# I am STEM: STEM Week Lesson

Written By: The STEM Education Center

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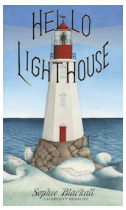
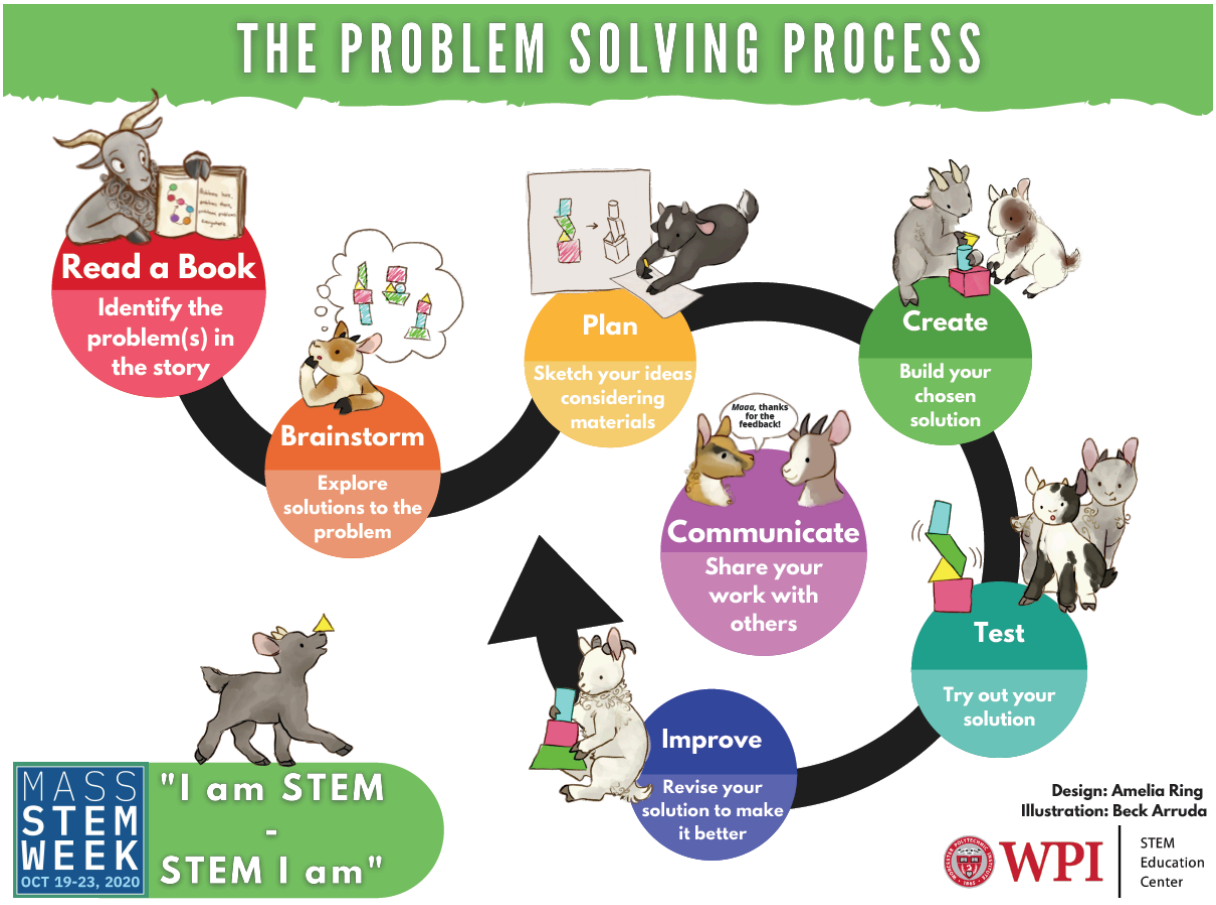
| Selected Book | **Title:** Hello Lighthouse<br>**Written by:** Sophie Blackall<br>**Illustrated by:** Sophie Blackall  | | |
| Grade | 2 | Read-Aloud Link | https://youtu.be/Jos3gkJ9Jg4 |
| Challenge Overview: | A family lives in an unusual building: a lighthouse. How do you accommodate regular furniture in a round room? Students will be taking the role of interior designers to design the family's bedroom after the baby arrives. They will be sketching and organizing furniture in the circular room, and then building a 3-D model of the room. Students will be comparing multiple solutions to determine the strengths and weaknesses of each one. | | |



| | Monday | Tuesday | Wednesday | Thursday | Friday |
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| STEM/ Problem Solving | Read the book.<br><br>**Identify the problem(s)** in the story.<br><br>Define criteria and constraints.<br><br>**Brainstorm** possible solutions. | **Plan** your solution:<br><br>Sketch your ideas<br><br>Gather and explore materials.<br><br>**Share** your work | **Create** your chosen solution.<br><br>**Share** your work. | **Test** your solution.<br><br>**Share** and obtain feedback.<br><br>**Improve** your solution. | **Communicate** your revised solution to an audience. |

## STE, Math, DLCS, and ELA Practices

| STE | Math |
|---|---|
| ✓ Asking questions and defining problems<br>✓ Developing and using models<br>✓ Planning and carrying out investigations<br>✓ Analyzing and interpreting data<br>✓ Using mathematics and computational thinking<br>✓ Constructing explanations and designing solutions<br>✓ Engaging in argument from evidence<br>✓ Obtaining, evaluating, and communicating information | ✓ Make sense of problems and persevere in solving them<br>✓ Reason abstractly and quantitatively<br>✓ Construct viable arguments and critique the reasoning of others<br>✓ Model with mathematics<br>✓ Use appropriate tools strategically<br>✓ Attend to precision<br>✓ Look for and make use of structure<br>✓ Look for and express regularity in repeated reasoning |
| **ELA** | **Computer Science (DLCS)** |
| ✓ Demonstrate independence<br>✓ Build strong content knowledge<br>✓ Respond to the varying demands of the audience, task, purpose and discipline<br>✓ Comprehend as well as critique<br>✓ Value evidence<br>✓ Use technology and digital media strategically and capably<br>✓ Come to understanding other perspective and cultures | ✓ Creating computational artifacts<br>✓ Connecting computing concepts<br>✓ Abstracting to develop models and manage information<br>✓ Analyzing computational artifacts created by themselves and others<br>✓ Communicating clearly, accurately, and responsibly<br>✓ Collaborating with others<br>✓ Researching |

## Culturally & Linguistically Sustaining Practices (CLSP)

- ❏ Connect the content of the book to your students' cultural and linguistic backgrounds.
- ❏ Ask relevant and inclusive questions that connect to all students from various backgrounds (i.e. Asking what kind of instruments and music they like or hear in their homes, rather than what instruments they play).
- ❏ Ask students to make connections to the problems in the stories by relating them to their home and community experiences.
- ❏ Encourage students to express and communicate their knowledge and ideas using multiple modes and modalities (i.e. writing, drawing, speaking, etc…), including students' home language.
- ❏ Select materials and tools that are developmentally appropriate, culturally accepted and easily available for all students.
- ❏ Give students plenty of opportunities to discuss and share various stages and possibilities of the design.
- ❏ When possible, assist students in group work by providing them clear and fluid roles.
- ❏ Scaffold students' learning using their family and home funds of knowledge (i.e. connect the students' family/community expertise to inform the problem solving process).

## MA STE, Math or DLCS Standards

**Reason with shapes and their attributes:**
2.G.A.1. Recognize and draw shapes having specified attributes, such as a given number of angles or a given number of equal faces.
2.G.A.2. Identify triangles, squares, rectangles, rhombuses, trapezoids, pentagons, hexagons, and cubes.
2.G.A.3. Partition circles and rectangles into two, three, or four equal shares, describe the shares using the words halves, thirds, half of, a third of, etc., and describe the whole as two halves, three thirds, four fourths. Recognize that equal shares of identical wholes need not have the same shape.
**Engineering Design:**
2.K.2.ETS1.3. Analyze data from tests of two objects designed to solve the same design problem to compare the strengths and weaknesses of how each object performs.
Clarification Statements: • Data can include observations and be either qualitative or quantitative. • Examples can include how different objects insulate cold water or how different types of grocery bags perform.

| Learning Targets: | *Students will be able to:*<br>● Recognize and draw shapes having specified attributes<br>● Partition circles and rectangles into equal shares<br>● Describe shape shares using the words halves, thirds, etc. |
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| | • Analyze data from tests of two objects designed to solve the same design problem<br>• Compare the strengths and weaknesses of how each object performs |

## MA ELA Standards

**Integration of Knowledge and Ideas:**
CCSS.ELA-LITERACY.RL.2.7. Use the information gained from the illustrations and words in a print or digital text to demonstrate an understanding of its characters, setting, or plot.
**Knowledge of Language**
CCSS.ELA-Literacy.L.5.3. Use knowledge of the language and its conventions when writing, speaking, reading, or listening.

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| ELA Learning Targets: | *Students will be able to:*<br>• Use vocabulary words in context<br>• Answer the prompt using at least two details from the story to support the response |

## Key Vocabulary Words

| Tier 1 | Tier 2 | Tier 3 |
|---|---|---|
| - Water<br>- Wave<br>- Ocean<br>- Boat<br>- Baby<br>- Problem<br>- Solution | - Lighthouse<br>- Sailors<br>- Mainland<br>- Shape<br>- Circle<br>- Triangle<br>- Rectangle<br>- Strength<br>- Weakness | - Circular<br>- Trapezoid<br>- Attribute<br>- Angle<br>- Face<br>- Partition<br>- Equal<br>- Half, Third, Quarter<br>- Design<br>- Analyze |

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| CLSP Strategies: | • Connect the content of the book to your students' cultural and linguistic backgrounds.<br>• Encourage students to express and communicate their knowledge and ideas using multiple modes and modalities (i.e. writing, drawing, speaking, etc…), including students' home language. |

## Materials

G2 Hello Lighthouse Caregiver Letter
G2 Hello Lighthouse Rubric

**Lesson Handouts**
N/A

**Online Resources**
Hello Lighthouse by Sophie Blackall

**Hands-on Materials**
Variety of materials for building including but not limited to…

- Craft materials like rubber bands, popsicle sticks, string, felt, etc…
- Household materials like spoons, paper towels, tissues, paper, foil, etc…
- Recycled materials like boxes, plastic containers, paper towel rolls, plastic bottles, bags, etc...
- Glue or Tape
- Scissors
- Writing Tools
- Protractor
- *Optional:* Shape cut-outs of different sizes; triangles, squares, rectangles, rhombuses, trapezoids, pentagons, hexagons, and cubes

| CLSP Strategies: | • Select materials and tools developmentally and culturally appropriate/available for all students. |
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| Monday |  |
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| Teacher Preparation: | • Copy and distribute Caregiver Letter - G2 Hello Lighthouse Caregiver Letter<br>• Lesson Rubric - G2 Hello Lighthouse Rubric<br>• Listen to the story read aloud *https://youtu.be/Jos3gkJ9Jg4*<br>• Identify key vocabulary words<br>• Prepare paper and pen or note-taking app<br>• Display the Engineering Design Process (EDP) visual<br>• Prepare examples of objects in different shapes |
| Student Preparation: | • Listen to the story read aloud *https://youtu.be/Jos3gkJ9Jg4*<br>• Gather materials from the list |
| Problem Solving: | • Read the book.<br>• **Identify the problem(s)** in the story.<br>• Define criteria and constraints.<br>• **Brainstorm** possible solutions |
| CLSP Strategies | • Connect the content of the book to your students' cultural and linguistic backgrounds.<br>• Ask relevant and inclusive questions that connect to all students from various backgrounds (e.g. Asking what kind of instruments and music they like or hear in their homes, rather than what instruments they play).<br>• Connect the problems in the stories to all students' home and community experiences.<br>• Scaffold students' learning using their family and home funds of knowledge (e.g. connect the problem to the students' family/community expertise). |

| Activity (Duration) | Instructions | Product |
|---|---|---|
| Read: Hello Lighthouse (20 minutes) | Read Hello Lighthouse<br><br>Discuss the secluded location of the lighthouse and the shape of the lighthouse<br><br>Ask students what it would be like to live away from people<br><br>Ask students whether they have visited a circular room<br><br>*Optional:* ask students to draw a picture of their own room | *Optional:* students drawing of their own room |
| **Identify the problem**<br><br>Define criteria & constraints<br><br>(10 minutes) | Present the EDP visual.<br><br>Present the challenge:<br><br>**The family had a new baby. Let's help them design their bedroom space to accommodate the new baby.**<br><br>Review the Criteria and Constraints:<br><br>The room should be circular.<br><br>One ¼ of the room should be left vacant for the staircase.<br><br>The baby's part should not take more than ¼ of the room<br><br>Baby's items include a bed, dresser and chair, all made up of different shapes | |
| **Brainstorm** possible solutions (15 minutes) | Have the students brainstorm solutions together in small groups | Students ideas |

| Tuesday |  |
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| Teacher Preparation: | • Display the EDP visuals<br>• Prepare paper and pen or note-taking app |
| Student Preparation: | • Prepare paper and writing tools<br>• Prepare paper, pencil, large circular object<br>• Prepare items in different shapes to trace<br>  ○ Alternatively, access and practice with using shapes on google slides |
| Problem Solving: | **Plan** your solution:<br>• Sketch your ideas<br>• Gather and explore materials.<br>• **Share** your work |
| CLSP Strategies | • Encourage students to express and communicate their knowledge and ideas using multiple modes and modalities, including students' home language.<br>• Give students plenty of opportunities to discuss and share various stages and possibilities of the design.<br>• Assist students in group work by providing them clear and fluid roles, whenever possible. |

| Activity (Duration) | Instructions | Product |
|---|---|---|
| **Plan** your solution (35 minutes) | Present the EDP visual and review steps<br>Remind students of the criteria and constraints<br>Start planning their solutions by drawing the different shapes in the circular 'room' | Students' plans for the solutions |
| **Share** your work (10 minutes) | Students share their plans with the class | |

| Wednesday |  |
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| Teacher Preparation: | • Display the EDP visual<br>• Prepare paper and pen or note-taking app<br>• Gather materials needed to build their 3D room (if done in class) |
| Student Preparation: | • Gather materials needed to build their 3D room (if done at home) |
| Problem Solving: | • **Create** your chosen solution.<br>• **Share** your work. |
| CLSP Strategies | • Encourage students to express and communicate their knowledge and ideas using multiple modes and modalities, including students' home language.<br>• Give students plenty of opportunities to discuss and share various stages and possibilities of the design.<br>• Assist students in group work by providing them clear and fluid roles, whenever possible. |

| Activity (Duration) | Instructions | Product |
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| **Create** your chosen solution<br>(30 minutes) | Present the EDP visual and review steps<br><br>Review the challenge and criteria<br><br>Begin to build their first 3-D model based on their 2-D plan | Students' first model |
| **Share** your work<br>(15 minutes) | Share their model with the class, identifying the shapes they used and how they partitioned the room (using vocabulary)<br><br>Encouraged other students to provide feedback about the model | |

| Thursday |  |
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| Teacher Preparation: | • Display the EDP visual<br>• Prepare paper and pen or note-taking app |
| Student Preparation: | • Gather materials needed according to their plans<br>• Prepare paper and writing tools |
| Problem Solving: | • **Test** your solution.<br>• **Share** and obtain feedback.<br>• **Improve** your solution. |
| CLSP Strategies | • Encourage students to express and communicate their knowledge and ideas using multiple modes and modalities, including students' home language.<br>• Give students plenty of opportunities to discuss and share various stages and possibilities of the design.<br>• Assist students in group work by providing them clear and fluid roles, whenever possible. |

| Activity (Duration) | Instructions | Product |
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| **Test** your solution<br><br>**Share** and obtain feedback<br><br>(25 minutes) | Present EDP visual and review steps<br><br>Have the students share their solutions<br><br>Compare the different designs:<br><br>Do all solutions meet criteria and constraints?<br><br>Which one allows for the most family space?<br><br>Have the students provide feedback to one another<br><br>Ask the students: *How can we make it better?* | Students' revised model<br><br>Students write down feedback |
| **Improve** your solution<br>(20 minutes) | Revise their solution based on the feedback they received.<br><br>*Optional:* Have the students test and revise it on their own after the lesson until they are happy with their solutions! | Students' improved solutions |

| Friday |  |
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| Teacher Preparation: | • Lesson Rubric - G2 Hello Lighthouse Rubric<br>• Invite a special guest to join the class (perhaps an interior designer?)<br>• Display the EDP visual<br>• Prepare paper and pen or note-taking app |
| Student Preparation: | • Prepare a finished model from previous days<br>• Write and draw “I do STEM when…” |
| Problem Solving: | • **Communicate** your revised solution to an audience. |
| CLSP Strategies | • Ask relevant and inclusive questions that connect to all students from various backgrounds.<br>• Encourage students to express and communicate their knowledge and ideas using multiple modes and modalities, including students’ home language.<br>• Give students plenty of opportunities to discuss and share various stages and possibilities of the design. |

| Activity (Duration) | Instructions | Product |
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| **Communicate** and **share** the solution (45 minutes) | Introduce the special guest to the class, and share with them the process that students followed during the week<br><br>Have each student show their solution to a special guest and classmates<br><br>Have students identify the shapes they used and and how they partitioned the room (using vocabulary)<br><br>Have students present their paper on I do STEM when…<br><br>Celebrate how they solved a problem like engineers! | Students' finished solution<br><br>Students' work on "I do STEM when…" |
| Family connection | *Optional:*<br><br>Put together a digital class book or slideshow and share it with all students and families after the lesson | *Optional:*<br><br>Book or Slideshow |