Lesson 3.5
Testing and Revising Our Solutions
Rereading Let’s Test!

The teacher rereads *Let’s Test!* aloud to students. With students’ input, the teacher fills in the Let’s Test! Solutions chart.

Instructional Guide

1. **Augment instruction.** If you are adjusting instruction in this activity in response to the Critical Juncture Assessment 3 (from Lesson 3.4), review the Assessment note in the Teacher Support tab (Augmenting Instruction: Differentiating in Response to Critical Juncture Assessment 3) for suggested modifications to this activity.

2. **Frame the day’s lesson.**

   - En nuestra lección anterior, comenzamos a hacer nuestras plantillas. Diseñamos estas plantillas porque pensamos que ayudarán a resolver el problema de la compañía de teatro de marionetas.

   Point to the design-cycle diagram on the What Engineers Do chart.

   - Una vez que los ingenieros han creado una posible solución a un problema, ¿cuál es el siguiente paso que toman? [Testean las soluciones].

   - Hoy testearemos nuestras plantillas y veremos si resuelven el problema de la compañía de teatro de marionetas.

3. **Hold up the front cover of the *Let’s Test!* big book.**

   - Los niños en este libro testearon varias soluciones para el problema que tenían. Vamos a leer este libro de nuevo para ayudarnos a pensar en testear nuestras propias soluciones.

   - Recuerden que hacer preguntas mientras leemos puede ayudarnos a entender mejor. Una pregunta en la que quiero pensar es ¿Cómo testearon y luego cambiaron su solución los niños? Leamos y pensemos en esta pregunta. Nos ayudará con nuestras propias soluciones.

4. **Introduce the Let’s Test! Solutions chart.** Explain that together, you will complete this chart as you read *Let’s Test!* to help think about what the children in the book learned when they tested their solutions.

¿Cuál es el problema?  
[El sol es demasiado brillante].

- Record the problem at the top of the Let’s Test! Solutions chart. Write “The sun is too bright.”

Si el sol brillante es el problema, ¿qué necesitan hacer los niños para resolver el problema?  
[Necesitan hacer algo de sombra. Necesitan bloquear algo de la luz del sol y aún poder ver].

- Explain that these ideas are the children’s design goals, or what they need their solution to do to solve their problem.
- Record the design goals on the chart. Write “They need to make some shade.” “They need to block some of the sunlight and still be able to see.”
- Remind students that they have also been using a set of design goals to help create solutions for the puppet-theater company. Revisit the Puppet Scene Design Goals chart as needed.

6. Read aloud pages 6 and 7. Pause at the end of page 7 and pose the following questions.

¿Qué material testearon los niños?  
[Una manta].

- In the “What material did they test?” column, write “blanket.” If you wish, make a quick sketch of a blanket next to this word as a cue for students.

¿Qué descubrieron los niños de su prueba?  
[La manta bloqueó demasiada luz, así que el puesto de limonada estaba demasiado oscuro].

- Point to the second column on the chart.

¿Cumplieron los niños con la primera meta de diseño que era hacerlo más oscuro?  
[Sí].

¿Cumplieron con la segunda meta de diseño que era que todavía necesitaban ver?  
[No].

- In the second column, write “Yes.” In the third column, write “No.”
- Point out that testing this material showed the children that this solution met one, but not both, of the design goals.

7. Read aloud pages 8 and 9. Pause at the end of page 9 to repeat the process of filling in another row on the chart while posing the design questions—this time for lace.
• In the first column, write “lace.” If you wish, make a quick sketch of a piece of lace next to this word as a cue for students.

• Record students’ responses in the second and third columns of the chart.

8. Read aloud pages 10 and 11. Pause at the end of page 11 to repeat the process of filling in another row on the chart while posing the design questions—this time for a bedsheets.

• In the first column, write “bedsheets.” If you wish, make a quick sketch of a bedsheets next to this word as a cue for students.

• Record students’ responses in the second and third columns of the chart.


10. Connect the ideas in Let’s Test! to the What Engineers Do chart.

Cada vez que los niños testearon una nueva solución, aprendieron algo nuevo. Aprendieron si la solución cumplía con sus metas de diseño.

Igual que los niños en ¡Testeemos!, ustedes van a testear sus soluciones para aprender algo nuevo. Luego, pueden pensar en si su solución cumple o no con las metas del diseño para la compañía de teatro de marionetas.

• Draw an arrow from the Test hexagon to the Learn hexagon.

Estoy dibujando esta flecha desde Testear hasta Aprender para mostrar que el aprendizaje vino después de las pruebas.

¿Notan que esto nos lleva de regreso a donde comenzamos? ¡Estamos al comienzo del ciclo de diseño de nuevo! ¿Qué piensan que nos dice esto sobre lo que hacen los ingenieros?

• If students don’t mention that engineers repeat the steps of the design cycle to keep learning, planning, making, and testing to design solutions to problems, point this out to them.

Teacher Support

Assessment

Augmenting Instruction: Differentiating in Response to Critical Juncture Assessment 3
This lesson provides an opportunity to support students who showed difficulty with content from Chapter 3 (as revealed through Critical Juncture Assessment 3 in Lesson 3.4). If you think that students may not have a clear understanding of some materials allowing some or all light to pass through, take time for additional instruction during Activity 1.
Lesson Overview

Students return to the book *Let’s Test!* to reflect on the role of testing and revising in the design process. They learn how to use the design goals to check whether or not a proposed solution will work. Students test and revise their own solutions and then record their observations of the bright, medium-bright, and dark areas created on a surface by their stencils. Finally, students evaluate their own solutions according to their adherence to the three design goals set by the puppet-theater company. The purpose of this lesson is to engage students in several key practices of engineers: testing solutions, evaluating solutions in relation to design goals, and revising solutions based on test results.

**Design Problem:** Design a puppet-show scene, using light.

**Students learn:**

- Engineers test their solutions and use the test results to revise and improve these solutions.
Rereading Let’s Test!

The teacher rereads Let’s Test! aloud to students. With students’ input, the teacher fills in the Let’s Test! Solutions chart.

Instructional Guide

1. **Augment instruction.** If you are adjusting instruction in this activity in response to the Critical Juncture Assessment 3 (from Lesson 3.4), review the Assessment note in the Teacher Support tab (Augmenting Instruction: Differentiating in Response to Critical Juncture Assessment 3) for suggested modifications to this activity.

2. **Frame the day’s lesson.**

   ![Question](image)
   In our last lesson, we started making our stencils. We designed these stencils because we think they will help solve the puppet-theater company’s problem.

   ![Question](image)
   Point to the design-cycle diagram on the What Engineers Do chart.

   ![Question](image)
   Once engineers have made a possible solution to a problem, what is the next step they take? [They test their solutions.]

   ![Question](image)
   Today, we will test our stencils and see if they solve the puppet-theater company’s problem.

3. **Hold up the front cover of the Let’s Test! big book.**

   ![Question](image)
   The children in this book tested several solutions to the problem they had. We are going to read this book again to help us think about testing our own solutions.

   ![Question](image)
   Remember that asking questions while we read can help us understand better. One question I want to think about is *How did the children test and then change their solution?* Let’s read and think about this question. It will help us with our own solutions.

4. **Introduce the Let’s Test! Solutions chart.** Explain that together, you will complete this chart as you read Let’s Test! to help think about what the children in the book learned when they tested their solutions.

What is the problem?
[The sun is too bright.]

- Record the problem at the top of the Let’s Test! Solutions chart. Write “The sun is too bright.”

If the bright sun is the problem, what do the children need to do to solve the problem?
[They need to make some shade. They need to block some of the sunlight and still be able to see.]

- Explain that these ideas are the children’s design goals, or what they need their solution to do to solve their problem.
- Record the design goals on the chart. Write “They need to make some shade.” “They need to block some of the sunlight and still be able to see.”
- Remind students that they have also been using a set of design goals to help create solutions for the puppet-theater company. Revisit the Puppet Scene Design Goals chart as needed.

6. Read aloud pages 6 and 7. Pause at the end of page 7 and pose the following questions.

What material did the children test?
[A blanket.]

- In the “What material did they test?” column, write “blanket.” If you wish, make a quick sketch of a blanket next to this word as a cue for students.

What did the children find out from their test?
[The blanket blocked too much light, so the lemonade stand was too dark.]

- Point to the second column on the chart.

Did the children meet the first design goal of making it darker?
[Yes.]

Did they meet the second design goal that they still needed to see?
[No.]

- In the second column, write “Yes.” In the third column, write “No.”
- Point out that testing this material showed the children that this solution met one, but not both, of the design goals.

7. Read aloud pages 8 and 9. Pause at the end of page 9 to repeat the process of filling in another row on the chart while posing the design questions—this time for lace.
• In the first column, write “lace.” If you wish, make a quick sketch of a piece of lace next to this word as a cue for students.

• Record students’ responses in the second and third columns of the chart.

8. Read aloud pages 10 and 11. Pause at the end of page 11 to repeat the process of filling in another row on the chart while posing the design questions—this time for a bedsit.

• In the first column, write “bedsheet.” If you wish, make a quick sketch of a bedsit next to this word as a cue for students.

• Record students’ responses in the second and third columns of the chart.


10. Connect the ideas in Let’s Test! to the What Engineers Do chart.

Every time the children tested a new solution, they learned something new. They learned whether or not the solution met their design goals.

Just like the children in Let’s Test!, you are going to test your solutions to learn something new. Then, you can think about whether or not your solution meets the design goals for the puppet-theater company.

• Draw an arrow from the Test hexagon to the Learn hexagon.

I am drawing this arrow from Test to Learn to show that learning came next after testing.

Do you notice this brings us back to where we started? We are at the beginning of the design cycle again! What do you think this tells us about what engineers do?

• If students don’t mention that engineers repeat the steps of the design cycle to keep learning, planning, making, and testing to design solutions to problems, point this out to them.

Teacher Support

Assessment

Augmenting Instruction: Differentiating in Response to Critical Juncture Assessment 3

This lesson provides an opportunity to support students who showed difficulty with content from Chapter 3 (as revealed through Critical Juncture Assessment 3 in Lesson 3.4). If you think that students may not have a clear understanding of some materials allowing some or all light to pass through, take time for additional instruction during Activity 1.
• Post the ___ so ___ and the ___ because ___. Explanation Language Frames (from Lessons 1.4 and 2.1, respectively) to help students make the connection between how much light passes through the material and the resulting brightness or darkness.

• Each time you turn to a page in Let’s Test! where the children are testing a new material, have students talk with a partner about what the children found out about the material from their test. One student should use the so language frame, and the other student should use the because language frame.

• If you think students need extra support, go through the blanket example, step by step.

• After partners have practiced explaining a particular material, invite students to share their explanations with the class.

If you need to correct students’ explanations, do so from the text. For example, you could say, “It says here that the blanket blocks almost all the light, and I can see a dark area on the lemonade stand in the picture. This means that in order to explain it, I would say ‘The lemonade stand is dark, because the blanket lets no light pass through to get to the stand.’”). Have students repeat this sentence. Extend this practice by inviting students to explain the same example, using the ___ so ___ Explanation Language Frame.

Background

Engineering Practices: Engineers Iterate Through Testing and Revision
A fundamental aspect of engineering is iteration—the successive improvement of a solution. Engineers test aspects of their solutions through many phases of development—exploring and testing possible materials to choose the best options, creating and testing models or prototypes to inform the construction of the actual solution, and testing a version of the solution in realistic conditions. Sometimes, this process of iteration informs engineers’ understanding of the problem as well as the design of the solution. Testing materials can identify the constraints those materials create. Testing prototypes or early solutions with users can clarify the criteria with which users evaluate a solution. Testing also provides engineers with information about the performance of a solution compared to their goals and expectations so they can make changes that will improve the solution’s performance.