

Exploring Earth Through Maps and Technology

Exercises on map concepts and data/imaging technology

This lesson provides a starting point for learning about what maps are and how we use them. Then we will learn about ways to explore the earth from above. You will read about maps, what they are, the different types and how we can use technology along with maps to study the earth.

Section 1 - Maps: What are they?

Have you seen a map before or had the opportunity to use one? If you haven't, then it is possible that you have seen an adult look at one when trying to get directions to a destination. Maps help us to figure out how can we get from where we are right now to where we need to be.

Let's define what a map is:

A **map** is a representation on a plane surface of a region of the earth or heavens.

If we look at this definition, there are a few key words that may help us understand what a map is.

They are:

Representation- a likeness of something

Surface- the outer layer or top portion of something

Earth- our planet which is the third planet from our sun

Heavens –the sky that we see from the earth

Now we can define what a map is a bit differently:

A map is a tool that works to show us what the earth or the sky looks like.

A map really is a great tool to help us learn about what the earth looks like and where places and geographical features (oceans, mountains, rivers, lakes) are located. Plus, there are different kinds of maps that you can use depending on what you are seeking.

Section 1 - Maps: What are they? (Cont'd)

Here are some of them:

Topographic maps show what the land looks like. For example, a topographic map would show mountains, rivers, and oceans. Topographic maps can also show cultural features like main roads and city boundaries. Some topographic maps are **three dimensional** and show how high, deep or wide a feature is, such as a mountain, an ocean or a river.

Thematic maps show specific information about a place such as climate and weather, population or natural resources.

Political maps show the land and boundaries of a country including the capital.

Geologic maps show some of the same features as topographic maps, but may also include the location of fossils, mineral deposits and other natural resources.

Now we can discuss the basic elements or parts of a map.

What are those parts of a map?

Geographic grids are systems of lines that intersect on a map. These lines help us to pinpoint features on the map.

Scale is expressed as a fraction, like $1/25,000$ as an example. Each map has its own scale. What it shows is how the distances shown in the map compare to what the distances are in real life. The scale allows us to look at a map and accurately measure distances between different points on the map (like two cities). Then we can know the real distance between New York City and Los Angeles by looking at a map and measuring the distance between those two cities using a ruler. We calculate the distance by using the scale of the map and how many inches (or centimeters) are between the two points.

Relief shows the topography of a map. Do you remember what you learned about topography (topographic map)? The relief can be shown in three dimensions.

As you have learned, maps can show us a lot about the land, the sky and other information like weather, natural resources, roads and cities. Maps can provide directions to get from one place to another.

Section 1 - Maps: What are they? (Cont'd)

Assessment:

Let's take time to review some key concepts. Please complete Worksheet 1 from your teacher.

Section 2 - Latitude and Longitude

In school, you have probably seen a globe which is a representation of the earth in the shape of a sphere or ball.

A globe functions like a map, because we can use it to find places and identify topographical features (like lakes, rivers, mountains).

Latitude and longitude help us to locate specific places and topographical features. How do they work?

We can look at a globe or a map to understand latitude and longitude.

Using the map provided by your teacher, we will identify the latitude and longitude lines.

If you look carefully, you will see that there are lines on the map. Some go up and down or north and south. Others go from east to west across the map.

Latitude lines extend from east to west.

Longitude lines run from the North to the South Pole.

These lines are expressed in degrees. For example, the equator is located at 0 degrees on the globe or a world map. Places on the earth can also be identified using longitude lines. We use Greenwich, England as a point of reference. This means that areas on the earth are located according to how far away they are from Greenwich, England (which is located at 0 degrees).

Now let's get some practice finding latitude and longitude. □

Assessment:

Complete Worksheet 2. Your teacher has a world map that you will use to identify latitude and longitude lines.

Section 3 - Using Technology to Study the Earth

We have powerful tools available to study the earth from above. Some of these tools are on board satellites which orbit the earth in space. Weather satellites take digital images (photographs) of most regions of the earth and send important information to people who make decisions. This information is especially helpful, because these satellites can track hurricanes and other severe weather. Government officials can use this information to make decisions about mandatory evacuations and other warnings to the public.

Satellites are also used for global positioning systems or GPS. GPS helps us to navigate our way around the earth. You may have already seen GPS. Many vehicles have navigation systems installed which have digital maps and turn by turn instructions to get to your destination. Companies like Federal Express use GPS to help the drivers know where to make their deliveries.

In addition to the satellites, the International Space Station (ISS) orbits the earth at 17,500 miles per hour. The ISS, like its name, is an international effort. Astronauts from the United States and from foreign countries take part in the missions. Once on board, the astronauts conduct scientific experiments that may help us to better understand the Earth's history. On board the ISS is a special digital camera used to take pictures of the earth. The pictures taken with the EarthKAM help scientists and students learn how the earth is changing in terms of climate and the impact of catastrophic events.

Assessments:

- a) Complete Worksheet 3 and view the video about the ISS EarthKAM.
- b) Project: EarthKAM Photo and Map

What did you learn?

Write a one to two paragraph summary about what you learned in this unit.

Worksheet 1- Map Terms

Define the following terms:

1. Map-
2. Topographic map-
3. Thematic map-
4. Political map-
5. Geologic map-
6. Relief-

Answer the following questions using short answers:

7. What is the purpose of a map's scale?
8. What does the map's relief show?

Latitude and Longitude Questions

Exercise:

Using the markers or colored pencils provided by your teacher, trace the longitude lines using blue. Next, trace the latitude lines in red.

Circle the following labels on your map:

North Pole

Equator

South Pole

Prime Meridian

Answer the following questions:

- 1) Locate the Southern Hemisphere on your map. Name two continents located in the Southern Hemisphere.
- 2) Locate the Northern Hemisphere on your map. Name two continents located in the Northern Hemisphere.

Name _____

Date _____

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Worksheet 3 - International Space Station- EarthKAM

Activity:

Watch the video about the ISS EarthKAM on the computer by visiting the following link:

<http://www.earthkam.ucsd.edu/>

Answer the following question:

Name and discuss one example of a climate, weather or catastrophic event that could be studied from space using the EarthKAM. Why would knowing about this information be helpful?

Research Project Information Sheet

Your teacher will assign you to a small group. You will be collaborating (working together) to research a country and prepare a presentation. Your teacher will give you instructions about which maps to use for your research, as well as the poster paper for your presentation.

Procedure:

- 1) Using the images database on the EarthKAM website (<http://www.earthkam.ucsd.edu/index.shtml>), choose a photo from any country. Then answer the questions on Worksheet 4.
- 2) Using a world atlas (CIA World Factbook), find a map of the same country. Answer the questions on Worksheet 4. Using the CIA World Fact Book website and your worksheet, answer the questions about the country you chose.
- 3) Using the information from Worksheet 4, create a poster presentation with illustrations for your country and the facts you gathered.
- 4) Your group will present the poster to the class.

Resources:

- a) NOAA-National Oceanic and Atmospheric Administration's National Weather Service
http://www.weather.gov/sat_tab.php?image=ir
- b) NASA- International Space Station
<http://www.nasa.gov/home/index.html>
- c) Digital photographs from a satellite
<http://earth.jsc.nasa.gov/sseop/efs/>
- d) CIA World Factbook
<https://www.cia.gov/library/publications/the-world-factbook/>

Worksheet 4 - Research Project

EarthKAM Image:

- 1) Identify the country, record the latitude and longitude where the photo was taken, and write a description about what you see in the photo.

Country-

Latitude-

Longitude-

Describe what you see in the photo:

- 2) Find the latitude and longitude on this map that were used for the photo. This information is on the same page as your selected photo. Record this information and your answers to question 2 [a, b, and c] on the reverse side of this worksheet.
 - a) Describe the natural features that you see on your map in this location; mountains, rivers, lakes, glaciers or oceans.
 - b) What can you see on the map that you cannot see in the photo?
 - c) What can you see in the photo that you cannot see on the map?
- 3) Using the CIA World Factbook and your chosen country, research the following: continent, hemisphere, population, type of government, climate and weather, natural resources, commerce and catastrophic events in last 50 years (if there are any)

Record this information in your notebook. Write your information neatly on index cards or lined paper, then attach them to your poster board. On your poster board, create two illustrations based on the map and digital photo of the country. Your group will present the information to the class.

Worksheet 1- Map Terms Answers**Define the following terms:**

1. **Map-** A **map** is a representation on a plane surface of a region of the earth or heavens.
2. **Topographic map-** These maps show what the land looks like. For example, a topographic map would show mountains, rivers, and oceans. Topographic maps can also show cultural features like main roads and city boundaries.
3. **Thematic map- These maps** show specific information about a place such as climate and weather, population or natural resources.
4. **Political map-** These maps show the land and boundaries of a country including the capital.
5. **Geologic map-** These maps show some of the same features as topographic maps, but may also include the location of fossils, mineral deposits and other natural resources.
6. **Relief-** Relief shows the topography of a map and it may be three dimensional.

Answer the following questions using short answers:

7. **What is the purpose of a map's scale?**
A map's scale enables us to accurately measure distances between different points on the map (like two cities).
8. **What does the map's relief show?**
The relief shows the topography of a map.

Latitude and Longitude: -Teachers should provide a copy of a world map for the students to use in this exercise.

Circle the following labels on your map:

North Pole

Equator

South Pole

Prime Meridian

Answer the following questions:

Worksheet 1- Map Terms Answers (Cont'd)

1. Locate the Southern Hemisphere on your map. Name two continents located in the Southern Hemisphere. Two continents in the Southern Hemisphere are Latin America and Africa. Student answers will vary.
2. Locate the Northern Hemisphere on your map. Name two continents located in the Northern Hemisphere. Two continents in the Northern Hemisphere are North America and Asia.

Using technology to study Earth

Answer the following question:

Name and discuss one example of a climate, weather or catastrophic event that could be studied from space using the EarthKAM. Why would knowing about this information be helpful? The before and after pictures of the damage done by Hurricane Katrina would be a good example of a case study using the EarthKAM.

Research Project Information

Your teacher will assign you to a small group. You will be collaborating (working together) to research a country and prepare a presentation. Your teacher will give you instructions about which maps to use for your research, as well as the poster paper for your presentation.

Procedure:

- 1) Using the images database on the EarthKAM website (<http://www.earthkam.ucsd.edu/index.shtml>), choose a photo from any country. Then answer the questions on Worksheet 4.
- 2) Using a world atlas (CIA World Factbook), find a map of the same country. Answer the questions on Worksheet 4. Using the CIA World Fact Book website and your worksheet, answer the questions about the country you chose.
- 3) Using the information from Worksheet 4, create a poster presentation with illustrations for your country and the facts you gathered.
- 4) Your group will present the poster to the class.

Resources:

- a) NOAA-National Oceanic and Atmospheric Administration's National Weather Service
http://www.weather.gov/sat_tab.php?image=ir
- b) NASA- International Space Station
<http://www.nasa.gov/home/index.html>
- c) Digital photographs from a satellite
<http://earth.jsc.nasa.gov/sseop/efs/>
- d) CIA World Factbook
<https://www.cia.gov/library/publications/the-world-factbook/>

Worksheet 4 - Research Project

EarthKAM Image:

- e) Identify the country, record the latitude and longitude where the photo was taken, and write a description about what you see in the photo.

Country- can vary; Example is Spain.

Latitude- 40.00N

Longitude- 4.00 W

Describe what you see in the photo:

Students should be able to see one or more of the following: water, mountains, clouds or the coastline.

- f) Find the latitude and longitude on this map that were used for the photo. This information is on the same page as your selected photo. Record this information and your answers to question 2 [a, b, and c] on the reverse side of this worksheet.
- d) Describe the natural features that you see on your map in this location; mountains, rivers, lakes, glaciers or oceans.
Students should be able to see one or more of the following: water, mountains, clouds or the coastline.
- e) What can you see on the map that you cannot see in the photo?
Students may typically report that they can see roads, names, political boundaries, and more specific variations in topography.
- f) What can you see in the photo that you cannot see on the map?
Students may typically report that a coastline in a photo looks quite different from the map; variations in tone, texture, color and depth might be what students try to articulate.
- g) Using the CIA World Factbook and your chosen country, research the following:
continent, hemisphere, population, type of government, climate and weather, natural resources, commerce and catastrophic events in last 50 years (if there are any)

Worksheet 4 - Research Project (Cont'd)

This response will vary depending on the selected country.

For Spain: **Continent-Europe**
 Hemisphere- northern
 Population- 40,500,000
 Type of government- parliamentary monarchy
 Climate/weather- temperate; hot summers, cold winters
 Natural resources: coal, lignite, iron ore, copper, lead, zinc,
 uranium, tungsten, mercury, pyrites and others; arable land
 Commerce- machinery, motor vehicles; foodstuffs,
 pharmaceuticals, medicines, other consumer goods
 Catastrophic events- earthquakes and flooding

Record this information in your notebook. Write your information neatly on index cards or lined paper, then attach them to your poster board. On your poster board, create two illustrations based on the map and digital photo of the country. Your group will present the information to the class.

Students will work cooperatively to not only design and draw the illustrations on the poster, but also write the information on their country study to be placed on the poster. Students will also share in presenting the information in front of the class.