Introduction to Mapping: 6-8 Script

Introduction

All Aboard!
All aboard and welcome to the USGIF Express! We are on a journey to visit your friend who lives in Hawaii. Along the way we will travel the globe and learn about the exciting world of mapmaking. First things first, you need to learn some map basics before you can earn your ticket.

All Aboard!
Video plays.

USGIF
The United States Geospatial Intelligence Foundation, also known as the USGIF, is an educational nonprofit dedicated to promoting geospatial intelligence (GEOINT).

GEOINT
GEOINT, short for Geospatial Intelligence, is using maps, satellites, drones, and sensors to gather and visualize data in order to make a decision. GEOINT can be applied to most career fields.

Time to Fly
You've earned your ticket! Better hurry, we are about to take off. Let's fly to the Pacific Ocean off the coast of South America to learn some basic map knowledge.

Map Knowledge

What is a Map?
What is a Map? Maps are two-dimensional, or flat, representations of features on the Earth's surface.

What is a Map?
Maps can show physical features like landforms and bodies of water, as well as political features like country boundaries and the location of cities.

What is a Map?
Maps can also display patterns of people and things, such as migration or weather.

What is a Cartography?
What is cartography? Cartography is the science of map making, and we refer to mapmakers as Cartographers.

Reading the Map
Oh no! The pilot's glasses just flew out of the window of the plane. He can no longer read the map. We need you to step up and learn to read a map so we can continue our journey safely.

Key Map Elements
There are some key map elements that you will find on almost every map that help us read and interpret the map.

Title
The title tells you what the map is meant to show you. A map named "Parks in Herndon, Virginia" will show you something different than a map named "Counties in Illinois".

North Arrow
Without a north arrow it is difficult to determine the orientation, such as North, South, East, West, of a map. With a north arrow, a user can determine direction.

Legend/Key
The legend or key shows the user what different symbols on the map mean. For instance, a square with a flag on top usually represents a school.

Scale
The map's scale indicates how many units on the earth's surface is equal to one unit on the map. For example, a map scale of 1:100,000 means that one centimeter on the map equals 100,000 centimeters on the Earth.

Grid
Maps often feature a grid pattern that is made of lines of latitude and longitude.

Latitude
Latitude is represented by lines running across the map. All lines of latitude fall within 0 and 90˚ north and south. The Equator is a line of latitude that splits Earth into the Northern and Southern Hemispheres and is located at 0˚. All of the lines above the Equator are considered North latitude; all below are considered South latitude.

Longitude
Longitude is represented by lines going up and down on the map. All lines of longitude fall within 0 and 180˚ east or west. The Prime Meridian is a line of longitude that splits the Earth into the Eastern and Western Hemispheres and is located at 0˚. All lines west of the Prime Meridian are West latitude, and all east are considered East latitude.
It is important to remember that lines of latitude and longitude are representative, or just for reference, and not actual lines on the ground!

Let's Jet!

Awesome, you are now ready to navigate! Let's zoom up to Greenland to learn about map projections.

Map Projections

What are map projections?

In order to make a map, we need to take a 3-D, spherical object (the Earth) and fit it onto a 2-D, flat surface, which will be our map. A globe is a more accurate model of the Earth as it is spherical, just like the Earth is. However, it is not practical to carry a globe around with us or use it for analysis. Cartographers use projections to transform the 3D object to the 2D map. Because projection changes the surface in some way, maps always come with distortion, or an inaccurate representation. All maps are wrong compared to globes. A map projection can accurately represent at least one feature like area, shape, distance, or direction, but it's always at the expense of the other features.

Earn your Wings

Understanding the spherical nature of the Earth is necessary to fly a plane. Our pilot needs you to step up and be her copilot, but she wants to make sure you understand map projections first. She has given you an exciting challenge. Let's watch this video to see how...

Orange You Glad the Earth is Round?

Video plays.

Now it's Your Turn!

Now it's your turn! The pilot wants you to use an orange peel, just like in the video, to learn more about map projections. The materials you will need are an orange and a permanent marker. On your orange, draw some continents using the permanent marker. Try your best to peel the orange in one single piece, or as close to one as possible. If you need, ask a parent to help you with this part. After the orange is peeled, go ahead and lay the peel flat on your table.

Now it's Your Turn!

What do you notice when you try to flatten your orange peel?

How does your map look different now that you have peeled it? Consider things like shape, direction, and size.

Now that you've had a chance to think about it, notice that it is impossible to completely flatten the orange peel. Factors like direction, shape, scale, or other factors have changed now that you have peeled the orange. This represents the distortion we discussed earlier that comes with map projections. Using an orange peel is a great way of understanding how flattening a 3D object like the Earth and projecting it onto a 2D surface, always loses some accuracy.

Promoted to Copilot

Now that you've completed the challenge, our Pilot thinks you are ready to help her fly... after you learn the Mercator projection. We're in Greenland, after all!

Mercator Projection
Map projections are generally named after the person who first used it, the method used to produce it, or a combination of the two. The most popular map projection is the Mercator projection. This projection is named after cartographer Gerardus Mercator, and is most likely the projection of the world map hanging in your classroom. The portion of the map closest to the equator will be the most accurate, or to scale, and as you move farther away the land expands and distorts. These red dots are an example.

Example #1
Look what happens when we move the United States farther away from the equator. The farther away we move the outline, the bigger and more distorted it gets, just like the red dots from before.

Example #2
Greenland is one of the most noticeable errors with the Mercator Projection. If we look at Greenland's actual position on the map it looks huge, even bigger than Africa. Look what happens when we move it closer to the equator. If we put it right on the equator we see its actual size, fitting nicely inside Africa.

Lift Off!
All systems are a go! The pilot now has you as her copilot. Let's fly to Asia to go back in time and learn some map history.

Early Mapping

Ancient Chinese Navigation
The ancient Chinese were the first to create a navigation tool—the compass. The most popular style used is a lodestone, made from iron oxide with a bronze plate. The lodestone was carved into the shape of a spoon and placed on the plate of bronze. When the bronze plate was moved, the lodestone spun around until it stopped, orienting itself to north and south with the handle of the spoon pointing south. This type of compass was called a "south-pointer".

Early Mapping
Which early European was sponsored to explore and claim land in the Americas for Spain?

A. Robert La Salle
B. Christopher Columbus
C. Francisco Coronado
D. Ferdinand Magellan

Christopher Columbus
That's right, the answer is Christopher Columbus! On the morning of August 3, 1492, Christopher Columbus began a long voyage on behalf of Spain. He was trying to find a way to reach Asia, a place with a lot of resources needed by Spain. Columbus knew the Earth

was round, so he decided to sail west across the Atlantic Ocean instead of east, as everyone else did during that time.

Early Mapping
At that time, Europeans knowledge of the world looked very different from today. Look at this map and considering the following questions:

1. How is it different from the maps of the world today?
2. And what do you think is missing?

George Washington
Before George Washington became the first president, he was an enthusiastic land surveyor. Washington was responsible for mapping most of western Virginia and completed 200 surveys, totaling 60,000 acres in his career.

Lewis & Clark & Sacagawea
Lewis and Clark were tasked to explore the West following the Louisiana Purchase in the early 1800s. They began their journey in St. Louis, which is also known as the Gateway to the West, and traveled 8,000 miles to the Pacific Coast. Until the Louisiana Purchase, the Mississippi River was the western extent of the United States. They followed the Missouri River for most of their travels. They used compasses in order to create maps and charts of the land. Sacagawea accompanied Louis and Clark because she was knowledgeable of the land and was able to communicate with many Native American tribes they encountered.

Dr. John Snow (1850s)
This is one of the first and well-known examples of collecting data and putting it in a map.

Snow lived in SoHo, London in 1854. At this time there was a cholera outbreak that made a lot of people sick. During this time in history, little was known about the spread of diseases like cholera and bubonic plague. The most common theory was it was caused by pollution or "bad air." Snow, on the other hand, believed the Cholera outbreak was being transmitted through water sources. This was a radical theory at the time and was dismissed by almost all scientists and doctors. Snow decided to prove his theory by using a map. This is a copy of Dr. Snow's map.

SoHo London
This is a modern version of Snow's map of SoHo.

Water Pumps in The Area
In 1854, there was no running water and all the town's water was supplied by pumps. Because of his theory that the disease was being spread by water, Snow put a point on the map where every water pump was located.

Houses with Cholera
Snow then put a point on all the houses where someone was sick with cholera. Do you notice a pattern in the red dots?

The Broad Street Pump
Snow concluded that the Broad Street pump was the culprit. There are houses that contracted cholera with a pump closer but through his investigation Snow found these people either worked around the Broad Street pump, frequented the area, or some just preferred the flavor of water from that pump opposed to a closer pump.

Hit the Runway
We've learned so much here in Asia about early mapping, but we now need to fly to the Indian Ocean to learn about different types of maps!

Map Types

Map Types
There are many different styles of maps. Cartographers choose the type of map they want to use based on the type of story they are trying to tell.

Topographic Map
A topographic map shows the shape of the Earth's surface using contour lines. Contour lines connect points of the same elevation on the map. Contours make it possible to measure the height of mountains, depths of the ocean floor, and steepness of slopes. This is a map of the Stowe, home of Vermont's tallest peak, and has numbers representing how high or low the elevation is.

Nautical Chart
Nautical charts are a special type of map that shows what is under, on, and around water. They can include information of the depth of water, coastline details, and information on tides and currents. They are useful in navigation to help a ship travel safely on the water and determine the best route.

Political Maps
Political maps often show the state and national boundaries of an area. They can also include locations of cities, counties, and important bodies of water. This is a political map of the continent of Europe.

Physical Maps
Physical maps show the physical landscape features of a place. They generally show things like mountains, rivers, valleys, and other natural features. This is a physical map of the world, and shows features like the Rocky Mountains of North America, the Amazon Basin of South America, and the Sahara Desert in Africa.

Road Maps
Road maps primarily display roads and transportation links used for travel and navigation. This is a road map of Philadelphia, Pennsylvania.

Thematic

Thematic maps show the distribution of a specific theme or idea. Some examples would be a map of hurricane paths in the United States, or a map showing where various languages are spoken across the world. One form of data visualization often used in thematic mapping is a heat map. A heat map shows the intensity or magnitude of a phenomenon by shading it darker or lighter. This fun map uses different colors to show what Americans call soft drink in every county in the country. Counties colored blue call it “Pop”. Counties colored red call it “Coke”, and counties colored yellow call it “Soda”. Try and find where you live and see what your neighbors call soft drinks. Does it match what you call it?

Aeronautical Charts
Aeronautical charts are special maps that show airports, airways, and airspace allowing airplanes to navigate safely around the world. Pilots use these charts to find airports in the weather and land safely on runways when they can't see out the window!

Quiz Time
The airport won't let us take off for our final destination until we answer the following questions!

Quiz Time
What kind of map would be best for finding your way from Washington, DC to Baltimore, MD?

A. Political Map
B. Road Map
C. Thematic Map
D. Topographic Map

Answer
The answer is: B. a Road Map!

Question
What type of map is John Snow’s Cholera Map?

Answer
John Snow’s map is a thematic map. He maps the pattern of cholera and water pumps through geographic points.

Question
What do the brown lines on this map represent?

Answer
Answer: The brown lines represent elevation. They are contour lines on a topographic map.

Aced it!
Great job! Grab your passport, it's time to fly to Hawaii and unite with your friend.

Conclusion

Land ho!

Video plays.

Land ho!

You've made it to Hawaii. Now it is time to use what you've learned and try out the activities with your friend.

Thanks for flying with the USGIF Express!

Closing Slides