Exploring Our Planet With Open-Source Software

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Exploring Our Planet with Open-Source Software

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- [http://www.virginiaview.net/education](http://www.virginiaview.net/education)
- [https://americaview.org/exploringourplanet](https://americaview.org/exploringourplanet)

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Credit for the cover photo:

101106-N-8863V-113 NORCO, Calif. (Nov. 6, 2010). Girl Scouts competed in the Mission Ocean Challenge during the USS California Science Experience at Naval Surface Warfare Center, (NSWC) Corona Division. This event intended to introduce students to real world STEM applications. (U.S. Navy photo by Greg Vojtko/Released).

http://www.navy.mil/gallery_search_results.asp

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Exploring Our Planet with Open-Source Software

This manual, and associated written tutorials, introduce instructors and students to open-source, on-line, software that supports student learning in cartography, image analysis, GIS, and map interpretation as they apply to Geography, Social Sciences, History, Current Events — basically, many of the topics that form subject matter for school curricula of our educational systems at several levels.

**National Geographic Mapmaker Interactive.** NGS Mapmaker Interactive offers users a capability for preparing individualized maps, measuring distances, adding place marks and layers. Users can select and switch base map layers. National Geographic Mapmaker Interactive allows students to add layers to represent environmental features, agriculture, human conditions, political boundaries, water, economy, and energy. Data is available for countries around the world. Together, these features provide opportunities for learning map skills, geographic concepts, and the context for historical reference features. Users can change scale, roam, and label features. Map displays can created using data overlays representing food, energy, culture, environment, water, climate, and weather, among others. Mapmaker interactive is designed for use by student of all ages.

**Google Earth.** Most readers are likely already aware of Google Earth—a well-known open-access computer program that provides 3-D representations of the Earth’s surface based on aerial imagery – aerial photography for finely-detailed views of landscapes and cities, and satellite imagery for broad-scale views of larger regions. Google Earth is not available in three forms – a desktop-version called Pro and a web-based version available through Chrome, and as a mobile app available for both android and Apple devices.

**OpenStreetMap (OSM)** provides a free interactive map of the world depicting street patterns as compiled by volunteers. OSM is available without cost on computers, and mobile apps. Map data is collected directly from local observation by volunteers using GPS units, notebooks, and cameras. Data can be submitted into the OpenStreetMap database.
**Introduction to this Manual**

This manual, and associated written tutorials introduce instructors and students to open-source, on-line, software that supports student learning in cartography, image analysis, GIS, and map interpretation as they apply to Geography, Social Sciences, History, Current Events — basically, many of the topics that form subject matter for school curricula of our educational systems several levels. Most activities are prepared for use with computers, tablets, and iPads, and require intent access.

The accompanying videos will guide you in learning to work with these programs. They have applications in (for example) K-12 instruction, community colleges, and many introductory university courses, or in following your own individual interests.

*Open-source software* refers (in our present context) to software available to the public (typically through the internet) without cost to the user, require varying levels of expertise (from novice to expert), or equipment, and provides resources to guide learning and application of its capabilities. Here, we have selected a few of the many resources available, characterized by: (a) presentation of a range of important topics and skills; (b) created and maintained by established organizations; (c) together, cover deliver a spectrum of topics that prepare students with skills and perspectives that pertain to a range of subject matter.

At the end of this introduction, readers will find a link of YouTube videos that have been completed in conjunction with this written tutorial for *National Geographic Mapmaker Interactive*, *Google Earth Web* and *Google Earth Pro*. The YouTube videos do not cover every aspect of the written tutorials. Additionally, the tutorials do not cover every aspect of each of these open-source programs.

**National Geographic Mapmaker Interactive.** NGS Mapmaker Interactive offers users a capability for preparing individualized maps, measuring distances, adding place marks and layers. Users can select and switch base map layers. National Geographic Mapmaker Interactive allows students to add layers to represent environmental features, agriculture, human conditions, political boundaries, water, economy, and energy. Data is available countries around the world. Together, these features provide opportunities for learning map skills, geographic concepts, and the context for historical reference features. Users can change scale, roam, and label features. Map displays can created using date overlays representing food, energy, culture, environment, water, climate, and weather, among others. Chapter 1 of this tutorial covers National Geographic Mapmaker Interactive. Pages 1 – 16 in this tutorial.

**Google Earth.** Most readers are likely already aware of *Google Earth*— a well-known open-access computer program provides a 3D representations of the Earth’s surface based on aerial imagery – aerial photography for finely-detailed views of landscapes and cities, and satellite imagery for broad-scale views of larger regions. The program represents the Earth by projecting satellite imagery, aerial photos, and GIS data onto a 3D representation of the globe, allowing users to see cities and landscapes from various perspectives. Users can navigate to explore the globe by entering addresses, coordinates, and place names, and by roaming using the computer mouse and zoom tools to change, location, scale, and orientation.
Google Earth is presently available in three forms – Google Earth Pro, Google Earth Web (sometimes called Google Earth for Chrome), and a mobile app. Each one of these versions provides different capabilities, although, some of the capabilities are very similar. It is very important that educators review the use terms in Google Earth before using the program in their classroom because of specific age limitations. Google Earth Web is covered in Chapter 2 (pages 17 – 39). Google Earth Pro in Chapter 3 (pages 40 – 107).

Google Earth provides a series of specific tools through the desktop application. Google Earth Pro provides suite of additional tools that allow users to compute distance and areas, manipulate, and export data, access historical data, and create new files and maps. It, additionally, provides capability to utilize existing GIS data to create individualized maps, annotate, outline, and prepare maps for use in other media.

An older version called Google Earth Desktop, is no longer available for download but, our final chapter – Chapter 5 (pages 126 -163), has details on using this application in case users still have this old program on their computer.

OpenStreetMap (OSM) provides a free interactive map of the world displaying street patterns as complied by volunteer contributions (aka crowd sourcing). It is available on computers, and mobile apps without charge. Map data is collected from scratch by volunteers performing systematic ground surveys using tools such as a handheld GPS unit, a notebook, digital camera, or a voice recorder. The data is then entered into the OpenStreetMap database. OSM is covered in Chapter 4, and, again, we did not complete any accompanying YouTube videos for OSM. Pages 108 - 125.

YouTube Videos prepared for use with this tutorials

**National Geographic Mapmaker Interactive**

1. Introduction to National Geographic Mapmaker Interactive  
   [https://youtu.be/BWgUKRzWY4I](https://youtu.be/BWgUKRzWY4I)
2. Using Basemaps in National Geographic Mapmaker Interactive  
   [https://youtu.be/kVHzdKjiS0k](https://youtu.be/kVHzdKjiS0k)
3. Using Help, Bookmarks and Reset Map in National Geographic Mapmaker Interactive  
   [https://youtu.be/1Z-C__4Tr4s](https://youtu.be/1Z-C__4Tr4s)
4. Drawing Tools in National Geographic Mapmaker Interactive  
   [https://youtu.be/-8yo-je347k](https://youtu.be/-8yo-je347k)
5. Saving, Sharing, Printing in National Geographic Mapmaker Interactive  
   [https://youtu.be/uxM7x7PU2Oo](https://youtu.be/uxM7x7PU2Oo)
6. Layers in National Geographic Mapmaker Interactive  
   [https://youtu.be/Yx8zWXkg6V0](https://youtu.be/Yx8zWXkg6V0)
7. Country Flags and Latitude and Longitude in National Geographic Mapmaker Interactive  
   [https://youtu.be/_MkTfKLo5A](https://youtu.be/_MkTfKLo5A)
Google Earth

8. Introduction to Google Earth
   https://youtu.be/DaluBU8ZO3A
9. Locating KML Files for Google Earth
   https://youtu.be/8bLweAYxQoM

Google Earth Web

10. Introduction to Google Earth Web
    https://youtu.be/NjWJIt-jWF4
11. Navigating in Google Earth Web
    https://youtu.be/1-SNUm58tc4
12. My Places in Google Earth Web
    https://youtu.be/njzDD-t6TS0
13. Map Styles in Google Earth Web
14. Sharing in Google Earth Web
    https://youtu.be/KkS8MVH8Me4
15. Using a KML File in Google Earth Web
    https://youtu.be/G2uGOShk6ns

Google Earth Pro

16. Introduction to Google Earth Pro
    https://youtu.be/JStJz-AUYvQ
17. Changing Settings in Google Earth Pro
    https://youtu.be/IxqzT4zUkE0
18. My Places in Google Earth Pro
    https://youtu.be/EJPUY4QDGvI
19. Default Table of Contents, Part 1 in Google Earth Pro
    https://youtu.be/KyjRgT2icME
20. Default Table of Contents, Part 2 in Google Earth Pro
    https://youtu.be/vk1Lv3A2TA
21. Measuring in Google Earth Pro
    https://youtu.be/qsCxoSOL5SM
22. Exploring Historical Imagery in Google Earth Pro
    https://youtu.be/7r1ETosfKmU
23. Adding GPS Data to Google Earth Pro
    https://youtu.be/x6ljzbi0iIo
24. Using a KML File in Google Earth Pro
    https://youtu.be/p2KI-8Gyyh0
25. Finding GIS Shapefiles to use Google Earth Pro
    https://youtu.be/gH20ARsLixA
26. Using GIS Shapefiles in Google Earth Pro, without a Style Template
    https://youtu.be/4GXWB3JDmxA
27. Using GIS Shapefiles in Google Earth Pro, with a Style Template
    https://youtu.be/wG0WyxqieIY
28. Using Regionate in Google Earth Pro
    https://youtu.be/p84BqO1ro_w