, cardboard, etc) or a different type of 'food' like beads: does that change how the invention is made?

Additional Teacher Guidance

- Consider reading the book multiple times to help support student understanding.
- Ensure children know that they can use the class brainstorm ideas and solutions
- This activity involves an informal version of a Design Process. If you use a Design Process with your class, include each step of the process as you lead kids through this activity.
- Feel comfortable altering the introduction and closing scripts depending on your class and grade level. Younger students are more likely to be deeply engaged by paper Mazie than 5th graders!
- Children might need support thinking of how to use the materials. Try phrases like, "What could you do with the paper?" "How could you use the masking tape?"



Mazie McGear paper puppet

Standards Alignment for Mazie’s Amazing Machine Activities

ENGINEER WITH MAZIE

Common Core State Standards ELA (CCSS)
<p>Kindergarten:</p> <ul style="list-style-type: none">• CCSS.ELA-LITERACY.W.K.2 Use a combination of drawing, dictating, and writing to compose informative/explanatory texts in which they name what they are writing about and supply some information about the topic. (Kids draw a plan and write down the materials they will use)• CCSS.ELA-LITERACY.SL.K.6 Speak audibly and express thoughts, feelings, and ideas clearly. (Kids explain their inventions to peers)• CCSS.ELA-LITERACY.L.K.6 Use words and phrases acquired through conversations, reading and being read to, and responding to texts. (Kids are encouraged to use words for the text like engineer and invention as they talk about what they are doing)
<p>First Grade:</p> <ul style="list-style-type: none">• CCSS.ELA-LITERACY.SL.1.4 Describe people, places, things, and events with relevant details, expressing ideas and feelings clearly. (Kids describe the invention they are creative and explain how it works)• CCSS.ELA-LITERACY.L.1.6 Use words and phrases acquired through conversations, reading and being read to, and responding to texts, including using frequently occurring conjunctions to signal simple relationships (e.g., because). (Kids respond to “why” framed questions as they explain their inventions)
<p>Second Grade:</p> <ul style="list-style-type: none">• CCSS.ELA-LITERACY.SL.2.3 Ask and answer questions about what a speaker says in order to clarify comprehension, gather additional information, or deepen understanding of a topic or issue. (Kids are encouraged to listen to others present about their inventions and ask questions)
Next Generation Science Standards (NGSS)
<ul style="list-style-type: none">• K-2-ETS1-1. Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool. (Students listen to Mazie’s problem and request for help and define the problem before imagining ways to solve it)• K-2-ETS1-2. Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem. (Students imagine and draw a plan for a Filler-Up Machine before beginning to create their invention)• K-2-ETS1-3. Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs. (Kids are encouraged to test their inventions multiple times to inform improvements)