Galileo Lesson Plan

Central Historical Question:
Was Galileo really a heretic?

Materials:

- Background PowerPoint
- Copies of Heliocentrism and the Catholic Church Timeline
- Copies of Documents A & B
- Copies of Optional Documents C & D (to extend the lesson, if desired)
- Copies of Guiding Questions

Plan of Instruction:

Note: Students should be familiar with the Protestant Reformation and the Catholic Reformation that followed before beginning this lesson. This lesson may be used as a two- or four-document lesson.

1. Warm-up: Is the earth or the sun in the center of the solar system? How do we know?
    a. *Hopefully students know that the sun is in the center of the solar system. Students will probably say that we know this because of scientific discoveries. Scientists have conducted extensive research on this topic.*
    b. Ask students: If you didn't know about any of these scientific studies and only knew what you could see or observe, would you think that the sun or the earth orbits the other?
        Many students will probably say it seems like the sun moves around the earth. We can't feel the earth moving, and it looks likes the sun moves across the sky throughout the day.
    c. Explain to students that in early modern Christian Europe, most people, even very smart people, believed the earth was the center of the universe and the sun moved around the earth.
    d. During the Scientific Revolution, some people, notably Copernicus, began to challenge this belief. One person, Galileo, became very famous for this belief because it got him in trouble with the Catholic Church.

2. Background PowerPoint and Timeline
    a. Pass out Heliocentrism and the Catholic Church Timeline and have students follow along during the PowerPoint presentation.
    b. Make sure to emphasize the following key points on each slide:
        i. Slide 1: Galileo. *During the 17th century, European scholars increasingly tried to understand the natural world through science. Galileo Galilei was one of these scientists, and he is sometimes called the Father of Scientific Reason.*
        ii. Slide 2: Models of the Solar System.

1. *Geocentrism is a model that places the earth at the center of the astronomical system. In this model, other bodies in space orbit around the earth.* Geo *comes from the Greek word for earth.*
2. *Heliocentrism is a model that places the sun at the center of the astronomical system. In this model, other bodies in space orbit around the earth.* Helio *comes from the Greek word for the sun.*
3. *We know that the earth orbits the sun, which is at the center of the solar system. Across centuries some astronomers debated models of their known universes. We know that some early Greek and Indian astronomers challenged aspects of the heliocentric model. Some medieval Islamic and western European astronomers also raised doubts about the model. But in 17th-century Italy, people didn't know that the solar system was but a tiny piece of a much larger galaxy and universe. In Galileo's time and place, nearly everyone believed that the earth was at the center of the universe (geocentric model). Even very smart people did not believe the Earth orbited because they couldn't feel it move.*

iii. Slide 3: The Problem. *The heliocentric model seemed to contradict the Bible. This passage from Joshua is an example.*

iv. Slide 4: Copernicus. *Copernicus was one of the first medieval European scientists to challenge this idea, but he knew how radical his theory was, so he waited to publish his book until right before his death.*

v. Slide 5: The Council of Trent. *The Catholic Church convened the Council of Trent in 1545 to stop the spread of Protestantism and to revive the Catholic Church. The council decreed that only the Catholic Church could interpret the Bible and established the Holy Office of the Roman Inquisition to persecute heretics.* ***A heretic is someone whose beliefs go against the Church's official beliefs.***

vi. Slide 6: Giordano Bruno. *Giordano Bruno was another scientist who supported the heliocentric model. Additionally, he correctly theorized that the sun is just one of many moving stars and that the universe contained many planets orbiting other stars. In 1600 he was tried before the Inquisition and burned at the stake. We don't know the exact charges he was found guilty of, and in addition to his astronomical theories, he held many religious beliefs contrary to the Church's doctrines.*

vii. Slide 7: Galileo. *Galileo was born in Pisa, Italy in 1564. He was a religious man and even wanted to be a monk at one point. Instead, he studied motion and physics at the University of Pisa. The more he studied, the more he started to believe the heliocentric theory. In 1609, he built a telescope. The observations he made from the*

telescope convinced him that Copernicus's heliocentric model was right, and Galileo and began teaching the model to his students.

viii. Slide 8: Conflict. In 1615, *The Church warned Galileo to stop teaching the heliocentric model. In 1616, the Church banned the works of Copernicus and others that supported heliocentrism. Galileo continued to write and publish ideas about his theory. Pope Urban VIII told Galileo he could discuss Copernicus's theory, as long as he didn't say it was absolutely true. His 1632 book,* Dialogue Concerning the Two Chief World Systems*, came too close to arguing the theory was true, and he was brought before the Inquisition as a heretic the following year.*

ix. Slide 9: Central Historical Question. *Using these facts and two documents (one from Galileo and one from the Church) you are going to decide for yourself: Was Galileo really a heretic?*

x. Save Slides 10 & 11 until after students make their judgments.

3. Document A: Galileo's Letter (1615)
    a. Pass out Document A: Galileo's letter to Duchess Christina defending his beliefs.
    b. Have students read the document and answer questions in pairs or groups.
    c. Discuss answers as a class.
        i. *Context: Students should recognize that in 1615, the year of this letter, the Church warned Galileo to stop sharing his beliefs in public. Therefore, it makes sense for Galileo to write a letter defending these beliefs. Also the Church executed Bruno for similar beliefs in 1600, so Galileo might have wanted to prevent the same thing from happening to him.*
        ii. *Close-reading: Galileo's beliefs about the sun and earth seemed to go against some passages in the Bible. However, Galileo believed people were interpreting those passages incorrectly.*
        iii. *Context: This might be a more difficult question for students. The Catholic Church probably won't accept Galileo's defense. He did not believe he was going against the Bible, but he was also interpreting passages of the Bible on his own. The Church was very nervous about people doing this because of what had happened with Martin Luther and the Protestant Reformation.*

4. Document B: Cardinal Robert Bellarmine's letter (1615)
    a. Explain that students are now going to read the Catholic Church's point of view in a letter from Cardinal Robert Bellarmine. This is not a direct response to Galileo's letter to Duchess Christina, because Bellarmine never saw that letter, but he addresses many of Galileo's points.
    b. Pass out Document B and have students read the document and answer the questions in pairs. As they read the letter, they should see if

Bellarmine made any of the points they predicted when discussing the context of Document A.

c. Discuss
    i. *Close reading: Bellarmine says it is obvious from human experience that the earth stands still and the sun moves. Plus this is what the Bible says. Not only does the Bible say this, but all of the Church's leaders have interpreted these passages literally. Therefore, according to Bellarmine, Galileo's interpretation of these passages must be wrong. Further, Bellarmine suggests the real issue was denying any part of the Bible. His concern was that if people denied one part of the Bible, they could deny more, or even all, of it.*
    ii. Context: *New Renaissance ideas, the Protestant Reformation, and increasingly powerful monarchs were already challenging the Catholic Church's power in Europe. If the Church began to admit that it might be wrong about one thing, it could have opened the door to people challenging other Church doctrines. The Church feared it could lose even more power.*

5. Judgment
    a. Explain to students that now that they have read these two document and the facts from the timeline, they are going to make a judgment about Galileo: Was he really a heretic?
        i. Remind them that a heretic is someone whose beliefs go against the teachings of the Church. Therefore, they should not try to prove Galileo's theory was right. Instead, they should focus on the issue of heresy.
        ii. Galileo's trial focused on whether he was a heretic. Based on the evidence in the lesson, students should formulate their own rulings in response to the question of whether Galileo was a heretic.
    b. Have students complete the Judgment section on their Guiding Questions individually.
    c. Discuss: Was Galileo really a heretic?
        i. Yes, Galileo was a heretic: *He went against the teachings of the Church. The Church told him to stop teaching the heliocentric model, and he did it anyway. He tried to interpret the Bible on his own, which the Church said individuals could not do.*
        ii. No, Galileo was not a heretic: *He may have gone against a few of the Church's rules, but he still believed in the Bible. He said that the Bible was true, but people might not understand everything it says. He said that people were interpreting the Bible incorrectly, not that the Bible was wrong.*
    d. How do they think the Catholic Church ruled in 1633?

6. Optional Documents C & D. If you decide not to work with these documents, then proceed to The Ruling section of the lesson.

a. Documents C and D show students how the Catholic Church's position on science and the Galileo issue has changed over the centuries. These documents provide more context about Galileo's case. However, they are not essential to this lesson.
b. Have students read Documents C & D and answer the Guiding Questions. Discuss the answers as a class.
    i. Document C: *Galileo was found guilty of teaching a model (heliocentrism) that went against the Bible. He was also guilty of arguing something could be true even if the Church believed it contradicted the Bible.*
    ii. Document D: *Pope John Paul II admitted that the Church's treatment of Galileo was wrong. He said the Church used the knowledge it had at the time and misinterpreted the Bible. It made something that was scientific into something about faith. This was basically what Galileo had argued.*

7. The Ruling
    a. Return to the PowerPoint
        i. Slide 10: What happened to Galileo? *Under the threat of punishment and torture, Galileo agreed to **recant**, or take back, his beliefs and was sentenced to house arrest. He died in 1642.*
        ii. Slide 11: After Galileo. *In 1661 Isaac Newton taught Galileo and Copernicus's ideas in England.*
    b. If you did not use the optional documents, summarize the following:
        i. The Church's indictment. *Galileo was found guilty of teaching a theory (heliocentrism) that went against the Bible. He was also guilty of arguing something could be true even if the Church believed it contradicted the Bible.*
        ii. Pope John Paul II's response. *Other popes praised Galileo in the 20th century. Obviously the Church knew Galileo was right by this time. However, Pope John Paul wanted an investigation so the Church could better understand these issues in the future. Pope John Paul II admitted that the Church's treatment of Galileo was wrong. He said the Church used the knowledge it had at the time and misinterpreted the Bible. The Church had transformed a scientific issue into an issue of faith. This is basically what Galileo had argued.*

8. Final Discussion: Context
    a. Why was it easier for the Church to admit Galileo was right in 1979, than it was in 1633?
    b. Based on this controversy, how was the historical context of the 17th century different from 1979?
    c. How might people understand and study our beliefs in 300 years?

Citations:

Document A
Galilei, Galileo. “Letter to the Grand Duchess Cristina of Tuscany, 1615.” Internet History Sourcebooks. Fordham University. http://www.fordham.edu/Halsall/mod/galileo-tuscany.asp.

Document B
Bellarmine, Cardinal Robert. “Letter on Galileo’s Theories, 1615.” Internet History Sourcebooks. Fordham University. http://www.fordham.edu/Halsall/mod/1615bellarmine-letter.asp.

Document C
“The Crime of Galileo: Indictment and Abjuration of 1633.” Internet History Sourcebooks. Fordham University. http://www.fordham.edu/Halsall/mod/1630galileo.asp

Document D
“Vatican Science Panel Told by Pope: Galileo Was Right.” *New York Times*, November 1, 1992. http://www.nytimes.com/1992/11/01/world/vatican-science-panel-told-by-pope-galileo-was-right.html.