Upham Woods Grab and Go: DOTS Tool-Thermal Imager

Concept:
Understand how to use a Thermal Imager and be able to compare a non-thermal overlay image to an infrared image and make observations.

Age level:
Grades 5th-12th

Education Standards:
Next Generation Science Standards MS-LS2-5 MS-PS4-3 MS-ETS1-1 MS-ETS1-2 MS-ETS1-3 MS-ETS1-4 MS-LS2-2

Success Indicator:
Youth will be able to interpret pictures on the Thermal Imager with regards to the percentage of infrared overlay.

Preparation

Time: 30 minutes

Space: Anywhere

Materials:
- Fluke Visual IR Thermometer VT02 or VT04A
- Print-outs of thermal images (can be at different percentages of thermal overlay) and the corresponding original image

Background Information:
Technology has been integrated into virtually every facet of education. Through Digital Observation Technology Skills (DOTS) youth are able to experience and identify various aspects of nature through technology. One of the tools used to make these connections with nature is the Thermal Imager. This tools purpose is designed to record the infrared emission variations of surrounding objects and convert that information into a temperature reading

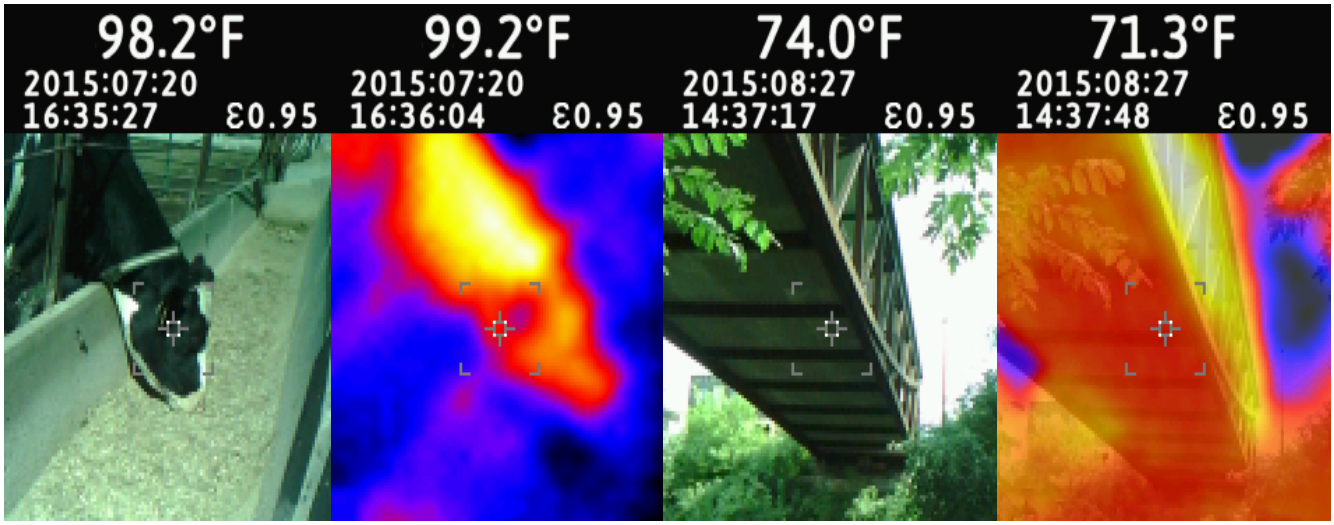
Using the Thermal Imager:
1. Turn on the Thermal Imager by holding down the menu button.
2. Once the screen has loaded, begin pointing the thermometer at various living and non-living object.
3. Be aware, the thermometer gives reading in Fahrenheit.
4. Keep the thermometer as still as possible when pointing it at an object.
5. To observe the object in infrared, press the up and down buttons. This will change the view screen from no thermal overlay, to 25%, 50%, 75%, and 100% infrared view. If you continue to press the arrows the thermometer will cycle through and return to the original image.
6. To take a picture, press the green button located on the back of the thermometer.
7. To save a picture after taking it, press the select button (✓). Otherwise press the menu button (X) to return to the main view screen.

Instructions for Matching Game:
1. For this activity the students will be placed in groups in order for the students to work together to match up the images.
2. Starting with images that have a lighter layering of thermal imagery, hand out printed-out images and explain that the goal is to match the thermal images to the original photos (which have no layer of thermal imaging)
3. Give the students time to discuss amongst themselves which pictures match up
4. Once each group has made their matches, go through the pictures with the group and identify the accurate corresponding thermal image.
5. Hand out the print-outs of the same images, but with more layering of thermal imagery, along with the original photos.
6. As before, give the students' time to discuss and then go over the accurate answers as a group.
7. If time, allow the groups to use their thermal imager to choose and item, take a picture of it with thermal imagery layering, and have the rest of their group try to guess which item was chosen.

More Information on Thermal Imagers

A thermal imager is a tool that measures temperature without having to be in contact with the object being measured. It works by detecting the infrared energy being emitted, transmitted, or reflected by all objects. The imager records the heat signature of all materials that it is being pointed at, then converts the difference in infrared energy emission into a temperature reading. Since it uses infrared energy to create the electronic images on the screen, thermal imagers can be used at night or if there is a lot of smoke/fog/haze.

With these thermal imagers, the temperature difference is reflected in the different colors. White is the hottest and blue is the coldest. A tricky aspect of the thermal imager is that the temperature difference is being shown relative to all the objects in the view screen. This means that an object may be white when in one location, but will no longer be white when moved to a different location.



Deeper Thinking Questions

1. What techniques helped you match the pictures together?
2. Why do you think thermal imagery makes things look so different?
3. How could you use this tool in your life?
4. What questions could you answer by using this tool?
5. Can you think of any scientific studies that you could create and work through by using the thermal imager?
6. What jobs would benefit from having this tool?