

Unit 2/Week 1

Title: Galileo

Suggested Time: 5 days (45 minutes per day)

Common Core ELA Standards: RI.5.1, RI.5.2, RI.5.3, RI.5.8, RI.5.10;
RF.5.3, RF.5.4; W.5.4, W.5.8; SL.5.1, SL.5.2; L.5.1, L.5.2, L.5.5

Teacher Instructions

Refer to the Introduction for further details.

Before Teaching

1. Read the Big Ideas and Key Understandings and the Synopsis. Please do **not** read this to the students. This is a description for teachers, about the big ideas and key understanding that students should take away **after** completing this task.

Big Ideas and Key Understandings

The unknowns in astronomy in Galileo's time brought out Galileo's creativity, curiosity, and motivation whereas these same unknowns unsettled others and caused them to silence those who opposed their views.

Synopsis:

Galileo refines the telescope and becomes one of the pioneers of astronomy. He discovers that the Earth is not a still body around which the sun revolves. This novel idea is unsettling to the Church at the time and Galileo is punished by the Church. He had to withdraw this idea and never speak of it publicly.

2. Read entire main selection text, keeping in mind the Big Ideas and Key Understandings.
3. Re-read the main selection text while noting the stopping points for the Text Dependent Questions and Vocabulary.

During Teaching

1. Students read the entire main selection text independently.
2. Teacher reads the main selection text aloud with students following along.

- Students and teacher re-read the text while stopping to respond to and discuss the questions and returning to the text. A variety of methods can be used to structure the reading and discussion (i.e., whole class discussion, think-pair-share, independent written response, group work, etc.)

Text Dependent Questions

Text Dependent Questions	Answers
Describe why the “tube” was an exciting invention to Galileo. What was Galileo’s hypothesis about the 2 lenses? (Pg. 102)	The new tube made distant objects appear closer. Galileo drew the 2 lenses, he made the hypothesis that if a concave lens was placed the right distance behind a convex lens, it would magnify light.
Demolish, from <i>de-</i> "down" + <i>moliri</i> "build, construct" means to destroy or breakdown. What does the author mean on page 103 when he wrote, “now he would make a tube to demolish distance”?	The author meant that the power of the telescope was to “break down” the distance between where the observer was and what they were observing through the telescope.
Reread paragraphs 3-4. What evidence does the author provide that demonstrates Galileo’s character? (Pg. 103)	Galileo is a problem solver and creative thinker. Evidence includes the fact that he worked diligently and patiently to create the telescope. To find out how much light the telescope could gather, he was creative enough cut different sized circles of paper to compare the size difference between what he could see with the naked eye and with the scope.
What evidence proves Galileo’s hypothesis? (Pg. 104)	The Venetians “found that they could see ships at sea a good two hours before they were visible to the naked eye.”
How did Galileo’s findings motivate him even further? (Pg. 104)	He was motivated to improve/increase the power of the telescope to go beyond the seas and explore the heavens.
What about the moon puzzled Galileo? (Pg. 105)	“He noticed that the boundary between light and dark on the moon’s surface was wavy and uneven. Also, small spots of light dotted over the dark areas.” (Students can draw a picture from this description to help them understand what Galileo saw through the telescope.)

<p>What deductions, new ideas based on evidence, about the moon did he make? Quoting evidence from the text, why did the author describe these deductions as 'bold'? (Pg. 105)</p>	<p>He deduced that the "spots of light are mountains bathed in sunlight." Also, he decided that the boundary between light and dark was there were mountains. These new ideas were bold because he noted that, "Until then no one had seriously thought the Moon might be something like the Earth," with mountains as mountains.</p>
<p>Through his invention of the stronger magnification of the telescope, what were Galileo's discoveries? (Pgs. 106-107)</p>	<p>The constellation of Pleides had 43 stars rather than 7. The Milky Way was a "crowded cluster" of stars. The small (stars) is beyond determination." Jupiter has moons that 'swing' around it, just as the Earth has mountains.</p>
<p>What discoveries did Galileo make about the sun and how did they differ from the views of the time? (Pg. 109)</p>	<p>He traced the movement of the mysterious sunspots on the sun and deduced that the sun was spinning on its axis. This differed from the popular belief, supported by the Church of Rome, of that time that celestial bodies were without blemish." "The movement of the sun proved that the sun was not still, it was moving on its axis, just as the Earth was."</p>
<p>How did Galileo openly defy the Church? How was the defiance resolved? (Pgs. 109-110)</p>	<p>"In 1623, a new pope was elected, and the Church turned against Galileo. He received warnings, but went his way." Galileo publicly defied the church by publishing <i>Dialogue on the Great World Systems</i>, which argued that the Earth did not stand still, but circled the sun. This differed from the Church's belief that the Earth was stationary and was the center of the universe. The defiance ended with Galileo never again speaking publicly against Church beliefs.</p>
<p>What is the author's position on the conflict between Galileo and the Roman Catholic Church? What evidence from the text leads you to believe that? (Pg. 110)</p>	<p>The author has a positive view of Galileo. The author sides with Galileo by what the author writes about. The author wrote about Galileo's many discoveries starting from the recreation of the Earth's discovery that the Earth circled the sun. "His discoveries made Galileo a much more famous man" (p.109). The author spoke of Galileo with praise as "(he) opened up a new vision of the heavens." Galileo had a "brilliant argument in favor of his beliefs." "the great astronomer was now seventy years old." By choosing to write about Galileo's discoveries with positive words and phrases to describe Galileo, the author shows that the author has a positive view of Galileo.</p>

Vocabulary

	KEY WORDS ESSENTIAL TO UNDERSTANDING	WORDS WORTH KNOWING General teaching suggestions are provided
TEACHER PROVIDES DEFINITION Not enough contextual clues provided in the text	Page 105 - heavenly bodies Page 103 - apparatus Page 106 - revelation, constellation Page 108 - methodical Page 109 - satellite Page 110 - defy/defiance	Page 102 - convex, concave, trance Page 103 - naked eye Page 104 - primitive Page 106 - myriads, pendulum
STUDENTS FIGURE OUT THE MEANING Sufficient context clues are provided in the text	Page 103 - 'demolish distance' Page 104 - telescope Page 109 - unsettling, refrain, curb Page 110 - unconvinced, hardened, inquisition	Page 102 - obscure, employ Page 104 - clambered Page 105 - devised Page 106 - sharp-eyed, peering, astonished Page 107 - bewilderment

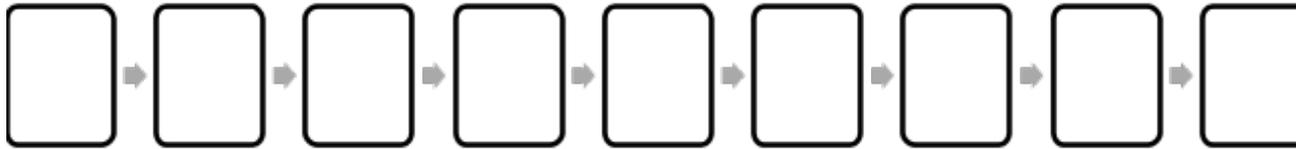
Culminating Task

Re-Read, Think, Discuss, Write

- *Sequence the discoveries Galileo made that led up to the discovery that the Earth was not a still body by creating a Sequencing Map.*

Answer: In a Sequencing Map:

Galileo's Discoveries



- recreated the Dutch cylinder
- made a telescope that magnified 3 times
- made a telescope that magnified 30 times
- discovered the landscape on the moon
- examined the other constellations and found more stars
- discovered that Jupiter has four moons that move around it, just as Earth has one
- discovered that there are millions and millions of stars
- discovered that Venus' appearance changes in the night sky
- discovered that sun spots move across the sun
- discovered that the Earth circled the sun

(Rubric: Advanced – response includes 8-9 discoveries; Proficient – 6-7 discoveries; Developing – 5 or less discoveries)

- *Summarize the popular view of the 'heavens' in Galileo's time and contrast Galileo's discoveries to this popular view.*

Answer: In Galileo's time, it was believed that the stars were unchanging. It was also believed that heavenly bodies like the moon and planets were unblemished bodies very different from Earth. At that time, most people believed that the Earth did not move and that the Earth was the center of the universe.

Galileo disproved that the stars were unchanging when he refined the telescope to magnify 30 times. The skies simply had myriads of 'new' stars because more of them became visible with the use of the telescope. He also discovered that what appeared to be blemishes, bright and dark spots, on the moon were mountaintops and valleys that reflected the sunlight. Similarly, the blemishes on the sun were sun spots that showed the sun was moving on its own axis. He discovered that Jupiter didn't swing like a pendulum between its moons. Instead, Jupiter's moons moved around it, just as Earth's moon orbits Earth. He used all of these discoveries to further conclude that the Earth was not the center of the universe nor was it a still body in the sky.

Additional Tasks

- What lessons about astronomy might this piece teach future scientists, astronomers, and inventors? (Sample

Answer: There are times when we have to be open to new ideas even when it is starkly different from what is accepted and popular. New discoveries always lead to more unknowns.

- Research the contributions of Copernicus to astronomy. Compare and contrast the discoveries of Copernicus and Galileo.
- Galileo's revolutionary idea that the Earth circles the sun is now considered common knowledge. Research the history of Galileo's idea and how it has stood the test of time.

Name _____ Date _____

“Galileo”

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4. What evidence proves Galileo’s hypothesis? (Pg. 104)
5. How did Galileo’s findings motivate him even further? (Pg. 104)

