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TEACHER GUIDE

INFORMATION TRANSFER GRADES 3-5

COMMON MISCONCEPTIONS

- Students think information is transferred by digital devices using electricity.**
Although electricity powers our electronic devices, the information we send each other - whether text, sound, or images - is coded using numbers. A pattern of 1's and 0's is used to represent text, sound, and images. These numbers are decoded on the receiving end into their original form.
- Digital devices such as phones, tablets, and computers magically transfer information.**
Math and patterns, not magic, are used to transfer information. Patterns of 1s and 0s are used to code text, sound, and images so that it can be shared and stored.

MORSE CODE

An early method for communicating information between two distant places was Morse code. Morse code was developed primarily by Samuel Morse in the mid-1800s to communicate information using electrical pulses created with an electromagnet. Morse code uses patterns of dots and dashes to represent letters and numbers. The length of one "dot" is one unit. The length of one dash is equal to three units. One unit is left between parts of the same letter, three units are left between letters and seven units are left between words. Just as we use abbreviations in texting today to save time (LOL), abbreviations or new concise terms were common when Morse code was used to transfer information quickly (most famously, SOS which by some accounts stands for Save Our Ship and by others is a standalone term which does not stand for anything).

Help us

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SOS

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BINARY SYSTEM

The patterns of zeros and ones addressed through this lesson and NGSS Performance Expectation are commonly called the binary system. However, this terminology is not used with students at this level. Instead, focus is placed on the concept of using patterns for information transfer. Although too advanced at this level, it may be helpful background to know that zeros and ones are also referred to as bits. With so much information to transfer, such as information for thousands or even millions of colored pixels in photos, zeros and ones—bits—are grouped. For example, one pixel might be equal to eight bits of information. This is where computer coding terminology 8-bit comes from. 8-bits are also called a byte. How many bits are grouped together depends on the system being used.

PIXELS

A pixel is one small square piece of a larger image. The more pixels an image is broken into, the better the resolution (the clearer the image looks). Pixels are used to decode patterns of zeros and ones to create images by telling a computer or other device which areas of the screen to turn on or off, and what color to make them.

CODING

Although computers use patterns of zeros and ones to code and decode information, this is different from computer coding as a job. Although all computer coding systems are based on the binary system (patterns of ones and zeros), people who write code for computers today are not entering patterns of ones and zeros. This simple system of transferring information has led to much more advanced technology. Coders use computer programming languages that are much more human friendly, such as JAVA, Python, or C++. This human-friendly code is then turned by the computer into ones and zeros that the computer understands. Just like learning French or Japanese, coders learn these languages and use them to communicate with computers to tell them what they want them to do. If students are interested in learning more about coding, Google CS offers free courses for them to explore.

