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The Internet: Present and Future

Unit 3. Information and the Internet

Revision Date: Jan 05, 2020
Duration: 2 50-minute sessions

Lesson Summary

Summary

The Internet is growing to connect to everything we do in our lives. Over the years, it has grown from being a representation of static content to web 2.0: a place where users interact with a collection of users and "things." In this lesson, the students will conceptualize devices that collect data and send it through the Internet.

Learning Objectives

CSP Objectives

- *EU DAT-1 - The way a computer represents data internally is different from the way the data is interpreted and displayed for the user. Programs are used to translate data into a representation more easily understood by people.*
  - LO DAT-1.A - Explain how data can be represented using bits.
- *EU DAT-2 - Programs can be used to process data, which allows users to discover information and create new knowledge.*
  - LO DAT-2.C: - Identify the challenges associated with processing data.
- *EU CSN-1 - Computer systems and networks facilitate how data are transferred.*
  - LO CSN-1.A - Explain how computing devices work together in a network.
  - LO CSN-1.B - Explain how the Internet works.
- *EU IOC-1 - While computing innovations are typically designed to achieve a specific purpose, they may have unintended consequences.*
  - LO IOC-1.A - Explain how an effect of a computing innovation can be both beneficial and harmful.
  - LO IOC-1.B - Explain how a computing innovation can have an impact beyond its intended purpose.
- *EU IOC-2 - The use of computing innovations may involve risks to your personal safety and identity.*
  - LO IOC-2.A - Describe the risks to privacy from collecting and storing personal data on a computer system.

Common Core ELA:

- RST 12.7 - Integrate and evaluate multiple sources of information presented in diverse formats and media
- WHST 12.1 - Write arguments on discipline specific content
- WHST 12.2 - Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes
- WHST 12.6 - Use technology, including the Internet, to produce, publish, and update writing products
- WHST 12.9 - Draw evidence from informational texts to support analysis, reflection, and research

Key Concepts

The Internet is an ever-evolving system of increasing complexity. It has evolved from representing static information to providing interactivity of data between users and objects (things).

Outcomes

- Students will understand the development of the Internet.
- Students will understand how the digital divide is reflected in Internet access.
- Students will understand how devices communicate on the Internet.
- Students will imagine/design things (that don't yet exist) that could connect to the Internet.
- Students will identify how artificial intelligence has enabled innovation but also create additional causes of discrimination.

Essential Questions

- How can computational models and simulations help generate new understanding and knowledge?
- What is the Internet, how is it built, and how does it function?
- What aspects of the Internet's design and development have helped it scale and flourish?
- How does computing enhance human communication, interaction, and cognition?
- How does computing enable innovation?
- What are some potential beneficial and harmful effects of computing?
- How do economic, social, and cultural contexts influence innovation and the use of computing?

Teacher Resources

Student computer usage for this lesson is: **optional**

Students need access to paper for documentation.

Blown to Bits (Abelson, Ledeen, Lewis). Text is free as pdf: http://www.bitsbook.com/ (http://www.bitsbook.com/)

Access to Internet connectivty for these links/videos:

- https://www.youtube.com/watch?v=ZgWbWCv0J5E (https://www.youtube.com/watch?v=ZgWbWCv0J5E) A day in the life of the Internet of Things
- http://www.zdnet.com/the-internet-of-things-outlook-for-2014-everything-connected-and-communicating-7000024930/ (http://www.zdnet.com/the-internet-of-things-outlook-for-2014-everything-connected-and-communicating-7000024930/)
- http://www.ibm.com/smarterplanet/us/en/overview/article/iot_video.html (http://www.ibm.com/smarterplanet/us/en/overview/article/iot_video.html)

In the Lesson Resources Folder:

- "Commercial Python Project" Project Description Document
- "Commercial Python Project Rubric" Rubric for the Commercial Project

Lesson Plan

Session 1

Getting Started (5 min) - Journal / Discussion

1. In their journals, ask students to identify as many objects in the school as they can that are connected to the Internet (or that would be more useful if they were connected to the Internet).
2. Have students share with a neighbor. Then, communicate through a whip-around or a large group discussion. Generate a list of devices.
3. Optional: Review investigations of Internet usage statistics that the students completed in Lesson 3-1 (particularly useful if the students completed the investigation as homework).

Guided Activities (40 min)

Part 1 - (15 min)

Say: Devices connected to the Internet collect data. Sometimes those devices and the programs that store and process the data can have applications that the developers did not intend and may be very significant. For instance, consider this video from CNN about an app called Strava. https://www.cnn.com/2018/01/28/politics/strava-military-bases-location/index.html

(https://www.cnn.com/2018/01/28/politics/strava-military-bases-location/index.html) Play the video.(2:12). Have a brief discussion using the following questions as prompts.

- What was the intended purpose of the app?
- What purpose could the app have that the developers never intended.

Say: Data collection is not just from devices people knowingly use but increasingly from things connected to the internet they may not be aware of. Many computing innovations affect people in ways that were not anticipated.

> Show the video (no audio except music) on how an average everyday person uses objects connected to the Internet in our current society: https://www.youtube.com/watch?v=ZgWbWCv0J5E (https://www.youtube.com/watch?v=ZgWbWCv0J5E) (3:58)
>
> *Summary: A day in the life of the Internet of things shows these things connected to the Internet: cell phone, thermostat in the house, car entry system and radio, car GPS intelligently looking for available parking, parking sensors on the ground using mesh networking (short-range connections to a larger deployment system in a central box), a heart rate monitor with results that can be viewed online in real-time, a watch that connects with a cash register/inventory system, a package pickup system that connects with a drone to take the package directly to the customer.*

Say: The data collected today is too large to be processed by people. Two strategies used to analyze large amounts of data are called data mining and artificial intelligence. While both tools regularly find useful results - useful in science and in business - the information obtained may result, in adverse decisions made against individuals or groups.

Students read the May 21, 2019 Guardian article, *Facial recognition will soon be everywhere. Are we prepared? (*https://www.theguardian.com/commentisfree/2019/may/21/facial-recognition-privacy-prepared-regulation (https://www.theguardian.com/commentisfree/2019/may/21/facial-recognition-privacy-prepared-regulation)). As students read, have them prepare to respond to the following prompts.

- Identify an ethical concern or an ethical advantage of near-continuous surveillance supported by the Internet of Things.
- Identify a legal concern or advantage of near-continuous surveillance supported by the Internet of Things.
- Identify how information gathered and evaluated by computers has and can lead to discrimination.

Part 2 - Internet of Things (10 min)

Say: Originally people generated the traffic on the internet. In the future, the vast majority of traffic on the internet will be generated by things.

Show this video about how data is generated by devices connected online:

- https://www.youtube.com/watch?v=uEsKZGOxNKw (1:30 - 8:00) (https://youtu.be/ipdTLJcIkWI)
  Summary: Discussion of the internet of things and the impact of the data collected by them.

Ask students if there were any objects that they did not think about earlier that are connected to the Internet. Adjust the list as needed. Analyze which devices would continue to be a high priority or useful if the ability to communicate on the Internet was suddenly diminished by an event like a hurricane or earthquake.

Journal. Pair and share.

1. What systems on the Internet are most critical today?
2. What systems will be the most important in the future?

Part 3 (15 min)

With a partner, imagine a device that might someday be a part of the "Internet of Things," but currently does not exist. An example might be a shoe that has its own wireless acquired IP address and keeps track of how many steps one takes each day. (**Note**: This may already exist.)

As a small group, the students should create a document answering the following questions:

1. What is the purpose of this device?
2. What data will your device collect?
3. What sensors will it use?
4. What are the risks to the privacy of the data stored on the device?

This document should also include a sketch of the device.

Wrap Up (5 min)

Students display a thumbs up or thumbs down to this question: Did this lesson help you comprehend the concept of the Internet as an entity that is comprised of both people (users) and objects or machines?

Homework

Read *Blown to Bits* (Pg 303 - 306) - IP Addresses - stop at "The Key to It All: Passing Packets."

Session 2

Getting Started (5 min) - Journal

Say: Today we will think about the future of the internet. The internet was designed to be scalable or to be adaptable to serve increasing demands. This ability to adapt to meet increases in demand, or scalability, was a design goal of the original internet. It was not part of the internet's original design to serve commercial needs.
Ask students to respond to these questions about how commercial needs have impacted them.

1. How much advertising is imbedded in apps and web pages?
2. Does everyone see the same ads?
3. Is the impact of advertisements increasing?

Guided Activities (40 min)

Say: Revenue from advertising is used to pay many of the expenses for content and services delivered by the internet. Businesses use data they collect about individuals to put them in a group and to target them for ads. Individuals and businesses both can benefit from seeing advertisements that most interest them.

Ask: Think about how individuals and groups could be harmed by the targeting of ads. Have a brief discussion about the possible harms. Be sure to address the three bullet points below.

- How might an individual be harmed?
- What groups might be harmed?
- How might one or more of these groups be harmed?

Creative Writing Project

Students create a story to summarize what they have learned about what the internet is and what they expect it to become in the future. The summary should include what impact the internet has already had, what impacts they think it might be intended to have in the future and what unintended impacts it might have.

Say: As you think about the future of the internet remember that the protocols it uses are open to everyone so technologies not yet developed can be adapted to use them. In this project, you are asked to envision what one of these technologies might be.

Students may present the story in written or other formats.

Optional - Python Programming Project

Using the document in the Lesson Resources folder called "Commercial Python Project", assign students the project to explore more about the "Internet of Things" and think about what the future of the "Internet of Things" might be. In the project, students consider creating their own product commercial template. Consider adding the requirement that their program includes conditional statements. Extra time will be needed.

The rubric for this project can also be found in the Lesson Resources Folder

Options for Differentiated Instruction

Ask students to think about and document how their selected device may have an impact on our daily lives. Could their be any controversy associated with their device or the use of their device? If so, what is that controversy? Students should document their opinions and/or findings.

When selecting the pairs, aim for diversity of background, so the students learn how others view technology.

Evidence of Learning

Formative Assessment

With a partner, imagine a device that might someday be part of the Internet of Things, but currently does not exist.

As a group, the students should submit a document answering the following questions:

- What is the purpose of this device?
- What data will your device collect?
- What sensors will it use?
- Who will make use of the data?
- What will be the range of values needed to store the data?

This document should also include a sketch of the device.

Summative Assessment

How does the Internet effectively connect devices and networks?

How do devices and networks that make up the Internet communicate?

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