TELUS WORLD of SCIENCE Edmonton

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SEE THE STATION

Grade Level: 6 & 9

Curriculum Connections:

- *Grade 6 Topic C: Sky Science* 6–7 Observe, describe and interpret the movement of objects in the sky; and identify pattern and order in these movements.

- *Grade 9 Unit E: Space Exploration*

Specific Learner Expectations:

Grade 6 Topic C: Sky Science

- 3-Recognize that the apparent movement of objects in the night sky is regular and predictable, and explain how this apparent movement is related to Earth's rotation.
- 11-Identify technologies and procedures by which knowledge, about planets and other objects in the night sky, has been gathered.

Grade 9 Unit E: Space Exploration

- 1. Students will: investigate and describe ways that human understanding of Earth and space has depended on technological development
- 2. Students will: identify problems in developing technologies for space exploration, describe technologies developed for life in space, and explain the scientific principles involved

Key terms:

- *Satellite:* an artificial body placed in orbit around the earth or moon or another planet in order to collect information or for communication.
- *ISS:* abbreviation for the International Space Station
- *Orbit:* the curved path of a celestial object or spacecraft around a star, planet, or moon.
- *Transit:* the passage of an inferior celestial body across the face of the sun or moon.

Introduction

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- Do you ever look up at the night sky and see a star that appears to be moving? These objects are actually human made satellites in orbit around planet Earth. One such satellite is the International Space Station (ISS) and in this lesson we will explore what makes the ISS such a special satellite.

Activities:

Spot the ISS:

Goal: visit the NASA website https://spotthestation.nasa.gov/ and plan when you will go outside and spot the ISS as it orbits overhead

Materials:

- Computer

Instructions:

1. Visit https://spotthestation.nasa.gov/
2. Enter in your location to determine when you can next view the ISS
3. Choose when you will view the ISS.
4. Spot the ISS as it orbits overhead.

Results: successfully view the ISS as it orbits overhead at the chosen time.

Discussion Questions (Extending the Learning):

1. Why do you think we can't see satellites during the daytime?
2. Why do you think satellites orbit above Earth at different heights?

Assessment (Questions or Tasks to Gauge Understanding):

1. Name at least 2 functions of satellites that orbit above Earth.
2. What does ISS stand for?
3. If the ISS orbits Earth once every 90-93 minutes, approximately how many times will it orbit Earth in one day?

Background Information:

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The First Satellites

- The first artificial satellite, Sputnik, was launched by the Soviet Union (today's Russia) on October 4, 1957, ushering in the space age.
- The first ever space station was Salyut 1 launched by the Soviet Union in 1971. This space station orbited the Earth 3000 times during its 175 days in space before falling back to the Earth, burning up as it entered the Earth's atmosphere.
- The USA's orbiting space station, Skylab, was launched 1973 and fell back to Earth in 1975. During its life of occupancy from May 1973 to February 1974, three astronaut crews lived and worked in space for a period of time to carry out experiments and do space and Earth observations.
- Skylab fell to the Earth on July 11, 1979, burning up over the southern hemisphere by Australia.

The ISS

- The construction of the International Space Station (ISS) began on November 20, 1998 with the first component, Zarya, launched from the Baikonur Cosmodrome in Kazakhstan (a placed leased to Russia) on a ROSCOMOS Proton rocket.
- With the completion of the ISS in 2001, the station is 72.8 meters long and 108.5 meters wide. It is the single largest object in Earth orbit , making its passes in our evening sky a delight to behold.
- The ISS is a cooperative effort of various countries and space agencies including the United States, Russia, Europe, Japan and Canada.
- The ISS is easy to observe on certain nights as it moves from west to east on its passages.
- When the ISS is exposed to sunlight, it is seen as a bright object moving in the sky. When the ISS moves into the shadow of the Earth it is not visible, as there is no sunlight reflecting off its surface to be visible.
- The ISS takes approximately 90 to 93 minutes to orbit once around the Earth depending upon the altitude of the ISS which does change over time.
- The altitude of the ISS is about 400 km but its height varies a bit due to atmospheric drag (which lowers the station) and then regular boosts (to heighten the station). The orbit is not quite circular, with a perigee (closest to Earth) height of 417 km and an apogee (furthest from the Earth) height of 419 km. This is still considered low Earth orbit.

Current Satellites

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- There are now over 40,000 satellites of various types in Earth orbit. Some are scientific and weather satellites, a lot are communications satellites, and some are military satellites. A lot of the artificial satellites now are also just space junk, not working satellites.

References

Satellite Pass Websites

- https://heavens-above.com/
- https://spotthestation.nasa.gov/
- https://www.n2yo.com/
- https://transit-finder.com/
- http://www.satflare.com/home.asp

Upcoming Launches and News

- https://spaceflightnow.com/
- https://everydayastronaut.com/prelaunch-previews/