Amplify CKLA

GRADE 4

Unit 9

Inspiration and Ingenuity: **American Innovation**

Teacher Guide

Grade 4 | Unit 9

Inspiration and Ingenuity: American Innovation

Teacher Guide

Amplify CKLA | Core Knowledge®

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Welcome to Amplify CKLA

Dear Educator,

I am thrilled to welcome you to your Amplify CKLA 3rd Edition Teacher Guide.

At Amplify, we are dedicated to collaborating with educators like you to create learning experiences that support literacy development for all students. Amplify CKLA was designed to help you bring effective Science of Reading practices to life in your classroom, and we have been thrilled to see the impact it has had on students across the country.

The 3rd Edition builds on the robust principles and instruction of previous editions of Amplify CKLA to provide better-than-ever support for teaching and learning.

We've made significant improvements to Amplify CKLA in the areas you told us mattered most. In 3rd Edition, you will find more opportunities for differentiation to meet the needs of all learners—including multilingual/English learners—streamlined pacing, and bolstered writing instruction based on the science of reading and writing.

At its foundation, Amplify CKLA is built on the finding that word recognition and language comprehension are both critical to reading comprehension and writing composition.

In Grades 3–5, Amplify CKLA lessons combine skills and knowledge in content-driven units with increasingly complex texts, close reading, and a greater writing emphasis. Students start to use their skills to go on their own independent reading and writing adventures.

I know how overwhelming it can feel to start a new curriculum, but you are not alone! As you embark on this literacy journey with Amplify CKLA, we are here to support. We offer comprehensive professional development resources, including videos, podcasts, webinars, and virtual and in-person training, to help you make the shift to the Science of Reading.

We share the common belief that every child deserves to become a proficient, enthusiastic reader and writer, and I am confident that we can realize this goal together. Thank you for your unwavering commitment to your students' success and for your role in shaping the future of literacy instruction.

Sincerely,

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Educators across the country who have provided essential feedback on previous editions of CKLA, helping us to make the program better for teachers and students.

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INSPIRATION AND INGENUITY: AMERICAN INNOVATION

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Introduction

INSPIRATION AND INGENUITY: AMERICAN INNOVATION

This introduction includes necessary background information to be used in teaching the *Inspiration and Ingenuity: American Innovation* unit. The Teacher Guide contains sixteen daily lessons and two Pausing Point days. Each lesson will require a total of 90 minutes.

As noted, two days are intended to be used as Pausing Point days. These Pausing Points are found at the end of the unit, after the Unit Assessment. Pausing Points can be used to focus on content understanding, writing, and reading. Student Performance Assessment 3 can be administered either before or after the Pausing Point days.

TEACHER COMPONENTS

- Teacher Guide
- *Patricia's Vision: The Doctor Who Saved Sight* by Michelle Lord
- *Mr. Ferris and His Wheel* by Kathryn Gibbs Davis

DIGITAL TEACHER COMPONENTS

These resources can be found at learning.amplify.com:

- Teacher Presentation Screens
- Visual Supports for Teaching
- General English Learners
- Assessment Guide: Student Performance Assessments
- Take-Home Pages
- Caregiver Letter
- Fluency Supplement
- Decoding and Encoding Remediation Guide
- Intervention Toolkit

STUDENT COMPONENTS

- Activity Book

Note: Students may need computer access if you choose to have students conduct digital research for their project and to publish their essays on the computer.

In the back of this Teacher Guide, you will find a section titled Teacher Resources, where you will find the following:

- Activity Book Answer Key

WHY THIS UNIT IS IMPORTANT

Students will explore the rich history of American innovation, building on the foundational knowledge gained from the *Eureka! Student Inventor* unit. In this unit, the focus will shift towards studying lesser-known innovators from various backgrounds, underscoring the diverse contributions that have shaped American society, and considering the common characteristics of the innovation cycle. The unit seeks to broaden students' understanding of innovation, moving beyond familiar narratives.

Throughout the unit, students will explore the stories of inventors, innovators and their creations. Students will consider the background, motivations, and challenges faced by these innovators, as well as the impact of their creations on society. Students will learn about the importance of patents in protecting intellectual property, the role of prototypes in testing and refining ideas, and the iterative cycle of innovation, which involves continuous improvement and refinement of products or processes. Students will examine innovations from diverse groups and backgrounds, highlighting the collective impact of American ingenuity. This allows students to gain a comprehensive perspective of collective contributions to overall progress and development.

The unit prompts students to identify and formulate ideas about the ongoing need for innovation, both historically and in addressing contemporary challenges. This exploration allows students to appreciate the ongoing relevance of innovation in shaping the nation's progress.

The instructional approach includes a research component, where students choose an innovator, develop a research question, conduct research and undertake a research writing project. This project deepens knowledge and provides opportunities for teachers to tailor the project to specific interests or themes. As a culminating task, students will present their research findings and writing in an Innovation Exhibition for teachers and peers.

WHAT STUDENTS HAVE ALREADY LEARNED

The following domains, and the specific core content that was targeted in those domains, are particularly relevant to the lessons in *Inspiration and Ingenuity: American Innovation*. This background knowledge will greatly enhance students' understanding of the unit:

- Kindergarten, *All Around the World: Geography*
- Grade 1, *Charting the World: Geography*
- Grade 4, *Eureka! Student Inventor*

CORE VOCABULARY

The following list contains core vocabulary words from the unit. They can be found in the Vocabulary section at the beginning of each lesson. Boldfaced words in the list have an associated Word Work activity. The inclusion of the words on this list does not mean that students are immediately expected to be able to use all of these words on their own. However, through repeated exposure throughout the lessons, they should acquire a good understanding of most of these words and begin to use some of them in conversation.

Lesson 1 invention catalyzed revolutionary **innovation** efficient	**Lesson 2** **entrepreneur** resilient sulfur beeswax philanthropy	**Lesson 3** patent intellectual property collided filter stenographer **perishables** preserve
Lesson 4 inconvenient incandescent **current** filament investor fluorescent light-emitting diode	**Lesson 5** tinkering version **iteration** refine	**Lesson 6** revolution nozzle array **customized** resin
Lesson 7 soloists **improvised**	**Lesson 8** ophthalmologist cataract cornea restore **arduous**	**Lesson 9** **spare** filter adapter
Lesson 10 engineer muster alloy **lenders** saturated axle		

CORE CONTENT OBJECTIVES

- Identify the main ideas and supporting details in an informational text
- Compare and contrast inventors and innovators
- Ask and answer relevant questions
- Make text-based inferences
- Generate questions based on prior knowledge and gathered information
- Synthesize details across texts to demonstrate comprehension
- Demonstrate understanding of theme within a text
- Identify and cite primary and secondary sources
- Research and gather information from relevant sources
- Draft, revise, and publish an informational research paper, drawing from informational text sources
- Present research findings using diverse formats

WRITING

In this unit, students will focus on research and inquiry using information gathered from the texts in Read-Alouds, articles, and passages. With teacher support, students develop and follow a research plan. Throughout the unit, students use the Internet and classroom resources to identify and gather information from a variety of reliable sources. They will learn to take notes, paraphrase and summarize their key findings, and identify and correctly cite both primary and secondary sources. They then will work through drafting an informative research essay from planning, to drafting the introduction, body paragraphs and conclusion, to revising, editing, and publishing.

The following activities may be added to students' writing portfolios to showcase student writing within and across domains:

- Draft of a research essay about an American innovator and their innovation (Lesson 12)
- Final copy of a research essay about an American innovator and their innovation, including a bibliography (Lesson 15)

STUDENT PERFORMANCE ASSESSMENT 3

This unit concludes with a Student Performance Assessment to help you determine whether students have adequate preparation for Grade 5 CKLA instruction the following year. This assessment is not available digitally. The directions for administering the assessment, student assessment pages, and answer keys can be found in the Assessment Guide: Student Performance Assessments component. Please make copies of the student pages to distribute to students.

The Student Performance Assessment includes three components to be administered in a whole group setting, completed independently by each student: a written assessment of silent reading comprehension, a written assessment of grammar, and a written assessment of morphology.

The Reading Comprehension Assessment is designed to be completed during a 90-minute block of time.

The Grammar and Morphology Assessments are meant to be completed during two 45-minute blocks of time. You should spend no more than three days to complete all the assessments.

The oral portion of the Student Performance Assessment (administered to students who scored 10 or fewer on the Reading Comprehension Assessment, or between 11–13, as time allows) evaluates skills in reading words in isolation. Students will be asked to read words one-on-one as you mark their pronunciation. Explicit directions of the administration of this assessment are included in the Assessment Guide: Student Performance Assessments booklet.

The fluency assessment is to be administered to all students. Instructions for the administration of this assessment are included in the Assessment Guide: Student Performance Assessments booklet.

After administering the Student Performance Assessment, you will complete an analysis summary of individual student performance. This summary should be passed on, along with the completed assessments, to students' teachers for the following school year.

LESSON

1

Invention and Innovation

PRIMARY FOCUS OF LESSON

Reading

Students will distinguish between the characteristics of invention and innovation. **[RI.4.2, RI.4.3]**

Students will demonstrate an understanding of the Tier 2 word *Innovation*. **[L.4.4]**

Speaking and Listening

Students will use a Venn diagram to compare and contrast the roles of innovators and inventors and will discuss their understanding in small groups. **[SL.4.1b, SL.4.1d, W.4.2]**

FORMATIVE ASSESSMENT

Exit Pass

Speaking and Listening Use your completed Venn diagram to write and discuss in one to three sentences the similarities and differences between inventors and innovators. **[SL.4.1b, SL.4.1d, W.4.2]**

Teacher Presentation Screens:
all lessons include slides

LESSON AT A GLANCE

	Grouping Recommendations	Time	Materials
Reading (45 min.)			
Core Connections: Introduce the Read-Aloud	Whole Group	5 min.	❑ "Invention and Innovation" ❑ Visual Supports 1.1–1.7 ❑ Activity Pages 1.1, 1.3
Read-Aloud	Whole Group	20 min.	
Discussing the Read-Aloud	Whole Group	15 min.	
Word Work: *Innovation*	Whole Group	5 min.	
Speaking and Listening (45 min.)			
Compare and Contrast	Small Group	15 min.	❑ Visual Supports 1.8, 1.9 ❑ Activity Page 1.2 ❑ Exit Pass
Partner Share	Partner	15 min.	
Research Preparation	Whole Group	15 min.	
Take-Home Material			
Caregiver Letter			❑ Caregiver Letter

ADVANCE PREPARATION

Reading

- Prepare a classroom library of teacher-approved informational books related to the unit's ideas (such as patents, prototypes, the innovation cycle, and various innovators in fields such as medicine, music, STEM, and entrepreneurship), so that throughout the unit students can use these as resources in addition to the Internet.
- Prepare to introduce students to their individual KWL charts using Activity Page 1.1.
- Prepare to assign partners for the Turn and Talk and Think-Pair-Share activities.

Speaking and Listening

- Plan to project Activity Page 1.2.
- Prepare to break students into groups and pairs.

Visual Support 1.8

- Prepare Visual Support 1.8 to project or display during the Partner Share activity.

Visual Support 1.9

- Plan to introduce students to their final project using Visual Support 1.9.
- Prepare to distribute copies of the Exit Pass for each student to complete at the end of the speaking and listening segment.

Universal Access

Reading

- Allow adequate thinking time for students to respond during the discussion. Post the guiding questions on the board and refer to them as you ask the questions.

Speaking and Listening

- Consider pairing students with peers who speak their home language and allow students to answer the questions in their home language. You may wish to continue this throughout the unit.
- To ensure all students have the opportunity to contribute during Turn and Talk and Think-Pair-Share exchanges, provide students with a signal, such as folding their hands or raising a hand to indicate when both partners have added to the conversation.

VOCABULARY

Core Vocabulary

- You may choose to preview the vocabulary words before reading the text.

invention, n. the creation of a new or improved product or device

catalyzed, v. sparked changed or helped move things forward

revolutionary, adj. significant or groundbreaking

innovation, n. the process of introducing new ideas or ways of thinking about doing things

efficient, adj. doing things in a smart and quick way

Vocabulary Chart for "Invention and Innovation"			
Vocabulary Type	**Tier 3 Domain-Specific Words**	**Tier 2 General Academic Words**	**Tier 1 Everyday Speech Words**
Vocabulary		invention catalyzed revolutionary innovation efficient	
Spanish Cognates		invención catalizado revolucionario innovación eficiente	
Multiple-Meaning			
Sayings and Phrases			

Start Lesson

Lesson 1: Invention and Innovation

Reading

45M

Primary Focus

Students will distinguish between the characteristics of invention and innovation. **[RI.4.2, RI.4.3]**

Students will demonstrate an understanding of the Tier 2 word *innovation*. **[L.4.4]**

CORE CONNECTIONS: INTRODUCE THE READ-ALOUD (5 MIN.)

- Remind students that they learned about inventions in the *Eureka! Student Inventor* unit. Ask them to review some things they learned in that unit.
  - » Answers may vary but could include that they learned about inventors, such as Hedy Lamarr and George Washington Carver, or that they learned about specific inventions, such as the light bulb.
- Ask students why a rock is not an invention.
  - » Answers may vary but could include that no one made them; they were never new or different.
- Remind students that an inventor is someone who creates a new or improved product or device.
- Define an innovator as a person with new ideas about how something can be done.
- Encourage students to consider what might motivate someone to develop new ideas or enhance an existing method. Have volunteers share their thoughts with the rest of the group.
- Tell students that innovation often starts by having exciting ideas to make things more fun, interesting, or helpful.
- Explain that innovations happen in many areas of life, from music, art, and fashion to science and architecture.

Activity Pages 1.1 and 1.3

READ-ALOUD (20 MIN.)

- Display Activity Page 1.1. Tell students that the class will revisit this throughout the unit. Today we will begin by filling out each column using existing knowledge and information they learn from the text.
- Distribute copies of the text using Activity Page 1.3 for students to follow along as you read the text aloud.

- Begin reading aloud the text for students.
- During the Read-Aloud, pause for students to underline key phrases in the text that relate to the definition and characteristics of innovation. This could include terms like *original ideas*, *creative thinking*, and *collaboration*.

"Invention and Innovation"

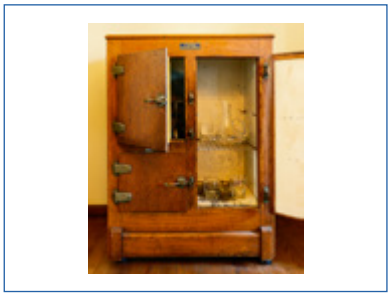
What do a light bulb, a dishwasher, and a surgical laser have in common? Each was created by a curious person who noticed a problem and decided to find a solution to it. In other words, someone invented each of them!

Invention as Problem Solving

Show Visual Support 1.1
Oil Lamp

To invent something is to bring something new into the world. Sometimes an inventor creates a new **invention** in much the same way that a mathematician or a scientist investigates a problem. It is dark at night, and we need a way to make light. But the only way to make light is with a fire, which can be dangerous. So the inventor tries to solve the problem: what is a light source that is not dangerous?

One inventor who started by trying to solve a problem is Josephine Cochrane. As a housewife who hosted many large parties, she often found herself using many, many dishes. Cochran was wealthy and had servants to wash dishes for her, but the dishes often ended up chipped and cracked. Cochrane knew there had to be a better way than doing it all by hand. Her frustration over the dishes **catalyzed** her. *To catalyze something is to spark it or help it move forward.* Inspired to create a dishwasher, she worked on her invention in a shed behind her home. She identified a problem she believed she could solve. And in solving it, she benefited many other people, too.



Show Visual Support 1.2
Vintage Icebox

The dishwasher is one of many inventions, including the traffic light, mailbox, and refrigerator, that happened because a curious person wanted to solve a problem. *What other inventions do you think happened because someone wanted to solve a problem?* While it is true that people lived for a long time without these inventions, life got a lot easier after them. Traffic lights make our roads safer, dishwashers make cleaning a breeze in the houses that have them, and mailboxes protect our mail from all kinds of weather. Before refrigerators, it was hard for people to keep perishable goods, or any object that spoils if not kept at a certain temperature. But with refrigerators, fresh food could last longer, and medicine could be stored at certain temperatures. It was a **revolutionary** invention; one that dramatically changed the way people lived. Revolutionary *means significant or groundbreaking.*

Invention as Curiosity

Not every invention happens because someone sees a problem that needs to be fixed. Sometimes, inventions happen when people are curious about something and decide to explore it. They do not even need to have a specific problem in mind.

Show Visual Support 1.3
Vacuum Tube TV

In the 1920s, Philo Farnsworth, a high school chemistry student, got curious about vacuum tubes. Vacuum tubes were an early tool that controlled the direction of an electrical current, or flow of electricity. Farnsworth created an innovative technique that used vacuum tubes to break apart a picture, turn it into electricity, then put it back together again. His curiosity about vacuum tubes eventually led to black-and-white television, a new way to share information, stories, and entertainment. Later, Guillermo González Camarena innovated further with Farnsworth's methods. This led to him inventing color television!

In 1890, George Ferris saw a prototype, or early version, of the Eiffel Tower, a structure made of iron. He grew curious about what would happen if he tried to use his knowledge about building steel bridges to make other monumental, or very large, shapes. By exploring that question, he invented the Ferris wheel.

Show Visual Support 1.4
Lydia Villa-Komaroff

In 1978, Lydia Villa-Komaroff grew curious about the behavior of some of the bacteria she was studying. By exploring them, she discovered a new way to create insulin, a life-saving substance for people with diabetes.

In 1986, an ophthalmologist, or eye doctor, named Patricia Bath grew curious about lasers. By exploring how she could use them in her practice, she invented a device that removes cataracts, which helped blind people to see again.

All of these people grew curious about something and began to explore and investigate it. These inventions, which grew from that curiosity, changed the world.

What Is Innovation?

Sometimes, curiosity and problem-solving lead to brand new inventions. But **innovations**, and innovative thinking, are just as important. *An innovation is the process of introducing new ideas or ways of thinking about doing things.* Innovators are creative thinkers who come up with new ways of doing things. When we innovate, we often use inventions in new ways.

Show Visual Support 1.5
Edison Bulb and LED Bulb

In 1881, Lewis Latimer was working for a company that wanted to make Edison-style bulbs. A key part that made Edison's light bulb work was a small piece of bamboo covered in a special kind of dust called carbon. Adding the carbon to the bamboo required a lot of heat, which could break the delicate bamboo pieces. Latimer needed to make many bulbs, and he did not want to waste bamboo. Thinking creatively, he innovated on the process by putting the bamboo pieces into special cardboard envelopes that helped protect them from the heat. As a result of his innovation, he not only helped the company, but he invented a whole new type of light bulb!

Inventors and innovators like Latimer and Shuji Nakamura improved Thomas Edison's invention in ways that turned into inventions of their own. As a result of their work, light bulbs last longer and are more **efficient**, meaning they use much less electricity. Light bulbs today look very different and work much better because of those later inventions.

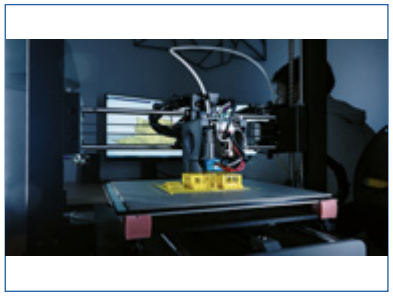
Madam C. J. Walker did not invent the idea of hair care products. But she did realize that the products she used did not work very well on the hair of Black people. Walker used her knowledge as a chemist to improve them, inventing new products and innovative methods that nourished and cared more effectively for Black people's hair. She also innovated on the business of hair, training her own beauticians who could apply and explain her products. Hair care today looks very different and works much better because of her innovations.

Show Visual Support 1.6
Louis Armstrong and Tito Puente

The history of innovation is also the history of human creativity. Neither Louis Armstrong nor Tito Puente invented jazz. But with his distinctive vocal style and trumpet, Louis Armstrong was a jazz innovator. Because of him, jazz now often includes a solo in which the performer improvises their music, or makes it up in the moment. And by combining jazz with Cuban and Caribbean instruments and dance rhythms, Tito Puente became a jazz innovator, too. Jazz sounds different and better because of their innovations.

Three Keys to Innovation

So, is it better to be an inventor or an innovator? This is a complicated question! Sometimes it can be very hard to tell the difference between the two. Some innovators start as inventors, and some inventors start by using something in an innovative way, which leads to another invention. Often, inventors and innovators do a little of both jobs.



Show Visual Support 1.7
Industrial 3D Printer

Three key ingredients help make innovative thinking happen. (You do not need all three!) One is improved technology. Over time, as a result of different inventions and innovations, the technology we use gets better. Scientists

know more about how the world works, new sources of materials are found, and we develop new uses for old materials.

Collaboration, or working together, is often another important ingredient of innovation. People often tell stories about the "lonely inventor" who goes into a lab and comes out with brilliant, new inventions. Sometimes these stories are even true. But more often than not, inventors and innovators work with others, sharing skills and knowledge to do something new. Thomas Edison's name is associated with the light bulb, but machinists in his lab played a huge part. Musicians share ideas among the members of their bands, and writers and artists look at one another's work and talk through ideas. Without collaboration, invention and innovation can be very slow work!

But the most important ingredient for innovation is creative thinking, the quality which helps us explore problems and stay curious. Without that curiosity, it is hard to get started at all.

These three—creative thinking, improved technology, and collaboration—can feed into one another. Creative thinking fuels curiosity and often leads to new inventions. Those inventions can advance technology, making it easier for more people to do more things. That frequently leads to more collaboration, as many people start to use an invention and see new and innovative ways to work with it. One small invention, or an innovative way to use it, can have big effects.

Let's Get Curious!

Curiosity and problem-solving have the power to change our world. Nowadays, people do not always know who invented the things they use every day. We just enjoy them. But learning about how things came to be is more than learning about history. When we learn the stories of inventors and innovators, we remember that just like inventors of the past, we have the power to change our world, too.

Someone, or some group of people, had to invent everything from roads, to household appliances, to medical procedures, and artistic styles. And over time, with new technology and cultural shifts, all those good things transform and grow through innovation, too. Original ideas do not necessarily have to be big to make a big impact. There is always a way to improve upon something else.

With that in mind, can you think of a problem, big or small, that you would like to help solve?

- Have students add to each row of their individual KWL charts if they have a question or thought about something they want to know, wonder, or learn.

DISCUSSING THE READ-ALOUD (15 MIN.)

- Have students discuss the text as a group.

Comprehension Questions

1. **Literal.** Name some American innovators.
    - » Answers may vary but could include Lydia Villa-Komaroff, Louis Armstrong, and Tito Puente.
2. **Inferential.** What do innovators and inventors have in common?
    - » They are creative problem solvers and people who impact society.
3. **Inferential.** What connects a light bulb, a dishwasher, and a surgical laser, according to the text?
    - » They were all inventions created by curious individuals who noticed a problem and decided to find a solution.
4. **Evaluative.** How does the text describe the role of innovation in relation to inventions?
    - » Answers may vary but could include that innovation is coming up with new ideas or new ways to do things. Inventions are products or devices. Innovation can be a catalyst for inventing.
5. **Evaluative.** *Think-Pair-Write*: Why might collaboration be an important ingredient for innovation?

    Complete the following sentence stem using *because*, *but*, and *so*: Collaboration is important for innovation . . . Remind students to signal when both partners have contributed to the conversation. Then have students write the three sentences they discussed.
    - » Answers may vary but could include that collaboration is important for innovation because it helps people share their skills and ideas. Collaboration is important for innovation, but sometimes working together is tricky when everyone has different ideas. Collaboration is important for innovation, so people often work together to speed up the process of creating new things.

WORD WORK: *INNOVATION* (5 MIN.)

1. In the text you read, "The history of innovation is also the history of human creativity."
2. Say the word *innovation* with me.
3. An innovation is the process of introducing new ideas or ways of thinking about doing things.
4. Jazz sounds different and better because of Louis Armstrong's and Tito Puente's innovations.
5. How can innovation lead to new and improved products or processes? Be sure to use the word *innovation* in your response.
    - Ask two or three students to use the target word in a sentence. If necessary, guide and/or rephrase students' responses to make complete sentences: "Innovation can help make new and better things by___."
6. What part of speech is the word *innovation*?
    - » noun

Use a Discussion activity for follow up. Talk with a partner about what makes an innovation successful or impactful. Be sure to use the word *innovation* in complete sentences as you discuss with your partner.

Check for Understanding

Ask, "What does it mean to be an innovator?"

- » a person with new ideas about how something can be done

Differentiation

Challenge

Have students identify a need or problem in their own world—it could be at home, in school, or even in their community. Have students brainstorm a creative solution or innovation to address the need or problem they identified.

Support

Remind students that innovation involves a fresh approach or perspective to how things are done. Prompt them to identify and underline 1–2 examples of innovation in the text, and then explain how each was a new way of thinking or doing something.

ML/EL MULTILINGUAL/ENGLISH LEARNERS

Reading

Reading for Information

Entering/Emerging	Provide students with blank paper divided into two sections: one for the problem and one for the solution. Allow students to draw a diagram of a problem and innovative solution described in the text.
Transitioning/ Expanding	Provide the following sentence starters for participating in small group discussions: People's lives changed because . . ..
Bridging	Ask the students to name examples of modern innovations to provide context for the key vocabulary word *innovation*.

Lesson 1: Invention and Innovation

Speaking and Listening

45M

Primary Focus: Students will use a Venn diagram to compare and contrast the roles of innovators and inventors and will discuss their understanding in small groups. **[SL.4.1b, SL.4.1d, W.4.2]**

COMPARE AND CONTRAST (15 MIN.)

Small Group

- Tell students that they will discuss the text in smaller groups to take a closer look at the similarities and differences between innovators and inventors.
- Have students raise their hands or give a thumbs up if they have already thought of similarities and differences during the Read-Aloud.
- Display Activity Page 1.2.
- **Turn and Talk:** Before they add information to their Venn diagram, have students explain the purpose of using a Venn diagram with a partner by asking specific questions, such as "Why do we use a Venn diagram?" or "How does a Venn diagram help us to organize information?" Remind students to signal when both partners have contributed to the conversation. As time allows, call on a few students to share what their partner said and jot a few of their responses on the board.
  - » Answers may vary but could include comparing and contrasting information, seeing similarities and differences between two or more things, and organizing information in a clear and visual way.

Activity Page 1.2

- On your projected display, point to the overlapping circle and say, "Both inventors and innovators share a common trait. They are problem solvers, so I am going to write 'problem solvers' in the overlapping circle of the Venn diagram."
- Instruct students to write this shared characteristic on their Venn diagram to get them started.
- On your projected display, write "create new products" in the Inventors section of the Venn diagram and "think of new processes" in the Innovators section of the Venn diagram. Explain your thinking by saying, "I know from the reading that inventors create new products, while innovators concentrate on thinking of new processes or ways of doing things."
- Instruct students to write these differences on their Venn diagram to get them started.
- Tell students that they will use the KWL chart and the text to complete their Activity Page 1.2.
- Put students into small groups to discuss the information as they complete their Venn diagrams.

PARTNER SHARE (15 MIN.)

Visual Support 1.8

- Provide each pair a list of discussion prompts to explore the commonalities and differences they identified. Display Visual Support 1.8 with the following discussion prompts:
  - What makes someone an inventor?
  - In what ways are innovators different from inventors?
  - How are inventors and innovators similar?
  - Can you think of an example from the text of someone who was both an inventor and an innovator?
- Have each pair of students play one quick round of Rock, Paper, Scissors to decide who will share first.
- Allow students eight to ten minutes to discuss the four prompts with their partners. Encourage them to share their thoughts, listen actively, and take turns speaking.
- Provide a non-disruptive signal for turn-taking. For example, students could use a hand signal, such as raising their hand briefly, when they want to signal they have finished speaking.

- Bring the class back together and invite a few pairs to share their insights and key takeaways with the whole class.

RESEARCH PREPARATION (15 MIN.)

- Tell students that by comparing and contrasting inventors and innovators they have begun to see the unique qualities that make them both pioneers in their fields.
- Have students revisit Activity Page 1.1 to reflect on what they already knew, questions they have, and what they learned today that they did not know before.
- Explain that in this unit, students will become researchers on a journey to explore important, but lesser known, innovators from American history.
- Tell students that as they read about these innovators, they will follow their interests and ask questions about the ideas in the texts, adding new knowledge and wonderings to their charts.

Visual Support 1.9

- Introduce the culminating activity, using Visual Support 1.9.
- Tell students they will research an innovator. At the end of the unit they will become experts on their chosen innovator and present their research findings, thoughts, and writing in an Innovation Exhibition in which they will share with you and their classmates their research discoveries and their understanding of the innovators and innovations they have studied.

Exit Pass

Use your completed Venn diagram to write one to three sentences explaining similarities and differences between inventors and innovators.

End Lesson

Lesson 1: Invention and Innovation

Take-Home Material

CAREGIVER LETTER

- Caregiver Letter: this overview can be found in the program's online resources.

LESSON

2

Entrepreneurs as Innovators

PRIMARY FOCUS OF LESSON

Reading

Students will use textual evidence to make inferences about the impact of Madam C. J. Walker's innovations. **[RI.4.1]**

Students will demonstrate an understanding of the Tier 2 word *entrepreneur*. **[L.4.4]**

Writing

Students will use textual evidence to write paragraphs summarizing the key achievements of Madam C. J. Walker. **[W.4.2]**

FORMATIVE ASSESSMENT

Activity Page 2.3	**Entrepreneurs as Innovators** Students will write a paragraph identifying Madam C. J. Walker's key achievements and explaining how they impacted society. **[W.4.2]**

Teacher Presentation Screens:
all lessons include slides

LESSON AT A GLANCE

	Grouping Recommendations	Time	Materials
Reading (50 min.)			
Introduce the Text	Whole Group	5 min.	❑ "Innovative Entrepreneurs: Madam C. J. Walker" ❑ Visual Supports 2.1–2.5 ❑ Activity Pages 1.1, 2.1
Close Reading	Partner	30 min.	
Discuss the Reading	Whole Group	10 min.	
Word Work: *Entrepreneur*	Whole Group	5 min.	
Writing (40 min.)			
Modeling: Paraphrasing	Whole Group	5 min.	❑ Visual Support 2.6 ❑ Activity Pages 2.2, 2.3
Paraphrasing Text	Partner	20 min.	
Writing: Entrepreneurs as Innovators	Independent	15 min.	

ADVANCE PREPARATION

Reading

Visual Supports 2.1–2.5

- Prepare to display Visual Supports 2.1–2.5.
- Ensure that students have their individual KWL chart (Activity Page 1.1) to modify as they progress through the unit.
- Locate and prepare to project a map of Indiana and circle the location of Indianapolis, Indiana.
- Plan for heterogeneous groups of students to partner read.

Writing

Visual Support 2.6

- Prepare to display Visual Support 2.6.
- During the paraphrasing text portion of the lesson, prepare to allow students to use a thesaurus from the classroom library or online thesaurus to find synonyms when they need to use another word with the same meaning as a word in the text.

Universal Access

Reading

- To ensure all students have the opportunity to contribute during Turn and Talk and Think-Pair-Share exchanges, provide students with a signal such as folding their hands or raising a hand to indicate when both partners have added to the conversation.

Writing

- Scaffold paraphrasing text for students by modeling locating synonyms for words in the text. Students may use a thesaurus from the classroom library or an online thesaurus when seeking alternative words with similar meanings.

VOCABULARY

Core Vocabulary

- You may choose to preview the vocabulary words before reading the text.

entrepreneur, n. a person who starts and owns a business

resilient, adj. able to recover from challenges or difficulties with strength

sulfur, n. a yellow element found in nature, used for various purposes including making certain medicines

beeswax, n. substance made by bees, used for things like making candles, lotions, and other products

philanthropy, n. the act of giving money, time, or resources to help others

Vocabulary Chart for "Innovative Entrepreneurs: Madam C. J. Walker"			
Vocabulary Type	**Tier 3 Domain-Specific Words**	**Tier 2 General Academic Words**	**Tier 1 Everyday Speech Words**
Vocabulary	sulfur beeswax	entrepreneur resilient philanthropy	
Spanish Cognates		emprendedor resiliente filantropía	
Multiple-Meaning			
Sayings and Phrases			

Start Lesson

Lesson 2: Entrepreneurs as Innovators

Reading

50M

Primary Focus

Students will use textual evidence to make inferences about the impact of Madam C. J. Walker's innovations. **[RI.4.1]**

Students will demonstrate an understanding of the Tier 3 word *entrepreneur*. **[L.4.4]**

INTRODUCE THE TEXT (5 MIN.)

- Tell students that they have been learning about innovation and today they are going to learn about a specific innovator.
- **Turn and Talk:** Ask students if they have ever heard of Madam C. J. Walker. Remind students to signal when both partners have contributed to the conversation.
  - » Answers may vary but could include that she was an important figure in history.
- Tell students that Madam C. J. Walker was an American businesswoman known for her innovations in hair care, particularly for Black women.
- Explain that Madam C. J. Walker established her business headquarters in Indianapolis, Indiana, in 1910.
- Show students Indianapolis, Indiana, on the projected map of Indiana.

CLOSE READING (30 MIN.)

Activity Page 2.1

- Have students take out Activity Page 2.1.
- Tell students they will read with a partner. As they read, they should underline key details, note the questions they have, and what they wonder or find challenging.

Visual Support 2.5

- Project Visual Support 2.5 with the beginning of the text to read, think aloud, and model underlining key details, questions, and circling.

Note: A full copy of the text can be found at the end of the close-reading segment.

- Read the passage aloud while modeling a think-aloud. Provide a running commentary on your thoughts as you read:
    - "The woman who became Madam C. J. Walker *(I notice the use of 'became,' indicating a change. I will underline that.)* was born on December 23, 1867, on a plantation in Louisiana *(interesting setting, important detail).* Her parents named her Sarah Breedlove. *Why did she change her name?* Sarah was the youngest of six children, as well as the first child in her family born after the Thirteenth Amendment, which abolished slavery *(historical detail)*. Orphaned at the age of seven *(that is a significant challenge)*, Sarah went to live with her older sister, Louvenia. As time went on, she got married, had a daughter, and moved around the country to different places. By the early 1900s, she was working as a laundress, or someone who washes clothes, to support her family. It was a difficult struggle, but Sarah was a resilient person. *I wonder what resilient means? Let me circle this word*. She did not give up, no matter how tough it got. *This sentence tells me resilient means to not give up.*"
- Make annotations on the projection as you model the think-aloud. Underline key details, circle challenging elements, and write brief comments in the margins.
- Encourage students to share any different details, questions, or challenging parts they have noticed in this specific passage.
- Write the following questions on the board before students begin reading:
    - What do you see?
    - What do you think about it?
    - What does it make you wonder?

Visual Support 2.1

- Display Visual Support 2.1. Have students view the image and write a one-sentence response to each question on the board.
- Have students share their writing with their partner.
- Tell students they will read with a partner and annotate the text by underlining key details, writing questions in the margins and circling parts of the text they do not understand.
- Allow students to begin their close reading of the passage.
- After students read the first three paragraphs, prompt them with the question: "What challenges did Walker encounter earlier in her life?"
    - » Answers may vary but could include being born on a plantation, being orphaned at age seven, working as a laundress to support her family.

Visual Support 2.2

- Display Visual Support 2.2 and have students turn and talk with their partner to respond to each question you wrote on the board. Remind students to signal when both partners have contributed to the conversation.
- Allow students to continue reading the next three paragraphs.
- After students read the next three paragraphs, have them pause and ask: "What were some of the innovative steps Walker took to develop her hair care products?"
    - » Answers may vary but could include experimenting with different materials to improve Annie T. Malone's hair care formula, changing her name to establish her own brand.

Visual Support 2.3

- Show Visual Support 2.3. Have students turn and talk with their partner to respond to each question you wrote on the board. Remind students to signal when both partners have contributed to the conversation.

Visual Support 2.4

- Show Visual Support 2.4. Have students turn and talk with their partner to respond to each question you wrote on the board. Remind students to signal when both partners have contributed to the conversation.
- Allow students to finish reading the text.
- After students have read the text, have them update their KWL charts (Activity Page 1.1) with any new findings or questions that arose during their close reading.
- Conclude by asking students to expand the following sentence about Madam C. J. Walker:
    - Madam C. J. Walker opened a factory and beauty school.
    - When?:
    - Where?:
    - Why?:
        - » Answers may vary but could include:
    - Madam C. J. Walker opened a factory and beauty school.
    - When?: 1910
    - Where?: Indianapolis, Indiana
    - Why?: to address issues Black women had with their hair

In 1910, Madam C. J. Walker opened a factory and beauty school in Indianapolis, Indiana, to address issues Black women had with their hair.

- Have a few student volunteers share their annotations and expanded sentences with the class.

"Innovative Entrepreneurs: Madam C. J. Walker"

To be an **entrepreneur**, you have got to start with a good, innovative idea, and you have to believe in it enough to build a business from it. Sometimes that can be risky. You might lose all the money you start with. And you might be starting from a very difficult place. But if you stick with it—and if you use creative thinking to find new ways to solve problems—you might just find yourself a success.

A Difficult Start

The woman who became Madam C. J. Walker was born on December 23, 1867, on a plantation in Louisiana. Her parents named her Sarah Breedlove. Sarah was the youngest of six children, as well as the first child in her family born after the Thirteenth Amendment, which abolished slavery. Orphaned at age seven, Sarah went to live with her older sister, Louvenia. As time went on, she got married, had a daughter, and moved around the country to different places. By the early 1900s, she was working as a laundress, or someone who washes clothes, to support her family. It was a difficult struggle, but Sarah was a **resilient** person. She did not give up, no matter how tough it got.

Working in a laundry in the late 1800s was a dangerous job, full of hot steam and powerful lye soap, which was made from the ashes of burned wood. Over time, the work and the chemicals in the soap began to affect Sarah, and her hair started to fall out. Other Black women Sarah knew had similar problems, partly because the hair products available at the time did not work well for them. Sometimes they even made hair problems worse.

Sarah worked to find a solution to keep her hair healthy. Her brothers were working as barbers, and she began to experiment, taking what they taught her about hair care as a starting point. Before long, she learned about a company called Poro, run by another Black entrepreneur named Annie T. Malone. Poro's hair products helped restore Sarah's hair. Sarah, now curious, wanted to learn why. What about Malone's formula had been so successful? And were there ways to improve it even more? She decided to join Malone's sales team to help spread the word about the product and to learn about the business of hair and beauty.

Becoming Madam C. J. Walker

Sarah moved to Denver, Colorado, where she continued to work as part of Malone's sales force. The whole time, she never stopped thinking creatively. She still was not satisfied with some things about Malone's formula. So she experimented with different materials, looking for innovative ways to combine them. As she experimented, she tested her formulas on herself.

In the end, Sarah came up with a formula that included many different ingredients. Her formula combined a very pure form of a chemical called **sulfur**, as well as **beeswax**, coconut oil, and a bright, blue crystal called copper sulfate. The sulfur in the formula had a strong odor, so Sarah added a violet perfume to make it smell sweet.

While developing this new secret formula, Sarah married a newspaper man named Charles Joseph Walker. Deciding the time was right to go into business for herself, she changed her name to something much more dramatic—Madam C. J. Walker—and launched her own new line of hair care products. One was called "Madam Walker's Wonderful Hair Grower." At last, Sarah—now Madam C. J. Walker—was taking the risk of becoming an entrepreneur.

Innovation Plus Effort

To be a successful entrepreneur, it is not enough just to have a secret formula. Customers had to know about the new product, why it was better than the old product, and how it could help them. And from early experiences, back when she was losing her hair and looking hard for a solution, Madam Walker had learned many people did not know that treatments like her new Wonderful Hair Grower were available. Not everyone had barbers for brothers or the ability to do chemistry experiments! Walker had a new problem to solve: how would she get her hair treatments to the people who needed them most? She had innovated on hair care. Now she had to innovate new sales techniques to sell it.

Walker started to solve this problem by being careful where she chose to advertise her product, or tell people about it. She focused on independent Black-owned newspapers, where the people who could most use her Wonderful Hair Grower were likely to see it. Walker also started to sell her "Wonderful Hair Grower" door to door. To help people trust her and her products, she used herself as a model, explaining her story and showing off the full head of hair her research and work had helped her grow. Personal connection by personal connection, ad by ad, she started to build up loyal customers for herself.

Walker sold her products in person, at fairs, and at events put on by her church. The members of Walker's church believed strongly in entrepreneurship, and friends she met there, like teacher Jessie Batts Robinson, helped mentor her, or guide her work. Collaboration can be an important part of successful innovation, so Walker relied on her friends like Robinson for advice. Another friend named Alice Kelly eventually became so important to Walker that she offered Kelly a job managing one of her factories.

The "Wonderful Hair Grower" was followed by another successful innovation called the "Walker System," a step-by-step process for using Walker's products and iron combs to care for hair. As her business grew, so did her sales force. Walker taught other women to sell her products door to door, as she had done. These uniformed salespeople, dressed in white shirts and black skirts, were referred to as "beauty culturists." Over time, people began to see them more and more often across the United States.

A Lasting Legacy

By early 1910, Walker's business was booming. She relocated to Indianapolis, where she was able to build a factory, a laboratory, a salon, and a beauty school to train more sales agents. The Madam C. J. Walker Manufacturing Company was born. As Walker's fleet of beauty culturists grew, so did her customer base. Her products began to appear in drugstores, and she began to travel farther and farther away on sales trips. Slowly but surely, Walker's products and treatments found homes in countries like Cuba, Jamaica, Haiti, Panama, and Costa Rica. Her American innovations were starting to find a worldwide audience.

Through her work and innovations, Madam C. J. Walker was the first woman in America to become a self-made millionaire. Like many entrepreneurs, Walker also practiced **philanthropy**, or using money and resources to help other people. Walker moved to an office in Harlem, New York, that had been built from two houses. The office had been designed by the architect Vertner Woodson Tandy, who would also eventually design her home, a famous mansion named Villa Lewaro. The office included a beauty parlor and a school to train Walker's beauty culturists. From both places, Walker worked to establish scholarships for students. She donated large amounts to retirement homes and other organizations. She also used her powerful voice to speak up for the safety and rights of other Blacks, and she turned her home into a gathering place for writers like Zora Neale Hurston and thinkers like W. E. B. DuBois.

D Differentiation

Challenge

Challenge students to expand the given sentence in multiple ways. Encourage students to incorporate additional details, varied sentence structures, and descriptive language.

Support

Provide sentence starters or frames to help students structure and expand their sentences. For example, you can offer prompts like "In [year], [person] [action] in [location] because [reason]."

Madam C. J. Walker started with a good, innovative idea for a new hair treatment. She worked creatively, using the best technology available, and she found new ways to collaborate with friends and her sales team to reach people around the world. It was a risk. She had started from a difficult place. But in the end, she got where she was going—and through her innovations and her philanthropy, she made it better and easier for the people who would come after her.

DISCUSS THE READING (10 MIN.)

- Have students use evidence or quotations from the text to discuss the following questions:

1. **Literal.** What products did Madam C. J. Walker create?
    - » She created a line of beauty and hair care products, including the Wonderful Hair Grower.
2. **Inferential.** How did Walker's products address her customers' needs?
    - » Her products made Black peoples' hair healthier and helped them style it.
3. **Inferential.** Why might Madam C. J. Walker's innovations be considered groundbreaking during her time?
    - » She came up with new things and made big changes in the beauty and hair care industry. Her success in starting her own business also helped women by giving them chances to make money and have jobs.
4. **Evaluative.** How did collaboration play a role in Madam C. J. Walker's success?
    - » Collaboration was really important for Madam C. J. Walker's success. She had friends who helped and gave her advice, like her friend Jessie Batts Robinson. Madam Walker also had a team of women, called beauty culturists, who sold her products. They worked together to make her business grow. So, collaborating, or teaming up with others, helped Madam C. J. Walker in her business.
5. **Evaluative.** What does the text tell you about the importance of having a good, innovative idea when starting a business?
    - » Answers may vary but could include that recognizing an unmet need and finding a solution to address it is crucial when starting a business. Madam C. J. Walker identified a significant gap in the market for effective hair treatments for Black people and developed an innovative solution.

WORD WORK: *ENTREPRENEUR* (5 MIN.)

1. In the text, you read, "To be an entrepreneur, you have got to start with a good, innovative idea, and you have to believe in it enough to build a business from it."
2. Say the word *entrepreneur* with me.
3. *Entrepreneur* means a person who starts and owns a business.
4. In 1910, Madam C. J. Walker started her business, making her an entrepreneur.
5. If you were an entrepreneur, what kind of business would you start? Be sure to use the word *entrepreneur* in your response.
    - Ask two or three students to use the target word in a sentence. If necessary, guide and/or rephrase students' responses to make complete sentences: "If I were an entrepreneur, I would start a ___ business because___."
6. What part of speech is the word *entrepreneur*?
    - » *noun*

Using a Sharing activity for follow-up. Say, "Turn to the person sitting next to you and share another entrepreneur you have heard of, and what business they started. Be sure to use the word *entrepreneur* in your discussion."

Lesson 2: Entrepreneurs as Innovators

Writing

Primary Focus: Students will use textual evidence to write paragraphs summarizing the key achievements of Madam C. J. Walker. **[W.4.2]**

MODELING: PARAPHRASING (5 MIN.)

Visual Support 2.6

- Display Visual Support 2.6.
- Tell students they will be writing paragraphs summarizing Madam C. J. Walker's key achievements.
- Explain that writers paraphrase text to help avoid plagiarizing and to demonstrate that they understand what they have read.

- Model by writing a direct quote from Madam C. J. Walker then writing a paraphrased sentence of the direct quote from the text, highlighting and discussing keywords that helped you understand, as seen below:

DIRECT QUOTE from Text (use quotation marks)	PARAPHRASED Text (your own words)
" . . . Sarah came up with a formula that included many different ingredients. Her formula combined a very pure form of a chemical called **sulfur**, as well as **beeswax**, coconut oil, and a bright, blue crystal called copper sulfate. The sulfur in the formula had a strong odor, so Sarah added a violet perfume to make it smell sweet."	
	Show plagiarism example here: Sarah devised a formula that included many different ingredients. Her formula combined a very pure form of a chemical called sulfur, as well as beeswax, coconut oil, and a bright, blue crystal called copper sulfate. Due to the strong order of the sulfur, Sarah decided to add a violet perfume to make it smell sweet.

- Define and demonstrate an example of plagiarizing for students. Bring students' attention to the example of plagiarizing, as seen on Visual Support 2.6.
- Tell students that plagiarism is like stealing another author's words.
- **Turn and Talk:** Is this paraphrased or plagiarized? Explain how you know when a text is plagiarized. Remind students to signal when both partners have contributed to the conversation.
  - » Plagiarized. Students should answer that the writer's sentence is not in their own words, the wording is almost identical.
- Explain that while the wording is not identical, it is still too similar to be considered a paraphrase.
- Tell students that the writer did not change the words enough from the original text, which constitutes plagiarism.
- Have students take out Activity Page 2.2.
- Draw students' attention to the reminder "your own words" written on the Paraphrased Text side of their charts.

Activity Page 2.2

- Tell students that now that they have had some exposure to paraphrasing excerpts of a text, using *Madam C. J. Walker*, they will practice paraphrasing excerpts of the passage.
- Leave Visual Support 2.6 displayed while students apply the skill with a partner.

PARAPHRASING TEXT (20 MIN.)

- Tell students that they will work together to better understand and paraphrase key achievements of Madam C. J. Walker as an innovator.
- Tell students that they will have fifteen minutes to complete this task, and they may apply the skill to more than one direct quote if time permits.
- Allow students to use a thesaurus from the classroom library or online thesaurus to find synonyms when they need to use another word with the same meaning as a word in the text.
- Using Activity Page 2.2, have students work with their designated partner.
- Allow a few partners to share the direct quote and how they paraphrased it. Student responses should not include plagiarism or language copied verbatim from the passage. Instead, students should use their own words with keywords from the text, used sparingly.

Check for Understanding

Ask, "Why do researchers and writers paraphrase text?"

» to help avoid plagiarizing and to demonstrate that they understand what they have read

ML/EL

MULTILINGUAL/ENGLISH LEARNERS

Writing

Paraphrasing Text

Entering/Emerging	Provide sentence starters for paraphrasing, such as "In the text, it says . . . ," or "According to the passage . . . ." to help students begin their paraphrased sentences. Offer additional support by allowing the use of bilingual dictionaries or translating tools to find equivalent words in their native language.
Transitioning/ Expanding	Have students work in pairs or small groups to discuss and paraphrase the text collaboratively. Provide a word bank with synonyms for common words in the text.
Bridging	Have students work in pairs to complete the Paraphrasing Text chart.

WRITING: ENTREPRENEURS AS INNOVATORS (15 MIN.)

Activity Page 2.3

- Distribute Activity Page 2.3 and review the prompt it contains.
  - Prompt: What were some of Madam C. J. Walker's key achievements as an innovator? How did her contributions have a positive impact on her society?
- Allow students to synthesize and use the information from the Paraphrasing Text side of their charts to write a response to the prompt.
- Collect students' work at the end of the lesson.

End Lesson

LESSON

3

Inventions Used in Daily Life

PRIMARY FOCUS OF LESSON

Reading

Students will describe how the patent system is connected to innovation and how inventions improve daily life. **[RI.4.3]**

Students will demonstrate an understanding of the Tier 2 word *perishables*. **[L.4.4]**

Writing

Students will practice developing research questions and compile a bibliography to support their research. **[W.4.8]**

FORMATIVE ASSESSMENT

Activity Page 3.3	**Practice Bibliography Page** Students will identify various sources of information to answer questions. **[W.4.8]**

Teacher Presentation Screens:
all lessons include slides

LESSON AT A GLANCE

	Grouping Recommendations	Time	Materials
Reading (50 min.)			
Introduce the Reading	Whole Group	5 min.	❑ "Inventions Used in Daily Life" ❑ Visual Supports 3.1–3.9 ❑ Activity Pages 3.1, 3.2
Reading for Information	Partner	40 min.	
Word Work: *Perishables*	Whole Group	5 min.	
Writing (40 min.)			
Inquiry and Research Process	Whole Group	20 min.	❑ Visual Support 3.10 ❑ Activity Pages 1.1, 3.3
Independent Research	Independent	20 min.	

ADVANCE PREPARATION

Reading

- Predetermine reading partners.
- Prepare to demonstrate using a search engine to search for "inventor of the dishwasher" to find Josephine Cochrane.

Visual Supports 3.1–3.9

- Prepare to project Visual Supports 3.1–3.9.

Writing

- Gather research resources, including books, magazines, and online articles and databases related to the unit's ideas (e.g., patents, prototypes, the innovation cycle, and various innovators in fields, such as medicine, music, STEM, and entrepreneurship).
- Plan for one-on-one computer usage in the school library, computer lab, or classroom so students may conduct independent research.
- Prepare to review the following Internet research guidelines (or other guidelines that reflect your school's technology policy) and to monitor students on computers:
    - When searching the Internet, students will only type the following in the search engine:
        1. the words in their research questions
        2. ideas or topics related to their research questions
        3. names of places, people, and things related to the research questions, ideas, or topics

Visual Support 3.10

- Prepare to project Visual Support 3.10, or recreate the list on an anchor chart that can remain on display in the classroom after this lesson.
- Prepare to project Activity Page 3.3.

Universal Access

Reading

- To ensure all students have the opportunity to contribute during Turn and Talk and Think-Pair-Share exchanges, provide students with a signal, such as folding their hands or raising a hand to indicate when both partners have added to the conversation.

- Chunk the text so that students can focus on reading about one inventor at a time while completing Activity Page 3.2.

Writing

- Prepare questions for students (Who was ___? What were ___? Why was ___? When was___? How did ___? Where did ___?).
- Prepare and distribute a list of websites that may assist with student research and bibliography writing.

VOCABULARY

Core Vocabulary

- You may choose to preview the vocabulary words before reading the text.

patent, n. a legal document that gives someone permission to be the only creator of something

intellectual property, n. an original idea and creation that comes from someone's mind.

collided, v. bumped into something with force

filter, n. a special tool that helps to clean or separate things

stenographer, n. person who writes things down to capture spoken words accurately during meetings or speeches using a special machine

perishables, n. things that will spoil or go bad if not kept under specific conditions

preserve, v. to save or keep for a longer time

Vocabulary Chart for "Inventions Used in Daily Life"

Vocabulary Type	Tier 3 Domain-Specific Words	Tier 2 General Academic Words	Tier 1 Everyday Speech Words
Vocabulary	patent intellectual property stenographer	collided filter perishables preserve	
Spanish Cognates	patente propiedad intelectual estenógrafo	filtro perecederos preservar	
Multiple-Meaning			
Sayings and Phrases			

Start Lesson

Lesson 3: Inventions Used in Daily Life

Reading

50M

Primary Focus

Students will describe how the patent system is connected to innovation and how inventions improve daily life. **[RI.4.3]**

Students will demonstrate an understanding of the Tier 2 word *perishables*. **[L.4.4]**

INTRODUCE THE READING (5 MIN.)

- Remind students that in the previous lesson they learned about Madam C. J. Walker and the way she innovated hair care.
- Ask, "What invention resulted from Walker's innovative approaches?"
  - » Her new hair product—Madam Walker's Wonderful Hair Grower
- **Turn and Talk:** Ask, "How have inventions made everyday tasks easier for people?" Remind students to signal when both partners have contributed to the conversation.
  - » Answers may vary but could include that inventions like washing machines have made doing laundry easier because they save time and effort compared to washing clothes by hand. Remind students to signal when both partners have contributed to the conversation.
- Model thinking about an example of something you use daily by saying, "Now, the dishwasher is an invention that has really made my life easier. Instead of spending a lot of time washing dishes by hand, I can simply load them into the dishwasher, add some soap, press a button, and voila! The machine does the work for me. This invention saves me a lot of time and effort. I really appreciate the person who came up with the idea of the dishwasher. I wonder who that person is?"
- Briefly explain the Internet search guidelines for students using the following steps or your school's approved technology policy.
- Tell students that they should only type the following things in the search engine: 1) the words in their research questions 2) ideas or topics related to their research and 3) names of places, people, and things related to the research questions, ideas, or topics.
- Demonstrate how information about American inventor Josephine Cochrane is generated by using a search engine.

- Allow students to see you typing the following words into the search engine, "inventor of the dishwasher" to find information about Josephine Cochrane.
- Show students an image of Josephine Cohrane and an image of her patent drawing of the dishwasher.
- Briefly explain that inventors submit applications for patents to the United States Patent and Trademark Office. Tell students that the patent applications must explain the purpose of the invention and include a sketch of the invention to help show how it will work.

READING FOR INFORMATION (40 MIN.)

- Assign reading partners.
- Have students take out Activity Page 3.1.

Activity Page 3.1

Note: A full copy of the text can be found at the end of the Reading for Information segment.

- Read the last paragraph about the mailbox aloud from the text. As you read, pause to identify key information for students.
- For example, highlight important dates like '1891' when Downing's mailbox patent was approved, or a notable fact about the widespread adoption of his design in cities like New York, showing that his invention had a significant impact beyond just its creation.
- Write the following questions on the board before students begin reading:
  - What do you see?
  - What do you think about it?
  - What does it make you wonder?

Visual Support 3.1

- Display Visual Support 3.1. Have students view the image and write a one-sentence response to each question on the board.
- Have students share their writing with their partner.

Visual Support 3.2

Activity Page 3.2

- Display Visual Support 3.2. Have students turn and talk with a partner about what they see, think, and wonder. Remind students to signal when both partners have contributed to the conversation.
- Instruct students to begin reading with their partner for important information, using Activity Page 3.2 to document facts about each inventor.

- After students have read the first six paragraphs, pause and ask: "How did Philip Downing improve the design of the mailbox to address the problems with earlier designs?"
    - » Answers may vary but could include he added a curved top to prevent snow and rain from building up on top of the box, or he made the mailbox out of strong metal to withstand wear-and-tear.

Visual Support 3.3

- Display Visual Support 3.3. Have students turn and talk with their partner to respond to each question you wrote on the board. Remind students to signal when both partners have contributed to the conversation.
- Allow students to read the next six paragraphs. Then ask, "What problem did Garrett Morgan identify with the early traffic lights, and how did he solve it?"
    - » Answers may vary but could include that Garrett Morgan identified that when the signal changed from "go" to "stop," there was no warning for drivers, which could lead to accidents. To solve this problem, Morgan invented a third sign that signaled "caution" before the "stop" signal, giving drivers a warning to slow down.

Visual Support 3.4

- Display Visual Support 3.4. Have students turn and talk with their partner to respond to each question you wrote on the board. Remind students to signal when both partners have contributed to the conversation.

Visual Support 3.5

- Display Visual Support 3.5. Have students turn and talk with their partner to respond to each question you wrote on the board. Remind students to signal when both partners have contributed to the conversation.
- Have students read the next four paragraphs then ask, "Why was Josephine Cochrane frustrated with washing dishes by hand?"
    - » Answers may vary but could include her dishes were often chipped and cracked when being washed by hand, or the large piles of dishes resulting from hosting events and parties were difficult and time-consuming to wash manually.

Visual Support 3.6

- Display Visual Support 3.6. Have students turn and talk with their partner to respond to each question you wrote on the board. Remind students to signal when both partners have contributed to the conversation.
- Allow students to finish reading for information.

Visual Support 3.7

- Display Visual Support 3.7. Have students turn and talk with their partner to respond to each question you wrote on the board. Remind students to signal when both partners have contributed to the conversation.

Visual Support 3.8

- Display Visual Support 3.8. Have students turn and talk with their partner to respond to each question you wrote on the board. Remind students to signal when both partners have contributed to the conversation.

Visual Support 3.9

- Display Visual Support 3.9. Have students turn and talk with their partner to respond to each question you wrote on the board. Remind students to signal when both partners have contributed to the conversation.
- Afterward, facilitate a discussion to review some of the information from the text to ensure students have synthesized it correctly.

Discussion Questions

1. **Literal.** What objects are mentioned in the text as examples of everyday inventions?
    - » The text mentions objects, such as traffic lights, dishwashers, refrigerators, and mailboxes as examples of everyday inventions.
2. **Literal.** What did Florence Parpart invent after being splashed by someone sweeping mud and dirt from the streets?
    - » a mechanical street sweeper
3. **Inferential.** Why would General Motors need to purchase Garrett Morgan's patent for a traffic light?
    - » Answers may vary but could include so they could be the only ones allowed to make and sell his traffic light.
4. **Inferential.** Why do you think Philip Downing chose to focus on improving the design of the mailbox? Explain your thinking by saying, "He focused on improving the design of the mailbox because___. He focused on improving the design of the mailbox, but___. He focused on improving the design of the mailbox, so ___."
    - » Answers may vary but could include he focused on improving the design of the mailbox because he saw a common problem with existing designs. He focused on improving the design of the mailbox, but also aimed to make mail delivery safer. He focused on improving the design of the mailbox, so more people could receive and send mail easily and wanted to create a solution to make the mailing process more efficient and convenient for people.
5. **Evaluative.** How do you think the world would be different if inventions like mailboxes and traffic lights were never created?
    - » Answers may vary but could include without inventions like mailboxes and traffic lights, communication and transportation systems would be less efficient, potentially leading to more chaos and inconveniences in daily life.

6. **Evaluative.** What do you think might happen if inventors did not have patents for their inventions?
    - » Answers may vary but could include if inventors did not have patents, they might worry that someone could steal their ideas without asking. This might make them less likely to share their inventions with the world.

"Inventions Used in Daily Life"

Do you still like the same things you liked last year? What about three years ago? Many things about us change over time. From day to day, it is hard to notice it happening. But over time, things might start to become very different.

It is the same with the world around us. Every day, we pass street lights, paved roads, telephone poles, and people on cell phones. If we went back in time by a week, we would probably notice mostly the same things. But if we went back ten years, things might start to look a little bit different. And if we went back farther—fifty years, one hundred years, two hundred years—things might appear very, very different!

Many of the objects around us today—even the shoes on our feet, or the pavement we walk on—result from someone else's creative thought. Here are just a few examples of those inventions we use in everyday life.

Mailing It In

Perhaps you have noticed it: a dark blue metal box standing right on the busy street. It has a curved top with a little door that creaks open. When you open it, anyone can drop their mail and be sure it will be safe. At certain times during the day, a mail carrier comes to pick up the mail and deliver it to a nearby post office. From there, it will be sent to its destination.

Did you know that such boxes did not always exist? Before the invention of the mailbox, people had to travel long distances to reach mail centers. There were public boxes where people could drop mail, but these boxes came with their own problems. They were too small, inconveniently placed, and often lacked privacy. Sometimes, they failed to protect the mail inside from rain and snow.

After one too many soaking wet letters, a Rhode Island inventor named Philip Downing got to work. He studied previous popular mailbox designs, and he noted what worked well and what needed to be improved. He added a curved top to his design, which would prevent snow and rain from building up on top of the box. The mailbox also had to be a strong metal so it could withstand

general wear-and-tear. The hinged door was an important part of Downing's design. It prevented snow or rain from falling into the box on top of mail. As for privacy, only an official mail carrier had the key to open the box.

Downing filed a **patent** for his design with the United States Patent Office. A patent gives an inventor exclusive rights to their invention, protecting them from copycats and imitations. Patents are important as a type of **intellectual property**. By holding a patent, inventors like Downing can be sure that they also hold ownership of their inventions.

In 1891, the patent for Downing's mailbox design was approved. Cities all over the country implemented this design to great success. Today, New York City alone has over seven thousand mailboxes that use the features Downing designed! Much of Downing's original design has not changed since its debut. People with mail to send and the postal workers who carry it still depend on the results of his problem-solving skills to make their lives easier in cities all over the United States. And while none of these boxes bear Downing's name, the people who use them surely owe him a debt of gratitude.

Red Light, Yellow Light, Green Light, Go!

Imagine a time when driving a car was still new. Many roads were bumpy and unpaved, and new car drivers **collided** with carriages drawn by horses. The results were often chaotic. To help solve this problem, the first traffic signals began to appear in the United States in the early years of the twentieth century. But they were not perfect solutions. To manage traffic during the day, a police officer would be on duty at an intersection, or a place where two roads meet, to switch the signals between "stop" and "go." If the officer did not switch to "stop" fast enough, there could be accidents. At night, the problems got worse. Because the signals were not easy for drivers to see in the dark, some early traffic lights used lamps that burned a special kind of oil called kerosene. They were not very safe to use, because sometimes, the kerosene in these night lights would explode.

After witnessing a terrible road accident, an Ohio inventor named Garrett Morgan used creative thinking to find a solution. He considered all the problems in the traffic lights he had seen, and he decided that one problem stood out most. When the sign changed from "go" to "stop," there was no warning, and drivers had to slam down their brakes. It takes a fast-moving car a little bit of time to slow down. If a car was too close to the intersection when the light changed to "stop," it might end up stopping in the middle of the intersection by mistake.

With this in mind, Morgan took the original design already available on roads and invented a key adjustment: a third sign. Instead of just "stop" and "go," this third sign signaled "caution." This would give drivers a warning that a "stop" signal was coming up, so they could begin to slow down. This led to fewer drivers accidentally running through red lights. The patent for Morgan's new and improved three-part traffic signal was approved in 1923. It was such a success that General Motors decided to purchase Morgan's patent, so it could manufacture his traffic lights nationwide. Over time, Morgan's T-shaped traffic light evolved into the electric model we see on the roads today, with its three lights: red for stop, green for go, and yellow for that much-needed caution.

The Dishwasher

Another notable inventor from Ohio was Josephine Cochrane. Cochrane's duties as a housewife included hosting events and parties. As was common, these parties often resulted in piles and piles of dishes in the sink. Cochrane liked to use her loveliest dishes to charm her guests, and she was frustrated to find that the dishes were often chipped and cracked when being washed. She was the daughter of inventors and engineers herself. Her grandfather, John Fitch, had patented the first steamboat. Thinking of her family history, she turned her frustration over her damaged dishes into creative thinking and problem solving. Cochrane grew determined to invent a device that would automatically wash dishes but that would not damage them. People doubted her mechanical knowledge. But Cochrane worked tirelessly to make her vision a reality.

Receiving a patent in 1886, Cochrane's design was a true marvel: a dish-washing machine that held dishes in place while spraying them with hot, soapy water. It was capable of taking in 200 dirty dishes at a time, then returning 200 clean ones in only a few minutes. What is more, none of the dishes were damaged! The Garis-Cochrane dishwasher was born.

Although her invention was inspired by a problem she had faced at home, for many years the Garis-Cochrane dishwasher was too expensive for most families. It required a large amount of hot water, so hotels and restaurants, which had to wash a lot of dishes to stay in business, were more likely to buy them.

Today, dishwashers are more sophisticated. They can **filter** out, or remove small pieces of food, and they can even dry dishes as well as wash them. Dishwashers are also small enough now that many homes can use them, rather than just large restaurants. Each new version of the dishwasher is a new invention, and each is built on the original designs of one very determined inventor named Josephine Cochrane.

Keeping It Cool

Florence Parpart, New Jersey housewife and **stenographer**, was no stranger to problem solving. A stenographer is someone whose job is to take notes during meetings using a special code of abbreviations. Parpart worked for the Eastern Sanitary Street Cleaning Company, and would have been in many meetings, carefully listening and taking notes. As she wrote, she also developed her own ideas.

After getting splashed by someone sweeping mud and dirt from the streets, Parpart decided to put one of her ideas into practice. She filed a patent for a new mechanical street sweeper that would result in cleaner streets and fewer muddy pedestrians. The invention was successful, and mechanical street sweepers are still a common sight on the streets of big cities today.

Parpart's next big challenge was the refrigerator. Before her invention, most people had a hard time storing **perishables**, or items like food and medicine that were difficult to **preserve**. They would move these to a cool place, like a basement or root cellar. Many people used iceboxes, which are exactly what they sound like: a small box with a huge block of ice in it. A metal rack inside would hold food, and workers would deliver large blocks of ice from door to door. Over time, the ice in an icebox would melt. Parpart thought she could improve on this. Working with her husband, an electrician named Hiram Layman, she designed a system that used electrical power to send cold water circling through a sealed box. This kept everything inside the box cold—as long as you had access to electricity, of course.

Parpart patented her invention, and the results were revolutionary. People were able to keep food and some forms of medicine fresh for a longer time. And just as the street sweeper kept people from having to do the hard work of cleaning the streets by hand, the refrigerator saved many people from the work of hauling huge blocks of ice into their basements.

Conclusion

These inventions have each changed our world in big ways. Our cities and homes look different, and the ways we live have become different, too. If you showed someone from Josephine Cochran or Garrett Morgan's time a modern city street, they might not recognize it. But many of the inventors discussed above were able to think ahead and imagine a little bit of what the world might look like in the future.

While people from over a hundred years ago might find it hard to imagine our world today, it is just as difficult for us to imagine what the world a hundred

years in the future might look like. In the days before these inventors, soaking wet mail, hand-operated traffic lights, broken dishes, and iceboxes were all normal parts of life. What are the difficult parts of life today that, one hundred years from now, some future student might read about? What are the inventions that could solve those problems? If you think carefully and creatively about this, then like the inventors of the past, you might just invent the thing you are looking for.

WORD WORK: *PERISHABLES* (5 MIN.)

1. In the text you read, "Before her invention, most people had a hard time storing perishables."
2. Say the word *perishables* with me.
3. Perishables means things that will spoil or go bad if not kept under specific conditions.
4. Florence Parpart's invention of the refrigerator made it easy to store perishables, like milk and cheese.
5. What are some other perishables that can spoil if not stored properly? Be sure to use the word *perishables* in your response.
    - Ask two or three students to use the target word in a sentence. If necessary, guide and/or rephrase the students' responses to make complete sentences: "Perishables that can spoil are ___ and ___."
6. What part of speech is the word *perishables*?
    - » noun

Use a Making Choices Activity for follow-up. Say, "I will read a statement about something related to perishables. After I read the statement, you will say, 'That would lead to wasting perishables' or 'That would help preserve perishables.'"

1. leaving fruits and vegetables out in the sun for too long
    - » That would lead to wasting perishables.
2. placing meat and dairy products in the refrigerator
    - » That would help preserve perishables.
3. leaving milk out of the refrigerator for too long
    - » That would lead to wasting perishables.

D Differentiation

Challenge

Have students identify a modern invention not covered in the text and research its original patent. They should discuss how the invention has evolved over time, addressing specific improvements or changes, and share their findings with the class.

Support

Support a small group of students by rereading portions of the text aloud, conferencing with them on their Activity Page 3.1 notes.

4. using airtight containers to store leftovers in the fridge
    - » That would help preserve perishables.
5. keeping canned goods in a cool and dry pantry
    - » That would help preserve perishables.

Check for Understanding

Ask, "What does it mean for an inventor to receive a patent?"

- » This means that others cannot make, use, or sell the invention without the inventor's permission.

ML/EL	MULTILINGUAL/ENGLISH LEARNERS **Reading** **Reading for Information**
Entering/Emerging	Chunk the text to aid students' comprehension.
Transitioning/ Expanding	Provide a glossary of key terms related to patents and inventions in both English and students' native languages.
Bridging	Incorporate academic vocabulary related to the reading activity, such as "analyze," "synthesize," and "evaluate," to enhance language proficiency.

Lesson 3: Inventions Used in Daily Life

Writing

Primary Focus: Students will practice developing research questions and compile a bibliography to support their research. **[W.4.8]**

INQUIRY AND RESEARCH PROCESS (20 MIN.)

- Begin by explaining to students why research is important. Say, "It helps us explore new ideas, deepen our understanding of topics, and discover new knowledge."

Visual Support 3.10

- Display Visual Support 3.10.
- Tell students that the research process is a cycle with the following steps:
  1. Find an idea/topic that interests them.
  2. Write a research question.
  3. Use sources to find answers or facts.
  4. Write about the idea/topic.
- Explain that today students will focus on the first two steps, finding a topic and writing practice questions, based on their interests about ideas they have started to explore in the unit.
- Clarify that students will not search for answers yet. Instead, they will compile a list of sources called a bibliography.
- Review the definitions of *source* and *bibliography*.
  - Explain that a source is a book, person, or other material that gives information.
  - A bibliography is a list of books, magazines, articles, or websites, about a particular subject.
- Ask students why research questions are important to the research process.
  - » Answers may vary but could include a research question that is important for focusing our learning and discovering more about a topic.
- Explain that asking questions and then learning about something that interests them about a topic is very exciting.
- Direct students to revisit the KWL chart (Activity Page 1.1).
- Encourage students to review the "W" column of their KWL chart and use it as a starting point for generating research questions. Ask them to consider what topics they are most curious about or interested in exploring further.
- After reviewing the KWL chart, explain that students will need to narrow down their list of questions to focus on one main research question.
- Tell students that research questions should be open-ended, meaning that they can use it to get more information, instead of a close-ended question that limits responses to yes/no or short answers.
- Ask students to put a thumbs-up if a question is open-ended and thumbs down if a question is close-ended: Are strawberries red? *(close-ended)*, How are strawberries grown? *(open-ended)*, What date did Philip Downing receive his patent? *(close-ended)*, How did the mailbox impact American history? *(open-ended)*.

- Ask students if they have any questions about any step of the research process you have explained so far.
  - » Answers may vary but could include questions about steps 1–2 of the research process.
- Remind students that asking open-ended questions will lead to meaningful research, noting that they can refine their questions with the help of teacher feedback.

INDEPENDENT RESEARCH (20 MIN.)

- Show students sources you have collected in the classroom library.
- Project Activity Page 3.3.
- Begin with a think-aloud strategy where you express your interest and formulate a research question. You may say, "I am interested in learning more about Garret Morgan's traffic light. Here is my research question: In what ways did Garret Morgan make traffic lights better than the ones before?"
- On the projected Activity Page 3.3, write your research question: "In what ways did Garret Morgan make traffic lights better than the ones before?" in the space provided.
- Proceed to demonstrate how a question can be used to search for additional information on the Internet by typing the question into a search engine. As you do so, explain how the search results provide a starting point for exploration and show students the variety of sources that appear.
- Click on a website to demonstrate finding sources with facts.
- In the Type of Source column, write the type of source you have found (article, website, etc.).
- In the Title of Source column, write the title of the article, for example.
- In the Source information column, write the author's name, publishing date, URL, or other information related to the source.
- Distribute Activity Page 3.3 and guide students to craft a clear research question.
- Instruct students to record three to four sources on the activity page.
- Facilitate, monitor, and assist students as needed while they are searching and completing the activity page.
- Collect the activity page at the end of the lesson.

Activity Page 3.3

End Lesson

LESSON

4

A Light Bulb Moment

PRIMARY FOCUS OF LESSON

Reading

Students will read independently to recognize the main idea and key details of the text. **[RI.4.2]**

Students will demonstrate an understanding of the Tier 2 word *current*. **[L.4.4]**

Writing

Students will use their notes to write a paragraph summarizing the advancements made to the light bulb. **[RI.4.2, W.4.9b]**

FORMATIVE ASSESSMENT

Activity Page 4.2	**"Invention Today, Innovation Tomorrow"** Students use their notes to summarize the advancements to the light bulb in a paragraph. **[RI.4.2, W.4.9b]**

Teacher Presentation Screens:
all lessons include slides

LESSON AT A GLANCE

	Grouping Recommendations	Time	Materials
Reading (70 min.)			
What Have We Already Learned?	Whole Group	5 min.	❑ "A Light Bulb Moment" ❑ Visual Supports 4.1–4.10 ❑ Activity Page 4.1
Modeling Note-Taking	Whole Group	10 min.	
Independent Reading	Independent	40 min.	
Discussing the Main Idea	Whole Group	10 min.	
Word Work: *Current*	Whole Group	5 min.	
Writing (20 min.)			
Informative Writing	Independent	20 min.	❑ Activity Pages 4.2, 4.3

ADVANCE PREPARATION

Reading

Visual Supports 4.1–4.9

- Plan to project Visual Supports 4.1–4.9.

Visual Support 4.10

- Prepare to project Visual Support 4.10 to support students in answering the closing questions.

Writing

- For students who need support with their writing, plan arrangements for partner work or one-on-one time.

Universal Access

Reading

- For independent reading activities, if students need additional support, they can be assigned a partner.
- To ensure all students have the opportunity to contribute during Turn and Talk and Think-Pair-Share exchanges, provide students with a signal, such as folding their hands or raising a hand to indicate when both partners have added to the conversation.

Writing

- Have students who require additional scaffolding when writing a response for their activity page draw another graphic organizer instead where they can include details from their notes about the progression of the light bulb. In partners, or with teacher support, they can practice determining the main idea by working on one sentence that describes the progression of the light bulb.

VOCABULARY

Core Vocabulary

- You may choose to preview the vocabulary words before reading the text.

inconvenient, adj. not easy, or causing trouble

incandescent, adj. bright, glowing

current, n. 1. the flow of tiny particles called electrons through a wire or a circuit, 2. the movement of lake or ocean water, 3. happening or existing now; present

filament, n. a tiny, thread-like structure that produces light when hot

investor, n. a person who provides money to a company or project to help it grow, with the hope of gaining more money in return

fluorescent, adj. light-producing

light-emitting diode, LED, n. a small electronic device that gives off light when electricity flows through it

Vocabulary Chart for "A Light Bulb Moment"			
Vocabulary Type	**Tier 3 Domain-Specific Words**	**Tier 2 General Academic Words**	**Tier 1 Everyday Speech Words**
Vocabulary	filament light-emitting diode	incandescent investor fluorescent	inconvenient
Spanish Cognates	filamento	incandescente inversionista fluorescente corriente	inconveniente
Multiple-Meaning		current	
Sayings and Phrases	light bulb moment		

Start Lesson

Lesson 4: A Light Bulb Moment

Reading

70M

Primary Focus

Students will read independently to recognize the main idea and key details of the text. **[RI.4.2]**

Students will demonstrate an understanding of the Tier 2 word *current*. **[L.4.4]**

WHAT HAVE WE ALREADY LEARNED? (5 MIN.)

- Remind students that they learned about light bulbs in the *Eureka! Student Inventor* unit.
- **Turn and Talk:** Ask students to review some things they learned about Thomas Edison in that unit. Remind students to signal when both partners have contributed to the conversation.
  - » Answers may vary but could include that they learned he was an American inventor and owner of over a thousand patents, credited with developing the light bulb, phonograph, and microphone.
- Explain that students may remember learning about Thomas Edison before. Today, they will learn more about his invention of the light bulb—as well as improvements made to the light bulb from innovators, Lewis Latimer and Shuji Nakamura.

MODELING NOTE-TAKING (10 MIN.)

- Tell students they will read a passage called "A Light Bulb Moment." Explain that this passage is an informative text that provides information about the light bulb.
- Explain that when people say that they have had "a light bulb moment" it means that they suddenly understand something, like a light bulb turning on in their head.

Visual Support 4.9

- Display Visual Support 4.9, and explain that it will aid in understanding key details and the main idea of the text.
- Define the main idea of an informational text as the overall message about the topic that the author wants to communicate. Explain that identifying key details within the text will help students in determining the main idea.
- Tell students that the passage "A Light Bulb Moment" has a main idea, and each paragraph also contains key details that support this main idea.

- Draw students' attention to the words already printed in the key details columns on Visual Support 4.9. Explain that some key details are already filled in.
- Explain that in this lesson, students will focus on identifying the details used to illustrate the main idea of the text. Identifying and understanding the key details in each section of the text will clarify the main idea of the entire passage.
- Read the first paragraph of "A Light Bulb Moment" aloud.

Note: A full copy of the text can be found at the end of the Independent Reading segment.

> Before electricity, people only had candles, fireplaces, or oil lamps to light up the dark. This was inconvenient for many reasons. For example, fire is not always a bright source of light. Reading by candlelight strained people's eyes, and it was difficult to see into distances. These types of light sources were also open flames, so people had to be extra careful when using them. Without convenient sources of light, life was very different. Many people got up at sunrise and went to bed at sunset, using the hours of sunlight they had. Plus, traveling at night was sometimes very dangerous. Electricity changed our relationship to light, but it was a gradual change, with a lot of innovation along the way.

- Prompt students to look for the key details on the activity page. When they find it, direct them to give a thumbs up. Have students show where to write details on the model notes.
- Demonstrate how to find other key details in the text by saying, "I think I see a detail here, where it says 'Reading by candlelight strained people's eyes, and it was difficult to see into distances.' Would you agree that this is an important detail? Give me a thumbs up or thumbs down. You can give me a thumb in the middle if you are not sure."
- Write the detail 'candlelight strained people's eyes' and explain that this detail can help them determine the main idea.

INDEPENDENT READING (40 MIN.)

- Distribute Activity Pages 4.1 and 4.2.
- Tell students they will continue reading the text independently and add relevant details to Activity Page 4.2.
- Once they have done this work, they may also be ready to write down what they think the main idea of the passage is.
- Assure students that the main idea will be discussed and clarified for the whole class after they finish reading.

Activity Page 4.1

Activity Page 4.2

- Write the following questions on the board before students begin reading:
  - What do you see?
  - What do you think about it?
  - What does it make you wonder?

Visual Support 4.1

- Display Visual Support 4.1. Have students view the image and write a one-sentence response to each question on the board.
- Have students share their writing with a partner.
- Have students begin reading silently to themselves.

Visual Support 4.2

- After students have read the first two sections, display Visual Support 4.2 (Edison as a kid).
- Have students turn and talk with their partner to respond to each question you wrote on the board. Remind students to signal when both partners have contributed to the conversation.

Visual Support 4.3

- Display Visual Support 4.3 (Edison at Menlo Park with associates). Have students turn and talk with their partner to respond to each question you wrote on the board. Remind students to signal when both partners have contributed to the conversation.
- Allow students to read the next section about Lewis Latimer.
- After students have read this section, ask, "What challenges did Lewis Latimer face in his upbringing, and how did he overcome them?"
  - » Lewis Latimer faced challenges due to his parents' escape from slavery and their struggle to build a new life. Despite these challenges, Latimer began working as an assistant in a patent office where he taught himself mechanical drawing and became very skilled at creating patent drawings.

Visual Support 4.4

- Display Visual Support 4.4. Have students turn and talk with their partner to respond to each question you wrote on the board. Remind students to signal when both partners have contributed to the conversation.

Visual Support 4.5

- Display Visual Support 4.5. Have students turn and talk with their partner to respond to each question you wrote on the board. Remind students to signal when both partners have contributed to the conversation.
- Allow students to read the next section, "Fluorescents and LEDs."

- After students have read this section, have them pause and ask: What problem did both incandescent and fluorescent lights have?
  - » Incandescent and fluorescent lights were inefficient, wasting a lot of electrical energy.

Visual Support 4.6

- Display Visual Support 4.6. Have students turn and talk with their partner to respond to each question you wrote on the board. Remind students to signal when both partners have contributed to the conversation.
- Allow students to continue reading to learn about Shuji Nakamura.
- After students read the Shuji Nakamura section, have them pause and ask: What was the key chemical that helped Shuji Nakamura make blue LED light?
  - » gallium nitride

Visual Support 4.7

- Display Visual Support 4.7. Have students turn and talk with their partner to respond to each question you wrote on the board. Remind students to signal when both partners have contributed to the conversation.

Visual Support 4.8

- Tell students to finish reading the text. Then, display Visual Support 4.8.
- Have students turn and talk with their partner to respond to each question you wrote on the board. Remind students to signal when both partners have contributed to the conversation.
- Encourage students to consider why the blue LED light is important in mixing colored lights. Additionally, consider how this process differs from mixing colors on paper.

Visual Support 4.10

- Display Visual Support 4.10 to provide a visual aid that complements the discussion.
- Discuss the following questions once students finish reading:

1. **Literal.** What were the common sources of light before electricity?
   - » candles, fireplaces, and oil lamps
2. **Inferential.** Considering the challenges faced by inventors like Edison, Latimer, and Nakamura, what common traits or characteristics are important for innovators? Use information from the text in your answer.
   - » Answers may vary but could include a combination of persistence, curiosity, collaboration, and problem-solving. Edison loved learning on his own, and Latimer taught himself new skills. Edison and Latimer worked as a team, and Nakamura solved problems to create the blue LED light.

3. **Evaluative.** Why do people say, "light bulb moment," and what does it mean? Explain your thinking by saying, "People say 'light bulb moment' because . . . People say 'light bulb moment' but . . . People say 'light bulb moment' so . . ." Have students write their answers.
    - » Answers may vary but could include "People say 'light bulb moment' because they want to show when they get a great idea," "People say 'light bulb moment,' but not all ideas come instantly," or "People say 'light bulb moment,' so they can explain the feeling of sudden understanding."

"A Light Bulb Moment"

Before electricity, people only had candles, fireplaces, or oil lamps to light up the dark. This was **inconvenient** for many reasons. For example, fire isn't always a bright source of light. Reading by candlelight strained people's eyes, and it was difficult to see into distances. These types of light sources were also open flames, so people had to be extra careful when using them. Without convenient sources of light, life was very different. Many people got up at sunrise and went to bed at sunset, using the hours of sunlight they had. Plus, traveling at night was sometimes very dangerous. Electricity changed our relationship to light, but it was a gradual change, with a lot of innovation along the way.

Early electrical light bulbs had been invented by the late 1800s, but they were not easy to use. Many light bulbs, including the earliest ones, are **incandescent**. An incandescent light bulb works by passing electrical **current**, or a flow of electricity, through a thin piece of material called a **filament**. The current heats up the filament, causing it to glow with light, similar to a log in a fireplace. The problem was, in early bulbs, this filament would not stay lit for very long. Whenever these bulbs were lit, they would flicker and make hissing sounds. A bulb that hisses at you? Yikes. In order for the light bulb to come into wide use, someone had to solve the problem of the filament.

Introducing Thomas Edison

One of the key players in solving the problem of the filament was Thomas Alva Edison. As a child in the 1850s, he faced difficulties with hearing. Edison became totally deaf in one ear and hard of hearing in the other. In school, at that time, teachers often focused on asking students to memorize and recite long lists of facts. Edison, a very curious person who loved to read, was not interested in learning this way. It did not help that teachers often punished him for not being able to answer their questions.

Edison left school after only a couple of years to work for a railroad. From then on, he was responsible for his own education. It was a hard way to grow up. But at the same time, his early challenges turned him into an independent, curious, innovative thinker for life.

Menlo Park

By 1878, Edison had become well known as an inventor, and he was working in his own laboratory, or place to perform scientific experiments. He called his laboratory Menlo Park. There, he worked with many assistants, including two named Charles Batchelor and John Kruesi. Batchelor was a skilled mechanical artist who also worked as Edison's "ears," making written notes on conversations in the lab and supporting Edison in other ways. (At the time, hearing aids had not yet been invented, so Edison relied on Batchelor's help.) Kruesi took Batchelor's drawings and turned them into prototypes, or early versions of an invention. Through their collaboration, Edison and his assistants were able to experiment and develop new ideas quickly.

Edison soon became famous for the work he and his assistants were doing, which had earned him the nickname "The Wizard of Menlo Park." A group of **investors**, or people who give inventors and entrepreneurs money so that they can experiment and innovate, decided to give Edison $30,000 to try to solve the problem of the incandescent light bulb. Today, that amount of money would be worth more than a million dollars!

Edison was a creative thinker, but his lack of formal schooling meant there were serious gaps in his math knowledge. He collaborated with a man named Francis Upton, who had a degree from Princeton University. Upton provided math and science expertise Edison did not have.

It took many, many tries to find the right material for the light bulb's filament. Later in life, Edison would tell a reporter that he had not failed thousands of times with his experiments—he had just found thousands of ways that had not worked. At one point, he discovered that platinum, a rare and expensive metal, worked well. Of course, very few people could afford a platinum light bulb! By October 1879, he had hit on the idea of using carbon, a very common material found in wood, charcoal, and many other places. His final filament, which he and Upton completed in the summer of 1880, was made of fiber from a bamboo plant covered in carbon dust. In December, he lit up his lab and people from all over the world came to visit. They were in awe of the longer-lasting bulb that could now last for about fourteen hours. None of the bulbs even hissed.

Latimer

Edison worked with other innovators, too. One important innovator, inspired by Edison's work, was Lewis Latimer, born in 1848, around the same time as Edison. Latimer had a challenging upbringing. His parents had escaped from slavery, and they struggled to build a new life together with Lewis in Boston. In 1868, when he was twenty, Lewis began working as an assistant in a patent office to help his family earn money. To file a patent**,** or a claim of being the first to invent something, an inventor had to prepare a description of a new invention, as well as drawings. Latimer was fascinated by the patent drawings he got to see in his office work. Like Edison, he was a curious person who taught himself the skills he needed. By studying the drawings and spending many hours practicing, he taught himself to be a draftsman, or someone who creates mechanical drawings. This skill opened the doors to a whole new career.

Latimer knew about Edison's work and he was fascinated by it. Just as he had taught himself mechanical drawing, he wanted to teach himself everything he could about electric light. But when he experimented with making his own bulbs, he realized there was a problem. It was very difficult to apply the carbon to the bamboo filament. Latimer invented a new process, enclosing the bamboo filaments in an envelope of cardboard while carbon dust was being applied. This made electric light bulbs much easier and cheaper to make. Bulbs made with Latimer's process lasted longer, too. Soon, even people who had been hesitant to buy Edison's version of the light bulb were convinced. Latimer's version of the invention began to light up cities everywhere.

Edison was impressed by Latimer and hired him as an employee in 1884. Latimer's skill with electrical engineering and his experience with patent drawings made him very important in Edison's fight to stop people from stealing his inventions, which was becoming a big problem. Eventually, Latimer would even write a book explaining incandescent lights and how they worked. Their work paved the way for many more inventors and innovators to take on the challenge of electric light.

Fluorescents and LEDs

Over the years, as a result of Edison and Latimer's work, many more innovators improved the light bulb. **Fluorescent** light was invented. While incandescent light works by sending a current through a solid filament, fluorescent light works by sending a current through a gas. When electrified, the gas lights up. (Neon lighting is one form of fluorescent light.)

But both forms of light had one big problem. Neither incandescent nor fluorescent lights were very efficient. Each type of bulb wasted a lot of the electrical energy that flowed into it, turning only a very small amount of that energy into light. This meant people had to spend a lot of money on electricity, and buying new light bulbs when the old ones burned out. If someone could solve that problem, light bulbs could both be brighter and use less electricity.

In the 1930s, inventors had begun to experiment with a device called a **light-emitting diode**, or **LED**. A diode is a kind of electrical switch that traps electricity that flows through it. In other words, electricity can flow forward through a diode, but it can not flow back out again. When energy flows through a light-emitting diode, the diode lights up. Was this the solution to the problem of making an efficient light bulb? Maybe, but there was one big issue in the way: scientists had only figured out how to make LEDs in red or green. There were still uses for tiny red and green LED lights, and it became common to see these used for pocket calculators, public signs, and digital clocks. But no one wanted all the light bulbs in their house to be red and green, which would make things look very strange.

To make a real LED light bulb that would light a house, someone would have to invent blue LED light. Why was blue so important? Mixing colors on paper works differently than mixing colored lights. On paper, when you mix red, blue, and yellow, the colors become almost black. But when you mix red, green, and blue light, the colors combine to make white light. If you use different amounts of red, green, and blue light, you can also mix them to make any other color you want.

Shuji Nakamura

Shuji Nakamura was a Japanese-American scientist who studied new ways to use chemicals and other materials. In 1993, he was working in Japan for a small company named Nichia Chemical. Nichia Chemical made LED lights. A problem-solver like Edison and Latimer before him, Nakamura wanted to make blue LED light. He experimented with many different methods and materials before he finally succeeded. A chemical called gallium nitride was the key to helping Nakamura make blue LED light at last.

Nakamura's invention, which he quickly patented, led Nichia to skyrocketing success. His invention also opened the door to many other inventions, including BluRay movies and modern LED screens. And before long, blue LED led to cheap and useful LED light bulbs. An LED bulb that uses Nakamura's blue LED can burn brighter, last longer, and use less power. It can also shine in any color you would like.

Nakamura left Nichia to become a professor, but the story was not quite over. After he left Nichia, the company continued to use his work, but did not pay him the money he was owed as the one who held the patent. This became a big issue, and Nakamura might have thought many times of Lewis Latimer, testifying in court to protect his and Thomas Edison's intellectual property rights for their own inventions. But in the end, Nakamura won the dispute and was able to get his old company to pay him the money he was owed. (He also won a Nobel Prize for Physics, one of the world's most well-known science awards, for his work.)

Conclusion

A "light bulb moment" has become a symbol known around the world. It stands for an inspired idea showing up like a flash of light. And, while it takes no time at all for a switch on a wall to light up a room these days, Edison, Latimer, and Nakamura are all proof of how much work goes into that very flash of light.

But the result was worth the work. Two hundred years ago, the world was a darker place. Now around the world, the streets are lit in many colors, and the lights of cities can be seen from space. This all happened because of many people's persistence. So when you are investigating your own problems, and you run into trouble, keep going. If you work at it, you may just experience a light bulb moment of your own.

DISCUSSING THE MAIN IDEA (10 MIN.)

- Explain that students will now discuss and clarify the main idea of the informative text "A Light Bulb Moment."
- Tell students to be prepared to share the details they wrote down from the text.
- Remind students that the main idea is supported by the key details and explain that there are different ways to word the main idea of a text.

Visual Support 4.9

- Display Visual Support 4.9 again and ask for volunteers to share the details they wrote down in their notes.
  - » Answers may vary but could include Edison invented the first practical light bulb, solving the problem of the filament. Latimer improved the filament from bamboo to carbon. Nakamura's blue LED invention led to brighter, longer-lasting, and more energy-efficient LED light bulbs.
- Restate and write some of the details from the text that students share. Rephrase their contributions if needed to align more closely with the main idea. For example, if a student mentions Edison's invention of the first

practical light bulb, you can restate it as, "So, one important detail is how Thomas Edison's invention of the practical light bulb played a significant role in the progress of lighting technology."

- Ask for volunteers to share what they think is the main idea, or the overall message, of this passage.
  - » The main idea of the text is that lighting technology has progressed, including from using candles and oil lamps to having modern electric lights. Despite facing challenges, inventors such as Thomas Edison, and innovators Lewis Latimer and Shuji Nakamura made significant discoveries, including the invention of the incandescent light bulb and LEDs, which have transformed how we illuminate our homes.
- Once main ideas are shared, have students think about what fascinated or surprised them in the story of how light bulbs evolved.
- Prompt students to reflect on the broader impact. Ask: How has the evolution of light bulbs, with advancements like blue LED lights, influenced our lives today?
  - » Answers may vary but could include blue LED lights have enabled the creation of brighter and longer-lasting light sources, contributing to improved visibility and safety in various environments, such as streets, workplaces, and homes.

WORD WORK: *CURRENT* (5 MIN.)

1. In the text you read "The current heats up the filament, causing it to glow with light, similar to a log in a fireplace."
2. Say the word *current* with me.
3. *Current* means flow of electricity, through a tiny piece of wire.
4. A current is what makes things like light and appliances work.
5. In this context, what part of speech is the word *current*?
   - » noun

Use a Multiple-Meaning activity for follow-up. Tell students that the word *current* is a word with multiple meanings. Share the following with students:

- Meaning 1: flow of electricity, through a tiny piece of wire
- Meaning 2: movement of lake or ocean water
- Meaning 3: happening or existing now; present

- Say, "I am going to read several sentences. Listen to the context, or the text surrounding *current* in the sentence, for clues as to which meaning is being used. When you think a sentence is an example of meaning 1, hold up one finger.

When you think a sentence is an example of meaning 2, hold up two fingers. When you think a sentence is an example of meaning 3, hold up three fingers."

1. The current flowing through the wires powered the lights in the classroom.
   - » one finger
2. We learned about ocean currents in science class and how they move water around the world.
   - » two fingers
3. It is important to stay informed about current events happening around the world.
   - » three fingers
4. The boat struggled against the strong current as it sailed to its destination.
   - » two fingers
5. The electrician carefully handled the wires to ensure a steady current for the electronic devices in the room.
   - » one finger
6. The teacher asked the students to write a paragraph about a current issue in their community.
   - » three fingers

Lesson 4: A Light Bulb Moment

Writing

Primary Focus: Students will use their notes to write a paragraph summarizing the advancements made to the light bulb. **[RI.4.2, W.4.9b]**

INFORMATIVE WRITING (20 MIN.)

- Tell students that they will use their notes to write an informative paragraph about the important innovations made to improve the light bulb over time.
- Explain that when preparing to write an informative text, it is important to be sure that the information you have is based on fact and comes from reliable sources.
- Verify for students that the text in this lesson is a reliable source of information.

- **Turn and Talk:** What are some ways to determine if a source is reliable? Remind students to signal when both partners have contributed to the conversation.
  - » Answers may vary but could include who published it, where it is published, and when it was published.
- Tell students that they can use details from their notes to write an informative paragraph about the progression of the light bulb.
- Have students go back to Activity Page 4.2 and review the main idea and key details they wrote earlier in the lesson.
- Have students take out Activity Page 4.3 to write their informative paragraphs.
- Walk around the room and help students as needed.
- Collect the activity page at the end of the lesson.

Check for Understanding

Present students with a statement: *Thomas Edison's, Lewis Latimer's, and Shuji Nakamura's contributions played a significant role in advancing light bulbs and how we illuminate our world*. Ask students if this statement represents the main idea or a key detail from the text.

- » main idea

MULTILINGUAL/ENGLISH LEARNERS
Writing
Writing an Introductory Paragraph

Entering/Emerging	Give students three sentence stems for an oral summary: Thomas Edison's light bulb was useful because . . . Lewis Latimer made light bulbs . . . Shuji Nakamura made LED lights better because . . .
Transitioning/ Expanding	Have students give an oral summary of what they learned from the reading using the completed graphic organizer for support.
Bridging	Challenge students to describe details in complete sentences in their oral summary.

End Lesson

Activity Page 4.3

Differentiation

Challenge

Challenge students to write their paragraph in a different tone from the historical and educational tone of the reading. Explain that the tone of a text sets its mood, and while the reading is informative and historical, students could write about the same topic in an excited, proud, or even admiring way. For instance, suggest imagining they are writing a paragraph describing the benefits of LED lights in a persuasive manner.

Support

Encourage students to brainstorm adjectives that describe the advancements in lighting technology discussed in the text. For example, they might come up with words like *innovative*, *groundbreaking*, or *revolutionary*. This can help them incorporate more descriptive language into their writing when discussing the progression of light bulbs.

LESSON

5

The Innovation Cycle

PRIMARY FOCUS OF LESSON

Reading

Students will identify the steps of an innovation cycle and explain their significance. **[RI.4.3]**

Students will demonstrate an understanding of the Tier 2 word *iteration*. **[L.4.4]**

Writing

Students will use a graphic organizer to synthesize the steps of the innovation cycle in a paragraph. **[W.4.2, W.4.8]**

FORMATIVE ASSESSMENT

Activity Page 5.2 **Sequence Transition Words** Students will explain the steps of an innovation cycle. **[W.4.2, W.4.8]**

Teacher Presentation Screens:
all lessons include slides

LESSON AT A GLANCE

	Grouping Recommendations	Time	Materials
Reading (50 min.)			
Innovation Cycle Review	Whole Group	5 min.	❏ ReadWorks passage "Practice Makes Perfect" ❏ Visual Support 5.1 ❏ Activity Page 5.1
Introduce the Text	Whole Group	5 min.	
Close Reading	Independent	20 min.	
Iteration Discussion	Whole Group	15 min.	
Word Work: *Iteration*	Whole Group	5 min.	
Writing (40 min.)			
Writing With Transition Words	Whole Group	20 min.	❏ Activity Page 5.2
Arranging a Sequence	Partner	20 min.	

ADVANCE PREPARATION

Reading

- Prepare to print or give students digital access to the text prior to the lesson.

Writing

- Prepare to distribute sentence frames to ML/ELs students as they begin partner work.

Universal Access

Reading

- Prepare chunked excerpts of the ReadWorks passage for students to read as needed.
- To ensure all students have the opportunity to contribute during Turn and Talk and Think-Pair-Share exchanges, provide students with a signal, such as folding their hands or raising a hand to indicate when both partners have added to the conversation.

VOCABULARY

Core Vocabulary

- You may choose to preview the vocabulary words before reading the text.

tinkering, v. fixing something by making small adjustments or changes

version, n. a form of something

iteration, n. a new form or production of something

refine, v. to make something better; to improve

Vocabulary Chart for "Practice Makes Perfect"			
Vocabulary Type	**Tier 3 Domain-Specific Words**	**Tier 2 General Academic Words**	**Tier 1 Everyday Speech Words**
Vocabulary		tinkering version iteration refine	
Spanish Cognates		versión iteración refinar	
Multiple-Meaning			
Sayings and Phrases			

Start Lesson

Lesson 5: The Innovation Cycle

Reading

50M

Primary Focus

Students will identify the steps of an innovation cycle and explain their significance. **[RI.4.3]**

Students will demonstrate an understanding of the Tier 2 word *iteration*. **[L.4.4]**

INNOVATION CYCLE REVIEW (5 MIN.)

- Ask, "What are some key ingredients of innovation that we have learned about?"
  - » creative thinking, collaboration, and improved technology
- Tell students that innovation is a process that often happens in a cycle.
- Explain that this is called the innovation cycle because innovators work their way through steps that often repeat to improve their developments.

Visual Support 5.1

- Display Visual Support 5.1 and draw students' attention to the steps of the innovation cycle:
  1. Identify a problem
  2. Develop an Idea
  3. Test a prototype
  4. Refine
- Define *prototype* and *refine* for students. Explain that a prototype is the first version or model of something. *Refine* means to improve or make something better.
- Direct students' attention back to Visual Support 5.1.
- Prompt students to reflect on what they observe and connect it to their understanding of what innovators do. Ask guiding questions such as:
  - What do you think each step of the innovation cycle involves?
  - How do these steps relate to the work innovators do?
  - What role do you think each step plays in developing new ideas or solutions?

- Invite students to ask questions about the cycle. Encourage them to wonder about the importance of each step or potential challenges innovators might encounter.

INTRODUCE THE TEXT (5 MIN.)

- Ask students to recall what they have learned about innovation and innovators.
  - » Answers may vary but could include that innovation is coming up with new ideas or ways of thinking about or doing things. Innovators often use collaboration and problem-solving skills in their work.
- Define *iteration*. Explain that the process of iteration involves taking an idea and finding key ways to improve upon it through a cycle of innovation.
- Tell students that they are going to read an article about iteration. They will learn how inventors and innovators take an idea, test it, learn from it, and make it even better.
- Instruct students to take out Activity Page 5.1.
- Tell students that as they read, they will fill out information about each stage of the innovation cycle listed on the chart. They can refer to the innovation discussed in the article to gather details, which will serve as a reference for their writing.
- **Think-Pair-Share:** Think about a familiar technology, like a phone. How do you think it has changed or improved over time? Remind students to signal when both partners have contributed to the conversation.
  - » Answers may vary but could include that they started as devices for calling, but now they can take pictures, play games, and even help with giving directions or searching the Internet.

Activity Page 5.1

CLOSE READING (20 MIN.)

- Allow students twenty minutes to read the ReadWorks passage "Practice Makes Perfect" independently and complete Activity Page 5.1.
- Monitor students as they work, and work with individuals or small groups of students who need additional support.
- Have students share the details that they have aligned with each step of the innovation cycle.

ITERATION DISCUSSION (15 MIN.)

- Allow various students to answer the following comprehension questions in a whole group discussion of the text.

1. **Literal.** What is an iterative design process, and why is it called "iterative"?
    - » When people make something new, they do not always get it perfect on the first try. They might have to try many times, making changes each time to make it better. This is called "iterative," which means they keep trying until it is just right.
2. **Literal.** Why did Aisen Caro Chacin make a mold of the wearer's teeth in the first version of the Play-a-Grill?
    - » She created a mold of the person's teeth to see how much space is on the roof of their mouth for the device; she wanted to see how big it could be.
3. **Inferential.** Why did she change all of the features for the second version of the Play-a-Grill?
    - » Answers may vary but could include that Chacin made the device more comfortable and useful by using a new material and adding a tiny computer chip so it could do things on its own.
4. **Inferential.** Why does Chacin still want to change several areas of the Play-a-Grill in future versions, even though it has been featured in the news and on television?
    - » Answers may vary but could include that Chacin wants to make the Play-a-Grill better by upgrading its electronics, motors, and appearance.
5. **Evaluative.** How does iteration connect to the innovation cycle?
    - » Answers may vary but could include that iteration is connected to testing a prototype and refining.
6. **Evaluative.** Write a declarative, an interrogative, an exclamatory, and an imperative sentence to describe Chacin's Play-a-Grill. (If time allows, have students share their work with a partner or with the class.)
    - » Answers may vary but could include the following:
        - Declarative: *Chacin's Play-a-Grill is a device worn in the mouth that allows users to listen to music through bone conduction.*
        - Interrogative: *How does Chacin's Play-a-Grill work to produce sound through bone conduction?*
        - Exclamatory: *Chacin's Play-a-Grill is an innovative and creative solution to portable music listening!*
        - Imperative: *Try out Chacin's Play-a-Grill to experience music in a whole new way.*

WORD WORK: *ITERATION* (5 MIN.)

1. In the text you read "Even in its latest iteration, Chacin acknowledges, the Play-a-Grill is too bulky."
2. Say the word *iteration* with me.
3. *Iteration* means a new form or production of something.
4. When inventors or innovators use *iteration*, they make changes and improvements to their creations.
5. Why do you think iteration is important in innovation? Be sure to use the word *iteration* in your response.
    - Ask two or three students to use the target word in a sentence. If necessary, guide and/or rephrase students' responses to make complete sentences: "Iteration is important in innovation because . . ."
6. What part of speech is the word *iteration*?
    - » noun

Use a Hands-On activity for follow-up. Have students work in pairs to build a simple structure using building blocks or craft materials. Specify that the structure must stand on three legs and hold up a small object. After each round, encourage them to discuss and implement improvements to make their structure stronger. This activity allows students to experience *iteration* and understand the importance of making enhancements to achieve better outcomes.

Check for Understanding

Why does iteration involve making multiple versions of a product?

- » Answers may vary but could include that 'iteration' involves making multiple versions of a product because it allows inventors and innovators to test different ideas, improve on previous versions, and refine the product until it meets desired goals.

Differentiation

Challenge

Have students identify a familiar object or process that could be improved. Have them sketch and label a series of drawings, each representing a step toward making that improvement.

Support

Encourage students to reflect on activities or tasks they have practiced repeatedly in school such as writing an essay. Guide them to think about how they have likely made iterative improvements in their writing skills over time through regular practice and feedback. Connect this experience to *iteration* by emphasizing making improvements through repeated cycles of refinement.

Lesson 5: The Innovation Cycle

Writing

40M

Primary Focus: Students will use a graphic organizer to synthesize the steps of the innovation cycle in a paragraph. **[W.4.2, W.4.8]**

WRITING WITH TRANSITION WORDS (20 MIN.)

- Tell students that one way to retell a list of steps is to use transition words.
- Explain that they are going to practice using transition words to write about the steps of the innovation cycle.
- Ask students to take out their copies of the text and Activity Page 5.2.
- Direct the students' attention to the word bank at the top of the page. Tell students that these are some common transition words that are used to tell the order in which something happens. *Sequence* is another word for order.

Sequence Transition Words

first	third	then	last
second	next	finally	afterwards

- Ask which word to use for the initial step. Direct students to point to that word on their activity page in the word bank.
  - » first
- Ask, "What is the first step in the innovation cycle?" First, tell students to turn to a neighbor and share an answer. Then, ask students to share with the class.
  - » Correct answers should reference identifying a problem or need.
- Display the following sentence: Innovators identify a problem. Innovators identify a need.
- Using a Think-Aloud, refer to the display and tell the students, "I see that the first step involves identifying a problem. It also includes identifying a need. How can I combine the sentences? Let's record that on our papers using the transition word *first*."
- Display the enlarged Activity Page 5.2 and write the sentence *First, innovators identify a need or problem.*

- Ask, "What transition words might we use for the middle of our sequence?"
  - » Correct responses include *second*, *third*, *next*, and *then*.
- Then ask the students what transition words might be used for the last step.
  - » Correct responses include *finally*, *last*, and *afterwards*.

ARRANGING A SEQUENCE (20 MIN.)

Activity Page 5.2

- Direct students to independently complete Part 1 of Activity Page 5.2. When finished, have students find a nearby partner and complete Part 2 of Activity Page 5.2.
- Remind students to use the transition words and their new knowledge from the passage to complete the exercise.
- Have students check their partner's work and then hand in the completed page to you or a central location in the classroom.

ML/EL **MULTILINGUAL/ENGLISH LEARNERS**

Writing

Using Transition Words

Entering/Emerging	Have students use two to three transition words to orally rehearse their writing, such as *first*, *next*, and *last*.
Transitioning/ Expanding	Provide sentence frames for partner work. The first step in the innovation cycle is to _____. For the middle steps, we can use transition words like _____. Could you explain why you chose _____ as the transition word for that step?
Bridging	Distinguish the transition word bank word *then* from the word *than*. Explain that these words look and sound very similar but have different meanings and uses. Have students discuss the differences between the two with a partner.

End Lesson

LESSON

6

Ideas that Keep Growing

PRIMARY FOCUS OF LESSON

Reading

Students will generate and answer questions about key details in the text. **[RI.4.3]**

Students will demonstrate an understanding of the Tier 2 word *customized*. **[L.4.4]**

Writing

Students will write an informative body paragraph explaining a key detail of 3D printing. **[W.4.2]**

Students will develop inquiry skills by generating questions and conducting research to answer them. **[W.4.7]**

FORMATIVE ASSESSMENT

Activity Page 6.1 — **Question Words** Students will draft their own questions and research answers to them. **[RI.4.3, W.4.2, W.4.7]**

Teacher Presentation Screens:
all lessons include slides

LESSON AT A GLANCE

	Grouping Recommendations	Time	Materials
Reading (50 min.)			
Introduce the Text	Whole Group	5 min.	❏ ReadWorks passage "Printing the Future" ❏ Activity Page 6.1
Reading for Information	Partner	25 min.	
Elaborating Sentences	Independent	15 min.	
Word Work: *Customized*	Whole Group	5 min.	
Writing (40 min.)			
Writing Body Paragraphs	Whole Group	20 min.	❏ Visual Support 6.1 ❏ Activity Page 6.2
Student Research	Independent/Partner	20 min.	

ADVANCE PREPARATION

Reading

- Prepare to print or give students digital access to the text prior to the lesson.
- Locate and display an image of a 3D printer.
- Predetermine reading partners.

Writing

Visual Support 6.1

- Prepare to display model notes and Visual Support 6.1 for writing body paragraphs.
- Prepare research materials about 3D printing.
- Plan for one-on-one computer usage in the school library, computer lab, or classroom so students may conduct independent research. Ensure students can either print articles or sources located during their search or save articles in a digital folder to review later for writing.
- Prepare to review the following Internet research guidelines (or other guidelines that reflect your school's technology policy) and to monitor students on computers:
    - When searching the Internet, students will only type the following in the search engine:
        1. the words in their research questions
        2. ideas or topics related to their research questions
        3. names of places, people, and things related to the research questions, ideas, or topics

Universal Access

Reading

- To ensure all students have the opportunity to contribute during Turn and Talk and Think-Pair-Share exchanges, provide students with a signal, such as folding their hands or raising a hand, to indicate when both partners have added to the conversation.

VOCABULARY

Core Vocabulary

- You may choose to preview the vocabulary words before reading the text.

revolution, n. big, important change

nozzle, n. a tube at the end of a pipe or hose

array, n. a collection or group of things

customized, adj. made according to the specific preference or purpose

resin, n. sticky substance that comes from certain trees or plants

Vocabulary Chart for "Printing the Future"			
Vocabulary Type	**Tier 3 Domain-Specific Words**	**Tier 2 General Academic Words**	**Tier 1 Everyday Speech Words**
Vocabulary	resin	revolution array customized	nozzle
Spanish Cognates	resina	revolución	
Multiple-Meaning			
Sayings and Phrases			

Start Lesson

Lesson 6: Ideas that Keep Growing

Reading

50M

Primary Focus

Students will generate and answer questions about key details in the text. **[RI.4.3]**

Students will demonstrate an understanding of the Tier 2 word *customized*. **[L.4.4]**

INTRODUCE THE TEXT (5 MIN.)

- Remind students that they learned about the steps of the innovation cycle in the previous lesson. Ask them to review the steps.
  - » identify a problem, develop an idea, test a prototype, refine
- **Think-Pair-Share:** What is a printer used for? Remind students to signal when both partners have contributed to the conversation.
  - » Answers may vary but could include for creating documents or pictures or making copies of something.
- As students conclude their conversations, ask them to share one idea or fact their partner shared with them, and note key ideas on the whiteboard or chart paper.
- Display an image of a 3D printer.
- Ask, "Have you ever seen or heard of a 3D printer?" Encourage students to share any knowledge or experiences they might have with this technology.
- Tell students that 3D printing is an innovation in the field of manufacturing and technology.
- Explain that 3D printing involves creating objects layer by layer using special machines. The process differs from making things by cutting, molding, or carving materials.
- Explain that today's reading explores the world of 3D printing and how it is transforming various aspects of our lives.

READING FOR INFORMATION (25 MIN.)

- Assign reading partners and provide access to the text.
- Direct students to read the text using the following procedure:
  - ◦ One student reads a paragraph or section while the other listens actively.

- After reading a section, have students discuss the text with their partner. They can summarize what they have read, ask questions, or share their thoughts and reactions.
- After each section or paragraph, students should switch roles so that both partners have the opportunity to read aloud and discuss the text.

- After students have completed reading and discussing, lead a whole class discussion about the text.

Discussion Questions

1. **Literal.** Name three different possible uses of 3D printing.
   - » building houses, creating medical devices, producing food
2. **Inferential.** How might 3D printing impact various aspects of life?
   - » Answers may vary but could include using 3D printing could affect how affordable homes are, how easy it is to get healthcare, and how efficiently we produce food.
3. **Inferential.** Why is it important that a nonprofit organization and a construction company in Texas are collaborating to use 3D printers to build houses?
   - » Answers may vary but could include because they are finding a new way to build homes that cost less money, are faster to build, and stronger against things like big storms or earthquakes. This could help more people have a home that they can afford.
4. **Evaluative.** What are the advantages and disadvantages of using 3D printers to create medical devices like bionic arms?
   - » Answers may vary but could include 3D printers that can make devices that fit each person's special needs and likes. It might also cost less than making them the old way and lets us try out new ideas quickly. But it is also important to make sure that the rules and laws about making medical things are followed.
5. **Evaluative.** What challenges or considerations might arise when using 3D printing technology for various applications?
   - » Answers may vary but could include some challenges might be things like limits in the technology, thinking about the materials used, and the constant need to make improvements to meet changing demands.

ELABORATING SENTENCES (15 MIN.)

- Tell students that they can make their writing about a topic more interesting by asking questions like *who*, *what*, *where*, *when*, *why*, *and how* as they read and research the topic.

- Remind them that not all questions may have answers in the article, but those unanswered questions could be great for future research.
- Model how to make a sentence more detailed by asking questions about it. Write on the board the following sentence based on the ReadWorks passage: *3D printers have been used to construct medical devices like replacement limbs.*
- Say, "You can take the sentence '3D printers have been used to construct medical devices like replacement limbs,' and ask questions like *who* uses these devices, *where* are they used, and *why* are they important. You can then use the answers from those questions to add details to your sentence."
- Ask, "Can you find any details in the text about the *who* and *where* that we can add to the beginning of the sentence?"
  - » Doctors and medical companies in Florida use 3D printers to construct medical devices like replacement limbs.
- Ask, "Why are replacement limbs printed by a 3D printer a useful innovation?" Give students a chance to rewrite the sentence, adding this detail.
  - » Doctors and medical companies in Florida use 3D printers to construct medical devices like replacement limbs, so that kids can easily do things.

Activity Page 6.1

- Project Activity Page 6.1.
- After reviewing the example with students, distribute Activity Page 6.1.
- Remind students that they will take their information about *who*, *where*, *what*, *why*, and *how* from the chart and write complete sentences to communicate that information.
- Give students ten minutes to complete the activity page.

WORD WORK: *CUSTOMIZED* (5 MIN.)

1. In the text, you read "A Florida company has found a way to produce bionic arms for children that can be *customized* with superhero designs."
2. Say the word *customized* with me.
3. *Customized* means made according to the specific preference or purpose.
4. 3D printing allows for the creation of customized items.
5. If you could use a 3D printer to create something customized, what would it be? Be sure to use the word *customized* in your response.
   - Ask two or three students to use the target word in a sentence. If necessary, guide and/or rephrase students' responses to make complete sentences: "I would use a 3D printer to create a customized _____ because . . ."

6. What part of speech is the word *customized*?
    » adjective

Use a Synonyms and Antonyms activity for follow-up. Ask, "What does *customized* mean? What are some synonyms, or words that have a similar meaning?" Prompt students to provide words like *personalized*, *specialized*, and *tailored*. Then ask, "What are some antonyms, or words that have the opposite meaning?" Prompt students to provide words like *standard* and *generic*.

- As students discuss synonyms and antonyms, guide them to use the word *customized* in a complete sentence: "An antonym of *customized* is *generic*."

Lesson 6: Ideas that Keep Growing

Writing

Primary Focus

Students will write an informative body paragraph explaining a key detail of 3D printing. **[W.4.2]**

Students will develop inquiry skills by generating questions and conducting research to answer them. **[W.4.7]**

WRITING BODY PARAGRAPHS (20 MIN.)

- Display a page of model notes. Notes that may be used for this demonstration are included as follows:

Main Idea: Advancements in 3D printing, led by innovators like Charles Hull and S. Scott Crump, have transformed various fields by allowing for the use of different materials, such as concrete, metal, plastic, and even plant-based substances.			
Key Details			
Charles Hull is credited with inventing the first 3D printing technology (in the early 1980s) and S. Scott Crump developed a method for printing by melting plastic (in the late 1980s).	Materials used for 3D printing include concrete, metal and wood filaments, plastic, and plant-based materials.	Essential parts of a 3D printer are the filament (special ink), extruder (pushes out melted material), bed (where the object is made), and nozzle (opening).	3D printing is used in medicine (for implants and prosthetics), construction, art, and design, as well as in schools and universities.

Visual Support 6.1

- Display Visual Support 6.1 and demonstrate a Think-Aloud as you model how to convert notes about the parts of a 3D printer into sentences for an informative paragraph. Text that may be used in this demonstration is provided as follows:

  "A 3D printer has important parts that work together to make cool things! One key part is the 'extruder', like a magical pen that pushes out melted plastic. The 'bed' is where the object is made, and it helps the plastic stick and take shape. The 'filament' is the special ink for the printer, and the 'nozzle' is where the melted plastic comes out. All these parts team up: the extruder draws, the bed holds, and together they create awesome 3D prints!"

- Explain that writers group the information they want to present about their main idea into different body paragraphs, so that each body paragraph focuses on a category of key information and provides supporting facts and details.
- Tell students that body paragraphs begin with an idea that is expressed in a complete topic sentence. Adding facts and supporting details to the paragraph gives readers more information.
- Allow students to turn another idea from the displayed notes into a topic sentence for another body paragraph.
- Instruct students to elaborate on the idea from their topic sentence by using the supporting facts provided for that key detail to write a body paragraph.
- Allow eight to ten minutes for students to write.
- Walk around and monitor progress, conferring with students as needed.
- Have a few student volunteers read their body paragraph aloud.

Check for Understanding

Ask, "What should each body paragraph focus on?"

» a key part of the main idea, key details, and facts grouped around the same piece of the main idea

STUDENT RESEARCH (20 MIN.)

- Remind students that the article did not provide answers to all of the 5W questions explored earlier in the lesson.
- Explain that as researchers, they have an opportunity to discover answers to the additional questions they may have.
- Give students five minutes to generate as many who, what, where, why, when, and how questions as they can about 3D printing.
- Have students pick one of the questions they generated to explore and answer with research. Direct students to note down their chosen question at the top of Activity Page 6.2.
- Tell them they will use the research materials to find two to three pieces of information that will help them answer their research questions about 3D printers.
- Briefly review the Internet searching guidelines for students.
- Direct students to browse the research materials that you set up or to search for information on computers to complete Activity Page 6.2.

ML/EL **MULTILINGUAL/ENGLISH LEARNERS**

Writing

Taking Notes

Entering/Emerging	Work with students one-on-one to engage in oral discussions while taking notes, encouraging them to express their ideas verbally before writing.
Transitioning/ Expanding	Allow students to work with a partner to generate research questions and brainstorm ideas for accessing relevant materials.
Bridging	Allow students to use a print or digital dictionary to assist with unfamiliar vocabulary in research materials.

End Lesson

D Differentiation

Challenge

Tell students to look back at their research questions. Ask them to revise their questions to better match the information they find in the materials. The students may choose to make their questions more specific, more general, or add "and why?" to existing questions.

Support

Individually or in a small group, model changing one of the student's notes into sentences. Then, observe the student converting a note into a sentence before they continue independently.

Activity Page 6.2

LESSON

7

Innovators in Music

PRIMARY FOCUS OF LESSON

Reading

Students will use evidence from the text to answer questions about Louis Armstrong's role in advancing musical innovation. **[RI.4.1]**

Students will demonstrate an understanding of the Tier 2 word *improvised*. **[L.4.4]**

Writing

Students will identify primary and secondary sources on an American innovator in music. **[W.4.8]**

FORMATIVE ASSESSMENT

Activity Page 7.2 — **Exploring Louis Armstrong's Musical Innovations**
Students will use primary and secondary sources to answer their research question. **[W.4.8]**

Teacher Presentation Screens:
all lessons include slides

LESSON AT A GLANCE

	Grouping Recommendations	Time	Materials
Reading (40 min.)			
Close Reading	Small Group	35 min.	❏ ReadWorks passage "Louis Armstrong" ❏ Activity Pages 1.1, 7.1
Word Work: *Improvised*	Whole Group	5 min.	
Writing (50 min.)			
Identifying Primary and Secondary Sources	Whole Group	5 min.	❏ Visual Support 7.1 ❏ Activity Pages 1.1, 7.2
Developing Questions	Whole Group	15 min.	
Collecting Information	Whole Group	30 min.	

ADVANCE PREPARATION

Reading

- Prepare strategic small groups of three to five students for the reading activity.
- Ensure that students have their KWL charts (Activity Page 1.1) and blank paper to use after the close reading activity.

Writing

- Prepare research materials on Louis Armstrong and music innovators.

Visual Supports 7.1, 3.10

- Prepare to display Visual Supports 7.1 and 3.10.
- Prepare to review the following Internet research guidelines (or other guidelines that reflect your school's technology policy) and to monitor students on computers:
  - When searching the Internet, students will only type the following in the search engine:
    1. the words in their research questions
    2. ideas or topics related to their research questions
    3. names of places, people, and things related to the research questions, ideas, or topics
- Plan for one-on-one computer usage in the school library, computer lab, or classroom so students may conduct independent research.

Universal Access

Reading

- To ensure all students have the opportunity to contribute during Turn and Talk and Think-Pair-Share exchanges, provide students with a signal, such as folding their hands or raising a hand, to indicate when both partners have added to the conversation.
- Provide access to an audio copy of the text or preview the text prior to class.
- Prepare strategic groups, depending on students' needs.

Writing

Visual Support 3.10

- Prepare to project Visual Support 3.10 or recreate the list on an anchor chart that can remain on display in the classroom.
- Provide a question bank to support students' independent research by developing some guiding research questions to be used as examples or as research prompts if needed.
    - How did Louis Armstrong transform trumpet-playing techniques in jazz music?
    - What impact did Louis Armstrong's vocal style and scat singing have on the development of jazz?
    - How did Louis Armstrong's innovations influence the composition and arrangement of jazz music?
    - What were Louis Armstrong's most successful records and why?

VOCABULARY

Core Vocabulary

- You may choose to preview the vocabulary words before reading the text.

soloists, n. people who perform by themselves

improvised, v. performed or created something without preparation, or on the spot

Vocabulary Chart for "Louis Armstrong"			
Vocabulary Type	**Tier 3 Domain-Specific Words**	**Tier 2 General Academic Words**	**Tier 1 Everyday Speech Words**
Vocabulary	soloists	improvised	
Multiple-Meaning	solistas	improvisado	
Sayings and Phrases			

Start Lesson

Lesson 7: Innovators in Music

Reading

40M

Primary Focus

Students will use evidence from the text to answer questions about Louis Armstrong's role in advancing musical innovation. **[RI.4.1]**

Students will demonstrate an understanding of the Tier 2 word *improvised*. **[L.4.4]**

CLOSE READING (35 MIN.)

- **Think-Pair-Share:** Start the lesson by asking students about different kinds of innovation they have learned about so far in the unit. Remind students to signal when both partners have contributed to the conversation.
  - » Answers may vary but could include 3D printing, innovations to the light bulb, and innovations in hair care.
- Tell students that today they will learn about innovators in music. As they read, they will gather evidence from the text to answer questions about music innovators.

Activity Page 7.1

- Have students take out Activity Page 7.1.
- Begin by explaining to students what it means to find evidence. Explain that evidence is information from the text that provides, supports, and strengthens their answers.
- Explain that students will work in small groups to find evidence in the text that will support their answers to the questions on the page.
- Tell students to read the text, identify parts of the text that answer the question, and record the evidence for the answer in the space provided.
- Tell students to write answers to the questions in Part 1 of Activity Page 7.1 using the evidence they found in the text. Explain that any quotes they wrote down as evidence can be paraphrased in their own words when they write their responses.
- In small groups, direct the students to read the text using the following procedure:
  - The student with the next birthday starts reading one paragraph.
  - After reading the paragraph, the student to the reader's left tells the group what the paragraph was about in their own words.

    - The student who just summarized the paragraph reads the next paragraph.
- Once Part 1 has been completed, direct students to Part 2 where they will write the answers to the following question words on a blank sheet of paper to explain why Louis Armstrong is considered an innovator before writing an expanded sentence:
    - Louis Armstrong changed the way people played the trumpet in jazz music.
        - When?:
        - Why?:
        - How?:
- Ask two or three students to share an expanded sentence with the class.
    - » Answers may vary but could include in the 1920s and 1930s, Louis Armstrong changed the way people played the trumpet in jazz music by introducing new techniques and styles such as improvising to make jazz music more fun and exciting to listen to.
- Once students have completed Activity Page 7.1, discuss the following questions with the whole class.

Discussion Questions

1. **Literal.** When and where was Louis Armstrong born?
    - » Louis Armstrong was born on August 4, 1901, in New Orleans, Louisiana.
2. **Inferential.** Why is Louis Armstrong considered one of the most important figures in the history of music?
    - » Answers may vary but could include Louis Armstrong is considered one of the most important figures in the history of music because he was one of the first soloists and introduced new styles and techniques to jazz.
3. **Evaluative**. How significant was Louis Armstrong's impact on the music industry?
    - » Answers may vary but could include that Louis Armstrong had a significant impact on the music industry, as evidenced by his recognition as "the single most important figure in the history of jazz" by Billboard magazine. His innovative trumpet playing, scat singing, and groundbreaking solos laid the foundation for jazz music and influenced countless musicians. Additionally, his record-breaking success with "Hello, Dolly" at the age of 63 demonstrated his enduring popularity and talent.

Differentiation

Challenge

Ask students to use text-based evidence to explain how collaboration and innovative thinking apply to the jazz genre.

Support

Guide students through a structured discussion to analyze specific examples from the text that demonstrate collaboration and innovative thinking within the jazz genre. Encourage students to cite textual evidence to support their interpretations.

WORD WORK: *IMPROVISED* (5 MIN.)

1. In the text you read "Rather than follow the notes on the page, he improvised, playing what was in his head."
2. Say the word *improvised* with me.
3. *Improvised* means performed or created without preparation, or on the spot.
4. Louis Armstrong improvised while playing the trumpet, creating music spontaneously instead of following written notes.
5. Ask students to think about a time when they improvised or came up with something on the spot.
   - Have two or three students complete a sentence using the word *improvised* to describe a situation where they had to think quickly or act without preparation. If necessary, guide and/or rephrase students' responses to make complete sentences: "One day, I improvised when _____ because _____."
6. What part of speech is the word *improvised*?
   - » verb

Use a Synonyms and Antonyms activity for follow-up. Ask, "What does *improvised* mean? What are some synonyms, or words that have a similar meaning?" Prompt students to provide words like *spontaneous*, *unplanned*, and *ad-libbed*. Then ask, "What are some antonyms, or words that have the opposite meaning?" Prompt students to provide words like *rehearsed*, *unplanned*, and *scripted*.

- As students discuss synonyms and antonyms, guide them to use the word *improvised* in a complete sentence: "An antonym of *improvised* is *rehearsed*."

Check for Understanding

Ask students what it means to find evidence of something.

- » Evidence is information that supports a claim, provides support, or proves that something is correct or true, which is why it is important to provide evidence when you write research papers.

ML/EL MULTILINGUAL/ENGLISH LEARNERS

Reading

Identifying Evidence in Text

Entering/Emerging	Have students work with a partner to identify and discuss key actions performed by Louis Armstrong in the text. Encourage them to focus on verbs, such as sing, play, record, and improvise, and to consider how these actions contribute to Armstrong's importance as a musician.
Transitioning/ Expanding	Have students work with a partner to find verbs in the text that show what Louis Armstrong did to find his own style of jazz and become an important musician, such as *pioneered*, *improvised*, and *scat singing*. Have students copy down the quotes that contain the verbs in the space provided on Activity Page 7.1.
Bridging	Have students work with a partner to paraphrase evidence from the text to answer the questions on Activity Page 7.1.

Lesson 7: Innovators in Music

Writing

50M

Primary Focus: Students will identify primary and secondary sources on American innovators in music. **[W.4.8]**

IDENTIFYING PRIMARY AND SECONDARY SOURCES (5 MIN.)

- Begin this segment of the lesson by explaining primary and secondary sources to students.

Visual Support 7.1

- Display Visual Support 7.1.
- Tell students that a primary source includes information that is a first-hand account, created by or involving someone who participated or witnessed the events. A primary source could include a work of art, photographs, interviews, diaries, and other artifacts.
- Tell students that a secondary source is the report of a person or event by someone who did not experience or participate in the events or know the person, such as a researcher, writer, or historian. Secondary sources can include some websites, books, and articles. For example, if a historian today writes a book about the American Revolution, that is a secondary source.

- Use the following questions to check for understanding:
  - Would a copy of a personal diary entry written by your inventor be a primary or secondary source?
    - » primary
  - Would the book containing quotes from that diary entry be a primary or secondary source?
    - » secondary
  - Would a video recording of your inventor giving a presentation on their invention be a primary or secondary source?
    - » primary

DEVELOPING QUESTIONS (15 MIN.)

- Tell students to take out their individual KWL charts (Activity Page 1.1) and have them refer to the Louis Armstrong section.
- Ask students to independently reflect on the things they wonder about and to record their wonderings in the "W" section of their KWL chart.
- Remind students about the four-step research process, posted in the classroom.
- Tell students that good researchers know how to ask open-ended questions based on what they already know.
- Reread the first two paragraphs of the text aloud and use a think-aloud strategy to demonstrate how students might ask questions based on the text.
  - Say, "What challenges did Louis Armstrong encounter from his beginnings in New Orleans to becoming a famous jazz innovator? This is a question I would like to research further."

Activity Page 7.2

- Distribute Activity Page 7.2 and review the directions with students.
- Have students review their KWL charts. Based on the type of wonderings they recorded, guide them to circle one of the choices for Louis Armstrong's contributions to music from the top of Activity Page 7.2.
- Students will then use Activity Page 7.2 to generate and write one research question for the topic they chose.

COLLECTING INFORMATION (30 MIN.)

- Have students go to their research stations.
- Explain that they will use this time for independent research to answer the question they just identified.
- Tell students to identify at least one primary source and one secondary source for their research. Encourage them to record the name of each primary and secondary source of information and the date the information was collected on the chart on Activity Page 7.2.
- Instruct students to take notes on the key information and details they find that will help them answer their research question about their topic.
- Provide students with time to use their identified sources to answer their research question.
- At the end of the class, collect students' activity pages to review whether students can correctly identify information related to a research question, and whether they can distinguish between primary and secondary sources.

End Lesson

LESSON

8

Innovators in the Medical Field

PRIMARY FOCUS OF LESSON

Reading

Students will use text-based evidence to make inferences about innovation in medicine, specifically focusing on Patricia Bath's contributions and impact. **[RI.4.1]**

Students will demonstrate an understanding of the Tier 2 word *arduous*. **[L.4.4]**

Writing

Students will develop inquiry skills by generating questions on medical innovators and conducting research to answer them. **[W.4.7]**

FORMATIVE ASSESSMENT

Activity Page 8.1

Patricia's Vision: The Doctor Who Saved Sight
Main Idea and Key Details Students will listen to the Read-Aloud and identify key details to determine the main idea of the text. **[RI.4.1]**

Teacher Presentation Screens:
all lessons include slides

LESSON AT A GLANCE

	Grouping Recommendations	Time	Materials
Reading (45 min.)			
Introduce the Read-Aloud	Whole Group	5 min.	❑ *Patricia's Vision: The Doctor Who Saved Sight* by Michelle Lord ❑ Activity Page 8.1
Read-Aloud	Whole Group	35 min.	
Word Work: *Arduous*	Whole Group	5 min.	
Writing (45 min.)			
Inquiry and Innovator Research	Whole Group/ Independent	45 min.	❑ Visual Support 8.1 ❑ Activity Page 8.2

ADVANCE PREPARATION

Reading

- Prepare to read the tradebook *Patricia's Vision: The Doctor Who Saved Sight* by Michelle Lord. As you preview the book, you may wish to add page numbers and reference the guided reading for this lesson. This trade book does not have numbered pages, but for ease of use, we have referred to page numbers in our materials. We begin with page 1, which contains the text "Young Patricia Bath was curious . . . ," and number every page after that.
- Prepare to show Harlem, New York, on a map.
- Ensure that students have their KWL charts (Activity Page 1.1) available to add questions about things they want to know, wonder about, and learn before, during, and after reading the text.

Writing

Visual Support 8.1

- Prepare to display Visual Support 8.1.
- Prepare research materials on innovators in medicine such as Lydia Villa-Komaroff, Jonas Salk, Charles Drew, Benjamin Carson, and Virginia Apgar.
- Plan for one-on-one computer usage in the school library, computer lab, or classroom so students may conduct independent research.
- Prepare to review the following Internet research guidelines (or other guidelines that reflect your school's technology policy) and to monitor students on computers:
  - When searching the Internet, students will only type the following in the search engine:
    1. the words in their research questions
    2. ideas or topics related to their research questions
    3. names of people, places, and things related to the research questions, ideas, or topics

Universal Access

Writing

Visual Support 3.10

- Prepare to project Visual Support 3.10 or recreate the list on an anchor chart that can remain on display in the classroom.

- To ensure all students have the opportunity to contribute during Turn and Talk and Think-Pair-Share exchanges, provide students with a signal, such as folding their hands or raising a hand to indicate when both partners have added to the conversation.

VOCABULARY

Core Vocabulary

- You may choose to preview the vocabulary words before reading the text.

ophthalmologist, n. a doctor who takes care of the eyes

cataract, n. a problem that happens when the eye's lens, which is usually clear, becomes cloudy

cornea, n. clear, outer window of the eye

restore, v. to return to a previous or better condition or state

arduous, adj. very hard, difficult, or takes a lot of effort

Vocabulary Chart for *Patricia's Vision: The Doctor Who Saved Sight*

Vocabulary Type	**Tier 3 Domain-Specific Words**	**Tier 2 General Academic Words**	**Tier 1 Everyday Speech Words**
Vocabulary	ophthalmologist cataract cornea	restore arduous	
Spanish Cognates	oftalmólogo/a catarata córnea	restaurar arduo	
Multiple-Meaning			
Sayings and Phrases			

Start Lesson

Lesson 8: Innovators in the Medical Field

Reading

45M

Primary Focus

Students will use text-based evidence to make inferences about innovation in medicine, specifically focusing on Patricia Bath's contributions and impact. **[RI.4.1]**

Students will demonstrate an understanding of the Tier 2 word *arduous*. **[L.4.4]**

INTRODUCE THE READ-ALOUD (5 MIN.)

- Introduce students to the book *Patricia's Vision: The Doctor Who Saved Sight* by Michelle Lord.
- Ensure that students can view illustrations and read the text in the book *Patricia's Vision: The Doctor Who Saved Sight* by Michelle Lord.
- Tell students that this book is biographical. The book is based on the real life of Dr. Patricia Bath, an American ophthalmologist and inventor from Harlem, New York.
- Show students where Harlem, New York, is on the U.S. map.
- Ask students to recall the first step of the innovation cycle.
  - » identifying a problem
- Tell students that they will read about Dr. Bath to learn how she followed this step in her innovative work in medicine.
- Have students listen and follow along to learn more about her exciting life.

READ-ALOUD (35 MIN.)

Activity Page 8.1

- Have students take out Activity Page 8.1, which includes a graphic organizer for noting key details and identifying the main idea.
- Before beginning the Read-Aloud, explain that students will be actively listening for key details about Dr. Bath's innovations in medicine.
- Tell students to use the graphic organizer to record key details as they listen to the Read- Aloud. Encourage them to focus on important events, inventions, and contributions made by Dr. Bath.
- Explain that after noting the key details, students will use these details to infer the overall message or main idea of the story. Tell them that there can be more than one main idea.

- Discuss the definition of *infer*, explaining that it involves using evidence from the text to understand something that is not directly stated.
- Begin reading aloud *Patricia's Vision: The Doctor Who Saved Sight*, embedding the following comprehension opportunities:
    - After reading page 8, ask students to predict why curiosity might be important for someone who wants to make a difference in the world of medicine.
        - Answers may vary but could include curiosity helps people ask questions, explore new ideas, and discover solutions to problems. In medicine, being curious can lead to new discoveries and innovations that improve people's lives.
- Continue reading the text aloud.
    - After reading page 18, ask students to identify some of the challenges Patricia faced and how she overcame them.
        - Patricia faced challenges, such as gender inequality and limited access to resources due to her family's economic situation. She overcame these challenges by remaining determined, working hard, and seeking opportunities to learn and grow.
- Continue reading the text aloud.
    - After reading page 27, ask students to explain the innovation mentioned in the text and explain why it was important.
        - The Laserphaco Probe is a device used during cataract surgery to improve accuracy and reduce the risk of complications in removing cataracts. This innovation was important because it helped save people's sight.
- Continue reading the text aloud.
    - After reading the last page of the text, ask students to identify other contributions made by Dr. Bath aside from her innovation.
        - Answers may vary but could include establishing community eye clinics to provide affordable eye care and establishing organizations dedicated to promoting eye health and preventing blindness worldwide.
- After completing the Read-Aloud, give students additional time to independently write their main idea statement on Activity Page 8.1, based on the key details they identified.
- Encourage them to consider how these details connect to form the main idea of the text.
- Once students have finished writing, collect Activity Page 8.1 to assess their understanding of the main ideas inferred from the text.

D Differentiation

Challenge

Tell students to draw connections between Patricia Bath's story and the descriptions of innovators previously read in the unit, such as Madam C. J. Walker or Lewis Latimer. Have them identify common traits shared by these innovators.

Support

Provide students with three of Bath's accomplishments and ask them to identify an idea that connects each of these accomplishments.

WORD WORK: *ARDUOUS* (5 MIN.)

1. In the text you read "Taking the high road may be arduous and long, but it will lead to justice and triumph."
2. Say the word *arduous* with me.
3. *Arduous* means difficult or requiring a lot of effort.
4. Dr. Patricia Bath faced an arduous career path, overcoming tough challenges and putting in effort to improve medical practices.
5. Ask students to think about a time when they faced something arduous.
    - Have two or three students use the target word in a complete sentence. If necessary, guide and/or rephrase students' responses to make complete sentences: "I faced an arduous task when _____ ."
6. What part of speech is the word *arduous*?
    - » *adjective*

Use a Sharing activity for follow-up. Say, "Turn to the person sitting next to you and share about a time when you found a situation arduous. Be sure to use the word *arduous* in your discussion."

Check for Understanding

Ask students to turn to a partner and explain what it means to infer.

- » using evidence from the text to understand something that is not directly stated

ML/EL	MULTILINGUAL/ENGLISH LEARNERS **Reading** Making Inferences
Entering/Emerging	Revisit some of the images in the text with students. Have students orally describe each image and then express an inference about each image using one sentence.
Transitioning/ Expanding	After rereading the text with a teacher or partner, have students orally express their thoughts about key details in the text and why these details are important for understanding the story.
Bridging	Engage students in a discussion about the concept of making inferences by exploring examples from familiar stories or texts, emphasizing how making inferences involves using evidence from the text to understand information that is not directly stated.

Lesson 8: Innovators in the Medical Field

Writing

45M

Primary Focus: Students will develop inquiry skills by generating questions on medical innovators and conducting research to answer them. **[W.4.7]**

INQUIRY AND INNOVATOR RESEARCH (45 MIN.)

- **Think-Pair-Share:** Read the Author's Note on the next to last page of the book, and have students talk with a partner about why the author showed interest in Bath's innovation. Explain your thinking by saying, "The author was interested in Bath's innovation because ___. The author was interested in Bath's innovation but ___. The author was interested in Bath's innovation so ___." Have students write their answers. Remind students to signal when both partners have contributed to the conversation.
  - » The author was interested in Bath's innovation because her mother had been recently diagnosed with cataracts. The author was interested in Bath's innovation, but did not know she would have the chance to interview Bath about her life.The author was interested in Bath's innovation, so she decided to learn more about the woman who invented the laser probe to remove cataracts.
- Tell students that innovations in medicine will likely impact their lives or the lives of people they know.

- Have students review the four-step research process, posted in the classroom.
- Explain that Dr. Bath is just one example of an innovator in medicine and there are many more individuals who have made significant contributions, ranging from surgery techniques, to medical devices, and treatments.
- Say, "I have been wondering about other innovators in healthcare so I made a list of other medical innovators."

Visual Support 8.1

- Display Visual Support 8.1.
- Explain that the list may help them think about medical innovators they might research.
- Allow students an opportunity to read the anchor chart or projected display, which describes each medical innovator.

Activity Page 8.2

- Have students use Activity Page 8.2 to generate and write one research question for the innovator they choose.
- Have students use the Internet to search for sources to gather information on their chosen research question or provide them with access to age-appropriate resources, such as books, articles, or websites, to facilitate their research.
- Remind students to add facts and details, note sources used for all information gathered, and to answer their question on Activity Page 8.2.

End Lesson

LESSON

9

Science and Technology Innovators

PRIMARY FOCUS OF LESSON

Reading

Students will analyze how the modern television was invented and improved, focusing on how the author uses evidence for support. **[RI.4.8]**

Students will demonstrate an understanding of the Tier 2 word *spare*. **[L.4.4]**

Writing

Students will gather sources and information on innovators in television. **[W.4.8]**

Students will brainstorm potential innovators to research for their informative essays. **[W.4.5]**

FORMATIVE ASSESSMENT

Activity Page 9.1 — **Guillermo González Camarena: "An Inventor of Color Television"** Identify textual evidence that explains how the modern television was invented and improved. **[RI.4.8]**

Teacher Presentation Screens:
all lessons include slides

LESSON AT A GLANCE

	Grouping Recommendations	Time	Materials
Reading (40 min.)			
Close Reading	Small Group	35 min.	❑ ReadWorks passage "An Inventor of Color Television" ❑ Activity Page 9.1
Word Work: *Spare*	Whole Group	5 min.	
Writing (50 min.)			
Science and Technology Research	Partner	30 min.	❑ Visual Support 9.1 ❑ Activity Page 9.2
Research Plan	Partner	20 min.	

ADVANCE PREPARATION

Reading

- Provide print or digital access to the ReadWorks passage: "An Inventor of Color Television" for each student.
- Arrange small groups of three to five students for close reading.

Writing

- Prepare for students to work in pairs.

Visual Support 9.1

- Prepare to display Visual Support 9.1.
- Gather resources, including books, magazines, and online articles and databases about Philo Farnsworth and Guillermo González Camarena.
- Plan for 1:1 computer usage in the school library, computer lab, or classroom so students may conduct research.
- Prepare to review the following Internet research guidelines (or other guidelines that reflect your school's technology policy) and to monitor students on computers:
    - When searching the Internet, students will only type the following in the search engine:
        1. the words in their research questions
        2. ideas or topics related to their research questions
        3. names of people, places, and things related to the research questions, ideas, or topics
- Prepare to distribute chart paper for the brainstorming segment.

Universal Access

Reading

- Group students purposefully in small groups.

Writing

- To ensure all students have the opportunity to contribute during Turn and Talk and Think-Pair-Share exchanges, provide students with a signal, such as folding their hands or raising a hand, to indicate when both partners have added to the conversation.

VOCABULARY

Core Vocabulary

- You may choose to preview the vocabulary words before reading the text.

spare, adj. extra or unused; additional

filter, n. device that manages or modifies the intensity of light or the quality of a sound

adapter, n. a device that allows one machine or system to work in a way for which it was not originally designed.

Vocabulary Chart for "An Inventor of Color Television"

Vocabulary Type	Tier 3 Domain-Specific Words	Tier 2 General Academic Words	Tier 1 Everyday Speech Words
Vocabulary		spare filter adapter	
Spanish Cognates		filtro adaptador	
Multiple-Meaning			
Sayings and Phrases			

D Differentiation

Challenge

Challenge students to think of two more ways Guillermo González Camarena's color TV invention affected the world beyond just how people watch TV. Encourage students to consider how his work might have changed things in our society, culture, or technology.

Support

Have students write down any questions they have as they read information about Guillermo González Camarena. Remind them that they can review all the questions to determine which one might become their eventual research question.

Activity Page 9.1

Start Lesson

Lesson 9: Science and Technology Innovators

Reading

40M

Primary Focus

Students will analyze how the modern television was invented and improved, focusing on how the author uses evidence for support. **[RI.4.8]**

Students will demonstrate an understanding of the Tier 2 word *spare*. **[L.4.4]**

CLOSE READING (35 MIN.)

- Remind students that the innovation cycle involves several steps, from identifying a problem to refining prototypes.
- Ask students what it means to refine?
  - » make improvements or changes to make something better
- Tell students that the text they will read focuses on an inventor who has significantly influenced how we experience television today.
- Tell students that as they read, to pay attention to how he refined his ideas to improve color television technology.
- Assign students to groups of three to five. Instruct them to read a copy of the ReadWorks passage titled "An Inventor of Color Television." As they read, direct them to highlight sentences and details in the reading that help them answer the question, "How did Guillermo González Camarena help to change the way the world watches TV?"
- Tell students that once they have read through the article, they should review the text and complete the accompanying Activity Page 9.1.
- After the groups have completed their work, shuffle the group's members to create new groups and ask the students to compare their responses to Activity Page 9.1. Direct them to review the text in situations where group members have different answers. They should use the text to confirm which response is most accurate.
- After comparing their work, direct the students to turn in the activity page to you or to a central location in the classroom.

- Discuss the following question with the class:

1. **Inferential.** How did Camarena refine his idea to improve color television technology?
    - » Answers may vary, but could include Guillermo González Camarena initially developing a "tri-chromatic" adapter to transmit black-and-white TV images through a red, blue, and green filter, creating the appearance of color. However, this adapter was expensive to produce. González Camarena continued to work on improving his invention, eventually developing the "Simplified Bi-color System (SBCS)," which was a cheaper way to show color on TV.

WORD WORK: *SPARE* (5 MIN.)

1. In the text you read "By age 12, he had put together a radio from spare parts."
2. Say the word *spare* with me.
3. *Spare* means extra, or unused.
4. It is a good idea to keep spare batteries in case the ones in your flashlight run out.
5. Can you think of other examples of something that you might keep as a spare? Be sure to use the word "spare" in your response.
    - ◦ Ask two to three students to use the target word in a sentence. If necessary, guide and/or rephrase students' responses to make complete sentences: "Having spare ____ is important in case ____."
6. What part of speech is the word *spare*?
    - » adjective

Use a Discussion activity for follow-up. Say, "Talk with a partner about a time when having a spare something saved the day. Be sure to use the word *spare* in your discussion."

Lesson 9: Science and Technology Innovators

Writing

50M

Primary Focus

Students will gather sources and information on innovators in television. **[W.4.8]**

Students will brainstorm potential innovators to research for their informative essays. **[W.4.5]**

SCIENCE AND TECHNOLOGY RESEARCH (30 MIN.)

Visual Support 9.1

- Display the following excerpt using Visual Support 9.1:
  - "In the 1920s, Philo Farnsworth, a high school chemistry student, got curious about vacuum tubes. Vacuum tubes were an early tool that controlled the direction of an electrical current, or flow of electricity. Farnsworth created an innovative technique that used vacuum tubes to break apart a picture, turn it into electricity, and then put it back together again. His curiosity about vacuum tubes eventually led to black-and-white television, a new way to share information, stories, and entertainment. Later, Guillermo González Camarena innovated further with Farnsworth's methods. This led to him inventing color television—a clear improvement!"
- Encourage students to consider the connection between Philo Farnsworth and Guillermo González Camarena by asking, "How do you think the contributions of Philo Farnsworth and González Camarena are related?"
  - » Answers may vary but could include Philo Farnsworth made it possible to see moving pictures on the screen by inventing the first working television system. González Camarena invented a special system for adding colors to television.

Activity Page 9.2

- Distribute Activity Page 9.2 to each pair of students and instruct them to use the Internet and the provided resources to collect information about Farnsworth and Camarena.
- Explain that they will work with a partner to compare and contrast the contributions of both Farnsworth and Camarena using the information they gathered.
- **Think-Pair-Share:** After students complete their Venn Diagrams, encourage them to share their thinking with their partners by asking specific questions such as "How did the contributions of Farnsworth and González

impact the way people experience television?" Remind students to signal when both partners have contributed to the conversation.

- Have students share one idea from their partner, and write these thoughts on the whiteboard or chart paper.

Check for Understanding

Ask, "How did Philo Farnsworth and Guillermo González Camarena contribute to television technology?"

» Farnsworth invented the first working television system and Camarena invented color television.

RESEARCH PLAN (20 MIN.)

Visual Support 1.9

- Review the culminating activity and writing rubric, using Visual Support 1.9.
- Remind students that they will research and write an informative essay on an American innovator.
- Students will continue working in their pairs from the previous activity. Provide each pair with a large sheet of chart paper.
- Instruct students to brainstorm a list of American innovators they have learned about in the unit on the paper.
- Encourage students to discuss the innovators' backgrounds, their contributions, and why they find them inspiring or fascinating.
- After students have completed their brainstorming session, organize a gallery walk where pairs can visit other pairs' charts and add any additional innovators they find interesting onto their own chart.
- Conclude the brainstorming session by asking each pair to reflect on their list and choose one innovator they are most interested in researching further. Have them briefly explain their choice to their partner by saying, "I want to research ____ because _____. I want to research _____ but _____. I want to research _____ so _____."
- Inform students that they will develop research questions in the next lesson.

D Differentiation

Challenge

Have students organize the innovators they recorded into categories such as inventors, scientists, doctors, engineers, etc.

Support

Provide students with examples of innovators and their respective categories to serve as a model for organizing their ideas.

MULTILINGUAL/ENGLISH LEARNERS

Writing

Brainstorming

Entering/Emerging	Provide sentence starters or frames to scaffold students' responses when brainstorming about American innovators: One innovator I learned about is _____. This innovator is important because _____. I find this innovator inspiring because _____.
Transitioning/ Expanding	Encourage students to express more complex thoughts and ideas using sentence stems or prompts: I am interested in researching this innovator further because _____. One thing that makes this innovator unique is _____. This innovator's impact on society was significant because _____.
Bridging	Encourage independent or partner reflections, promoting critical thinking and analysis in students' brainstorming: After considering various innovators, I believe _____ is the most impactful because _____.

End Lesson

LESSON

10

Engineering and Math Innovators

PRIMARY FOCUS OF LESSON

Reading

Students will identify evidence in the text related to the relevance of engineering and math in the creation of the Ferris wheel. **[RI.4.8]**

Students will demonstrate an understanding of the Tier 2 word *lenders*. **[L.4.4]**

Writing

Students will generate their research question for their informative essays. **[W.4.5]**

FORMATIVE ASSESSMENT

Activity Page 10.1	**Exploring Engineering in the Ferris Wheel** Identify key words and phrases related to math and engineering in the creation of the Ferris wheel. **[RI.4.8]**
Activity Page 10.2	**Research Question and Source Recording** Develop a research question about an American innovator. **[W.4.5]**

Teacher Presentation Screens:
all lessons include slides

LESSON AT A GLANCE

	Grouping Recommendations	Time	Materials
Reading (50 min.)			
Introduce the Read-Aloud	Whole Group	5 min.	❑ *Mr. Ferris and His Wheel* by Kathryn Gibbs Davis ❑ Activity Page 10.1
Read-Aloud	Whole Group	25 min.	
Read-Aloud Discussion	Whole Group	15 min.	
Word Work: *Lenders*	Whole Group	5 min.	
Writing (40 min.)			
Research Question Development	Independent	30 min.	❑ Activity Page 10.2
Partner Share	Partner	10 min.	

ADVANCE PREPARATION

Reading

- Prepare to read the tradebook *Mr. Ferris and His Wheel* by Kathryn Gibbs Davis. As you preview the book, you may wish to add page numbers and reference the guided reading for this lesson. This trade book does not have numbered pages, but for ease of use, we have referred to page numbers in our materials. We begin with page 1, which contains the text "It was only ten months . . ." and number every page after that.
- Ensure students have access to writing materials during the discussion of the Read- Aloud.

Writing

- Ensure students have Activity Page 10.2
- Prepare students to work in pairs.

Universal Access

Reading

- To ensure all students have the opportunity to contribute during Turn and Talk and Think-Pair-Share exchanges, provide students with a signal, such as folding their hands or raising a hand, to indicate when both partners have added to the conversation.

Writing

Visual Support 3.10

- Prepare to project Visual Support 3.10 or recreate the list on an anchor chart that can remain on display in the classroom.

VOCABULARY

Core Vocabulary

- You may choose to preview the vocabulary words before reading the text.

engineer, n. a person who uses their knowledge of science and math to design, create, and improve structures and systems

muster, v. to gather a group of people, things, or ideas

alloy, n. a substance made by mixing two or more metals together

lenders, n. people or places (such as banks) that give money to someone with the agreement that it will be paid back

saturated, adj. filled or soaked completely

axle, n. a rod around which a wheel or a set of wheels revolves

Vocabulary Chart for *Mr. Ferris and His Wheel*

Vocabulary Type	**Tier 3 Domain-Specific Words**	**Tier 2 General Academic Words**	**Tier 1 Everyday Speech Words**
Vocabulary	engineer alloy axle	muster lenders saturated	
Spanish Cognates	ingeniero/a	saturado	
Multiple-Meaning			
Sayings and Phrases	dilly-dallied		

Start Lesson

Lesson 10: Engineering and Math Innovators

Reading

50M

Primary Focus

Students will identify evidence in the text related to the relevance of engineering and math in the creation of the Ferris wheel. **[RI.4.8]**

Students will demonstrate an understanding of the Tier 2 word *lenders*. **[L.4.4]**

INTRODUCE THE READ-ALOUD (5 MIN.)

- Introduce the title of the text and its author, *Mr. Ferris and His Wheel* written by Kathryn Gibbs Davis.
- Tell students that the text they will read is about an inventor and engineer named George Ferris, and his creation that they might have experienced or seen: the Ferris wheel.
- Ask students if they have ridden on or seen a Ferris wheel.
- Ask students if they know what STEM stands for. Pause for student responses.
  - » Answers may vary but could include science, technology, engineering, or math.
- Explain that STEM stands for Science, Technology, Engineering, and Mathematics. Remind students that they learned about some science and technology innovators and how their ideas about television shaped the way we live in Lesson 9.
- Tell students that today they will focus on math and engineering to explore how numbers and problem solving come together to create some amazing inventions, including amusement rides like the Ferris wheel.
- Tell students that engineering is all about using science, math, and creativity to build and design things.
- Introduce and define the vocabulary word *engineer.*
- Tell students that as they are listening to the Read-Aloud they should think about how Ferris used engineering in the creation of the Ferris wheel. They should write down key words or phrases that will help them to answer the question, "How did George Ferris demonstrate the principles of engineering and mathematics in the creation of the Ferris wheel?"

READ-ALOUD (25 MIN.)

Activity Page 10.1

- Distribute Activity Page 10.1 to students.
- Begin the Read-Aloud, pausing after reading page 7.
- Model for students by thinking aloud about key phrases or words that demonstrate Ferris's use of engineering and mathematics. Say, "As I am listening, I hear about how George Ferris carefully measured and re-measured the dimensions of the Ferris wheel. This shows his attention to detail and precision in the engineering process. I also hear about Ferris working on drawings and plans for the Ferris wheel."
    - Allow students to write down key phrases or words they heard that show how Ferris used engineering and mathematics in the creation of the Ferris wheel. Students may write key words or phrases, such as *he measured and re-measured, a mistake of even an inch*.
    - After reading page 10, pause for students to write down key phrases or words they heard. Students may write key words or phrases, such as *a structure made of steel, rolled up his drawing, delicate looking and strong*.
    - After reading page 14, pause for students to write down key phrases or words they heard. Students may write key words or phrases, such as *crew worked on foundation, construction manager said frost was three feet deep.*
    - After reading page 16, pause for students to write down key phrases or words they heard. Students may write key words or phrases, such as *planted steel towers, bolted to crossbars, poured in cement, lowered an axle.*
    - After reading page 18, pause for students to write down key phrases or words they heard. Students may write key words or phrases, such as *100,000 parts, fit all the pieces together, and structural details.*
    - After reading page 19, pause for students to write down key phrases or words they heard. Students may write key words or phrases, such as *834 feet circumference, 265 feet above the ground, designed to move with precision.*
    - After reading page 21, pause for students to write down key phrases or words they heard. Students may write key words or phrases, such as *spin like a bike, tension wheel*.
- Finish reading the text, then allow students two minutes to quietly read over their list of key words and phrases.

- Have students circle three to five key words or phrases from their list to answer the question, "How did George Ferris demonstrate the principles of engineering and mathematics in the creation of the Ferris wheel?"

READ-ALOUD DISCUSSION (15 MIN.)

1. **Literal.** How did George Ferris come up with the idea for the Ferris wheel?
    - » George Ferris was inspired by the challenge to create a structure better than the Eiffel Tower.
2. **Literal.** What was the purpose of George Ferris's invention?
    - » The purpose of the Ferris wheel was to be the main focus at the 1893 Chicago World's Fair, providing visitors with a unique view of the fairgrounds.
3. **Inferential.** Why do you think George Ferris's engineering background was important in the creation of the Ferris wheel?
    - » Answers may vary but could include George Ferris's engineering background was important because it helped him solve tricky problems when making the Ferris wheel. One big problem was figuring out how to build a really big wheel that people could ride safely. Since Ferris knew a lot about building things, he could design the wheel to be strong and safe.

- Ask a few student volunteers to share their 3–5 circled key words or phrases from their list that helped them think about an answer to the question, "How did George Ferris demonstrate the principles of engineering and mathematics in the creation of the Ferris wheel?"
    - » Answers may vary but could include measuring carefully, drawing a strong and safe design, and using math to figure out the size and shape.

4. **Evaluative.** Have students write a sentence in each one of the sentence types—declarative, interrogative, exclamatory, and imperative—that explains how engineers apply STEM to design and operate a Ferris wheel. If time allows, have students share with the class.
    - » Answers may vary but could include the following:
        - Declarative: *Engineers use STEM to build Ferris wheels that are strong and safe.*
        - Interrogative: *Isn't it incredible how science and math come together to make Ferris wheels spin?*
        - Exclamatory: *Wow, engineers design Ferris wheels that reach high into the sky!*
        - Imperative: *Draw a plan that shows how the Ferris wheel operates!*

Check for Understanding

Turn and Talk: Have students talk with a partner about what an engineer does. Remind students to signal when both partners have contributed to the conversation.

- » An engineer is someone who uses science, math, and creativity to design and build structures, machines, or systems.

WORD WORK: *LENDERS* (5 MIN.)

1. In the text you read "But when he began describing his invention, lenders laughed him into the street."
2. Say the word *lenders* with me.
3. Lenders are people or places that give money to someone with an agreement that it will be paid back.
4. Many families have to borrow money from lenders to buy their homes.
5. Can you think of a situation where someone might need to borrow money from lenders?
    - ◦ Ask two or three students to use the target word in a sentence. If necessary, guide and/or rephrase the students' responses to make complete sentences: "Someone might need to borrow money from lenders to . . ."
6. What part of speech is *lenders?*
    - » noun

Use a Discussion activity for follow up. Say, "Discuss with a partner why someone might choose to borrow money from lenders instead of saving up for a purchase. Be sure to use the word *lenders* in complete sentences as you discuss this with your partner."

D Differentiation

Challenge

Challenge students to think critically about the relevance and significance of their research questions.

Support

For students who may need additional support, provide a list of suggested questions related to their innovator or guide them in generating questions. For example:

- What challenges did the innovator face during their lifetime?
- How did the innovator's background or experiences influence their work?
- What contributions did the innovator make to their field or to society?
- How did the innovator's inventions or ideas impact the world?

Activity Page 10.2

Lesson 10: Engineering and Math Innovators

Writing

40M

Primary Focus: Students will generate their research question for their informative essays. **[W.4.5]**

RESEARCH QUESTION DEVELOPMENT (30 MIN.)

- Ask students to name the four steps of the research process.
  - 1) Find an interesting idea/topic; 2) Write a research question; 3) Find answers/facts; 4) Write about the topic/idea.
- Remind students that in the previous lesson they decided on an innovator they are going to research and write about for their final presentation. Ask them what step of the process they have already done.
  - 1. Find an interesting idea/topic
- Ask students what the next step of the research process is.
  - 2. Write Research Question
- Explain that today students will only be developing questions, though they will have the opportunity to research information in the next lesson.
- Give students time to generate one or two questions they have about their innovator. Tell students to ask a question that is open-ended and requires more than one detail to answer.
- Explain the importance of this step in the research process and encourage students to carefully consider the questions they generate, as they will guide their research and shape their essays.
- Encourage students to consider different aspects of their innovator's life, work, and impact when formulating their questions.
- Walk around the room and help students as needed. Verify that students' questions are appropriate for their topics.
- Tell students to record their innovator's name and research questions on Activity Page 10.2. Explain that this will help them stay focused on their chosen topic and guide their research.

PARTNER SHARE (10 MIN.)

- Explain that students will share their questions with a partner and see if they can develop another question or two together. Have students pair up or get together with their assigned partner.
- Ask the following questions:
  - How are the things you and your partner are asking about similar? How are they different?
  - After hearing your partner's questions, are there other questions you could ask?
- Explain that asking new questions about innovators can help students think about them differently and understand them more.
- Tell students if they think of a new question or want to change their existing one, they are free to do so.
- Allow students to share and give feedback with their partners.
- Collect the activity page to review and return at the beginning of the next lesson. If students have added more than one question, star the question that may work best for their project; note students who will need additional support to identify a research question.

ML/EL

MULTILINGUAL/ENGLISH LEARNERS

Writing

Developing Questions

Entering/Emerging	Provide students with Who, What, Where, When, Why sentence starters to develop their questions.
Transitioning/ Expanding	Encourage students to incorporate key terms and concepts they have learned into their questions.
Bridging	Have students use vocabulary from the unit to generate a question.

End Lesson

LESSON

11

Researching for an Informative Essay

PRIMARY FOCUS OF LESSON

Writing

Students will conduct Internet research to identify and gather key information for their innovation research question. **[W.4.8]**

FORMATIVE ASSESSMENT

Activity Page 10.2 **Research Question and Source Recording** Students gather key information for their research question from multiple sources. **[W.4.8]**

Teacher Presentation Screens:
all lessons include slides

LESSON AT A GLANCE

	Grouping Recommendations	Time	Materials
Writing (90 min.)			
Innovator Research	Independent	90 min.	❑ Activity Page 10.2 ❑ Visual Support 7.1

ADVANCE PREPARATION

Writing

- Return Activity Page 10.2 with feedback, noting students who may need additional support in refining their questions.

Visual Support 7.1

- Prepare to display Visual Support 7.1.
- Gather research resources, including books and magazines related to the unit's ideas (such as patents, prototypes, the innovation cycle, and various innovators in fields, such as medicine, music, STEM, and entrepreneurship).
- Plan for one-on-one computer usage in the school library, computer lab, or classroom so students may conduct independent research.
- Prepare to review the following Internet research guidelines (or other guidelines that reflect your school's technology policy) and to monitor students on computers:
    - When searching the Internet, students will only type the following in the search engine:
        1. the words in their research questions
        2. ideas or topics related to their research questions
        3. names of people, places, and things related to the research questions, ideas, or topics
- Ensure students can either print articles or sources located during their search or digitally bookmark articles to review later for writing.

Universal Access

Writing

- To ensure all students have the opportunity to contribute during Turn and Talk and Think-Pair-Share exchanges, provide students with a signal, such as folding their hands or raising a hand to indicate when both partners have added to the conversation.
- If any students have not generated guiding questions for their research, work with those particular students individually while others proceed with their research.

Start Lesson

Lesson 11: Researching for an Informative Essay

Writing

Primary Focus: Students will conduct Internet research to identify and gather key information for their innovation research question. **[W.4.8]**

INNOVATOR RESEARCH (90 MIN.)

- Ensure students have Activity Page 10.2 ready for use.
- Confirm that students have written down one or two open-ended questions about the innovator they are researching.
- Explain that in this lesson, students will conduct research to gather information about their chosen innovator. Emphasize the importance of finding credible sources and extracting relevant information.

Visual Support 7.1

- Display Visual Support 7.1.
- Review the definitions and uses of primary and secondary sources.
- **Turn and Talk:** What is an example of a primary source? What is an example of a secondary source? Remind students to signal when both partners have contributed to the conversation.
  - » Answers may vary, but could include interviews with the subject (primary) and articles about the subject (secondary).
- Encourage students to explore their innovator's backgrounds and achievements by considering—and possibly posting—questions such as:
  - What problem interested this innovator?
  - What creative solution did they develop?
  - How did their solution involve new technology or a new approach?
  - Did the innovator collaborate with others in their work? If so, how?

D Differentiation

Challenge

Encourage students to think carefully about whether the information they find on the Internet is trustworthy. Ask them to check if the website looks professional and if it is written by someone who knows a lot about the topic. Remind them to look for dates to make sure the information is up-to-date.

Support

Provide students with a list of safe and reliable websites where they can find information about their innovator.

- Provide students with a sample sentence related to their innovator research: [Innovator's Name] became known for [innovation or achievement]. Ask students to expand the sentence as they conduct their research, addressing key questions using the following question words:

  When?:

  Where?:

  Why?:

  - » Answers may vary, but could include "While researching at the University of California Los Angeles Medical Center in the late 1980s, Dr. Patricia Bath became known for her laser technology because her work helped treat cataracts and improve eye care around the world."
- Instruct students to use a variety of sources, including books, articles, interviews, and online resources, to learn as much as possible about their innovator.
- Review the way in which students will record information from their sources in the designated sections on Activity Page 10.2. Answer any questions students have to ensure they accurately document key details from both primary and secondary sources.
- Direct students to their research stations. Allow students to gather information for the remainder of the lesson.
- Walk around the space and support students as needed.

ML/EL MULTILINGUAL/ENGLISH LEARNERS

Writing

Recording and Gathering Information

Entering/Emerging	Pair students with a research partner to collaboratively gather details on the following questions: What problem was the innovator trying to solve? What was the solution the innovator came up with? How did the innovation solve the problem?
Transitioning/ Expanding	Have students work with a research partner to talk about the information they gather and identify which details are most important to note.
Bridging	Have students independently gather details and identify what information is most important to note.

End Lesson

LESSON

12

Planning an Informative Essay

PRIMARY FOCUS OF LESSON

Writing

Students will use their research findings to begin planning an informative essay about a selected innovator. **[W.4.2a, W.4.2b, W.4.2d, W.4.2e, W.4.5]**

FORMATIVE ASSESSMENT

Activity Page 12.1 **Research Essay Map** Students will plan their informative essays. **[W.4.2a, W.4.2b, W.4.2d, W.4.2e, W.4.5]**

Teacher Presentation Screens:
all lessons include slides

LESSON AT A GLANCE

	Grouping Recommendations	Time	Materials
Writing (90 min.)			
Essay Planning	Whole Group/ Independent	90 min.	❑ Visual Support 1.9 ❑ Activity Pages 10.2, 12.1

ADVANCE PREPARATION

Writing

Visual Support 1.9

- Copy and distribute Visual Support 1.9.
- Students will need Activity Page 10.2.
- Prepare to display Activity Page 12.1.
- Prepare space for students to work in pairs or small groups if needed.

Universal Access

Writing

- To ensure all students have the opportunity to contribute during Turn and Talk and Think-Pair-Share exchanges, provide students with a signal, such as folding their hands or raising a hand to indicate when both partners have added to the conversation.

Start Lesson

Lesson 12: Planning an Informative Essay

Writing

90M

Primary Focus: Students will use their research findings to begin planning an informative essay about a selected innovator. **[W.4.2a, W.4.2b, W.4.2d, W.4.2e, W.4.5]**

ESSAY PLANNING (90 MIN.)

- Announce that it is time to begin their research essays. Tell students that in this lesson they will begin planning their essays.

Visual Support 1.9

- Display Visual Support 1.9 and ensure that each student has a copy of the Writing Rubric.
- Briefly go over the checklists in the Proficient column of the rubric with students, explaining that their essays will be graded on the ideas they express, how they organize those ideas, and the language they use.
- Explain that before they write their essays, they will review the information they have gathered, categorize it, and group details and ideas in a meaningful way.
- Direct students to the essay planning map on Activity Page 12.1.
- Explain that the essay map includes sections for the introduction, body paragraphs, and conclusion, helping organize their thoughts.
- First, review how to outline the Introduction.
  - Explain that the first sentence of the introductory paragraph will need to introduce the topic with their research question.
  - Explain that the next sentence will tell the reader who their innovator is and what innovation they will write about.
  - Explain that the next sentence in the introduction will tell the reader a detail about when the topic/idea happened.
  - Tell students that the last sentence in their introductory paragraph will tell the reader why this innovation is important or useful to understand.
- **Turn and Talk:** What are the four parts of the introductory paragraph? Remind students to signal when both partners have contributed to the conversation.
  - » Research Question, Who/What, When, Why

Activity Page 12.1

- Next, review how students will organize their research information for their body paragraphs.
    - Tell students that they will discuss three ideas related to their research question in the body of their essay. If useful, suggest the following structure for the body of this essay:
        - Paragraph 1: Describe the innovator and the problem that interested them.
        - Paragraph 2: Describe the innovation they developed to address the problem.
        - Paragraph 3: Describe the impact of their innovation.
    - Explain that for body paragraphs, students will need to write their ideas into complete topic sentences to tell the reader what each paragraph is about. They will add three facts related to each idea from their research notes (Activity Page 10.2).
- Finally, review how students can use Activity Page 12.1 to outline their conclusion. Explain to students that a concluding paragraph is an opportunity for the writer to end the essay by expressing why the topic is important. The writer could also give some additional interesting information that might spark the reader's curiosity to learn more.
    - Tell students that the topic sentence in the concluding paragraph will tell the reader what you have learned as a researcher.
    - Explain that the next sentence gives a reason why the ideas are important.
    - Explain that the third sentence gives another reason why the ideas are important.
    - In the example, the last sentence tells your reader the fact that was most memorable to you as a researcher.
    - Be sure to tell students that their last sentence could be written in other ways to bring their writing to a close. Give your students the following options for the last sentence of their conclusion paragraph:
    - The last sentence could also tell the reader what they want to learn more about.
    - Or, they could rephrase the research question as a concluding statement.

- **Think-Pair-Share:** Have students talk with a partner about how they plan to conclude the last sentence of their essays. Have them explain their thinking by saying, "I plan to conclude by saying _____ because ____. I plan to conclude by saying ____, but ____. I plan to conclude by saying _____, so_____." Remind students to signal when both partners have contributed to the conversation.
  - » Answers may vary but could include I plan to conclude by saying what I learned because I can include a memorable fact. I plan to conclude by saying what I learned, but I still want to learn more. I plan to conclude by saying what I learned, so that I answer my research question.
- Have students use the information they have gathered on Activity Page 10.2 to complete their essay maps.
- Walk around to support and guide students in completing the planning map.
- Collect Activity Page 12.1 to review and return at the beginning of the next lesson.

ML/EL **MULTILINGUAL/ENGLISH LEARNERS** **Writing** Planning	
Entering/Emerging	Have students dictate their research question for the introduction and three key ideas for the topic sentence of each body paragraph while you write their ideas in the research essay map.
Transitioning/ Expanding	Provide students with sentence stems to help them plan their paragraphs, such as: Paragraph 1: My innovator _____, became interested in the problem of _____. Paragraph 2: This innovation was _____, which addressed the problem because it _____ . Paragraph 3: One important impact this innovation has was _____.
Bridging	Have students read aloud information they wrote on the graphic organizers to a partner.

End Lesson

D Differentiation

Challenge

Encourage students to synthesize information from their research notes and prioritize key details that support their ideas.

Support

Provide sentence starters or sentence frames to help students structure their ideas in the essay planning map. For example: "One reason why [innovation] is important is . . . ," or "I learned that [innovator] collaborated with others when . . . ."

LESSON

13

Drafting an Informative Essay

PRIMARY FOCUS OF LESSON

Writing

Students will draft their informative essays.
[W.4.2a, W.4.2b, W.4.2d, W.4.2e, W.4.5]

FORMATIVE ASSESSMENT

Essay Drafts	Students will complete a rough draft of their informative essays. **[W.4.2a, W.4.2b, W.4.2d, W.4.2e, W.4.5]**
Exit Pass	How many different sources and notes did you take as you researched? How many facts from your notes have been included in your essay? **[W.4.8]**

Teacher Presentation Screens:
all lessons include slides

LESSON AT A GLANCE

	Grouping Recommendations	Time	Materials
Writing (90 min.)			
Drafting	Whole Group/ Independent	90 min.	❑ Activity Page 12.1 ❑ Visual Support 13.1 ❑ Exit Pass

ADVANCE PREPARATION

Writing

- Distribute loose leaf paper to students for drafting.
- Return Activity Page 12.1. Plan to conference with students who may need additional support in planning their essays.

Visual Support 13.1

- Prepare to display Visual Support 13.1.
- Prepare space for students to work in pairs or small groups if needed.
- Have paper available for use as an exit pass when students respond to the following two-part question: How many different sources and notes did you take as you researched? How many facts from your notes have been included in your essay?

Universal Access

- To ensure all students have the opportunity to contribute during Turn and Talk and Think-Pair-Share exchanges, provide students with a signal, such as folding their hands or raising a hand to indicate when both partners have added to the conversation.
- If any students have not generated essay maps for their writing, work with those particular students individually while others proceed with their drafts.

Start Lesson

Lesson 13: Drafting an Informative Essay

Writing

Primary Focus: Students will draft their informative essays. **[W.4.2a, W.4.2b, W.4.2d, W.4.2e, W.4.5]**

DRAFTING (90 MIN.)

- Ensure students have Activity Page 12.1 and note students who need additional support to complete their essay maps.
- Distribute loose leaf paper for students to draft, revise, and edit their informative essays.
- Tell students that today, they will use their research essay maps to draft their informative essays.

Visual Support 13.1

- Display Visual Support 13.1 to show students the Informational Writing Template.
- Use George Ferris as an example to show how to take information from Activity Page 12.1 to write a rough draft.
- First, review the draft of the introductory paragraph and support students in drafting their introduction.
- Explain that the introductory paragraph should start with a hook or engaging sentence related to the innovator or their innovation.
- Read the hook sentence: "Imagine a towering structure that revolutionized entertainment at the World's Fair." Have students write their own hook related to their topic on the sheet of loose leaf paper.
- Guide students to write their research question as the topic sentence of their introductory paragraph.
- Then, demonstrate how to write sentences introducing the innovator, the innovation, its timeline, and its significance.
- Remind students that the next sentence will tell the reader who the innovator is and what the innovation is. Read the "who/what" sentence from the Informational Writing Template Introductory Paragraph, then have students write their own "who/what" sentence related to their innovation topic.

- Remind students that the next sentence in the introduction will tell the reader a detail about when the topic/idea happened. Read the "when" sentence from the Informational Writing Template.
- Have students write their own "when" sentences.
- Remind students that the last sentence in their introductory paragraph will tell the reader why the topic is important. Read the "why" sentence from the Informational Writing template.
- Have students write their own "why" sentence related to their innovation research question.
- Have two to three students share their introductory paragraphs with the class.
- Have two to three students provide specific feedback about the hook. Model giving feedback using the following sentence starters:
  - Your hook effectively captures the reader's attention by _____.
  - The phrase/sentence _____ grabs the reader's interest because _____.
  - To enhance your hook, you could consider _____.
- Next, use the Informational Writing Template to show students how they will draft their essay body paragraphs and provide students time to draft.
- Tell students they will add transitions in the next lesson.
- Have students find the section of their Research Essay Map that corresponds to the section for each body paragraph.
- Remind students that each body paragraph focuses on an idea about their topic and provides supporting facts/details, citing relevant sources. If useful, provide the following structure for the body of this essay:
  - Paragraph 1: Describe the innovator and the problem that interested them.
  - Paragraph 2: Describe the innovation they developed to address the problem.
  - Paragraph 3: Describe the impact of the innovation.
- Read the sentences in the body paragraph section of the template. Point out and discuss how the topic sentence for each body paragraph states an idea that is connected to and supported by the facts and supporting details stated in the other body paragraph sentences.

Check for Understanding

Ask students to tell you how the body paragraphs are set up.

» topic sentence about an idea, with three separate fact/detail sentences

- Explain that students will follow the structure outlined in the displayed template to transform their planned ideas and facts into complete sentences for each paragraph. Emphasize that the essay map serves as a guide for organizing their essays.
- Provide students time to draft their body paragraphs. Circulate to support students.
- If useful, provide the following sentence starters for each body paragraph:
  - Paragraph 1: My innovator, _____, became interested in the problem of _____ which was important because _____.
  - Paragraph 2: This innovation was _____, which addressed the problem because _____ .
  - Paragraph 3: One important impact of this innovation was _____.
- With 20 minutes remaining in the writing time, review **the conclusion paragraph** of the Informational Writing Template and support students in drafting their conclusion.
- Remind students that the conclusion paragraph serves as a chance to conclude their essay by summarizing their learning and highlighting the importance of the topic.
- Model this for students by reading aloud the conclusion paragraph of the writing template.
- Leave Visual Support 13.1 displayed for students to reference as they write.
- Circulate to assist and monitor student progress as needed.
- Before ending the class, facilitate a Turn and Talk activity where students pair up with a partner. Instruct each student to read their rough draft to their partner. Then, ask the partners to compare the content of the draft with the notes they took, underlining or highlighting the facts and ideas used in the essays. Remind students to signal when both partners have contributed to the conversation.

D Differentiation

Challenge

Have students integrate vocabulary they have learned in the unit into their drafts. Explain that using new vocabulary will enhance their writing and demonstrate understanding of the words they learned.

Support

Work with students who are still struggling with drafting by helping them turn their prewritten graphic organizers into complete sentences. If needed, provide sentence stems such as, "One fact about (Name of innovator/ innovation) is _____, which is important because _____. "

- Tell the students to use what they just highlighted or underlined to complete the Exit Pass.
- Direct the students to hand in their drafts and exit passes to you or a central location in the classroom.

Exit Pass

1. How many different sources and notes did you take as you researched? 2. How many facts from your notes have been included in your essay?

MULTILINGUAL/ENGLISH LEARNERS

ML/EL

Writing

Drafting

Entering/Emerging	Provide 1:1 support to students as they craft topic sentences for each paragraph by providing key sentence stems, such as: What are the key things to know about [my research topic]? How did the innovation related to my research topic happen? In what ways did [my innovator] change how people [describe the impact]?
Transitioning/ Expanding	Allow students to work with a partner to share topic sentence ideas and turn their research questions into separate topic sentences for each body paragraph. Encourage students to discuss their details and facts for each body paragraph before writing.
Bridging	Offer students guidance on how to make their topic sentences engaging and informative using vocabulary they have learned during their research.

End Lesson

LESSON

14

Revising and Editing an Informative Essay

PRIMARY FOCUS OF LESSON

Writing

Students will revise and edit their informative essays. **[W.4.2a–e, W.4.5]**

FORMATIVE ASSESSMENT

Activity Page 14.1

Peer Review Checklist Students will work with a partner to complete and exchange peer review checklists after revising and editing their essays. **[W.4.2a–e, W.4.5]**

Teacher Presentation Screens:
all lessons include slides

LESSON AT A GLANCE

	Grouping Recommendations	Time	Materials
Writing (90 min.)			
Revising	Whole Group/ Independent	60 min.	❏ Visual Supports 1.9, 14.1, 14.2 ❏ Activity Page 14.1
Editing	Whole Group/ Independent	20 min.	
Peer Feedback	Partner	10 min.	

ADVANCE PREPARATION

Writing

- Return students' drafts. Plan to conference with students who may need additional support in drafting their essays.

Visual Supports 1.9, 14.1, 14.2

- Prepare to project Visual Supports 1.9, 14.1, and 14.2.
- Prepare for students to use a dictionary in the classroom or an online dictionary to check the spelling of words that may be misspelled.
- Prepare to use a visual timer to assist with time management and task completion of the revising and editing tasks.
- Prepare to put students into pairs.

Universal Access

Writing

- To ensure all students have the opportunity to contribute during Turn and Talk and Think-Pair-Share exchanges, provide students with a signal, such as folding their hands or raising a hand to indicate when both partners have added to the conversation.
- Use a visual timer for the revising and editing portions of the lesson to help students pace their work and progress towards completion of tasks.

Start Lesson

Lesson 14: Revising and Editing and Informative Essay

Writing

Primary Focus: Students will revise and edit their informative essays.
[W.4.2a–e, W.4.5]

REVISING (60 MIN.)

Visual Support 1.9

- Project and review Visual Support 1.9.
- Tell students that they will use this rubric to guide their revision process. Emphasize that they should aim to meet the criteria in the Proficient column first before considering advanced elements.
- Explain the key expectations outlined in the rubric:
  - An introduction that clearly presents the research topic.
  - Body paragraphs that develop each section of their research [the innovator, the innovation, the impact of the innovation] with their researched facts and details.
  - A conclusion that summarizes what they learned and why it is important.
  - Sentences that describe ideas and the connection between ideas clearly.
- Explain that during revision, writers are making changes to describe their ideas completely with enough detail and in the right order so that their reader understands their ideas.
- Outline specific revision tasks for students to focus on in this lesson:
  - Ensure each paragraph has a clear topic sentence and supporting facts and details.
  - Read each sentence carefully to decide whether it communicates the ideas clearly or whether it could be revised with better vocabulary or an additional phrase.
  - Add transitions between paragraphs.

Visual Support 14.1

- Display Visual Support 14.1.

- **Turn and Talk:** Ask students if they recall what a transition is in writing. Remind students to signal when both partners have contributed to the conversation.
  - » Answers may vary, but could include transitions show the order of events or include words, such as *first, next, then*, *finally,* etc.
- Tell students that transitions can help to introduce, to connect, and to conclude ideas.
- Model and demonstrate for students how to try out transitions in order to identify the transition that works best in the given set of sentences.
- Demonstrate putting a transition used 'to close' before a body paragraph on the displayed Informational Writing Template. Ask, "Would you say, 'In Conclusion, George Ferris, born in 1859, was an American engineer.' as the topic sentence of the first body paragraph?" (Students' answers should be 'no', because you are just starting, not ending your ideas.)
- Have a student choose a transition from the projected list that would work to start the first body paragraph in the template.
- Use Visual Support 14.2, the original and revised body paragraph, to walk the class through the type of revisions they might consider. [Adding transitions, combining sentences, breaking apart sentences, etc.]

Visual Support 14.2

Original Writing	Revised Writing
George Ferris, born in 1859, was an American engineer.	George Ferris, born in 1859, was an American engineer known for his curious spirit and love for creating exciting things.
The book, *Mr. Ferris and His Wheel* describes how Ferris liked to build things from a young age. He studied engineering at school.	To start, the book *Mr. Ferris and His Wheel* describes how Ferris liked to build things from a young age and studied engineering at school.
He started his career building bridges. He learned how to make strong structures.	When he started his career building bridges, he had learned how to make strong structures.
As the book also mentions, George Ferris was really good at solving problems, leading to numerous successful projects and a growing reputation within the engineering field.	Furthermore, as the book also mentions, George Ferris was really good at solving problems. This skill led to numerous successful projects and a growing reputation within the engineering field.
He faced a big challenge to design something amazing for the World's Columbian Exposition in Chicago.	You can see why he was the man given the big challenge to design something amazing for the World's Columbian Exposition in Chicago.

- Tell students that they can even change their sentence structures, using conjunctions (*and, or, but*) to combine ideas.
- Model for students using the sentences: *He started his career building bridges. He learned how to make strong structures.*
- Explain that students can combine the two complete sentences using a conjunction (*and, or, but*) to say, "He started his career building bridges and learned how to make strong structures."
- Suggest that during the revision process, students consider identifying sentences in their drafts that could be improved by using conjunctions.
- Guide students in managing their time effectively.
- Suggest spending 5-10 minutes revising the introductory paragraph, followed by the next 15-20 minutes on body paragraphs, and the remaining time on the conclusion. Set a visual timer to help them stay on track.
- Allow students to work independently on their drafts, using the writing rubric to self-assess and revise their own work.

EDITING (20 MIN.)

- Tell students that they will now edit or fix their work by looking closely at their writing to address the following areas: 1) spelling, 2) capitalization, 3) punctuation.
- Tell students that while editing they may use a dictionary in the classroom or computer to check the spelling of words that may be misspelled.
- Tell students that they will ensure that the beginnings of sentences and proper nouns (names of people, places, and things) are capitalized.
- Tell students that they will look for proper use of periods, commas, question marks, and other punctuation.
- You may model by writing a few sentences without a period, comma, or question mark and have students correct on the whiteboard by adding the appropriate punctuation.
- Allow students time to edit their drafts.

D Differentiation

Challenge

Challenge students to use different types of sentences for punctuation, such as exclamatory, interrogative, and declarative sentences.

Support

Provide students with a checklist or reference guide to help them remember the specific areas they need to focus on while editing, such as spelling, capitalization, and punctuation.

PEER FEEDBACK (10 MIN.)

- Have students take out Activity Page 14.1 and review the Peer Review Checklist with them.
- Explain each section of the Ideas, Organization, and Language. Point out that each section is just like the Writing Rubric that will be used to grade their essays.
- Have students pair up or get together with assigned partners, bringing their drafts and Activity Page 14.1.
- Explain that each student will be a peer reviewer. They will read each part of their partner's revised and edited draft and then fill out the Peer Review Checklist. Tell students to include one compliment about their partner's writing and one suggestion to help them to improve.
- Model giving feedback using the following sentence starters:
  - I really liked how you . . .
  - When you used the word ___, it helped me understand . . .
  - One suggestion for improvement could be to . . .
- Have students exchange their drafts and walk around to support students as needed.
- When time is up, have students return their partner's draft along with a completed Peer Review Checklist so the writer can review their peer feedback.
- Direct students to ask any clarifying questions about the feedback.
- Collect the Activity Page and tell students they will refer to it when they write their final drafts during the next lesson.

Activity Page 14.1

D Differentiation

Challenge

Have students revise two sentences by incorporating a vocabulary word they have learned from the unit into each sentence. They can choose these words from the bulletin board provided.

Support

Conference with students who need additional time or guidance to complete their drafts before moving onto revisions.

ML/EL

MULTILINGUAL/ENGLISH LEARNERS

Revising and Editing

Peer Feedback

Entering/Emerging	Provide sentence frames or starters to guide students in giving constructive feedback to their peers, such as: I liked when you _____ because _____. One suggestion for improvement is _____. Can you explain more about _____?
Transitioning/ Expanding	Encourage students to actively engage in peer feedback sessions by providing feedback based on specific criteria, such as organization and coherence and offering specific suggestions for improvement.
Bridging	Encourage students to use academic vocabulary and language structures appropriate for giving feedback, such as providing suggestions for revisions and offering praise for effective writing techniques.

End Lesson

LESSON

15

Publishing an Informative Essay

PRIMARY FOCUS OF LESSON

Writing

Students will publish their final research essays and bibliographies, and will adapt their research findings into an infographic. **[W.4.4, W.4.5, W.4.7, W.4.8]**

Speaking and Listening

Students will practice presenting their research and infographic to a partner for rubric-centered feedback. **[SL.4.4, SL.4.5]**

FORMATIVE ASSESSMENT

Final Draft	Informative Writing Rubric **[W.4.4, W.4.5, W.4.7, W.4.8, SL.4.4, SL.4.5]**

Teacher Presentation Screens:
all lessons include slides

LESSON AT A GLANCE

	Grouping Recommendations	Time	Materials
Writing (35 min.)			
Publishing: Innovation Essays	Whole Group	30 min.	❏ Activity Pages 10.2, 14.1 ❏ Visual Support 15.1
Adding the Bibliography Page	Independent	5 min.	
Speaking and Listening (55 min.)			
Creating a Presentation	Whole Group/ Independent	40 min.	❏ Activity Page 15.1 ❏ Visual Supports 15.2, 15.3
Peer Rehearsal: Presentation Practice	Partner	15 min.	

ADVANCE PREPARATION

Writing

- Make sure students have access to their revised essay drafts along with the Peer Review checklist (Activity Page 14.1) provided by their partner in the previous lesson.
- Students will need Activity Page 10.2 to write their bibliography pages.
- Distribute sheets of looseleaf paper for students to write their final drafts and bibliographies.
- Prepare for students to use a dictionary in the classroom or an online dictionary to check the spelling of words that may be misspelled.

Visual Support 15.1

- Prepare to display Visual Support 15.1.

Speaking and Listening

Visual Supports 15.2, 15.3

- Prepare to display Visual Supports 15.2 and 15.3.
- Consider arranging the room so that students have desk or table space to arrange their texts and visual components or laptops for their presentation if needed.
- Provide and support students with the options of printing photos, making illustrations, or incorporating visual aids digitally.
- Prepare students to work in pairs during the presentation practice.

Universal Access

Writing

- Plan to confer independently with and assist students who need extra support with the Publishing process.

Speaking and Listening

- To ensure all students have the opportunity to contribute during the Turn and Talk activity, provide students with a signal, such as folding their hands or raising a hand to indicate when both partners have added to the conversation.

Start Lesson

Lesson 15: Publishing an Informative Essay

Writing

35M

Primary Focus: Students will publish their final research essays and bibliographies, and will adapt their research findings into an infographic. **[W.4.4, W.4.5, W.4.7, W.4.8]**

PUBLISHING: INNOVATION ESSAYS (30 MIN.)

- Have students carefully review the feedback and comments they received from their peers on Activity Page 14.1.
- Ask them to consider and share their thoughts about how they can apply this feedback to their final drafts.
  - » Answers may vary, but could include by fixing any mistakes or adding details.
- Tell students to read their drafts quietly to themselves and reflect on potential areas for improvement based on their peers' feedback.
- Encourage students to think about how they can improve how clearly they communicate their ideas, whether they can add additional details or use transition words to help the reader better understand the connection between ideas.
- Distribute two blank sheets of paper to each student. Instruct them to write their name in the top right corner on both sheets.
- Explain that when students complete their final revisions and edits, they will compose the final draft of their research essay.
- Have students write the title of their essay at the top of the first page and 'Bibliography' at the top of the second page.
- Instruct students to copy the revised draft of each section (introduction, body paragraphs, conclusion) in order under the title of the essay.
- Remind them to include any additional edits for improvement as they write their final draft.

ADDING THE BIBLIOGRAPHY PAGE (5 MIN.)

- Ensure that students have Activity Page 10.2 on their desks.
- Tell students that in addition to their essays, they will need to have a Bibliography Page with at least three sources.

D Differentiation

Support

Encourage students to think critically about the effectiveness of the infographics they have seen, considering factors such as clarity of information, organization, and visual appeal.

Consider showing students images of infographics commonly used at schools or museums to provide additional context and inspiration.

Visual Support 15.1

- Draw students' attention to Visual Support 15.1 to assist them in including each source they cite. Review the examples and answer any questions students may have.

Lesson 15: Publishing an Informative Essay

Speaking and Listening

55M

Primary Focus: Students will practice presenting their research and infographic to a partner for rubric-centered feedback. **[SL.4.4, SL.4.5]**

CREATING A PRESENTATION (40 MIN.)

- Congratulate students on their hard work and publishing their Innovation informational texts.
- Explain that they will now transform the information from their research essays into infographics for their Innovation Presentation.
- Tell students that an infographic is a visually appealing way of presenting information, typically in a chart, diagram, or illustrated form.
- **Think-Pair-Share:** Where have you seen infographics? What type of information was shared? Remind students to signal when both partners have contributed to the conversation.
- Have students share one idea from their partner and write these thoughts on the whiteboard.
  - » Answers may vary, but could include mention of a museum (to share information about historical events), the cafeteria (the USDA Food Pyramid), or the Technology Lab (online safety tips).

Visual Support 15.2

- Display Visual Support 15.2 and explain the three main parts of infographics: organization of information, visuals, and design.

Visual Support 15.3

- Use Visual Support 15.3 to illustrate a possible approach to visualizing information and creating an infographic.

- **Think-Pair-Share:** Have students share observations about the sample infographic with a partner. Remind students to signal when both partners have contributed to the conversation. Call on a few students to share what their partner said and jot their responses on the board.
  - » Answers may vary, but could include mention of length, images, title, and summarizing information.
- Tell students that they will now use the information from their research essays to create their own infographics.
- Provide students with Activity Page 15.1 to plan their ideas.
- Have students review their essay and identify:
  - the topic of their infographic
  - three or four pieces of information they will include on their infographic
  - two to four images or illustrations that would enhance their infographic and support the information
- Explain that after creating their infographics, students will have the opportunity to present them to the class. Clarify that each presentation should be around 3-5 minutes long.
- Give students the option to create infographics using various methods, such as printing photos, making hand-drawn illustrations, or utilizing digital tools. Ensure they have access to the necessary materials or technology for their chosen method.
- Give students time to put together their infographics for their 3–5 minute visual presentations.
- Walk around the room and support students as needed.
- Be sure to collect each student's completed final draft for assessment, ensuring they have included their Bibliography page with the complete list of sources cited.

PEER REHEARSAL: PRESENTATION PRACTICE (15 MIN.)

- Pair each student with a peer partner for the rehearsal, ensuring each pair consists of one presenter and one observer.
- Briefly explain the purpose of the rehearsal: to practice presenting their infographics for the upcoming Innovation Exhibit.

Activity Page 15.1

D Differentiation

Challenge

Have students add a "Did you know?" or "Fun Facts" section to their infographic and presentation, which includes additional facts they find fun and interesting.

Support

Provide constructive feedback on student presentations as they are working, focusing on areas such as enthusiasm, clarity of expression, organization of ideas, engagement with the audience, and adherence to time limits.

- Ask students what presentation techniques they have seen people use to engage their audience.
  - » Answers may vary, but could include making eye contact with the audience, speaking clearly and at a reasonable volume, using movements or gestures; inviting audience participation.
- Remind students that it is important to speak clearly and make eye contact while presenting.
- Remind students that when they are observing someone's presentation, they should pay attention to the presenter's delivery, content clarity, and use of visual aids.
- Instruct observers to provide constructive feedback to the presenters. Encourage them to highlight positive aspects and suggest areas for improvement in a constructive manner.
- Prompt presenters and observers to switch roles for the next presentation round.
- Repeat the presentation and feedback process with the new roles reversed.
- Remind students to practice more at home and come prepared for their final presentations in the next lesson.

ML/EL

MULTILINGUAL/ENGLISH LEARNERS

Speaking and Listening

Peer Rehearsals

Entering/Emerging	Use simple language when speaking during peer rehearsals for the presentation. Provide individual support as needed to understand key terms and concepts.
Transitioning/ Expanding	Increase the use of vocabulary during peer rehearsals, incorporating more specific terms related to the topic.
Bridging	Demonstrate use of rich and varied vocabulary, including domain-specific terms, when speaking during peer rehearsals for the presentation.

End Lesson

LESSON

16

Innovation Presentation

PRIMARY FOCUS OF LESSON

Speaking and Listening

Students will speak clearly at an understandable pace as they share their infographic and key research findings from their selected research topic. **[SL.4.4, SL.4.5]**

FORMATIVE ASSESSMENT

Presentations	Students will share their infographic and research findings with their classmates. **[SL.4.4, SL.4.5]**
Exit Pass	Students reflect on the research process. **[W.4.9]**

Teacher Presentation Screens:
all lessons include slides

LESSON AT A GLANCE

	Grouping Recommendations	Time	Materials
Presentation (90 min.)			
Presentations	Whole Group	90 min.	❑ Visual Support 16.1 ❑ Exit Pass

ADVANCE PREPARATION

Speaking and Listening

- Depending on the class size and the needs of the group, plan a classroom arrangement where students can see the presenter and their materials/equipment and be prepared to listen actively.
- Prepare to display student visuals and/or infographics as they present. Posters may be displayed on the walls in different places around the classroom prior to beginning the presentations. Students can give their oral presentations standing next to their posters.
- Prepare to project if students will be sharing slide presentations.
- Prepare to print and distribute copies of the Exit Pass for each student to complete at the end of the speaking and listening segment.

Universal Access

Speaking and Listening

- To ensure all students have the opportunity to contribute during Turn and Talk and Think-Pair-Share exchanges, provide students with a signal such as folding their hands or raising a hand to indicate when both partners have added to the conversation.

Start Lesson

Lesson 16: Innovation Presentation

Speaking and Listening

Primary Focus: Students will speak clearly at an understandable pace as they share their infographic and key research findings from their selected research topic. **[SL.4.4, SL.4.5]**

PRESENTATIONS (90 MIN.)

- Tell students that today they will present their research findings and visuals during the Innovation Exhibition.
- Remind students that an Innovation Exhibition is a gallery where students present their discoveries and understanding of their chosen innovators and innovations.
- Remind students that great presenters are enthusiastic, confident speakers and engage their audience.
- **Turn and Talk:** What techniques will you use to engage your audience? Remind students to signal when both partners have contributed to the conversation.
  - » Answers may vary, but could include making eye contact with the audience, speaking clearly and at an appropriate pace, incorporating movement or gestures, and inviting audience participation.
- Depending on the class size and the needs of the group, present your chosen option for how to run the student presentations.
- Option 1: Have students present one by one, in front of the entire group. This option can work in smaller classes.
- Option 2: Divide the class into groups of presenters. Create different presentation spaces around the classroom, and assign each member of the first presenting group to a space. Then have the rest of the class rotate to listen to each presenter. Depending on the number of students, each presenter presents two or three times to smaller groups of students, before you assign each member of the second presenting group to take over as presenters in each space. This option is slightly less intimidating for presenters.

D Differentiation

Challenge

Encourage students to enhance their presentations by integrating storytelling techniques, such as sharing anecdotes, personal experiences, or vivid descriptions.

Support

Allow students to use notecards or read directly from their presentations.

- Option 3: Divide the class into smaller groups and have each presenter give their presentation to the other members of their assigned group, without rotation. Depending on the needs of the class, this can be a less intimidating option for student presenters.
- Before students take the stage, ensure that they have their infographic, any speaking notes, and any other visuals they need to successfully share their work. Ensure that any necessary equipment is in place.
- Keep presentations on track by instructing students to take five minutes for each presentation, including audience feedback and questions. Use a timer as needed to ensure each student has an opportunity to present at least once. Remind students that they may have time after each presentation to give feedback and ask questions. Review any guidelines for providing positive feedback. Prompt student questions if necessary, and ask teacher questions intermittently during the presentations.

Visual Support 16.1

- Display Visual Support 16.1 for students to inspire deep thinking and curiosity as they listen to the presentations.

Exit Pass

Final Reflection: Imagine you are writing to a future fourth grader. Write one of each sentence type (declarative, imperative, interrogative, and exclamatory) to describe what you have learned about innovation and being a researcher and writer in this unit.

» Answers may vary but could include the following:

Declarative: *I have learned about the many ways American innovators have changed the world with their ideas.*

Imperative: *Did you know the four steps of the innovation cycle are to identify the problem, develop an idea, test a prototype, and refine?*

Exclamatory: *It was interesting to learn about the inventors of things I use daily!*

Imperative: *Listen to my presentation to find out what I learned about Lewis Latimer.*

ML/EL MULTILINGUAL/ENGLISH LEARNERS

Speaking and Listening

Presenting

Entering/Emerging	Help students orally describe each of the visual aids in their presentation. "This is a picture of _____. I chose this picture to show_____ ." Encourage peers to use the sentence starter to provide feedback: "My favorite part of your presentation was _____."
Transitioning/ Expanding	Have students read or show their presentation to a small group. Have students ask two questions to the presenter about their research.
Bridging	Have students give their presentation in front of a small group. Have students ask and answer questions about their presentation and other student presentations.

End Lesson

Grade 4 | Unit 9

Pausing Point

NOTE TO TEACHER

Please use two days to address students' performance in this unit. Use your observations of student performance in class and assessment of their research projects and activity pages to evaluate their strengths and weaknesses and determine which remediation and/or enrichment opportunities will benefit particular students. In assigning these remediation and/or enrichment activities, you may choose to have students work individually, in small groups, or as a whole class.

You may do activities in any order or combination, using the whole class or small groups to meet the needs of the students.

REMEDIATION

Content

If students demonstrate a need for remediation on any of the elements of the research unit, refer to the lessons covering that element. Ask students to rework the activity that reflects a struggle with a particular concept [i.e., Venn Diagram for compare and contrast; paraphrasing a quotation; identifying facts and details in a text]. Allow students to work collaboratively to review their work, rereading the text and annotating the evidence from the text that supports their revision. Additionally, you should focus more heavily on the questions labeled Support in the Teacher Guide materials for that lesson.

Reading Comprehension

If students demonstrate a need for remediation in reading comprehension, including any issues pertaining to decoding, consult the CKLA Decoding and Encoding Remediation Supplement. This online publication provides further guidance in assessing, analyzing, and remediating specific skills related to decoding and letter-sound correspondence.

Fluency

Students who struggle with fluency will benefit from having multiple opportunities to reread a particular text. If students demonstrate a need for remediation related to fluency, you may have them either reread selections

from the unit or choose an excerpt from the collection of trade books previously curated for research purposes in this unit.

Writing

If students demonstrate a need for remediation in writing skills, refer to the individual lessons in which particular skills were addressed. You may wish to create specific writing prompts targeting the particular skill in which students need additional practice, or repeat targeted instruction and allow students the relevant elements of their research essay.

ENRICHMENT

If students have mastered the skills taught in the *Inspiration and Ingenuity: American Innovation* unit, you may use the following enrichment activities.

ACTIVITIES

Graffiti Wall

Materials: Chart paper and markers

Give students a key domain concept or vocabulary such as *intellectual property.* Have them brainstorm ideas associated with this concept, such as *patents*, *ownership*, *trademarks*, *creativity, protection,* etc. Students will record their responses in both words and pictures on the chart paper. Have students do a gallery walk of other groups' charts.

Riddles

Materials: Paper and pencil

Have students create and exchange riddles to review everything they have learned about innovations so far. For example, "I hang high above the street. With colors bright, I'm hard to beat. Red means stop, green means go, yellow warns so cars can slow. What am I?"

Innovation Timeline

Materials: Chart paper, markers, images of innovation

Ask students to create a timeline of significant American innovations, placing them in chronological order and describe their impact.

Inventor Interviews

Materials: Interview question prompts, recording device (optional)

Have students imagine they are interviewing one of the American innovators they have learned about in class. Provide them with a list of interview question prompts related to the innovator's background, inspirations, challenges faced, and impact of their invention. Students can either role-play the interview with a partner or conduct research to answer the questions based on what they have learned. If available, students can record their interviews or present them live to the class.

Creating a Light Bulb

Materials: white or yellow paper, scissors, small LED bulb, coin cell battery, and tape

Take the small piece of paper and cut it into a thin strip, about 3-4 inches long. Tell students that the strip represents the filament inside the bulb. Then, use tape to attach one end of the paper strip to the positive (+) side of the coin battery. Make sure the other end of the strip is free. Next, attach the small LED bulb to the free end of the paper strip using tape. The bulb should light up when the paper filament is connected to the battery. Have students discuss the role of the filament and the connection to electricity.

Writing Prompts

Materials: Paper and pencil

Writing prompt: Choose an innovation to research and write a paragraph explaining its significance and impact on society.

- Remind students to include specific details and examples from their research to support their explanation of the innovation's importance.
- Encourage students to consider how the innovation has influenced various aspects of society, such as technology, culture, economy, or daily life.
- Allow students to orally share their writing with a partner once they are done.

Writing prompt: Select what you consider to be the best innovation of all time. Write a paragraph explaining why using the following sentence stems:

- [Name of innovation] is the best innovation of all time because...
- [Name of innovation] is the best innovation of all time, but...
- [Name of innovation] is the best innovation of all time, so...

Independent Reading

Materials: Assortment of books about American innovators and inventions

Have students read additional trade books about innovation in your classroom or from the library. After reading, have the students write a book review that includes the following:

- The title and author.
- Why did you choose the book? Did the topic or innovator interest you?
- A brief summary.
- Who was the innovator?
- Did they face challenges in their work? If so, what were they?
- Describe the innovation and how it provided a solution to a problem or improved existing methods.
- Would you recommend the book to others interested in innovation? Why?

Vocabulary Pick Up Sticks

Materials: popsicle sticks, markers

- Distribute a set amount of popsicle sticks. Have students use the unit glossary to write key vocabulary on each stick—word on one side, definition on the other. Give students directions on how to use the popsicle sticks to play a game of pick-up sticks, reviewing with one another the vocabulary as they play.

Grade 4 | Unit 9

Teacher Resources

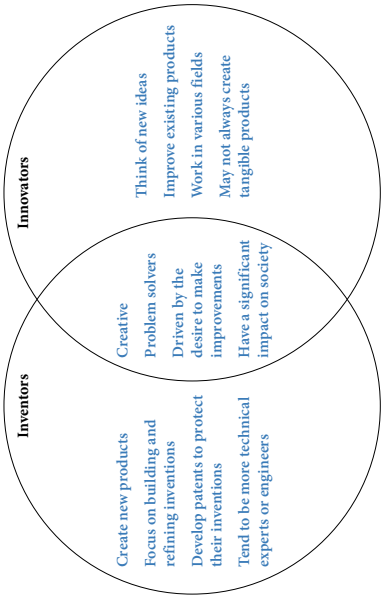
In this section, you will find:

- Activity Book Answer Key

NAME: _____
DATE: _____

1.2 Activity Page

Venn Diagram
Answers may vary.



NAME: _____
DATE: _____

2.2 Activity Page

Paraphrasing Text

Answers may vary.

Identify two or three key achievements of Madam Walker as an innovator from the text. Copy the direct quote that best describes an identified achievement onto one side of the Paraphrasing Text chart. Paraphrase the direct quote on the other side of the chart, using your own words while incorporating keywords from the text.

DIRECT QUOTE from Text (use quotation marks)	PARAPHRASED Text (your own words)
"Through her work and innovations, Madam C. J. Walker was the first woman in America to become a self-made millionaire."	Madam C. J. Walker made history as America's first female self-made millionaire because of her hard work and clever ideas.
"The "Wonderful Hair Grower" was followed by another successful innovation called the "Walker System," a step-by-step process for using Walker's products and iron combs to care for hair."	After the "Wonderful Hair Grower" came the "Walker System," a successful plan created by Mrs. Walker. It outlined step-by-step instructions for using her products and iron combs.

NAME: _____
DATE: _____

2.3 Activity Page

Entrepreneurs as Innovators

What were some of Madam C. J. Walker's key achievements as an innovator? How did her contributions have a positive impact on her society?

Answers may vary.

Madam C.J. Walker did really important things as an inventor. She was the first woman in America to make herself a millionaire with her own business. She also made special products for taking care of hair, like the "Wonderful Hair Grower" and the "Walker System." These products helped a lot of people, especially African American women, to take care of their hair better. By doing this, she gave jobs to many people and made her customers feel good about themselves. Madam Walker's success showed that women can be amazing business owners and helped change how people think about that.

NAME: _____
DATE: _____

3.2 Activity Page

Impactful Inventors

Answers may vary but sample answers follow.

Inventors	Dates, Facts, and Details
Garret Morgan	Garrett Morgan's patent for his three-part traffic signal was approved in 1923. He introduced the concept of a "caution" signal to warn drivers of an upcoming stop, reducing accidents caused by sudden stops.
Florence Parpart	Florence Parpart patented her mechanical street sweeper and refrigerator designs. Her street sweeper design aimed to keep streets clean by efficiently picking up trash, while her refrigerator innovation used electrical power to circulate cold water for food preservation.
Josephine Cochrane	Josephine Cochrane received a patent for her dishwasher design in 1886. Her invention featured a dish-washing machine that could hold and clean 200 dishes at a time without causing damage.
Philip Downing	Philip Downing filed a patent for his mailbox design, which was approved in 1891. His design featured a curved top to prevent snow and rain buildup, a strong metal construction, and a hinged door for mail protection and privacy.

NAME: _____

DATE: _____

3.3 Activity Page

Practice Bibliography Page

Research Question: _____

Answers may vary.

Type of Source	Source Title	Source Information
1.		
2.		
3.		
4.		

NAME: _____

DATE: _____

4.2 Activity Page

"Invention Today, Innovation Tomorrow"

Read the text provided. Identify the main idea, which is the central point or message of the text. Find key details that support or explain the main idea. Complete the graphic organizer below with the main idea and key details.

Answers may vary.

Main Idea: Lighting technology has progressed from using candles and oil lamps to having modern electric lights. Despite facing challenges, inventors such as Thomas Edison, and innovators Lewis Latimer and Shuji Nakamura made significant discoveries, including the invention of the incandescent light bulb and LEDs, which have transformed how we illuminate our homes.

Key Detail:	Key Detail:	Key Detail:	Key Detail:	Key Detail:	Key Detail:
Before electricity, people used candles, fireplaces, and oil lamps for light.	In the late 1800s, early electric light bulbs were invented, but they had issues like flickering and a short lifespan due to problems with the filament.	Thomas Edison played a crucial role in solving the filament problem, leading to the development of a longer-lasting light bulb made of carbon-coated bamboo filament.	Lewis Latimer's new filament made electric light bulbs easier, cheaper, and longer-lasting.	Nakamura's blue LED invention led to brighter, longer-lasting, and more energy-efficient LED light bulbs.	The blue LED also paved the way for inventions like BluRay movies and modern LED screens.

NAME: _____

DATE: _____

4.3 Activity Page

Writing an Informative Paragraph

Answers may vary.

Inventors like Thomas Edison, Lewis Latimer, and Shuji Nakamura worked hard to make light bulbs better. Edison had the first big breakthrough when he made a light bulb that lasted longer. Then, Latimer made improvements, using a different material for the filament, which made bulbs last even longer. Later on, Shuji Nakamura invented blue LED lights, which made bulbs brighter and saved more energy. These innovations changed how we light up our world, making it brighter and more efficient.

NAME: _____

DATE: _____

5.1 Activity Page

The Innovation Cycle

Use the article to provide detailed information about each step.

Answers may vary.

Steps	Details
Step 1: Identify a Problem	The inventor identifies a need or a problem that their innovation aims to solve. For example, Aisen Caro Chacin identified the need for a device that allows people to listen to music through bone conduction without traditional headphones.
Step 2: Develop an Idea	The innovator generates ideas or concepts to address the identified problem. For example, Chacin came up with the idea for "The Play-a-Grill," a device worn in the mouth that vibrates teeth to produce sound.
Step 3: Test a Prototype	The innovator makes a prototype, or test model, to see if their idea works. For example, Chacin made many versions of her device, trying out different materials and parts to make it more comfortable and useful.
Step 4: Refine	The innovator evaluates the prototype, gathers feedback, and makes improvements to refine the design. For example, Chacin made several refinements to versions of her device based on user feedback and her own observations, aiming to make it smaller, more comfortable, and enhance its appearance.

NAME: _____

DATE: _____

5.2 Activity Page

Sequence Transition Words

Answers may vary.

first	third	then	last
second	next	finally	afterwards

Part 1

Rewrite the steps of the innovation cycle in your own words. In each sentence, begin with a transition word from the word bank above. Use the text and your notes from Activity Page 5.1 to help you.

First, the inventor identifies a need or problem that their innovation aims to solve.

Next, they develop an idea or concept to address the identified need or problem.

Third, the inventor creates a prototype or experimental model to test the feasibility and functionality of their idea.

Then, they test the prototype and gather feedback from users to identify areas for improvement.

Afterwards, the inventor makes adjustments or refinements to the prototype based on feedback and observations.

Finally, after several iterations of testing and refining, the inventor produces the final version of the innovation.

NAME: _____

DATE: _____

6.1 Activity Page

Question Words

Use the article to answer the questions in the chart. Expand on your answers by writing a complete sentence.

Part 1 Answers may vary.

Who (is using this innovation)?	What (is being created/materials are being used)?	How (does this innovation make an impact)?
1. builders	1. concrete houses	1. helps build strong, affordable homes quickly
2. doctors	2. medical devices	2. gives people replacement limbs to do daily tasks more easily
3. bakers	3. custom designed desserts	3. makes special treats for celebrations, with cool designs on top
4. chefs	4. vegan burgers	4. offers food options made from plants, helping our planet too.

Example Sentence: Construction companies are using 3D printing in southern Mexico to make houses out of concrete.

Your Sentence: Chefs are using 3d printing to make plant based foods, such as vegan burgers.

Part 2

Use Part 1 to write 5 sentences explaining the significance of 3D printing in various fields.

Although 3D printers are a recent technology, they already have a wide variety of applications. Builders can now quickly and affordably construct strong homes using 3D printing with materials like concrete, making it easier for more people to find safe places to live. Bakers are using 3D printing to make special desserts for parties and events, adding fun designs to cakes and treats that make celebrations even more exciting. Chefs are getting creative with 3D printing by making delicious plant-based foods, like vegan burgers, which are good for us and the environment. Doctors are using 3D printing to make personalized prosthetics, like arms and legs, to help people who need them move better and feel more comfortable.

NAME: _____

DATE: _____

6.2 Activity Page

3D Printing

Research Question: Answers may vary.

Record the facts you find in research in the left-hand column below. After you finish researching, write each note in a complete sentence in the right-hand column of the chart.

Facts from Research	Sentence Form
Example: • small walls can be built in under 24 hours • larger single-family homes' walls in 10 to 45 days • traditional methods take six to eight months to construct	Example: On average, single family homes usually take six to eight months to build. 3D printing has made the process faster by building walls in time frames ranging from one to forty-five days.

NAME: _____

DATE: _____

7.1 Activity Page

Louis Armstrong

Part 1

Use evidence from the text to answer the following questions. Then write down the evidence and paragraph number that supports your answer.

Answers may vary.

1. What techniques did Louis Armstrong introduce to jazz music?

Evidence in paragraph 3 :

- "Rather than follow notes on a page, he improvised, playing what was in his head instead."
- "This type of playing laid the foundation for all jazz to come."

Evidence in paragraph 4 :

- "Armstrong also pioneered a type of singing. . . . The new style of singing that Louis Armstrong pioneered was called 'scat.'"

Your Answer:

Louis Armstrong introduced improvisation and scat singing to jazz music, revolutionizing the genre with his innovative approach to playing the trumpet and his unique vocal style.

2. What is scat singing?

Evidence in paragraph 4 :

- "Scat singing is a lot like improvising on a musical instrument."
- "Instead of singing real words, with scat one sings nonsense words to the melody."

Your Answer:

Scat singing is a vocal technique where singers use nonsense words to improvise melodies, much like how musicians improvise on musical instruments. Louis Armstrong popularized this unique style of singing, contributing to the evolution of jazz music.

Part 2

On a blank sheet of paper write the answers to the following question words to explain why Louis Armstrong is considered an innovator. Then write an expanded sentence:

Louis Armstrong changed the way people played the trumpet in jazz music.

- When: 1920's and 1930's
- Why: introducing new techniques
- How: improvising

Expanded Sentence: In the 1920s and 30s, Louis Armstrong changed the way people played the trumpet in jazz music by introducing new techniques and styles, such as improvising.

NAME: _____

DATE: _____

7.2 Activity Page

Exploring Louis Armstrong's Musical Innovations

Answers may vary.

Circle one aspect of Louis Armstrong's contributions to music that interests you the most.

- Trumpet Playing Techniques
- Vocal Style and Scat Singing
- Influence on Jazz Composition

Based on your chosen aspect of Louis Armstrong's music, create a research question that you want to explore further. Your research question should be clear and specific. Once you have your research question, begin gathering information by taking notes. Use the space below to jot down key points, facts, and ideas related to Louis Armstrong's innovations in music.

Note-Taking Tips:

- Use bullet points or short phrases to record important information.
- Write down the source of each piece of information.

Research Question: _____

NAME: _____

DATE: _____

8.1 Activity Page

Patricia's Vision: The Doctor Who Saved Sight

Answers may vary.

Main Idea and Key Details

As you listen to Read-Aloud note the key details. Then, use those details to determine the main idea of the text.

Main Idea: Through determination, innovation, and a commitment to community health, Patricia Bath overcame obstacles to make significant contributions to the field of ophthalmology, leaving a lasting legacy in medicine.

Key Detail #1: Patricia Bath was born and raised in Harlem, New York.

Key Detail #2: Despite facing challenges, she pursued her education in science and medicine.

Key Detail #3: Patricia Bath invented the Laserphaco Probe, revolutionizing cataract surgery.

Key Detail #4: She established community eye clinics to provide affordable eye care.

NAME: _____

DATE: _____

8.2 Activity Page

Innovators in Medicine

Answers may vary.

Research Question: _____

_____

Notes:

Facts/Details	Sources

Write three sentences to answer your research question.

_____

_____

_____

_____

_____

_____

NAME: _____

DATE: _____

9.1 Activity Page

Guillermo González Camarena: "An Inventor of Color Television"

Answers may vary.

Read the passage and answer the questions. Remember to support your answers.

1. How did González Camarena's interest in technology and engineering contribute to his inventions?

González Camarena's interest and passion for technology and engineering motivated him to explore and experiment with various inventions, including television. His background in engineering provided him with the knowledge and skills necessary to innovate and create solutions to existing problems in television technology.

2. What challenges did early television face, and how did inventors like González Camarena work to solve them?

Early television faced challenges such as limited image quality and the inability to display colors. Inventors like González Camarena worked to solve these challenges by developing innovative solutions such as the "tri-chromatic" adapter, which allowed black-and-white TV images to be perceived in color through the use of red, blue, and green filters.

3. How did González Camarena's invention, the "tri-chromatic" adapter, impact the way people experienced television?

González Camarena's invention of the "tri-chromatic" adapter significantly enhanced the television viewing experience by introducing color to black-and-white TV images. This innovation revolutionized the way people perceived and interacted with television, making the viewing experience more engaging and immersive.

4. Why did González Camarena continue to work on improving color TV and create the "Simplified Bi-color System (SBCS)"?

González Camarena continued to work on improving color TV and created the "Simplified Bi-color System (SBCS)" to address the issue of affordability and accessibility. He believed that color TV should be available to all people, not just a privileged few, and therefore sought to develop a lower-cost alternative to his initial invention.

5. How did González Camarena's inventions affect the accessibility of color TV, especially in Mexico?

González Camarena's inventions, particularly the "Simplified Bi-color System (SBCS)," played a crucial role in making color TV more accessible, especially in Mexico. The development of a cheaper alternative to traditional color TV systems allowed for the mass production and sale of color TV sets, thereby increasing their availability to a broader population.

NAME: _____

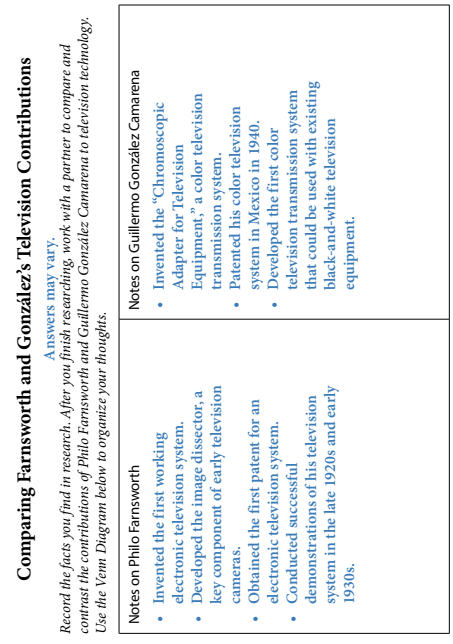
DATE: _____

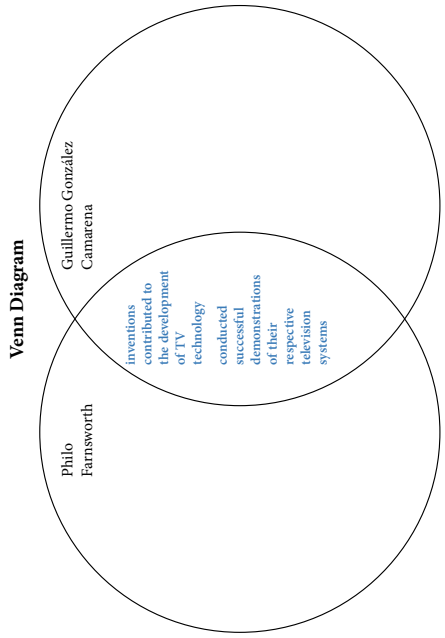
9.2 Activity Page

Comparing Farnsworth and González's Television Contributions

Answers may vary.

Record the facts you find in research. After you finish researching, work with a partner to compare and contrast the contributions of Philo Farnsworth and Guillermo González Camarena to television technology. Use the Venn Diagram below to organize your thoughts.





NAME: _____

DATE: _____

10.1 Activity Page

Exploring Engineering in the Ferris Wheel

Answers may vary.

- *Listen attentively to the Read-Aloud about George Ferris and the creation of the Ferris wheel.*
- *As you listen, pay close attention to how Ferris used engineering principles in designing and building the Ferris wheel.*
- *Write down key words or phrases that will help you answer the question: "How did George Ferris demonstrate the principles of engineering and mathematics in the creation of the Ferris wheel?"*

Response Section:

List key words or phrases that highlight engineering principles used by George Ferris in creating the Ferris wheel:

1. Strong metal frame
2. Big wheels and gears
3. Making sure it's not too heavy
4. Keeping it steady and balanced
5. Using math to measure and plan
6. Turning motion without falling over
7. Big, round ride that's safe
8. Building with strong materials

Credits

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