

## TITLE

### “TECHNOLOGY & COSMOS: Spying the universe”



#### *1<sup>st</sup> Teaching Period: Astronomers & Telescopes*

##### **Activity 1**

**Time:** 10 minutes

**Type of activity:** brainstorming

**Class organization:** whole class discussion

**Procedure:** The teacher sets questions to activate prior knowledge on the topic:

*“When do you believe the first astronomers (without telescopes) appeared?”*

*When do you think we discovered that earth is a sphere?*

*When did we discover that Earth wasn't the center of cosmos?*

*How many planets does our solar system have?*

*How do we know that cosmos has 100 billion of galaxies?”*

##### **Activity 2**

**Time:** 20 minutes

**Type of activity:** interactive video presentation (with questions)

**Class organization:** whole class work

**Procedure:** Students watch the interactive video on H5P <https://h5p.org/node/1219745> and answer the questions throughout the video in class. The teacher has used the first 12minutes (0:00-11:43) of the video “A History of Our Knowledge of the Solar System” from <https://www.youtube.com/watch?v=ecHhGAiBoI8> and has inserted the following questions through HP5 plugin:

@2:28> Ancient Greek [Aristotle](#) (in 350BC) proved that Earth is spherical from Earth's **shadow** on the Moon, during Lunar **eclipse**!

@3:24> Ancient Greek [Eratosthenes](#) (in 240BC) calculated Earth's **circumference** during summer **solstice** by using simply geometry.

@4:24> [Claudius Ptolemy](#)'s '*Almagest*' (in 150AD) was considered one of the most important scientific works of all time, cause it was an extended documentation of the collective **astronomical** knowledge from the prior few centuries.

@ 5:55> Middle Ages was a quiet time for European Astronomy, but a golden age period for Indian and Persian Astronomy. (True)

@6:35> Which one of the following European astronomers first suggested the heliocentric model?

- [Nicolaus Copernicus](#) (Polish)
- [Galileo Galilei](#) (Italian)
- [Aristarchus of Samos](#) (ancient Greek)

@8:11> Galileo Galilei first invented the [telescope](#) to observe the Moon. (False) *The earliest existing record of a telescope was a 1608 patent submitted to the government in the Netherlands by Middelburg spectacle maker [Hans Lippershey](#) for a refracting telescope. The actual inventor is unknown but word of it spread through Europe. Galileo heard about it and, in 1609, built his own version, and made his telescopic observations of celestial objects.*

@8:50> German astronomer [Johannes Kepler](#) stated that planets don't revolve in perfect circles, but rather ellipses, while their velocity is not constant. (True)

@9:12> [Isaac Newton](#) is famous for his law of universal **gravitation**, which explains that gravity is the **force** that causes planets to orbit the Sun or an apple's falling from a tree.

@9:44> British astronomer [William Herschel](#) discovered planet **Uranus** in 1781AD.

@11:11> How many planets astronomy textbooks listed till 1845AD, cause of the asteroid belt which exists between Mars and Jupiter? 11

@11:42> German astronomer Johann Gottfried Galle discovered planet **Neptune**.

@11:43> End of video

### Activity 3

**Time:** 15 minutes

**Type of activity:** presentation

**Class organization:** whole class

**Procedure:** The teacher explains the difference between **refracting** and **reflecting** telescopes using NASA's presentation "How Do Telescopes Work?" (<https://spaceplace.nasa.gov/telescopes/en/>)

There is a [glossary](#) available throughout the lessons.

### Homework

*Suppose you want to start making astronomical observations and in order to get more info about telescopes, you watched some youtube videos like "Choosing your first telescope" by J.Kelly Beatty (<https://www.youtube.com/watch?v=Thh9MKQlpeE>).*

Search the internet to find an entry-level telescope (around 250-300\$) for stargazing, planets and moon observation. **Choose a telescope and make a small presentation** with photos and technical characteristics (maximum magnification, focal length, diameter of its main optical component, etc). Is it a refracting or a reflecting one? Can you use your camera to take shots through this telescope? What's the use of eyepieces?

## 2<sup>nd</sup> Teaching Period: Space telescopes

### Activity 1

**Time:** 15 minutes

**Type of activity:** video presentation, discussion

**Class organization:** pair work

**Procedure:** The teacher presents the 5min (0:00-4:34) NASA's video "Launchpad: Atmosphere and Optical telescopes"

(<https://nasaclips.arc.nasa.gov/video/launchpad/launchpad-atmosphere-and-optical-telescopes>). Then students work in pairs and discuss "Problems that **atmosphere** and **light pollution** can cause, when we observe the universe through optical telescopes and how we overcame these problems. They present in class.

### Activity 2

**Time:** 5 minutes

**Type of activity:** photo presentation, conversation

**Class organization:** whole class work

**Procedure:** The teacher shows amazing pictures from the European Space Agency (ESA) site (<https://esahubble.org/images/>) and sets the following questions: "Are these amazing pictures from planets, stars, nebulae and galaxies, real camera shots or digitally made by artists?"

*Have these photos been shot from Earth or from outer space?"*

### Activity 3

**Time:** 25 minutes

**Type of activity:** video presentations, discussion, worksheet, internet search

**Class organization:** group work

**Procedure:** Students are divided into two teams. Both teams watch [NASA's](#) (National Aeronautics and Space Administration) [Hubble Space Telescope](#) through the 3min (0:00-3:14) video "What is Hubble?" (<https://www.youtube.com/watch?v=FEqDEPsBHQ>) and [James Webb Space Telescope](#) through 4min (0:00-3:43) youtube video "An Introduction to the James Webb Space Telescope mission" (<https://www.youtube.com/watch?v=6VqG3Jazrfs>).

Then each team fills up a column on the **worksheet**. Then they get in pairs and make comparisons between these two space telescopes. Teams can also use Wikipedia to get more information.

### **Homework**

Watch the 5min youtube video (about [European's Space Agency](https://www.youtube.com/watch?v=9wdbNU7Pu8U) activities) "This is ESA" (<https://www.youtube.com/watch?v=9wdbNU7Pu8U>) and make a **small presentation of ESA activities**.

## **3<sup>rd</sup> Teaching Period: Design and Construct your own space telescope!**

### **Activity 1**

**Time:** 45 minutes

**Type of activity:** design, handcrafting, implementation of ideas, problem solving, search on internet

**Class organization:** pair/group work

**Procedure:** Students are divided into teams of two or three students and asks them to design and handcraft a space telescope out of their imagination! Students must keep in mind that the basic construction must contain a container, a power source, scientific instruments, a communication device, an orientation finder and whatever else they can imagine! They can get more ideas and examples for their construction on <https://spaceplace.nasa.gov/build-a-spacecraft/en/>.

### **Homework**

Make a presentation with photos to present the technology of your space telescope. If it is a real one, will it be geostatic or orbital? How far from earth should it be?

## **4<sup>th</sup> Teaching Period: Present your own space telescope!**

### **Activity 1**

**Time:** 45 minutes

**Type of activity:** presentation

**Class organization:** pair/group work

**Procedure:** Every team presents in class photos and characteristics of their own designed space telescope!

### **Assessment/Practice**

<https://quizlet.com/632333240/match>

<https://quizlet.com/632333240/test>

<https://wordwall.net/play/23846/396/508>

[https://h5p.org/node/1221365?feed\\_me=nps](https://h5p.org/node/1221365?feed_me=nps)