# Earth & Space Science

## Grade 6

Written by Tracy Bellaire

The activities in this book have two intentions: to teach concepts related to earth and space science and to provide students the opportunity to apply necessary skills needed for mastery of science and technology curriculum objectives.

The experiments in this book fall under ten topics that relate to three aspects of **earth and space science**. In each section you will find teacher notes designed to provide you guidance with the learning intention, the success criteria, materials needed, a lesson outline, as well as provide some insight on what results to expect when the experiments are conducted. Suggestions for differentiation are also included so that all students can be successful in the learning environment.

**Tracy Bellaire** is an experienced teacher who continues to be involved in various levels of education in her role as Differentiated Learning Resource Teacher in an elementary school in Ontario. She enjoys creating educational materials for all types of learners, and providing tools for teachers to further develop their skill set in the classroom. She hopes that these lessons help all to discover their love of science!



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# At A Glance

| Learning Expectations | Our Solar System | The View from Earth | The Moon | Constellations | Asteroids, Comets, and Meteoroid | Space Exploration | Space Explorers | Going to the Extreme! | Technology in the Extreme | Aboriginal Contributions |
|---|---|---|---|---|---|---|---|---|---|---|
| **Knowledge and Understanding Content** | | | | | | | | | | |
| Identify and describe the unique features of each planet in our solar system. | • | | | | | | | | | |
| Determine the positions of the sun, Earth, and the moon; describe the sun's position in the sky throughout a day. | | • | | | | | | | | |
| Determine the shape and position of the moon throughout a month. | | | • | | | | | | | |
| Identify the constellations in our night sky. | | | | • | | | | | | |
| Research and describe the unique features of asteroids, comets, and meteoroids. | | | | | • | | | | | |
| Research and describe the technology needed for space exploration, and the costs and benefits of this science. | | | | | | • | | | | |
| Research and explain contributions to space exploration, and how humans adapt to life in space. | | | | | | | • | | | |
| Identify extreme environments; research and present the exploration of an extreme environment. | | | | | | | | • | | |
| Research and explain technological advances of instruments used for extreme environment exploration. | | | | | | | | | • | |
| Research and explain the contributions of Aboriginal technologies to the exploration of extreme environments. | | | | | | | | | | • |
| **Thinking Skills and Investigation Process** | | | | | | | | | | |
| Make predictions, formulate questions, and plan an investigation. | • | • | | | • | | • | | | |
| Gather and record observations and findings using drawings, tables, written descriptions. | • | • | • | • | • | • | • | • | • | • |
| Recognize and apply safety procedures in the classroom. | • | • | • | • | • | • | • | • | • | • |
| **Communication** | | | | | | | | | | |
| Communicate the procedure and conclusions of investigations using demonstrations, drawings, and oral or written descriptions, with use of science and technology vocabulary. | • | • | • | • | • | • | • | • | • | • |
| **Application of Knowledge and Skills to Society and the Environment** | | | | | | | | | | |
| Analyze the social and environmental costs and benefits of space exploration. | | | | | | • | | | | |
| Assess the contributions and benefits of space technology that allow humans to live in space. | | | | | | | • | | | |
| Evaluate responsible uses of technology that have led to important scientific discoveries vs. the possible misuses of technology that may affect society and our environment. | | | | | | | | | • | |



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# THE VIEW FROM EARTH

## Learning Intention:

Students will learn about the positions of the sun, Earth, and the moon; about the sun's position in the sky throughout a day.

## Success Criteria:

- describe how the Earth rotates on its axis and how it orbits the sun
- describe how the moon rotates and orbits the Earth, moving as one unit orbiting the sun
- demonstrate the rotation and orbit of the Earth and its moon around the sun
- create a sundial
- describe how the sun changes position throughout the day

## Materials Needed:

- a copy of "Day and Night" Worksheet 1 for each student
- a copy of "Revolving Around the Sun" Worksheet 2 for each student
- a copy of "A Look at the Moon" Worksheet 3 for each student
- a copy of "Rotate and Orbit!" Worksheet 4 and 5 for each student
- a copy of "Let's Create a Sundial!" Worksheet 6, 7, and 8 for each student
- a large ball, a small ball, a hat, 2 index cards (for each group of 3 students)
- a globe
- a large piece of poster paper or white Bristol board, a large empty can, a long stick or piece of dowelling, sand or small rocks, a ruler (for each pair or group of students)
- a sunny day
- a clock
- masking tape, markers, pencils

## Procedure:

***This lesson can be done as one long lesson, or be divided into three shorter lessons.**

1. Using Worksheet 1, 2, and 3, do a shared reading activity with the students. This will allow for reading practice and learning how to break down word parts in order to read the larger words in the text. Along with the content, discussion of certain vocabulary words would be of benefit for students to fully understand the passage.

   **Some interesting vocabulary words to focus on are:**

   - axis
   - orbit
   - revolution
   - rotate
   - tilted
   - hemisphere
   - exposure
   - journey
   - equator

   (As the moon orbits the Earth, the phases change. A phase of the moon is how much of the moon appears to us on Earth to be lit up by the sun. As the moon begins to orbit the Earth, we can only see a portion of the lit up side. As it continues to orbit the Earth, we see more of the lit up side until finally the moon is on the opposite side of the Earth from the sun and we get a full moon that is 100% lit up. As the moon continues orbiting, we see less of the lit up side. When we can't see any of the lit up side, this is called a new moon. In the new moon phase, the moon is between Earth and the sun.)

2. *This activity can be done in groups, or as a whole group demonstration. Students will **need teacher guidance** to demonstrate the Earth's orbit around the sun correctly.

   Give them Worksheets 4 and 5 and the materials to create a model of the positioning of the sun, the Earth, and its moon in the solar system. Read through the materials needed and what to do sections to ensure their understanding of the task before they begin. At this point, use the globe to show students how the Earth is divided into two



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hemispheres, Northern Hemisphere and Southern Hemisphere. Pointing out where the students live on the globe would be of interest to them also.

Once students have positioned themselves, the teacher will help the "Earth" to orbit the sun correctly. This means that as the "Earth" is approaching the half way around mark, the teacher ensures that the "Earth" begins to face away from the sun, so that the Northern Hemisphere now becomes further from the sun while the Southern Hemisphere becomes closer to the sun.

3. Explain to students that they will investigate how the sun moves in the sky through the day, and how it can create shadows. They will investigate this idea by creating their own sundials. This activity can be done in pairs. Give students Worksheet 6 and read through the materials needed and what to do sections to ensure students understand. Give students the materials and Worksheets 7 and 8. They will conduct the investigation, record observations, and make conclusions. *An option at the end of the activity is to have groups share their observations with another group to compare their findings.*

(Upon completion of this activity, students should understand that shadows are cast by objects that block the path of sunlight. In the morning and late afternoon, when the sun is lower in the sky, shadows are longer because the line from the sun to the object to the ground is flatter, making a longer shadow. Around noon, when the sun is directly overhead, there is almost no sunlight being blocked from hitting the ground, so a very small shadow is created.)

## Differentiation:

Slower learners may benefit by having another opportunity to re-read the information on Worksheets 1, 2, and 3 in a small group with teacher support. An additional accommodation would be to have these learners work in a small group with teacher support to complete the conclusion section on Worksheet 8. This would allow for an opportunity to discuss their observations before reaching conclusions.

**For enrichment,** faster learners could access the internet to research some interesting facts about the sun, the Earth, or the moon. This could be later shared with the large group to promote discussion on the topic.

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# Day and Night

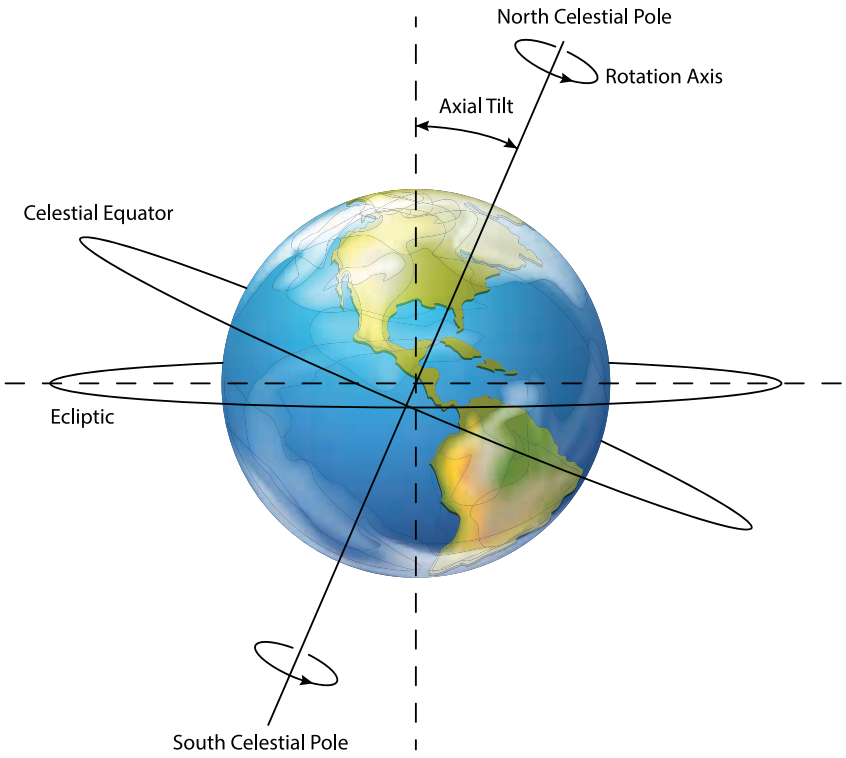
You have learned that the planet Earth is third in line from the sun. In measured distance, it is about 150 million kilometres from the sun. Even from that great distance, the sun is Earth's powerful heat energy source.

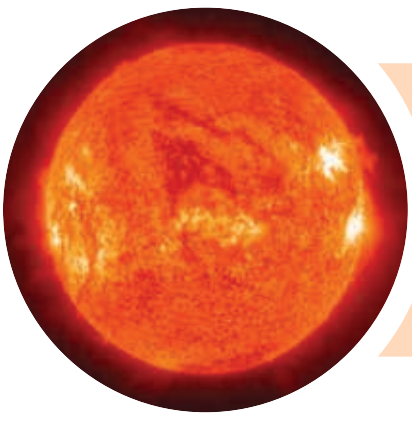
So what is the Earth doing while it is soaking up the sun's heat energy? It is rotating! The Earth has an axis that runs from the North Pole to the South Pole.

As the Earth spins on its axis, from east to west, we experience day time and night time. The Earth takes 24 hours to complete a rotation.

Its rotation gives each part of the Earth a turn to be warmed by the sun. Life forms on Earth need the heat and light from the sun. If the Earth did not rotate, one half of the Earth would always be too hot to support life, and the other half would be in a deep freeze!

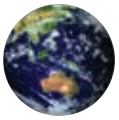
## Axial Tilt of the Earth



How long does it take for the sun's heat to reach Earth? Let's do the math!

We are 150 million km away from the sun. Light travels 300 000 km per second. Dividing these numbers, it will equal to 500 seconds, or 8 minutes and 20 seconds.





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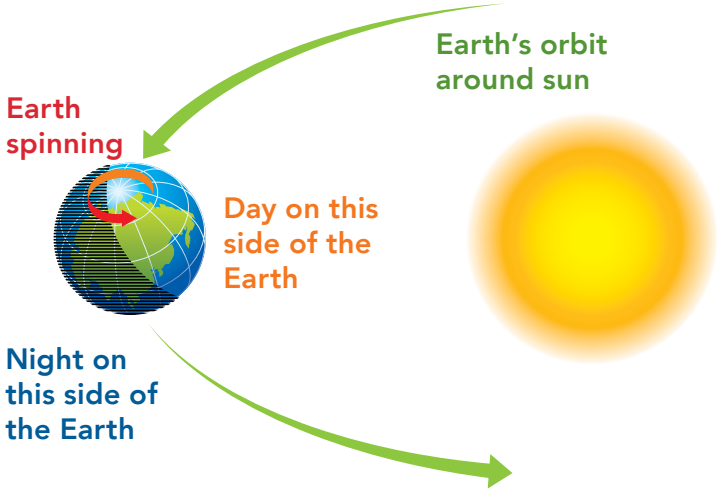
# Revolving Around the Sun

At the same time that the Earth is rotating on its axis, it is taking a journey around the sun. This journey is called a revolution.

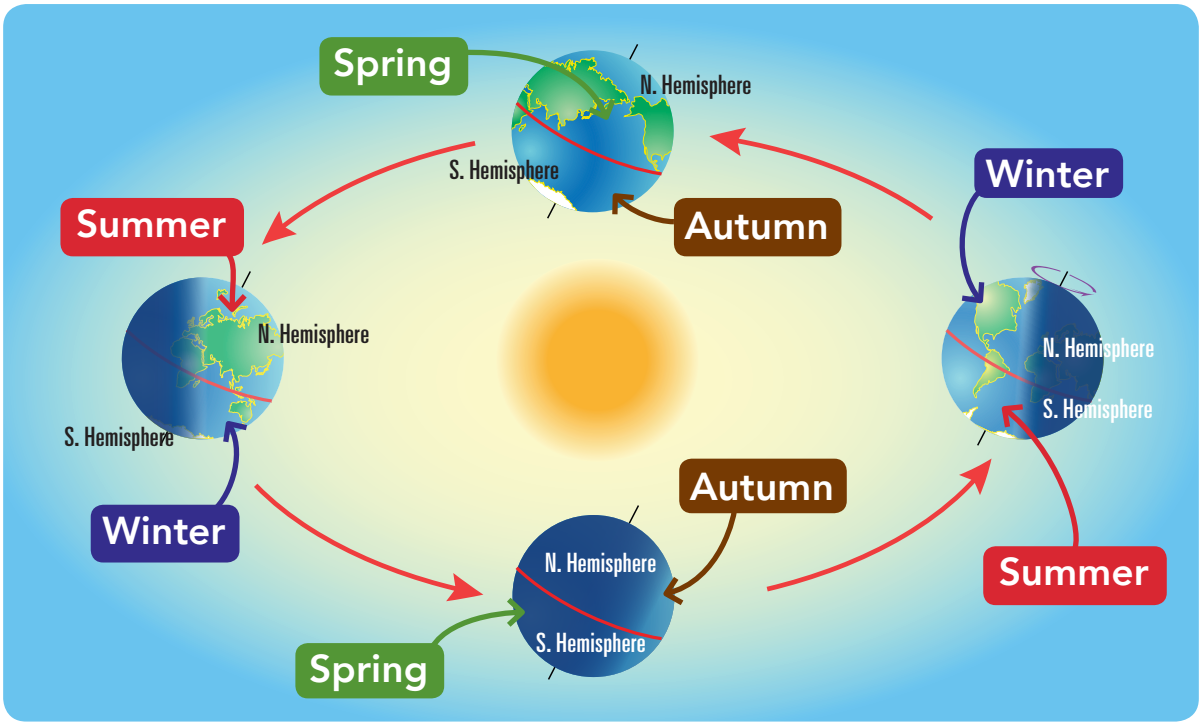
The Earth's journey around the sun is about 940 million kilometres long and it takes one year (365 days) to complete.




## Did You Know?

The Earth is divided into two hemispheres. They are the Northern Hemisphere and the Southern Hemisphere. As the Earth orbits the sun during a year, its tilt causes the Northern and Southern hemispheres to change from more or less exposure to the sun.

As a hemisphere is tilted away from the sun, the length of a day gets shorter and it gets colder. As it is tilted toward the sun, day lengths get longer and it gets warmer. The further you are from the equator in either hemisphere, the more obvious the effect. This is why we have the different seasons in the year, Spring, Summer, Winter, and Fall.

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