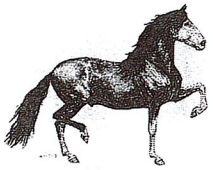
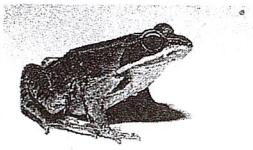
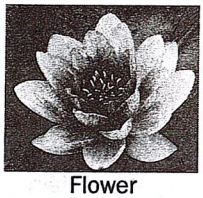
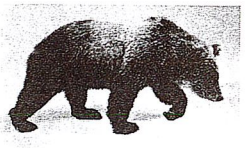
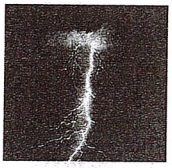
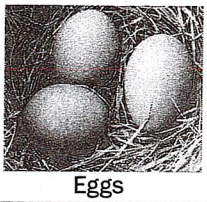
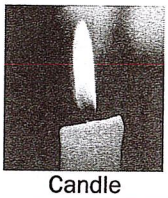
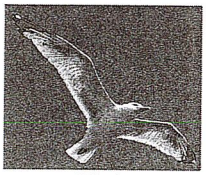
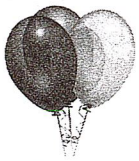
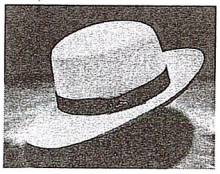
Is It a Technology?

Circle all the examples of technology.

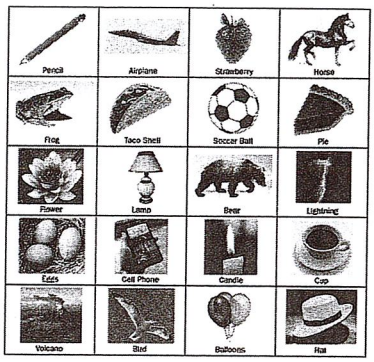
 Pencil	 Airplane	 Strawberry	 Horse
 Frog	 Taco Shell	 Soccer Ball	 Pie
 Flower	 Lamp	 Bear	 Lightning
 Eggs	 Cell Phone	 Candle	 Cup
 Volcano	 Bird	 Balloons	 Hat

Source: Concept adapted from Cunningham (2018).

Explain your thinking. What "rule" or reasoning did you use to decide which things are a technology?

Is It a Technology?

Teacher Notes



Purpose

The purpose of this assessment probe is to elicit students' ideas about what is and what is not technology. The probe is designed to find out if students have a broad understanding of technology as defined in the *Framework* (NRC 2012).

Type of Probe

Justified list

Related Key Ideas

- Technology is any modification of the natural world to fulfill human needs or desires.
- Technology includes all types of human-made systems and processes, not just modern electrical devices.
- We live in a world in which we are surrounded by technologies.

Explanation

The best answer is pencil, airplane, taco shell, soccer ball, pie, lamp, candle, cell phone, balloons, cup, and hat. *Technology* is defined in the *Framework* as "any modification of the natural world made to fulfill human needs or desires" (NRC 2012, p. 202). Given this definition, the remaining objects in the illustration are natural objects, and thus are not considered to be technologies. (However, arguments could be made that some of the objects, such as the strawberry and horse, are not entirely "natural" because they have been bred for particular characteristics.)

Administering the Probe

This probe is best used with students in grades 3–12. It can be used with interactive formative assessment strategies such as card sorts (Keeley 2016). First, check to make sure students are familiar with the objects on the list. You can extend the probe by adding additional natural and human-designed objects.

Connection to the Three Dimensions (NRC 2012; NGSS Lead States 2013)

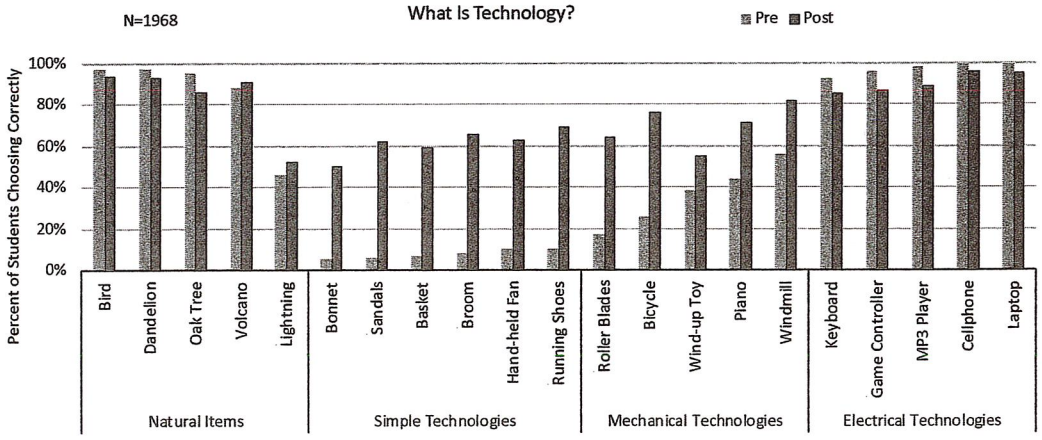
- DCI: ETS2.B. Influence of Science, Engineering, and Technology on Society and the Natural World

Related Research

- This probe is adapted from instruments used in a series of research studies (e.g., Jocz and Lachapelle 2012; Lachapelle et al. 2013) to evaluate the effectiveness of an elementary curriculum, Engineering is Elementary (EiE). The researchers scored the students' responses as "correct" if they circled examples of technologies and did not circle natural objects. The findings of the research studies were summarized in the following text and figure:

  Using these instruments, we found that our engineering curriculum has a dramatic, significant impact on broadening students' understandings of technology. A number of studies using control groups reinforced the fact that students gain a more accurate and nuanced understanding of technology after engaging in engineering. As [the figure] shows, after completing an EiE unit, students are much more likely to indicate that commonplace, simple technologies, such as brooms, baskets, and bicycles, are technologies. In response to the open-ended question 'How do you know if something is technology?' students are more likely to answer that technologies are human-made, and that technologies are designed to solve problems. (Cunningham 2018, p. 127)

Frequency of correct answers before and after instruction



Source: Adapted from Cunningham 2018, Figure 7.1, p. 127.

Suggestions for Instruction and Assessment

- Provide students with a broad definition of *technology*: any modification of the natural world to fulfill human needs or desires. Given that definition, would they change their minds about any of the objects?
- This probe can be used as a card sort. Print each item on a card and distribute a set of cards to each pair or small group of students. Students sort the cards into three columns: Examples of Technology, Not Examples of Technology, Unsure, or We Do Not All Agree. Students must discuss each card before placing it in a column. When finished, students come up with their "rule" or reason for selecting which cards are examples of technology. Results are shared with the class.
- Have students come up with a label for the set of objects that are not examples of technology. Listen to see if they recognize that these are natural objects.
- Have the class vote on each object in the probe to see if they think it is a technology or a natural object. It's best not to give your opinion when students don't agree, so they will continue to question each other about their understanding of technology.
- Take the class outdoors and challenge them to find a technology. Then have them find a natural object. Ask them the following: Which was more difficult to find, or took longer? Why do you think that's the case?
- A method to help students understand the concept of technology is to use the Frayer model for learning vocabulary (Keeley 2016). Students write the word *technology* in the middle of the page, and divide the rest of the page into four quadrants. In one quadrant they list the definition of technology. In the second they list characteristics of technology. In the third they list technology examples. In the fourth quadrant they list non-examples. Students can use the examples and non-examples from the probe for the third and fourth quadrants.

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