Lesson 1.7

Jelly Bean Engineer
Reading: Jelly Bean Engineer

Students partner read *Jelly Bean Engineer* and modify their earlier predictions based on what they learn.

Instructional Guide

1. **Refer to the Partner Reading Guidelines.** Have students take turns reading them aloud for the class. Review the guidelines with the class.

2. **Have students begin partner reading.** Remind students to continue to adjust their original predictions and make new predictions about what they may learn as they go along.

3. **Gather the class’ attention.** Once each group has finished reading, have them close their books and direct their attention to you.

4. **Remind the class of the Investigation Question they have been thinking about.** Have a student read aloud the Investigation Question written on the board: *How can the properties of a mixture change?*

   - We have been reading about how engineers make mixtures of different ingredients in order to make different kinds of jelly beans.

   - Let’s read Part One of the book again together, paying close attention to how the engineers make jelly bean mixtures.

   - This might tell us something about what made the properties of some jelly bean mixtures change to be different from others.

5. **Read page 4.** Explain that you are going to revisit the text one more time and ask some questions about what students are learning about jelly bean engineers.

6. **Read pages 4–10, stopping every few pages to ask a question.** You may wish to pose the following questions:

   - pages 4–6: What kinds of things do food engineers need to know in order to design new jelly beans?
• pages 7–10: Why is it important for engineers to work together in teams? How do you think the food engineers test their jelly beans? What do you think jelly bean engineers do when their flavors don’t work?

7. Read pages 11–15. Have students reflect on the following questions:

Q How do the jelly bean engineers test the properties of the jelly beans? [They use their senses: smell, taste, feel. They use machines to make sure the mixture has the right ingredients.]

Q Why do the jelly bean engineers test the jelly beans over and over? [To make sure they taste right. To know if they need to change the ingredients.]

Q What are some of the properties of different jelly beans that are described? [Some are soft; some are hard; some taste like grass, vomit, strawberry.]

8. Read page 16 to emphasize an important idea in science.

Q An amazing thing is that these jelly beans are made out of just a few ingredients—cornstarch, sugar, corn syrup, and flavors. We have tested cornstarch as a possible glue ingredient. The same few ingredients, mixed in different ways, can result in mixtures that are really different from each other.

9. Point out that scientists and engineers study the natural and material world.

Q Some scientists investigate animals. Others investigate plants. Those scientists are figuring things out about nature.

Q Engineers often work to solve problems that involve substances, like the food engineers in this book.

Q What problem were the food engineers in this book trying to solve? [They were trying to make jelly beans that are the right texture; they were trying to make new jelly bean flavors.]

Q When you grow up, you might decide to be a scientist who investigates things in nature, or you might decide to be a scientist or an engineer who investigates substances and makes new things that can solve problems.

Teacher Support

Background

About the Book: Jelly Bean Engineer

Jelly Bean Engineer shows how food engineers use design practices to create new kinds of food. In the book, readers meet Ambrose Lee, a food engineer who invents new jelly bean flavors. Students see Ambrose and his colleagues using their senses, designing mixtures to have certain properties, and working as a team. They learn about how ingredients create the texture of jelly beans and get a glimpse at the hard work and serendipity that are part of the design process. This book provides a real-world parallel to the work students are doing as they design mixtures in the classroom.
Instructional Suggestion

Literacy Note: Test as a Verb and a Noun
You may have noticed that the word test may be used either as a verb or a noun: Students test the ingredients, and they conduct the sticky test. Note that the Glossary in the Properties of Materials Investigation Notebook includes only the definition of the verb form—to try something out. If you’d like to define the noun form for your students, you could let them know that in science, a test is a way of trying something out.

Instructional Suggestion

Diverse Learners: Reading with a Small Group or as a Class
You may wish to adjust the lesson to provide more support for those who need it either by forming small groups who complete a first read together and/or by having students read with you. If many students in your class struggle significantly with reading, you may wish to read the text aloud and ask students to follow along and annotate as you read together.

Background

Crosscutting Concept: What Is Meant by Energy and Matter?
Energy and Matter is a crosscutting concept called out by the Next Generation Science Standards. It is one of seven powerful ideas that are widely useful across scientific topics and subdisciplines. Energy and matter are essential considerations throughout all of science—this is because the supply of energy and matter can be a limiting factor for properly functioning systems, whether that system is a plant, a flashlight, or a region’s weather. In second grade, students begin building their understanding of this crosscutting concept by focusing on matter.

Background

Crosscutting Concept: Energy and Matter Across This Unit
A big idea in science is that a great many objects can be built up from a small set of pieces. This is a foundational idea in understanding the nature of matter. In later grades, this idea will become important as students come to understand that everything in the world is made of different combinations of a few elements. However, in Grade 2, we want to introduce students to this idea more generally and at a visible scale. This happens in several ways. Throughout the unit, students are working with small sets of materials. Depending on which of those few ingredients and how much of each ingredient they add to their mixture, it can result in a mixture with very different properties. Pointing this out as you go will help students think about and gain experience with this important idea. There are also a number of times throughout the unit that students encounter this idea with objects. In Chapter 2, Lesson 1, as students read Can You Change It Back?, they have the opportunity to reflect on how wooden popsicle sticks may be rearranged in many ways to form larger constructions (a frame or house) with different sizes and shapes. Also, several times throughout the unit, there are Going Further notes that describe ways to engage students in making models of their mixtures, using colored plastic cubes, and reflecting on what the model shows (Lessons 1.9, 3.2, and 4.3).

Instructional Suggestion

Pedagogical Goals: Understanding the Nature of Science
One goal set forth by the Next Generation Science Standards (NGSS) is for students to understand the nature of science as a discipline and how scientific knowledge develops over time. The NGSS calls out eight understandings about the nature of science, which are woven throughout the Amplify Science curriculum. This unit gives students an
opportunity to experience the understandings that Science Is a Human Endeavor and that Science Addresses Questions About the Natural and Material World. Specifically, *Jelly Bean Engineer* illustrates the ideas that men and women of diverse backgrounds are scientists and engineers and that engineers study the natural and material world.

Across Grade 2, students broaden their experiences of the many ways that scientists investigate phenomena in the natural and designed world. Their initial classroom experiences with a range of science and engineering practices, core disciplinary ideas, and bigger ideas that cut across all science dimensions continue to create experiences with the nature of science as it is practiced. The nature of science perspective in Grade 2 continues to emphasize that scientists look for patterns and order when making observations about the world.

During each unit, point out to students at least one science practice that they are using to investigate the unit’s central phenomenon. Examples to highlight include asking questions, conducting investigations, making and using observations to answer questions, analyzing data, constructing evidence-based arguments, and developing models to represent patterns in the natural world. Help students begin to think about a more abstract understanding of the nature of science, namely that scientists study the natural and material world. In contrast, science does not study fictional, magical worlds.

Encourage students to reflect on the crosscutting idea of cause and effect. Scientists search for cause and effect relationships to explain natural events. Encourage students to apply that very big idea to events they notice in their daily lives. For example, daytime is generally warmer than night time because sunlight causes places to get warmer. When the sun sets, that event causes temperatures to get colder. Events have causes that can generate observable patterns, and student-generated examples can highlight how the crosscutting concepts of patterns and cause and effect can connect with each other.

To further help students understand the nature of science, pose questions that help students to reflect on how science practices and crosscutting concepts contribute to building scientific knowledge. For example:

- We looked for patterns when we were observing X. How is that like what scientists do?
- We have been making explanations about what causes something. How is that like what scientists do?
- We have been studying the natural world. How is that like what scientists do?

Note that students also reflect explicitly on the Nature of Science as part of Self-Assessment activities in this unit. See the Check Your Understanding pages in the Investigation Notebook for examples.
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5. **Read page 4.** Explain that you are going to revisit the text one more time and ask some questions about what students are learning about jelly bean engineers.

6. **Read pages 4–10, stopping every few pages to ask a question.** You may wish to pose the following questions:

   • pages 4–6: What kinds of things do food engineers need to know in order to design new jelly beans?
7. Read pages 11–15. Have students reflect on the following questions:

¿Cómo testean los ingenieros de jelly beans las propiedades de los jelly beans? [Usan sus sentidos: olfato, gusto, tacto. Usan máquinas para asegurarse de que la mezcla tenga los ingredientes correctos].

¿Por qué los ingenieros de jelly beans testean los jelly beans una y otra vez? [Para asegurarse de que tengan el sabor correcto. Para saber si necesitan cambiar los ingredientes].

¿Cuáles son algunas de las propiedades de diferentes jelly beans que se describen? [Algunos son suaves; otros son duros; algunos saben a pasto, vómito, fresa].

8. Read page 16 to emphasize an important idea in science.

Una cosa impresionante es que estos jelly beans están hechos de solo unos cuantos ingredientes: almidón de maíz, azúcar, jarabe de maíz y sabores. Hemos testado el almidón de maíz como un posible ingrediente del pegamento. Los mismos pocos ingredientes, mezclados de diferentes maneras, dan como resultado mezclas que son realmente diferentes entre sí.

9. Point out that scientists and engineers study the natural and material world.


Los ingenieros a menudo trabajan para resolver problemas que involucran sustancias, como los ingenieros en alimentos en este libro.

¿Qué problema estaban intentando resolver los ingenieros en alimentos en este libro? [Estaban intentando hacer jelly beans que tuvieran la textura correcta; estaban intentando crear nuevos sabores de jelly beans].

Cuando ustedes crezcan, podrían decidir ser científicos que investigan cosas en la naturaleza, o podrían decidir ser científicos o ingenieros que investigan sustancias y hacen cosas nuevas que pueden resolver problemas.

Teacher Support

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