NĀNĀKULI AHUPUA`A HIKE (Env. Sci.)
Tu, MAY 10 OR Th, MAY 12 – Period 1 OR 3 Only

**Purpose:** Students will hike to be able to see the entire ahupua`a (watershed) in which they live in order to build on their understanding of these DOE content standards addressed in this year’s lessons, projects and tests:

- Domain II, Standard 3 – Students make decisions needed to sustain life on Earth now and for future generations by considering the limited resources and fragile environmental conditions.
- Domain II, Standard 19 – students analyze the scientific view of how the Earth’s surface is formed

**Before the Field Trip!**
- Hand in your signed permission form & medical insurance info (no form, no medical, no trip!  *Note: school medical can be obtained – ask your teacher*)
- A chaperone will be with no more than 12 students for the morning. Stay within 25 feet of his/her sight at all times!
- Take this sheet home to let your family know more about the trip & to prepare all you will need to bring with you – this includes:
  1. sunscreen lotion, hat, umbrella (depending on weather)
  2. running or hiking shoes – slippers will not protect your feet & you will NOT be allowed to go on the trip with any open type of footwear
- Things not to bring: music walkmans, gameboys, other valuables

**On the Day of the Field Trip!**
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*Note: If you are not going on the trip, report to the class your teacher assigned you & bring your term notes to do alternate work. Stay there for only 1 class, & go to your other classes as normal. (Hike will take 1 hour, 20 min.)*

- in your classroom, review agenda, meet chaperone (5 min.)
  *Note: there is NO public restroom at sites so ... GO before you GO! 😊*
- walk with chaperones to Haleakala St. & along public roads to base of Heleakala Ridge, then hike to saddle of lower ridge (twin telephone poles are markers) (20 min.)
- Rock Treasure Hunt (find 3 rocks & brainstorm origins & uses) (10 min)
- Ahupuu'a Talkstory (evolution & history of Nānākuli mountains) (20 min.)
- return to school (20 min.)

**After the Field Trip!**
Think about the awesome history of your own ahupua’a, from the time it first formed as part of a volcano, through the history of the Hawaiian people to modern Hawai‘i today. Imagine what will happen to this beautiful `āina in future, and link your term project to what you saw on this hike, and what affect you will have on Nānākuli in your future. What do you want to see happen here?
TEACHER’S NOTES FOR AHUPUA’A HIKE

Rock Treasure Hunt Discussion Openers:
- try to date/age the flow which your rock came from, estimate how old the island is
- observe geological features, eg.
  - Why are there such big boulders in Nānākuli?
  - Where did they come from?
  - Why is Palikea lighter colored than the rest of the pali?
  - What uses could these rocks have for ancient Hawaiians?
  - How did the land come to be shaped this way?
  - Which mountains came first?

For the Rock Activities:
On the hike, pairs find 3 rock samples then teacher or chaperones & groups ask students to observe their rocks & the geology of the land they found them by noting features (similarities, differences), making hypotheses, and asking questions of the group. Anticipated teacher/chaperone info needed is …

1. origins – Heleakala was once part of the 4 million year old Wai’anae Shield Volcano; it is the eastern wall of a caldera that was about 10 miles across and like Kīlauea, took a million years to build up above sea level; across the valley, Piliokahe ridge looks different because it was formed about 3 million yrs ago on the outside ridge of the caldera by vents that spewed a different kind of lava in downward moving flows (Heleakala was formed by horizontal flows that stacked up over time); the beach area is older than Piliokahe, was formed 4 million yrs ago & was under water when the ancient sea levels were higher (so has fossilized coral embedded in it)

2. evolution by erosion by wind, rain, heat & gravity is seen in the small rockslides & errant boulders of Piliokahe (note, paths were also carved into the hillside in the 1800s for basalt and exploratory mining); erosion in Heleakala shows the many layers of every major eruption, and the tilt of the horizontal lines to the east shows how the caldera slowly slumped into the ocean (the present mountain range is only ½ of the original volcano … the rest is underwater were it sank due to its extreme weight); only 1 major slide occurred long ago off Ka’ena Point when the north ridge suddenly slid 60 miles into the ocean, causing a massive tsunami).

3. uses – (see more notes below) main ideas: ancient Hawaiians used basalt rocks for ʻōʻō digging tools (attached to sticks), & may have used them as grinders, scrapers, weapons, in religious ceremonies … basalt is found all over the world and has been used to do these things and make art pieces; basalt is coarse, hard and non-toxic to humans, so modern uses just extend ancient observations with technology to make roads, concrete, brake pads, fire protection & acid-resistant materials, durable & non-toxic containers, etc.
An igneous volcanic rock, dark gray to black, it is the volcanic equivalent of plutonic gabbro and is rich in ferromagnesian minerals. Basalt can be used in aggregate. It is used for roadbuilding; making cement; crushed stone, concrete aggregate, railroad ballast, production of high quality textile fibers, floor tiles, acid-resistant equipment for heavy industrial use, rockwool, basalt plastic pipers, basalt plastic reinforcement bars, basalt fiber roofing felt (ruberoid), basalt laminate used as a protective coating, heat-insulating basalt fiber materials, glass wool (fiber glass), etc.

- Basalt is the best reinforcement for concrete due to its tensile strength and natural resistance to deterioration from alkali
- Reinforcement for composites, polyester/epoxy resins and plastics as used in automotive body panels, boat hulls and pultruded products, etc.
- Friction materials such as brake pads and linings
- Manufacture of basalt mat/felt
- High-temperature insulation applications
- Passive fire protection materials
• Filler for gypsum and sheetrock board requiring increased ‘burn-thru’ capability, to meet building regulations
• High-performance automotive muffler filler
• Basalt Powder Packaging: Jars, pails, drums, multiply paper bags, bulk bags and fiberboard containers

MORE USES: The widespread occurrence of basalt masses, sizeable pieces of which have an overall homogeneity of color and other desirable characteristics, led to the early use of basalt for fashioning artifacts, which have been found on all continents except Antarctica and also on several Pacific and Caribbean islands. Among the artifacts recorded are weapons, tools, and diverse sculpted and carved pieces -- e.g., spearheads; adzes and scrapers; columns, bas reliefs, statues, statuettes, and manos and metates (the last two used for grinding corn and other grains and also in religious ceremonies). In addition, "more compact pieces ... were used for scarabs and intagli by the ... Egyptians. [And,] It is not unusual to find Gnostic amulets, belonging to the Alexandrian sects, engraved in Basalt." (King 1865, p.123)

Today, basalt continues to be used by sculptors and carvers who fashion pieces most of which are sold as decorative articles ranging from relatively inexpensive souvenirs to objets d'art with price tags of tens of thousands of dollars. In addition, basalt cut into rectilinear prisms and other relatively simple geometric solids has found rather widespread use as paper weights and bookends. Also, albeit rather rarely, basalt has been cut and polished to form, for example, cabochons for mounting in pendants and other jewelry.

The celebrated Rosetta stone -- which provided the key Champollion, the French linguist, used to decipher ancient Egyptian hieroglyphics -- is a basalt stele that was found near Rosetta (Rashid), near the western mouth of the Nile, in 1799, during Napoleon's occupation of Egypt. This basalt slab is now in the Royal British Museum in London.
Notes f/ SciHI Cultural Expert & Archeologist:

I usually take the topographical USGS Quad maps and blow up the sections. Make sure that you have a copy of the key. DLNR probably has the quad maps online, but you may want to supplement them with a simple line (traced) drawing.

It is easy enough to translate:

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top of peaks are ridges or peaks; Vs are the valleys. When the lines are closer together it means the slopes are steeper. When you see the lines really far apart it is a flat area. When you see the peaks coming to a circular area, it is a peak.

______........______........______ are streams; ======== are jeep trails or dirt roads (not necessarily in good shape)

Those are good maps to learn from. It takes time to look at it, but that is why we have highlighters.

If you are still unsatisfied with that, go to the C&C tax map site. You may have to get those maps and try to make a composite of maps to suit your purpose.

Lisa, there are several things to do with the students. One is to give a geological search for a many different kinds of rocks on Haleakala. Each kind can be identified for the kind of flow associated with it. Can we age rocks? Not really, but there are ways in which some flows have been aged. Geologists are trying to do that. Why would that be interesting to know…?

Which kinds of rocks are more ideal for making tools? Why? What kind of tools were made of rocks?

Teach them how to read a map. Show them where streams, valleys vs. ridges. Which parts of the map show the peaks. Testing would be to take them outside to show them the ridges that surround Nanakuli. (Can't see them all from the school). Identify them. Find their house on the map. Name streets shown on the maps.

Take a map up there and find the geological marker on the maps. I think there are two on the ridges that we visited. I could not find them. I would like to; perhaps some of the students are better detectives.