WISCONSIN 4-H YOUTH DEVELOPMENT

TECHNOLOGY

DOTS Thermal Imager

Activity Plan

University of Wisconsin-Extension

Project Skills or Goals or Objectives:
Understand how to use a Thermal Imager. Compare a non-thermal overlay image to an infrared image and make observations.

Life Skills:
Digital Literacy, STEM, Environmental Awareness

Audience:
4th – 12th grade

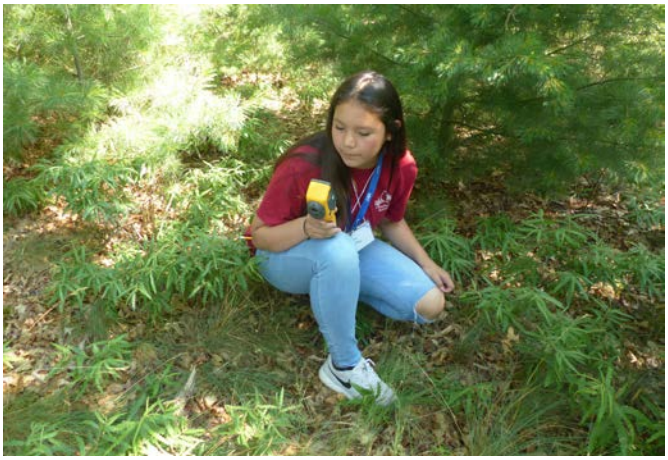
Time:
2-3 hours

Supplies Needed:
Fluke or Flir Thermal Imagers
Print outs of thermal images

Do Ahead:
Print and cut out thermal images

Sources:
Photo: DOTS participant

Developed by:
Justin Hougham and research naturalists



BACKGROUND

Technology has been integrated into education in a variety of ways to deepen learners' educational experiences. Through the Digital Observation Technology Skills (DOTS) program, learners use technology to experience the outdoors and identify elements and processes of the natural world. One of the tools used to make these connections with nature is the Thermal Imager. The purpose of this tool is to record the infrared emission variations of objects and convert that information into a temperature reading.

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 an object. 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 and surrounded by different temperatures around it.

University of Wisconsin-Extension

DOTS Digital Observation Technology Skills

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 objects.
3. Be aware, the thermometer gives readings 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 up/down 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, near your index finger position.
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 and not save the picture.

LEARNING ACTIVITY

Place the students in groups of 2-4 people to work together in this matching game.
Starting with images that have a lighter layering of thermal gradient, hand out printed images and explain that the goal is to match the thermal images to the original photos (which have no layer of thermal gradient).
Give students time to discuss amongst themselves which pictures match up.
Once each group has made their matches, go through the pictures with the group and identify the accurate corresponding thermal image. Next, hand out the print-outs of the same images, but with more layering of thermal gradient, along with the original photos. As before, give students time to discuss their answers within their group and then go over the correct answers all together.
If time allows, have the groups use their thermal imager to, take a picture of an item with maximum thermal gradient, save the photo to their tool, and then trade tools with another group to challenge each other in correct identification.

REFLECT AND APPLY

Questions to ask include:

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 conduct by using the thermal imager?
6. What jobs would benefit from having this tool?

ENHANCE AND SIMPLIFY

This program can focus on different aspect of the environment, such as plants, animals, geology, climate change, human intervention, etc., to suit the needs of a particular event. Data collection can also be done for 30 minute increments for several days to create phenology studies to compare across time/seasons.

Observation skills can be enhanced by including activities that involve inquiry. This includes having students sit in a certain spot for several minutes and make a sound map of everything they hear, or asking them to observe an object at 5 inches away for 5 minutes and recording what they notice.

Thermal Images for Matching Game