Google Earth in Schools: Making Geography Come Alive!

Learning of Geography

The word *Geography* (meaning *'to describe earth'* or *'to write about earth description')* is a combination of two Greek words, *"ge"* meaning *"earth"* and *"Grahein"* meaning *"to write"*. The process of describing the earth has passed through different phases and at each stage, the concept of learning geography too has undergone significant changes.

Geographers are spatial thinkers as they deal with the dimensional orientation of people and their quest is to find out about different places and their unique characteristics. They usually deal with questions such as *where things are located on the earth's surface, why they are located there, how they influence the environment,* and the *socio-economic life of the people,* etc. Thus, geography holds a special place in the history of mankind's development, and adding to its academic importance are the two ways to study it, with an integrated approach and a problem-solving approach.

Geographic Tools

Geographers use many tools to learn about the earth and explore the resources stored in it. Maps hold a special position in the study of geography, being one of the most important tools to learn, teach, understand, analyze, explore and describe earth. The art of map-making is called *cartography*, which was initiated by *Mercator* about 600 years back. Revolution took place when **GIS** (**Geographic**

Information System) came to light in the year 1972. This includes computer hardware, software, digital data, organizations and institutions for collecting, storing, analyzing and displaying geo-referenced information about Earth. *Resource satellites* (**Land Sat**) was then launched to provide a boost to the mapping field.

About 15 years later, a new term was introduced called **Geo-Spatial Technology**. It combines **remote sensing**, **GIS**, and **GPS** (**Global Positioning System**) and has become an essential technique for solving the latest geographical crisis situations. Tools such as GIS, GPS and online mapping on ***Google Earth*** allow us to view, understand and interpret our own location and presence on our planet. Today's world needs information that is fast, accurate and specific, and this makes Geo-Spatial information indispensable for everyone.

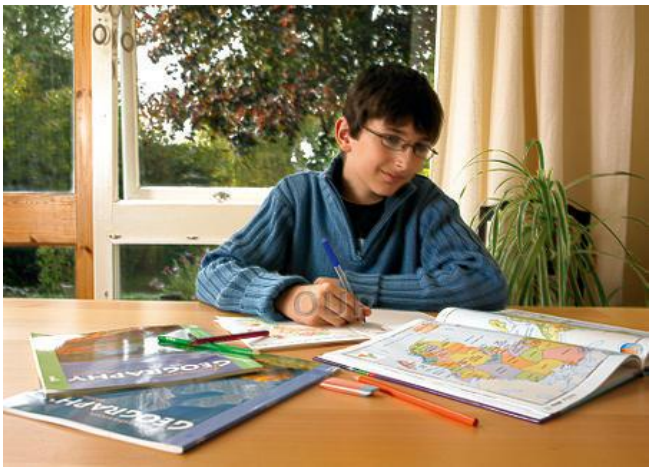
Classroom Application of Geo-Spatial Technology

Today's classroom teaching focuses on the best use of the available resources to motivate the students to be innovative in their approaches. Teaching in the 21st century has seen a radical change with the inclusion of ICT information and communication technology, making classroom learning more efficient and engaging. Similarly, Geo-Spatial technology should be used in the geography class as it will enhance and support the spatial thinking of the students. Nowadays, teenagers and children are very technologically sound and adept at using different types of software. Using digital remote sensing data and ***Google Earth*** in the classroom to make geography classes more effective has to be the natural progression, resulting in overwhelming benefits for the children.

Andreas Schleicher, says in ***The Case of 21st Century Learning***: *"A generation ago, teachers could expect that what they taught could last their student lifelong. Today, because of rapid economic and social change, schools have to prepare students for jobs that have not been created, technologies that have not been invented and problems that we don't know will arise."* This calls for major changes in teaching strategy planned for the 21st century classroom. Thus, networking and knowledge sharing become essential to explore and expand the horizon of learning.

By implementing Geo-Spatial technology properly, teachers can work with students to develop their ability of asking geographical questions and leading to investigations. Geographic enquiry will provide opportunities to students to actively engage in understanding their own place in their surroundings and

also the world they live in. Use of Geo-Spatial technology in the classroom will facilitate teachers to collaborate, share, modify and create knowledge through a meaningful and contemporary pedagogy than using traditional maps, atlases and toposheets. The students should be trained to



- view information,
- collect required data,
- visualize spatial patterns in the data,
- examine the cause and effect,
- compare and contrast the data, and
- create and share their interpretations.

Advantages

Field work is an important part of geography learning but taking students out for elaborate excursions is always not feasible for the school and the students. Students gain more if the classroom can provide opportunities for interactive learning which can substitute individual experiences in field. Research shows that Geo-Spatial technology will have a multi-perspective approach, i.e. from global to regional to local and a multisensory approach, i.e. involving the head, heart and hand. Moreover, it will motivate the students to evaluate problems, increase their scope of thinking and sensitize them to the current environmental hazards. Disaster management classes can be well understood by students if the teacher can use Geo-Spatial technology effectively as a tool for teaching geography. GIS would help in achieving structured learning as shown here:

The online database dealing with the magnitude of an earthquake, places of occurrence through a chart of information

⬇

The database can be further connected with the plate boundaries showing their movement

⬇

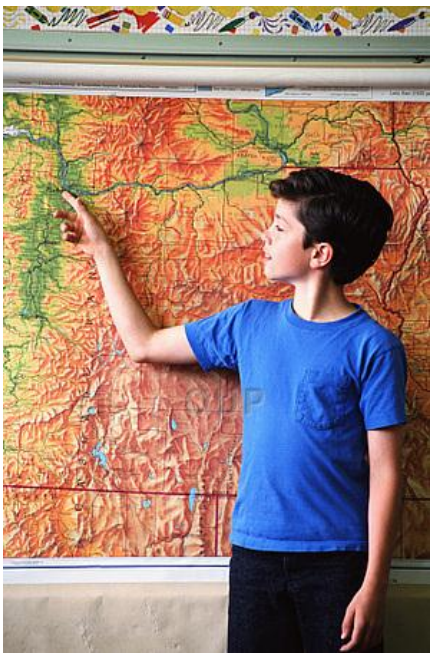
Emphasis on the location of the area from the database

⬇

Relate to the plate boundary and *Pacific Ring of Fire*, earthquake zones and active volcanoes

⬇

Inter-relation between earthquake zones and active volcanoes



This information will be appealing to the students, offering a unique way of looking at the geomorphologic and geological phenomena, and engaging them to exercise higher order thinking skills. The lesson will become so much more interesting if we can take our students to areas where active volcanoes are located and make them connect all the related data to investigate the reasons behind the presence of active volcanoes only in a few pockets of the world. The resources and the tools we use as teachers help us to bring to life what we teach.

Using Google Earth

Google Earth contains valuable information which can be easily taken to the classroom, an internet connection being the basic requirement. Satellite images of the earth and its landform motivate the students and fascinate them which in turn accelerate their learning process.

The following objectives can be achieved in the geography classroom by incorporating Geo-Spatial technology tools like ***Google Earth*** while teaching the importance of *natural vegetation cover* and *adverse effects of deforestation*.

a. **Spatial Orientation:** When the students are exposed to satellite imagery or aerial photographs, they develop the ability to transfer the virtual orientation to real conditions. For example, if we show images of deforestation in the classroom, they will be able to transfer this virtual knowledge into real condition when they visit an area affected by deforestation. They will also become aware about which area has thick vegetation cover and which is being subjected to deforestation.

b. **Creativity:** Students are able to acquire more authentic information when they combine other sources of knowledge like text, charts, and data with satellite images. They incorporate higher order thinking and lateral thinking which make them original and resourceful, promoting innovation. They will be competent enough to investigate the loss of vegetation cover and rate of deforestation in an area using the data available and conclude the adverse impact of deforestation on sustainable development.

c. **Communication:** Students will find ways to improve their geographical thinking and build their way to well-founded opinions on various environmental issues. They will be able to explore data independently and improve their understanding and ability to express geographical messages more adroitly.

d. **Evaluation:** Students can evaluate and analyze the selected situations and circumstances by using their geographical and geo-scientific knowledge. They are able to explore different regions and go on virtual voyages to different areas. They will learn to integrate the social, cultural and economic values associated with natural vegetation cover and analyze the adverse impact of deforestation on society and economy.

e. **Application:** Students will be competent enough to differentiate between sustainable and non-sustainable behaviour by analyzing and applying their geographical skills and thinking processes. There are lots of relevant topics in geography like *urbanization, desertification, land use pattern*, *resource utilization*, etc. that can be tackled easily using Geo-Spatial technology. The main reason behind using latest technologies of satellite imagery and aerial photographs will be to motivate students to understand the amazing processes that have shaped the earth in the past and continue to influence it in the present.

Conclusion

The quality and the effectiveness of the techniques that we select and the way we apply them in the classroom are crucial for our students' learning. Aerial photographs and satellite imagery are some of the helpful tools for teaching geography. They provide an incredible amount of details of any geographical entity. They give a bird's eye view of an area, they can establish the relationship between each component of the lithosphere, hydrosphere, atmosphere and biosphere.

Varied application facilities which allow the teachers and students to collect, interpret and evaluate data over large, often not easily accessible and dangerous areas make Geo-Spatial technology a useful teaching-learning tool. Effective use of such technologies can open up new avenues for novel perspectives and increase the students' holistic awareness about the world around them.

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Lesson plan on Using *Google Earth* in Schools (Class 6-7)

Objective: *Comparing and Contrasting Major Continents of the World with the help of ICT*

Technique: Using geographical links available and *Google Earth*

Important terms that one should be aware of before introducing the lesson:

Remote sensing: Remote sensing is a scientific and technical discipline that involves acquiring information of various features of the earth. This can be done via satellite or aircraft.

GIS: *Geographical Information System* can be defined as the technical discipline that uses computers and geo-spatial knowledge to map geographic data.

Geo-spatial data: It is the data that uses geographic location along with the available information.

Lesson Overview

Online maps and satellite imagery offer students a unique way of looking at earth from a vantage point and study it further. As the well known saying goes, "*We would understand the earth best if we see her from aloft*", these will be useful sources of study as the students will be able to view a smaller area in great detail and analyze the location, landscape, vegetation cover and human settlement.

Learning Outcomes

This lesson plan will help students

- ✓ acquire knowledge of using ***Google Earth***, instead of wall maps and atlas to collect, process and present data.
- ✓ recognize the know-how of acquiring geographic information.
- ✓ organize geographic data and information.
- ✓ analyze and interpret the spatial organization of people and their surroundings.
- ✓ present the geographical data from a spatial perspective.

Major objectives of the lesson

Students are expected to

- ✓ use ***Google Earth*** to identify the different earthly features, human settlement, transportation routes (roadways, railways, waterways, etc.).
- ✓ classify, compare and relate landforms.
- ✓ describe a continent accurately using the geographic parameters.
- ✓ communicate their interpretation with the help of a powerpoint or chart.

Procedure

Teacher's Preparation:

- The preparation time to use ***Google Earth*** depends on the experience of the teacher with this particular software. 1-2 hours preparation time is required for those who are new to using ***Google Earth***.
- Go to the educators' website to be familiarized with the content:- *http://sitecontent.google.com/google-earth-for-educators/tutorials-and-tips*

Duration: 3 periods

Materials Required: Computers with internet connection and ***Google Earth*** software

Pre lesson

First stage

- ✓ Reinforce the students' knowledge about continents.
- ✓ Play a continent game using online maps and the information given below. Quizzes can also be taken as a test.
- ✓ Provide them with a world map, asking them to locate as you conduct the quiz.

1. *The ocean that separates Europe and the two Americas -*
2. *The mountain range that forms a natural border between Europe and Asia -*
3. *The continent that lies totally in the Southern Hemisphere -*
4. *The water body that separates the two Americas -*
5. *The continent that has the largest area with hot weather condition -*
6. *The continent that has the largest area with cold weather condition -*

Second Stage

- ✓ Teach students how to use ***Google Earth***.
- ✓ Go to ***Google Earth*** website and show students the basic operations, demonstrating how to use them to study continents.
  (This lesson can be integrated with the ICT class, with detailed explanations of the Google Earth menu and operation of each icon.)
- ✓ Take them on a virtual voyage and show them all the areas they have located on the world map.

Developing the lesson:

Explanations about the continent with *Google Earth*

- ✓ Open the site of ***Google Earth*** and show the students the different continents.
- ✓ Answer each of the questions listed above with the help of satellite imagery from ***Google Earth***.
- ✓ Give a brief description of each distinctive feature of each continent.
- ✓ Show the terrain (mark the 3D view of the elevation of the terrain).
- ✓ Tell them that the technical terms signifying borders and labels are Geo-Spatial references.
- ✓ Explain to them that they can navigate through the different continents by using the navigation tool.
  (*Suggested activity that can be done in the ICT class to prepare the students for the upcoming project: Locate the different continents of the earth and the surrounding water bodies.)*

Learning activity:

- ✓ Divide the class into groups of four.
- ✓ Allocate one continent to each group.

Develop a worksheet adapted to the general ability of the students. This worksheet can be used for preparation to do the project by using ***Google Earth***:
Make a list of geographical features which will be easy to identify for your students, such as water bodies, mountain ranges, valleys, etc. of each continent along with respective latitudes and longitudes.

ACTUAL PROJECT

Geographical investigation:

Ask the students to

- describe briefly the physical characteristics of each continent e.g. mountains, rivers, lakes, plains, etc.
- describe various man-made features of each continent.
- find out about the various important cities of each country within each continent.
- locate few important geographical landmarks (volcanoes, geysers, high mountain peaks, eroded areas and so on) of each continent that make it unique.
- locate few cultural landmarks of each continent with geographical references.
- find out the latitudinal and longitudinal extents of each important city.

Weather and Climate

- ➢ Advise students to describe the different types of climatic parameters of the selected continent.
- ➢ Ask them to analyze the relations between the climate and the population.
- ➢ Ask them to infer about the type of vegetation they might find coinciding with the climatic parameter. Prompt them to look for *Biomes*.

Human-environment interaction and interrelation

Ask the students to

- identify any physical environment that has not been modified by human interference.
- determine the kind of land-use pattern they would find near the riverside and the mountainous region.
- find the difference between two land-use patterns, if any.
- list the different forms of communication.
- identify if any mode of communication follows physical features like rivers or mountain tracks.
- locate the industrial land-use pattern (e.g. industry, agro-based industry, mineral-based industry), and commercial land-use pattern (e.g. restaurants, banks, grocery stores, etc.) of each continent. Where are they located and why?

Analyzing the data

Recommend the students to interpret their data on the following basis:-

a. ***Location***:

✓ Location analysis: Why things are located where they are?

✓ Relative location analysis: Giving a description of the location in relation to some other feature.

b. ***Physical and Human Characteristics***:

✓ Physical characteristics like landforms, water and vegetation.

✓ Man-made features like settlement patterns, architecture, etc.

c. ***Human-environment interactions***:

✓ The way humans adapt to the environment to meet their needs, tabulating different economic activities.

d. ***Communication***:

✓ Transportation links for people to travel from one place to another.

e. ***Region***:

✓ The countries with geographical references that constitute the continent.

✓ Division of the continent on the basis of various functions and land-use patterns. (*if possible*)

Presentation of data

- Guide the students to present their data accurately.
- Direct them to make a slideshow to present the data with relevant information about the assigned continent.
- Each student should present at least three slides.
- The number of slides for each group should be approximately 12.
- Each slide should carry appropriate information related to geo-spatial references.
- Guide them to use hyperlinks for showing the satellite imagery from ***Google Earth***.

Closure

- Allow students to present their information and analysis in a form of powerpoint presentation.
- Let them compare each continent on the basis of geographical parameters.

Modification/Adaptation

The project is research-based, so students might find it difficult to work in the beginning. Help them as and when required. Give them handouts of different terms related to geographical features which will render support to the students. Monitor them as they carry on their investigation. A sample handout is given below:

Plateau - a table-like land
Atoll - a ring shaped coral reef
Cavern - an underground cave formed in the limestone topography
Canyon - a deep gorge cut by the river action
Delta - an area of deposition formed at the mouth of the river

Evaluation

i. Observation Checklist

Sl. no	Criteria	Yes/No	Additional Comments
1.	*Works with enthusiasm during the activity*		
2.	*Demonstrates discipline while doing the activity*		
3.	*Contributes to building new ideas*		
4.	*Relates to prior knowledge*		
5.	*Exhibits all new facts and concepts learnt*		
6.	*Demonstrates computer skills while investigating*		
7.	*Works independently*		
8.	*Follows rules and is organized*		
9.	*Organizes geographical data properly*		
10.	*Takes learning seriously*		

ii. Rubric for group activity (targeting mainly social and emotional skills)

Criteria	Excellent	Very Good	Good	Needs Improvement
Works effectively with team members				
Respects the opinions of team members				
Contributes to the team work				
Puts across one's own point respectfully				
Resolves disputes in the team amicably				
Demonstrates leadership quality within the team				

Power point presentation (targeting thinking skills)

Criteria	Excellent	Very Good	Good
Presentation is relevant to the content.			
Geographical interpretations are original and not taken directly from any other source.			
All geographical data is clearly and logically stated.			
Information adheres to the ultimate goal of the presentation.			

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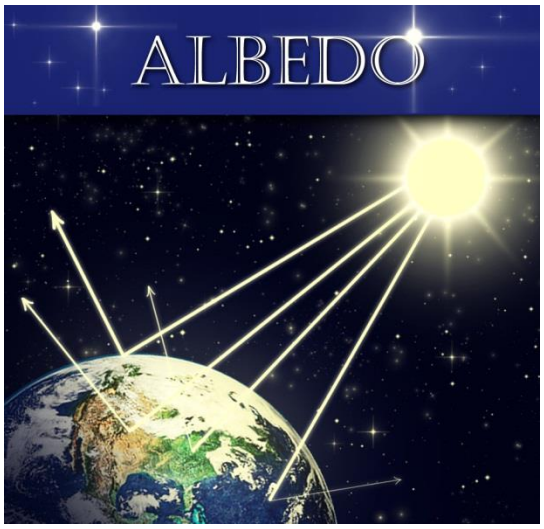
Words Section



Albedo (noun)

Meaning

- The proportion of the incident light or radiation that is reflected by a surface, typically that of a planet or moon. This definition can be generalized to any object, such as a part of the Earth's surface or atmosphere, a leaf, a soil element, etc. *(Oxforddictionaries.com)*

Origin (and additional information) ~ The term's first known use was in the mid 18th century: from Latin *albedo*, meaning *whiteness*, which in turn is derived from ecclesiastical Latin *albus*, meaning *white*. It is also known as *reflection coefficient*.

The term *albedo* was introduced into optics by *Johann Heinrich Lambert* in his 1760 work ***Photometria***. Its dimensionless nature lets it be expressed as a percentage and is measured on a scale from zero for no reflection of a perfectly black surface to 1 for perfect reflection of a white surface.

The albedo is an important concept in climatology, astronomy, geography and calculating reflectivity of different surfaces. The average overall albedo of Earth or its planetary albedo is 30 to 35% because of cloud cover, but widely varies locally across the surface because of different geological and environmental features.

Ice, especially with snow on top of it, has a high albedo: most sunlight hitting the surface bounces back towards space. Water is much more absorbent and less reflective. So, if there is a lot of water, more solar radiation is absorbed by the ocean than when ice dominates. Albedo is not important at high latitudes in winter as there is hardly any incoming sunlight. It becomes significant in spring and summer when the incoming radiation can greatly increase the melting rate of the sea ice.

Albedo affects climate and drives weather conditions. All weather is a result of the uneven heating of Earth caused by different areas of the planet having different albedos. Essentially, for the driving of weather, there are two types of albedo regions on Earth: *Land* and *Ocean*.

Words Section

Forests are generally attributed a low albedo, as the majority of the ultraviolet and visible spectrum is absorbed through *photosynthesis*. Through the *evapotranspiration* (it is the sum of evaporation and plant transpiration from the Earth's land and ocean surface to the atmosphere) of water, trees discharge excess heat from the forest canopy. This water vapour rises resulting in cloud cover which also has a high albedo, thereby further increasing the net global cooling effect attributable to forests.

The direct or the albedo effect of *aerosols* (very fine particles/droplets in the atmosphere) contributes to Earth's radiative balance by cooling the planet.

Usage ~

i. *Decades of photometry have been interpreted to derive maps of Pluto's surface reflectance, or albedo.*
ii. *These aerosols are reflective and increase the albedo of the planet.*
iii. *Albedometer is an instrument used to measure the albedo of a surface.*

Derivatives ~ *albedos,* plural