Binary Code Bracelets

Simple Science Activity

Purpose:	Students use their understanding of binary code to construct a name/initial bracelet.
Standard(s):	**ISTE Standard 7: Global Collaborator - Students use digital tools to broaden their perspectives and enrich their learning by collaborating with others and working effectively in teams locally and globally.** a. Students use digital tools to connect with learners from a variety of backgrounds and cultures, engaging with them in ways that broaden mutual understanding and learning.
Materials:	pipe cleaners (1 per student), dark beads (15 per student), light beads (15 per student), spacer beads (5-6 per student), binary code alphabet
Procedures:	1. Ask the students, "What are different languages that you speak or that you may have heard of?" Allow students time to respond. Ask, "Did you know that computers have their own language too? Does anyone know what it's called?" Allow students time to respond. Tell the students that binary code is like the language of computers. Binary code represents information using a two-digit system (0's and 1's) or bits. 2. Pass out the materials to each student (one pipe cleaner and beads (students may want to choose their own colors)). • Tell the students that they can either do: o Their first name (up to four letters) o Their nickname (up to four letters) o Their initials 3. Have the students choose a dark color for the 0's and a light color for the 1's. They will need 15 of each color. 4. Next, they will need to choose another color for the spacer. Count out five of these. 5. Start the bracelet with one spacer bead. 6. Using the binary code alphabet, determine the sequence of 0's and 1's for each letter. Remember to use a spacer in between each letter. 7. Finish the bracelet with two spacer beads. Loop around the wrist and twist to wear. 8. After completing the bracelet, students can "read" their bracelet to a partner.
Science Behind It:	50 years ago, scientists invented vacuum tubes to help electricity flow through electrical circuits while turning on and off in meaningful patterns.

	These tubes made it possible for televisions and computers to be invented as they relied on these on-off patterns to function. Unfortunately, they were big, expensive, and they tended to overheat and burn out. Transistors were the next step to help electricity flow and turn on and off in patterns. Hundreds of times smaller, transistors enabled circuits to be connected in integrated ways. Microchips were being invented at about the same time as transistors. Microchips provide places for electrical parts of circuits to be located on a microscopic scale. They also store information in the form of computer memory. Information in microchips is stored in the form of binary code. Binary code takes into account that computers can only understand two types of data – on and off. We have assigned a symbol for on and off (1 and 0) to make this easier for us to understand. The 0 or 1 by itself is called a bit. Sets of eight bits are called a byte.
Questions to Ask:	• What is binary code? • How else could we represent binary code? • What is a software engineer?

Teacher Notes:

- Binary Code Alphabet

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Binary Code Alphabet

Character	Binary Code
A	01000001
B	01000010
C	01000011
D	01000100
E	01000101
F	01000110
G	01000111
H	01001000
I	01001001
J	01001010
K	01001011
L	01001100
M	01001101
N	01001110
O	01001111
P	01010000
Q	01010001
R	01010010
S	01010011
T	01010100
U	01010101
V	01010110
W	01010111
X	01011000
Y	01011001
Z	01011010

Character	Binary Code
a	01100001
b	01100010
c	01100011
d	01100100
e	01100101
f	01100110
g	01100111
h	01101000
i	01101001
j	01101010
k	01101011
l	01101100
m	01101101
n	01101110
o	01101111
p	01110000
q	01110001
r	01110010
s	01110011
t	01110100
u	01110101
v	01110110
w	01110111
x	01111000
y	01111001
z	01111010

Character	Binary Code
!	00100001
“	00100010
#	00100011
$	00100100
%	00100101
&	00100110
‘	00100111
(	00101000
)	00101001
*****	00101010
+	00101011
,	00101100
-	00101101
.	00101110
/	00101111
0	00110000
1	00110001
2	00110010
3	00110011
4	00110100
5	00110101
6	00110110
7	00110111
8	00111000
9	00111001
?	00111111
@	01000000