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.

1. Read entire main selection text, keeping in mind the Big Ideas and Key Understandings.
2. 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.
3. 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

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| **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. When Galileo drew the 2 lenses, he made the hypothesis that if the concave lens was placed the right distance behind the convex lens, it would magnify light. |
| Demolish, from *de-* "down" + *moliri* "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 is able to “break down” the distance between where a person is observing to what they are seeing 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. The evidence includes the fact that he worked diligently until he was able to create the telescope. To find out how much it magnified, he was creative enough cut different sized circles of paper to compare the size difference between what he can 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 sailing towards them 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 magnification and 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 he saw bright spots of light dotted over the dark areas.” (Students can draw a picture from this description to help them visualize what was seen through the telescope.) |
| 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) | He deduced that the “spots of light are mountain peaks bathed in sunlight.” Also, he decided that the wavy line at the boundary between light and dark was there because of the mountains. These new ideas were bold because the author noted that, “Until then no one had seriously supposed that the Moon might be something like the Earth,” with landforms such as mountains. |
| Through his invention of the stronger magnification of the telescope, what were Galileo’s discoveries? (Pgs. 106-107) | The constellation of Pleides had 43 stars rather than 7. The Milky Way was a “crowded cluster” of stars. “The number of small (stars) is beyond determination.” Jupiter has 4 moons that ‘swing’ around it, just as the Earth has 1. |
| What discoveries did Galileo make about the sun and how did they differ from the views of the time? (Pg. 109) | He traced the movement of the mysterious spots across the sun and deduced that the sun was spinning around its own axis. This differed from the popular belief, specifically from the Church of Rome, of that time that celestial bodies “ought to be without blemish.” “The movement of the spots also suggested that the sun was not still, it was moving on its own axis, as Earth was.” |
| How did Galileo openly defy the Church? How was the defiance resolved? (Pgs. 109-110) | “In 1623, a new pope was elected, and the Church hardened against Galileo. He received warnings, but would not give way.” Galileo publicly defied the church by publishing the *Dialogue on the Great World Systems*, which stated the Earth did not stand still, but circled the sun. This conclusion greatly differed from the Church’s belief that the Earth did not move and was the center of the universe. The defiance was resolved with Galileo never again speaking publicly against the Church’s beliefs. |
| 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) | The author has a positive view of Galileo. I can tell that the author sides with Galileo by what the author chose to write about. The author wrote about Galileo’s many successes and discoveries starting from the recreation of the Dutch cylinder to the discovery that the Earth circled the sun. The author stated, “His discoveries made Galileo a much more important man” (p.109). The author spoke of Galileo with positive phrases such as “(he) opened up a new vision of the heavens” (p. 109), he had a “brilliant argument in favor of his beliefs” (p. 110), and “the great astronomer was now seventy years old . . .” (p. 110). By choosing to write about Galileo’s discoveries and using positive words and phrases to describe Galileo, I can conclude that the author has a positive view of Galileo. |

Vocabulary

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|  | **KEY WORDS ESSENTIAL TO UNDERSTANDING** | **WORDS WORTH KNOWING**  General teaching suggestions are provided in the Introduction |
| **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, astonishment  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.

Supports for English Language Learners (ELLs)

to use with Basal Alignment Project Lessons

When teaching any lesson, it is important to make sure you are including supports to help all students. We have prepared some examples of different types of supports that you can use in conjunction with our Basal Alignment Project Lessons to help support your ELLs. They are grouped by when they would best fit in a lesson. While these supports reflect research in how to support ELLs, these activities can help ALL students engage more deeply with these lessons. Note that some strategies should be used at multiple points within a lesson; we’ll point these out. It is also important to understand that these scaffolds represent options for teachers to select based on students’ needs; it is not the intention that teachers should do *all* of these things at every lesson.

**Before the reading:**

* Read passages, sing songs, watch videos, view photographs, discuss topics (e.g., using the [four corners strategy](http://www.theteachertoolkit.com/index.php/tool/four-corners)), or research topics that help provide context for what your students will be reading. This is especially true if the setting (e.g., 18th Century England) or topic (e.g., boats) is one that is unfamiliar to the students.
* Provide instruction, using multiple modalities, on selected vocabulary words that are *central to understanding the text*. When looking at the lesson plan, you should note the Tier 2 words, particularly those words with high conceptual complexity (i.e., they are difficult to visualize, learn from context clues, or are abstract), and consider introducing them ahead of reading. For more information on selecting such words, go [here](https://achievethecore.org/page/3167/selecting-and-using-academic-vocabulary-in-instruction). **You should plan to continue to reinforce these words, and additional vocabulary, in the context of reading and working with the text. (See additional activities in the During Reading and After Reading sections.)**

**Examples of Activities:**

* Provide students with the definition of the words and then have students work together to create [Frayer models](http://www.theteachertoolkit.com/index.php/tool/frayer-model) or other kinds of word maps for the words.
* When a word contains a prefix or suffix that has been introduced before, highlight how the word part can be used to help determine word meaning.
* Keep a word wall or word bank where these new words can be added and that students can access later.
* Have students create visual glossaries for whenever they encounter new words. Then have your students add these words to their visual glossaries.
* Create pictures using the word. These can even be added to your word wall!
* Create lists of synonyms and antonyms for the word.
* Have students practice using the words in conversation. For newcomers, consider providing them with [sentence frames](https://achievethecore.org/page/3159/ell-supports-for-writing-and-discussion) to ensure they can participate in the conversation.
  + Practice spelling the words using different spelling practice strategies and decoding strategies. Students could take turns spelling with a partner.
* Use graphic organizers to help introduce content.

**Examples of Activities:**

* Have students fill in a [KWL chart](http://www.nea.org/tools/k-w-l-know-want-to-know-learned.html) about what they will be reading about.
* Have students research setting or topic using a pre-approved website and fill in a chart about it. You could even have students work in groups where each group is assigned part of the topic.
* Have students fill in a bubble map where they write down anything that they find interesting about the topic while watching a video or reading a short passage about the topic. Then students can discuss why they picked the information.

**During reading:**

* Read the text aloud first so that ELLs can hear the passage read by a fluent reader before working with the text themselves.
* Allow ELLs to collaborate in their home languages to process content before participating in whole class discussions in English. Consider giving them the discussion questions to look over in advance (perhaps during the first read) and having them work with a partner to prepare.
* Encourage students to create sketch-notes or to storyboard the passage when they are reading it individually or with a partner. This will help show if they understand what they are reading as they are reading it.
* Ask questions related to the who, what, when, why, and how of the passage. For students that may need a little more help, provide them with [sentence stems](https://achievethecore.org/page/3159/ell-supports-for-writing-and-discussion).
* Continue to draw attention to and discuss the words that you introduced before the reading.

**Examples of Activities:**

* Have students include the example from the text in their glossary that they created.
* Create or find pictures that represent how the word was used in the passage.
* Practice creating sentences using the word in the way it was using in the passage.
* Have students discuss the author’s word choice.
* Use graphic organizers to help organize content and thinking.

**Examples of Activities:**

* Have students fill in a chart to keep track of their 5ws while they read to help them summarize later and figure out the central idea of a passage.
* It may again be beneficial to have somewhere for students to store new words that they encounter while reading the text. Students could use a chart to keep track of these new words and their meanings as they read.
* If you had students fill in a KWL, have them fill in the “L” section as they read the passage.
* Utilize any illustrations or text features that come with the story or passage to better understand the reading.
* Compare/contrast the passage with what the illustrations convey about the passage. Have students consider if the illustrations look the way they visualized the passage in their own minds or if the passage matches their predictions based on the illustrations.
* Identify any text features such as captions and discuss how they contribute to meaning.

**After reading:**

* Present directions for any post-reading assignments orally and visually; repeat often; and ask English Language Learners to rephrase.
* Allow ELLs to use English language that is still under development. Students should not be scored lower because of incorrect spelling or grammar (unless the goal of the assignment is to assess spelling or grammar skills specifically). When grading, be sure to focus on scoring your students only for the objective(s) that were shared with students.
* Scaffold questions for discussions so that questioning sequences include a mix of factual and inferential questions and a mix of shorter and more extended responses. Questions should build on each other and toward inferential and higher-order-thinking questions. There are not many factual questions already listed in the lesson instructions, so you will need to build some in as you see fit. More information on this strategy can be found [here](https://achievethecore.org/aligned/creating-sequencing-text-dependent-questions-support-english-language-learners/).
* Reinforce new vocabulary using multiple modalities

**Examples of activities:**

* Using the words that you had students work with before reading, have students write sentences in reference to the passage that you just finished reading.
* Require students to include the words introduced before reading in the culminating writing task.
* For newcomers, print out pictures that represent the words that you focused on and have students match the words to the pictures.
* Based on different features of the words, have the students sort them into different categories and explain their choices. For example, the students could sort the words by prefixes, suffixes, connotation, etc.
* After reading the passage, continue to examine important sentences (1–2) in the text that contribute to the overall meaning of the text. Guide students to break apart these sentences, analyze different elements, and determine meaning. More information on how to do this, including models of sentence deconstruction, can be found [here](https://achievethecore.org/page/3160/juicy-sentence-protocol).
* Provide differentiated scaffolds for writing assignments based on students’ English language proficiency levels.

**Examples of Activities:**

* For all students, go over the prompt in detail, making sure to break down what the prompt means before having the students get to work. Then have the students explain the directions back to you.
* Have students create an evidence tracking chart during reading, then direct them to look back over their evidence chart and work with a group to see if their evidence matches what the rest of the class wrote down. If some of the chart does not match, students should have a discussion about why.
* For students who need more support, model the proper writing format for your students and provide them with a properly formatted example for reference.
* For newcomers, you may consider creating sentence or paragraph frames to help them to write out their ideas.
* To further discussion about the passage, have students create their own who, what, when, where, why, and how questions related to the passage to ask each other and have students pair up and practice asking each other the questions. If available, pair students of the same home language to support the use of language still under development.