The IoT: How to Protect Oneself from Devices

TOPIC: ETHICS

GRADES: 6-8, 9-12

LESSON DURATION: TEACHER DISCRETION

SOFT SKILLS: COLLABORATION, PROBLEM SOLVING, COMMUNICATION, GRIT, CRITICAL THINKING

Learning Outcomes:

- Students will articulate and describe the positives and negatives of the Internet of Things.
- Students will identify the potential dangers of IoT devices through a dissection activity and practice caution with devices.

Materials:

- Smart toys/devices for dissection purposes (*The teacher could ask for old devices to be donated for this purpose or write a grant to acquire "Smart toys.")
- Small tools: screwdrivers and pliers
- Safety goggles
- Internet access
- Forbes article and video: https://www.forbes.com/sites/jacobmorgan/2014/05/13/simple-explanation-internet-things-that-anyone-can-understand
- Lab worksheet

Activities:

1. The teacher should introduce or review the concept of the IoT.
2. Show the video in the Forbes article above. Afterwards, have students list the positives and negatives of the IoT.
3. Explain that today, students will be doing their own investigation in the IoT.
4. Divide students into groups of 3-4. All students need safety goggles. Each group then needs a set of small tools and a smart toy to dissect. Talking teddy bears are a great choice but any IoT device would work. The teacher can write a grant or ask for donations of items.
5. Give each group a worksheet to follow through and answer questions.
6. From here, turn the students loose. The students will end up destroying the toy/device in most cases. If access to resources is minimal, the teacher should lead a whole class session and call on volunteers at different tasks to help with the dissection.
7. Have them begin to dissect the electronic/digital aspects of the toy. How does it work? What parts are inside? What is each part used for? What are the security precautions with this toy? Would you buy it now that you know what's inside? What human characteristics are in the toy? What can it do? What can't it do?

8. As students are dissecting, they should be using the internet to identify the different parts of the toy. A simple google search with the product numbers will tell students exactly what each piece is. Another follow-up search will tell its role.
9. Allow the students time to explore and be creative.
10. After all groups are done, have them reassemble the toy back to its original form.
11. Lead a wrap-up discussion on what was learned. The emphasis should be on practicing caution with IoT devices and understanding the security measures and flaws of each device.
12. The teacher can also explain that what they just did was a version of ethical hacking. The toy was compromised to ensure safety and discuss possible flaws and dangers. Because the end goal was to learn and to protect, this is an example of ethical hacking.

Assessment/Enrichment:

1. A suggested follow-up activity would be for students to make a list of the IoT devices in their personal lives. Have them create a list. Beside each item, have students list a positive of the item. In a separate column, have students list the dangers of the item.
   A. **Be sure to explain that students are NOT expected to dissect and tear apart these devices!
   B. Examples: baby monitors (creepy people hacking them), Fitbits used to see where people are, why does my flashlight need to know my location? Does my Starbucks gold card app really need to know where I am right now? Family car has a computer inside, etc.
2. The students could be asked to complete a follow-up activity in which they write a letter/email to the manufacturer of the toy. The letter could applaud them for safety precautions already taken, or it could give suggestions for ways the company could improve safety of their product. Dependent upon what students find, the teacher can adjust the letter requirements as needed. This activity would teach students about quality control. In most areas of technology, this sort of testing is done in a formalized setting and companies receive feedback on their products.
3. High school students could be asked to write an opinion piece following the activity. Should a manufacturer be held legally responsible to practice good ethical behaviors? For example, if a company releases a toy and the toy has known cyber vulnerabilities, should be company be punished by law? (Obviously they can be sued under civil law, but should criminal proceedings happen, as well?)