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MONITOR A VOLCANO WITH SATELLITE

Class level
3rd - 6th classes

Skills
Predicting, Experimenting, Observing, Recording & Analysing

Content
Science: Environmental Awareness and Care: Science and the Environment

Maths: Measures

Technology: Using technology to support learning

Cross - curricular links
History: Pompeii

Visual Arts: Make volcanoes

Music: Soundtrack to short animation film: Lava

Equipment
Volcano :
- Measuring Jug
- Red Food Colourant
- Funnel
- 0.5L Plastic bottle
- Baking soda
- Tray
- Vinegar
- Dark Soil
- Bin liner
- Water
- Washing up liquid

Satellite :
- Webcam: Wireless/USB
- Toy Figures (Lego/small world)
- Laptop
- Whiteboard/Projector

Preparation
3rd/4th Class may need to have the tables lined with bin liners in advance.

Background information
Technically the web cam is a satellite in appearance only. Real satellite radar (mapping) can show that volcanoes usually deform before an eruption. Measuring that deformation from space can make it possible to forecast when volcanoes will erupt!

Trigger questions
Here are some questions to ask the children to set the scene for the activity:

Think about selfies!
What's the most impressive selfie you've seen?

Have you seen the Earth's selfies?

How do you think these were taken?
(Satellites orbiting the earth)

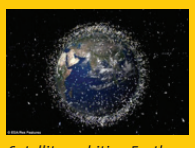
Do you think there are many satellites orbiting our earth right now?
How many would you estimate?

Do you think they all do the same job?


Europe at night


Hurricane


Volcano erupting


Satellites orbiting Earth

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Monitor a Volcano with Satellite

Activity

Carry out a search and rescue mission from an erupting volcano using webcam satellites.

- Children build a volcano - see below for details
- Place Lego/small world people and houses on each side.
- Children become 'human' satellites, viewing the volcano through a kitchen roll.
- Compare view points and determine best satellite vantage point for evacuation of the volcano.
- One child/group is in charge of positioning the camera for recording the eruption.
- Another child/group is on a laptop in the 'control room' (turned away or out of view of the volcano) and instructs the 'satellite' to move up / down / left / right to get into ideal position to record eruption.
- When the warning is given by the control room, the evacuation team remove the Lego men.
- Leave the Lego houses to see if the lava reaches them.
- Record the eruption on webcam to watch back and analyse. Watch it back slow motion too!
- For tips on Webcam recording: http://www.wikihow.com/Record-from-a-Webcam
- For tips on Slow-motion Playback: http://www.wondershare.com/video-editor/windows-movie-maker-slow-motion.html
- Repeat the eruption. (Add an effervescent tablet with the volcanic mixture to create a bigger explosion)
- What advantages did the satellite observation have over the peripheral 'human satellites'? (Overhead view, complete volcanic observation)
- Did the lava flow follow the same path each time? (No, each eruption was unique, but satellite observation enabled better prediction for lava flow)
- What happened to the shape of the volcano over time? (Changes shape, becomes smaller, mouth becomes wider)
- How do we make it a fair test?
  Same amount of ingredients used to erupt the volcano each time.
  Each satellite ('human' and 'eye' in the sky') must be equidistant from the volcano.

To Build the Volcano:

- Place a waterproof tray (approx 30 x 50 x 5cm) on a flat surface.
- Place an empty 500ml bottle in the middle of the tray.
- Place 10l of soil (or compost) around the bottle, shaping into a volcano. Mix the soil with water to ensure that it sticks together and allows you to shape around the bottle.
- Make a steep slope on one side and a gradual slope on the other.
- Put miniature people/houses/trees on opposite sides of the volcano.
- Put 5-10ml of red food colouring, 100ml of washing-up liquid, and some gold glitter (optional) into the bottle.
- Add 4 teaspoons of baking soda.
- Put the satellite camera into position.
- When you are ready, pour 200ml of vinegar into the bottle to create the eruption.

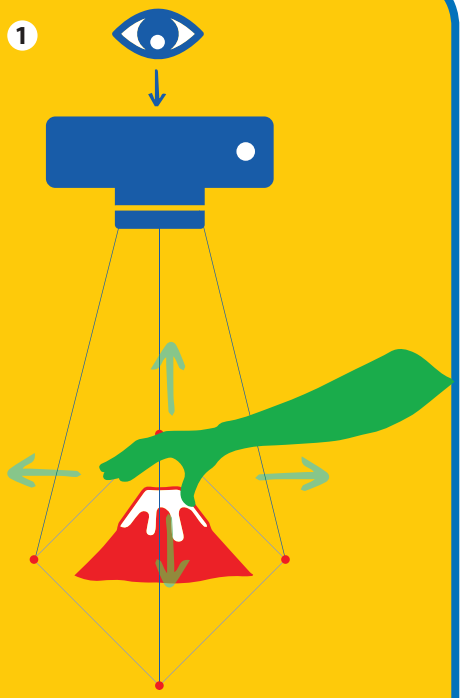
Maths Extension for

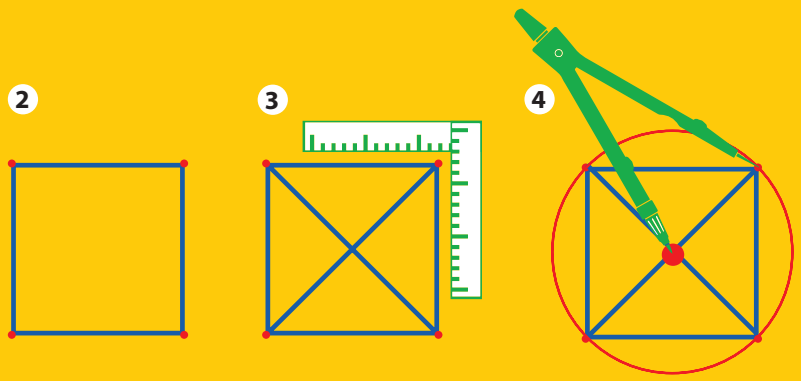
MONITOR A VOLCANO WITH SATELLITE

Maths: Measure the area viewed from the satellite

Use a compass to measure the area viewed from the satellite.

- Hold the camera still.
- One child moves her hand slowly across the centre of the volcano, when her hand leaves the screen she places a small marker down (its should appear at the edge of the screen on the IWB).
- Repeat until a square is formed.
- Measure the length and width of the square, find the centre point (draw a line across and another half way down, where they meet is the centre point).
- Draw the circle and measure its circumference.





Does the area viewed increase/decrease with the satellite's distance from the volcano?

Did you know?

Radar satellites can detect surface movements down to the millimetre. Italy's Phlegraean Fields – or Campi Flegrei – is a large, volcanic area near the city of Naples. Data from the Sentinel-1 mission will be employed to monitor this and other areas, helping us to understand the processes happening below Earth's surface. Link to satellite mapping of Italian volcano:

http://www.esa.int/spaceinvideos/Videos/2014/07/Monitoring_volcanoes_with_radar_satellites