Eighteen Software
www.18software.com

HawkEye

Teacher's Guide for California

Teachers can use Hawkeye Wizard in many different ways. This guide is a non-exhaustive list of suggestions emphasizing some selected California Standards.

- *Selected California Standards appear in underlined italic.*

- General comments about the teaching of these standards appear in regular font. These suggestions have been limited to a few. Teachers may use different ideas to illustrate a concept and create scenes better adapted to their way of teaching. They can also import additional data.

Teaching the standards implies a computer equipped with one or several large monitors or a computer equipped with a projector.

- Suggestions about students' activities appear in italic. These activities imply that students have access to a computer, the ideal situation being one computer per student, although two or three students for one computer may be acceptable in some cases.

These suggested activities are an optional complement to the more simple, although extremely instructive, activity of observation. Here, the student travels around at his or her own pace and discusses freely with the teacher the significance of observed features. HawkEye is a tool for personal investigation and discovery. Students should be aware that there are many visible features in the data that are not yet fully understood or even observed by the scientific community and that they could, if they like, have their word in these matters.

Many other activities, not mentioned below, can be proposed. Data from areas having a particular interest for students (DEMs for their neighborhood or for a national park, 3D images from Mars, etc) can be downloaded for free from the Internet. Activities about topography and maps (involving contour lines, slope lines, etc.) are easy to plan as well as activities focusing on special aspects of the Earth and Mars (glacial age imprints, volcanic and impact craters, islands, mountain ranges, etc).

*Although no specific suggestions are made here for **first, second, and third grades**, the simple activity of traveling around the Earth and Mars, is a powerful means of developing observation skills and interest in the Natural Sciences for the very young. HawkEye presents a definite recreational aspect and can be used in conjunction with other activities.*

Grade 4

5a *Students know some changes in the Earth are due to slow processes, such as erosion, and some changes are due to rapid processes, such as landslides, volcanic eruptions, and earthquakes.*

Many examples are given of slow processes, like the progression of erosion (see sections, "Glaciation" and "Fluvial erosion", for instance), ocean sedimentation ("The Amazon"), or the movement of plates (see section, "Tectonic movements"). Numerous examples of rapid processes are provided: landslides, volcanism, and faults causing earthquakes or tsunamis.

In the non-tutorial mode, the teacher asks the students to identify some locations showing evidence of erosion, volcanism, landslides, and faults. The students mark these locations by placing the banners "Slow" or "Rapid" along with indications about the process involved. They create "scenes" of their own.

5c *Students know moving water erodes landforms, reshaping the land by taking it away from some places and depositing it as pebbles, sand, silt, and mud in other places (weathering, transport, and deposition).*

Examples of erosion and sedimentation are given. For example for erosion, see the sections, "glaciation", "landslides", and "fluvial erosion". For transport and deposition, see the scene, "The Amazon" and its associate scene, "Beaches and dunes" (use 'F1' for caption).

In non-tutorial-mode, the teacher asks the students to identify some locations with evidence of erosion and sedimentation. The students indicate these locations by creating scenes with banners marking the site with the type of process involved.

Grade 5

3a *Students know most of Earth's water is present as salt water in the oceans, which cover most of Earth's surface*

The scene, "Planisphere and structure of the Earth" allows the measurement of the area, which is covered by oceans compared to the area of land ('Special tools/Draw hypsograph' command).
A simulation of a change of the sea level can also be performed ('Special tools/Set elevation range' command then set 'Lowest elevation' to zero).

In the non-tutorial mode, the teacher asks the students to place banners on areas of Earth where water is present as salt water.
The teacher asks the students to measure the area of the Earth covered by the oceans.
Students simulate changes in the sea level by clicking on the "Special tools/Set elevation range" command and then observe the way some countries may be affected. They draw conclusions from their investigations.

Grade 6

1a *Students know evidence of plate tectonics is derived from the fit of the continents; the location of earthquakes, volcanoes, and midocean ridges; and the distribution of fossils, rock types, and ancient climatic zones.*

Plate tectonics is demonstrated throughout the tutorial. See, for example, the scenes in the section, "Tectonic movements" and the scene, "The major plates and their boundaries" (use 'F1' for caption and 'Insert' for vignettes).

In the non-tutorial mode, the teacher asks the students to identify plate boundaries and their nature by placing banners: subduction zones, midocean ridges, etc... They create a "scene".

Students indicate with banners the areas prone to earthquakes and volcanism, according to their location inside a plate and create a "scene".

They find the best fits and draw arrows, linking a location on the midocean ridge of the Atlantic Ocean to its corresponding location on the American continental shelf and its corresponding location on the African continental shelf. They create a "scene".

1b *Students know Earth is composed of several layers: a cold, brittle lithosphere; a hot, convecting mantle; and a dense, metallic core.*

The structure of the Earth is introduced at several points during the exploration (for example, in the scenes, "The Nazca plate" or "Crater Lake"). A synthetic view is given in the scene, "Planisphere and structure of the Earth" (use 'F1' for caption and 'Insert' for vignettes).

The teacher chooses a location (for example, a volcanic arc or a hotspot) and asks the students to explain the observed features, taking into account the layers of the Earth. Students create "scenes" and draw conclusions from their investigations.

1c *Students know lithospheric plates the size of continents and oceans move at rates of centimeters per year in response to movements in the mantle.*

This aspect of plate tectonics is introduced throughout the tutorial. See, for example, the scenes in the section, "Tectonic movements" or the scene, "San Francisco". See also the scene, "The major plates and their boundaries".

The teacher asks the students to give an approximate indication of the relative movement of plates on each side of a midocean ridge. This can be done by looking at the topographic details of the ocean floor and by placing arrows. They create a "scene".

1d *Students know that earthquakes are sudden motions along breaks in the crust called faults and that volcanoes and fissures are locations where magma reaches the surface.*

This aspect is introduced in several places. See, for example, the scenes, "The Japanese Islands", "New Zealand", "The Himalayas", "Klamath Fall", "Summer Lake", "Crater Lake".

The teacher asks the students to identify faults by placing banners. They can also identify faults associated with volcanism (for example, start from "Crater Lake" and travel South or open "Mt. Shasta and Medicine Lake"). They create "scenes" and draw conclusions from their investigations.

1e *Students know major geologic events, such as earthquakes, volcanic eruptions, and mountain building, result from plate motions.*

This aspect is introduced throughout the tutorial. See, for example, "The Himalayas" for mountains, "San Francisco" for earthquakes, "The Japanese Islands" for volcanism.

The teacher asks the students to indicate areas prone to earthquakes, volcanism, and mountain building, using their ability to identify plate boundaries. Students place banners, arrows, and create "scenes". They draw conclusions from their investigations.

1f *Students know how to explain major features of California geology (including mountains, faults, volcanoes) in terms of plate tectonics.*

Data about California are provided in several places: the Globe, Mt. Shasta-Medicine Lake, Cape Mendocino, and San Francisco. More data can be downloaded via the Internet from the USGS.
The globe data can be used to observe and understand, in terms of plate tectonics, the main features of California: for example, the Sierra Nevada, the Great Valley, the Cascadia subduction zone.
See the scene, "Mt. Shasta and Medicine Lake" (press 'F1' for caption) and the scene, "San Francisco".

The teacher asks the students to identify the major features of California geology by placing banners indicating the plate boundaries, the relative movement of the plates, and the associated geologic features. Other data of California can be downloaded from the USGS via the Internet.

2a *Students know water running downhill is the dominant process in shaping the landscape, including California's landscape.*

The effect of running water and the power of erosion is introduced in several places. See, for example, the section "Glaciation", the scenes, "Bonneville Dam" or "Landslides at Cape Mendocino".
It is also introduced as a comparison to Earth in the scene about Mars.
A special tool, "Draw channel" may be used to show that any point on the ground is connected to a stream by a downhill path. It can be used in California (Cape Mendocino, for example).

Students are asked to find the path followed by running water to reach the main stream, starting from any location in a watershed. Other data can be downloaded from the USGS via the Internet.

2b *Students know rivers and streams are dynamic systems that erode, transport sediment, change course, and flood their banks in natural and recurring patterns.*

This aspect is introduced in several places. See, for example, the scenes in the section, "Fluvial erosion". Other examples are the scenes, "An incredible flood in the Pacific Northwest" and "Floods along the Mississippi" (press 'F1' for caption).
The scene, "The Amazon" shows the sedimentation on the ocean floor.

The teacher asks the students to find locations showing imprints of fluvial erosion and sedimentation. For example, the scenes mentioned above can be used. Students place banners and create "scenes".

2c *Students know beaches are dynamic systems in which the sand is supplied by rivers and moved along the coast by the action of waves.*

See, for example, the scenes, "The Amazon" and "Beaches and dunes" (press 'F1' for caption).

The teacher may ask the students to use banners and arrows to indicate sand spits and the direction of sand along the coast (scene "Beaches and dunes").

2d *Students know earthquakes, volcanic eruptions, landslides, and floods change human and wildlife habitats.*

See, for example, the scene, "Mt. Rainier", "The 2004 tsunami" in the section, "Geology and Catastrophic events". See also "The Cascade landslide at Bonneville Dam".

Students evaluate the time for tsunamis originating at certain locations (Hawaii, Sumatra, etc), to reach designated shores, taking into account the depth of the ocean (formula indicated in the scene, "the 2004 tsunami").

Students simulate the effects of rising sea level around the globe (command 'Special tools/Set elevation range') and draw conclusions about the consequences on human and wildlife habitats.

Grade 7

4a *Students know Earth processes today are similar to those that occurred in the past and slow geologic processes have large cumulative effects over long periods of time.*

The section "Tectonic movements" shows that plate tectonics is a slow process that began a long time ago and explains many present features of the Earth.
The scene, "Planisphere and structure of the Earth" shows that the continents around the Atlantic Ocean were once united.
Also see the scene, "The Sunda Islands", to show the changes of sea levels during ice ages.
Examples of ancient landslides ("Bonneville Dam"), imprints of ancient glaciers or ice sheets (see, for example, the section "Glaciation"), and imprints of ancient floods ("Bretz flood") can also be presented.

Assuming average speeds for the formation of the plates along the Atlantic Ocean ridge and identifying corresponding locations on each side of the ocean, students roughly evaluate the time when the rift began to open.

Students indicate ancient glacial features (around Crater Lake or Mt. Shasta, for example) by creating scenes with banners.

4b *Students know the history of life on Earth has been disrupted by major catastrophic events, such as major volcanic eruptions or the impacts of asteroids.*

See the section, "Geology and catastrophic events", the scenes "Crater Lake" and "Bonneville Dam".

Students perform measurements on impact craters (Meteor Crater, for example) and measurements of the speed of tsunamis (scene, "The 2004 tsunami") in order to understand the consequences that these events had on life.

4c *Students know that the rock cycle includes the formation of new sediment and rocks and that rocks are often found in layers, with the oldest generally on the bottom.*

See the section, "Fluvial erosion" and the scene, "A closer view of the Appalachians folds".

Students are asked to identify layers in the Appalachians. They place banners along some geological formations and indicate their relative ages. They create a "scene".

Grade 8

4e *Students know the appearance, general composition, relative position and size, and motion of objects in the solar system, including planets, planetary satellites, comets, and asteroids.*

The surface of Mars can be compared to the surface of the Earth, suggesting a different structure and a very different history (see scenes, “Planisphere and structure of the Earth” and “Planisphere of Mars”).
Hypsographs of the two planets can be compared ('Special tools/Draw hypsograph' command).

The students are asked to find clues about the existence, at one time, of running fluid on Mars.
They present a hypothesis explaining the different aspects of the two hemispheres of Mars (density of impact craters and average elevation).
They present a hypothesis explaining the different aspects of craters (single or multiple-rim craters).

Grade 9-12

1f *Students know the evidence for the dramatic effects that asteroid impacts have had in shaping the surface of planets and their moons and in mass extinctions of life on Earth.*

See the scene, "Meteor Crater" and the scene, "Planisphere of Mars" in order to understand the dramatic effect that impacts had in shaping the surface.
The different densities of the craters can be used to distinguish between ancient and recent areas of Mars.

Students are asked to measure the diameter and the depth of the biggest craters of Mars and compare them to Meteor Crater (or the Manicouagan Reservoir, Quebec).

3a *Students know features of the ocean floor (magnetic patterns, age, and sea-floor topography) provide evidence of plate tectonics.*

Many scenes can be used to show evidence of plate tectonics. See, for example, the section, "Tectonic movements".

Students are asked to indicate with banners, some locations demonstrating the existence of plate tectonics (trenches, mid-ocean ridges, transform faults, mountain ranges). They create "scenes".

3b *Students know the principal structures that form at the three different kinds of plate boundaries.*

See the section, "Tectonic movements" and the scene, "The major plates and their boundaries" (use 'Insert' several times).

The teacher asks the students to identify the different plate boundaries by placing banners on the planisphere. They create a "scene".

3e *Students know there are two kinds of volcanoes: one kind with violent eruptions producing steep slopes and the other kind with voluminous lava flows producing gentle slope.*

See, the scene, "Crater lake" and its associate scene, "Mt. Shasta and Medicine Lake" (press 'F1' for caption and 'Insert' for vignettes).

Students make measurements of some volcanoes: elevation, width, and slope in order to determine the type of eruption. This can be done, for example, in California, Oregon, Washington, and Hawaii.

3f *Students know the explanation for the location and properties of volcanoes that are due to hot spots and the explanation for those that are due to subduction.*

See the scenes, "the Japanese Islands", "The Hawaiian Archipelago", "Hotspots", and the section, "Volcanism".

The teacher asks the students to identify some volcanic arcs (associated with subduction) and some hotspot tracks by placing banners on the planisphere. They create "scenes" and draw conclusions about the location of the volcanoes and their properties.

4d *Students know the different greenhouse conditions on Earth, Mars, and Venus; the origin of these conditions; and the climatic consequences of each.*

See the scene, "The future Gulf of Mexico". Use the scene, "Planisphere and structure of the Earth" to simulate changes of the level of the oceans (command 'Special tools/Set elevation range').
The scene, "Fluvial erosion on Mars" can be used to introduce the greenhouse topic as well as simulation of a sea on Mars.

Students use the scene, "Planisphere and structure of the Earth" to simulate rises of the level of the oceans (command 'Special tools/Set elevation range') and draw conclusions about the consequences. They create "scenes".

Students observe and present hypotheses (greenhouse conditions and others) about the one-time existence then the disappearance of running water on Mars.

9b *Students know the principal natural hazards in different California regions and the geological basis of those hazards.*

See the scene, "San Francisco" for earthquakes and faults, the scene, "Mt. Shasta and Medicine Lake" for volcanic eruptions, the scene, "Cape Mendocino" for landslides. Also, more DEMs can be downloaded via the internet from the USGS.

Students are asked to locate areas in California that are prone to earthquakes, landslides, volcanism, and faulting. They place banners on these areas and indicate the geological basis of those hazards. They create "scenes".

Students download from the USGS, some additional data about California locations presenting particular hazards. These can be landslides (many examples), earthquakes (San Andreas Fault segments, San Jacinto fault, etc...), volcanism (Long Valley Caldera, Lassen Peak, etc…), faulting, flooding.