

# Reading and Writing about Technology, Science, and the Designed World

## Grade Band

K-2

## Estimated Lesson Time

Five 30-minute class sessions

## Overview

How do people solve big problems? What do engineers do? These questions are often asked by children and adults alike. Reading aloud non-fiction story and picture books helps to bring alive the idea that science and engineering can benefit all of society. Through guided discussions and written responses, students will identify an everyday problem and design their own creative engineering solution, and perhaps begin to think of themselves as engineers of the future.

## From Theory to Practice

**Science concepts which are taught in conjunction with a literacy method** and text-based system of information have been shown to have greater impact on concept development, literacy, and motivation than either science lessons taught solely in activity formats (Barber, et.al., 2006) or more traditional forms of literacy instruction. (Guthrie and McCann, 1997.)

Recent research has shown that **eighth students who state an interest in science and engineering careers are more likely to persevere** and actually graduate in those fields **than students of similar or greater academic abilities (mathematics)** who have not expressed an interest in these careers. (Tai, Liu, Maltese, and Fan, 2006.)

Research on **effective teaching and learning activities** shows that these strategies engage children in **social and cognitive collaboration**; the **transfer of meaning from one system of language use to another**, such as speech to text to diagrams or symbols; and the opportunity to provide a **variety of appropriate responses**. (Cambourne, 2001.)

## Enduring Understanding

Students will understand that

- Engineers use science, math, and creativity to solve real problems.
- Engineers' work is important to all of society.
- Everybody can do science and invent things and ideas.

## Student Objectives (literacy)

Students will

- Actively listen to read-aloud picture and story books focused on an engineering theme
- Participate in active discussions designed and scaffolded to support responses to text such as "Talking Back with Post-its", "Inserting", and "Critiquing and controlling"
- Develop written responses to what has been read
- Develop skill in reading comprehension and metacognition

## Student Objectives (science and technology)

Students will

- Develop understanding for the role of engineers in society and enthusiasm for creative problem solving
- Develop vision of self as thoughtful problem solver and engineer

## Resources

Picture and story books for read aloud

*Who Can Help? Ask an Engineer!*\*

*We Build Robots, Too*\*

*Robots Slither* by Ryan Ann Hunter\*\*

Folded booklets- one for each student

*We Build Robots\**  
*Real Cool, Real Robots\**

Chart paper and markers  
Post-It notes

\*Available for free download at [www.moe365.org/more.php](http://www.moe365.org/more.php)

\*\*Available for purchase at Amazon.com

## Instructional Plan

### Preparation

1. Be sure you are comfortable and familiar with the content of engineering careers and the instructional process of expressive engagement.

Two websites you can visit are

[www.DiscoverEngineering.org/aboutengineers.asp](http://www.DiscoverEngineering.org/aboutengineers.asp)

[www.ReadWriteThink.org/lesson\\_images/lesson156/expressive.pdf](http://www.ReadWriteThink.org/lesson_images/lesson156/expressive.pdf)

2. Become thoroughly familiar with the story book read alouds.

3. Prepare materials for follow-up activities

Student copies folded books, *We Build Robots* and *Real Cool, Real Robots*

Student copies of *Real Cool, Real Robot* contest applications

### Instruction and Activities

The following lessons are intended for five 30-minute lessons. They may need to be adjusted to accommodate your class size and student abilities.

## Session 1 *Who Can Help? Ask an Engineer!*

### *Before Reading- activate prior knowledge*

1. Gather students in comfortable space and briefly introduce the story by asking the following. Listen and respond briefly to their suggestions.

"Who do we call on for help with everyday problems?" and "Are there people whose JOB it is to help us solve problems?" (Possible responses, parents, teachers, older siblings and police, fire fighters, doctors, EMTs)

2. Set the stage by showing the book cover and introducing GIZMOE, a robot who knows someone to call on when we need help.

### *During Reading- talking back to the text*

1. Enthusiastically read the book "Who Can Help? Ask an Engineer!" pausing after the repeated question "Who can help?" to encourage the children to respond out loud "an engineer!"

2. Then turn the page to read and verify their responses. Use vocal emphasis such as "A chemical engineer," or "an electrical engineer," etc.

3. "*Gizmoe says*" sections are read in an aside, an informative, factual voice. Your comments MODEL talking back for the children " I didn't know that," or "Did YOU know that?"

### *After reading- Suggest alternatives to the story (Critiquing/controlling)*

1. Ask the children if an engineer should be added to the list of helping jobs. Revisit pg. 26 and have the group think of other problems that an engineer might help solve.

2. Ask "Is there a chore or job that you can't do or you don't like to do?" Brainstorm and list these on chart paper. Say "Tomorrow we will read about a group of young engineers who build robots to solve everyday problems."

## Session 2 *We Build Robots, Too*

### *Before reading- activate prior knowledge and set purpose*

1. Gather students in comfortable space. Remind students of previously read book. Ask "Who did Gizmoe ask for help?" and "What chores and jobs would we like help with?"

Review the group's list from yesterday.

2. State "Today we will learn about a group of young engineers who build robots to solve

everyday problems." Show the cover and first several pages. Ask students to predict who the engineers are and what they will do.

3. Use pictures to guide discussion. Ask why some people might be challenged or limited in everyday activities. (Possible responses are illness, age, or difficulties walking, reaching, or seeing.)

*During Reading- verify predictions and check for understanding*

1. Read aloud *We Build Robots, Too*. Stop at italicized words to check their meaning with the group. "What do you think that X means?"

Pg 5 How would someone in a wheelchair mail a package or buy some stamps at this post office?

Pg 7-9 This neighborhood and the robots are *very* small- what are they made of?

Pg 11 (*Predict and verify*) What do you think the competition will be like?

*After reading- Recall story elements*

1. Using chart paper, guide the children to recall the characters of the two books, *We Build Robots, Too* and *Who Can Help?* (Possible responses below.)

2. Ask "Who are the authors of these books and why would they write books like this?"

Book	Characters	Author's Purpose
WBR2	Elementary students Real people who need help Real engineers	To make people aware of the work that engineers do. To show how people can use science and math to solve real problems in everyday life.
WCH?	Gizmoe Real people who need help Real engineers	To make people aware of the work that engineers do. To show how people can use science and math to solve real problems in everyday life.

3. Say "Tomorrow we will read about some real cool robots that solve some really difficult problems."

4. Give out folded books *We Build Robots* and invite the children to partner read later in learning centers or at home with their families. (Depending on the students' needs this may need to be formally introduced or guided prior to partner reading.)

**Session 3 *Robots Slither*** (Option if not available, can use folded book *Real Cool Real Robots*)

*Before reading- KWL graphic organizer to activate prior knowledge*

1. Gather students in comfortable space and tell the children that today they will hear a story about real robots that solve real problems.

2. Have the group work together to develop a KWL chart on chart paper. Prompt them to share what they already KNOW about robots from tv, cartoons, and movies they have seen. Guide them in developing questions about what they might WANT to LEARN about robots

3. Read over the KWL chart before you begin the story. Ask the students to point out any surprising, funny or amazing facts they find while you read the story.

*During Reading- Talking Back with Post-Its*

1. Read aloud with attention to the rhyme and rhythm of the story. Read the factual side bars in a matter-of fact voice and, using post-it notes, add comments to the pages such as "That's amazing" or "Wow! How can they do that?" Invite students to respond and add their post-its, too.

2. Post-its can be very simply drawn or written by students to match their responses, e.g. ! or ? or Smiley faces; or Wow!, Ha-ha!, or What?

*After reading- review facts and responses*

1. Picture walk back through the story with the children to complete the Learn section of their KWL chart. Ask if any of their questions were answered.
2. At the same time, review the students' post-it responses to the text and place them beside the corresponding facts on the KWL chart.
3. Note that robots often do work that is too dangerous, dull, dirty, or distant for humans to do.
3. Give out folded books, Real Cool, Real Robots and invite the children to partner read later in learning centers or at home with their families. (Depending on the students' needs this may need to be formally introduced or guided prior to partner reading.)

#### **Session 4 Real Cool, Real Robots**

*Before writing- Brainstorm scenarios and develop vocabulary*

1. Have students remain at their tables or desks while you read or reread aloud the folded book We Build Robots. Guide the students in creating a shared definition of an engineer (the person.)
2. Then ask them to do the same for engineering (the verb/action.) Write the following on chart paper and ask students to suggest scenarios from the story WBR2:

The Lego team engineered a \_\_\_\_\_ to

3. We will use our list of everyday chores and tasks that we made to imagine and write about some robots of our own.

4. Write the following on chart paper. Guide the class to brainstorm and list many possible answers.

I wish someone would engineer a \_\_\_\_\_ to

*Set a purpose for writing.*

5. Read the contest application for *Real Cool, Real Robots* to the class. Ask them to FIRST decide on a problem that their robot will solve, and then draw the robot that will perform this task. **[NOTE- If contest has closed or you prefer a different application, you might use the students' work to develop a book for your own class or school library.]**
6. Explain that today they will write in their journals to create and name their robots. Tomorrow they will finalize their writing and put their robots onto the contest application and you will mail the entries to the robotics team to be considered for the contest.

*Journal writing- Insert yourself*

7. Allow the remainder of the time for student writing and sharing with their partners.

#### **Session 5- Finalize writing and follow up**

*Before writing- share journals and review term "to engineer"*

1. Ask students to meet in large group to read aloud their journal entries from yesterday. Use the words "engineer" and "engineered" when you comment or respond to their creations, e.g. I like how you engineered that robot's arms to do the job." or "How will you engineer the wheels to go up stairs?" etc.

2. Remind students to use capital letters with their robot names and to use ending punctuation marks in writing. "Good handwriting is also important if we want the MOE team to be able to read our work."

#### *During writing*

1. Provide students with contest applications to complete the sentences and draw their robot creations.

#### *After writing*

1. Display the large envelope that the applications will be mailed in and demonstrate how to address it.

2. Show students the [www.moe365.org](http://www.moe365.org) website. Explain that these high school students have authored some of the books you read this week and will use winning robot designs from the contest in a new coloring book.

3. Invite students to email the team authors about their responses to the books.

### Student Assessment and/or Reflection

° Teacher observation of student responses to class discussions

° Student writing samples, journals, and drawings

### Extensions or follow up ideas

° Visit the website Real Robots at [www.livescience.com/bestimg/index.php?cat=robots](http://www.livescience.com/bestimg/index.php?cat=robots) to vote on your favorite robot image or visit other sites listed at [www.moe365.org/more.php](http://www.moe365.org/more.php) to learn more about engineering and robotics

° Find other books about engineering, including *Around the World with MOE*

° Contact FIRST.org to find out about starting an FLL or JFLL team at your school.

### Content Standards- Gr. K-2 American Association Advancement of Science

#### The Nature of Technology

**People**, alone or in groups, are always inventing new ways to solve problems and get work done. The tools and ways of doing things that people have invented affect all ways of life.

**When a group of people** wants to build something or try something new, they should try to figure out ahead of time how it might affect other people.

**Tools are used** to do things better or more easily and to do some things that could not otherwise be done at all. In technology, tools are used to observe, measure, and make things.

#### The Nature of Science

**Everybody** can do science and invent things and ideas.

### References

**Cambourne, B. (2001).** What do I do with the rest of the class? The nature of teaching-learning activities. *Language Arts*, 79 (2), 124-135.

**Guthrie, J. T. & McCann, A. D. (1997).** Characteristics of classrooms that promote motivations and strategies for learning. In J. T. Guthrie and A. Wigfield (Eds.) *Reading engagement: Motivating readers through integrated instruction* (pp. 128-148). Newark:DE, International Reading Association.

**Tai, R. H., Liu, C. Q., Maltese, A. V., & Fan, X. (2006).** Planning early for careers in science. *Science*, 312, 1143-1144.

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