How Innovation Affects Our Lives

Unit 1. Your Virtual World

Revision Date: Jan 04, 2020
Duration: 1 50-minute session

Lesson Summary

Summary

Computing innovations have the potential to significantly impact our lives, both positively and negatively. In order to understand the full range of impact (or lack of impact) of a given innovation, one must consider how differences in geographic location, culture, and socioeconomic status influence the effect that given innovation has on a specific group of people. Students learn about the digital divide on national and global levels and analyze how three different computing innovations impact people, making ethical considerations while doing so in order to determine if the impact is beneficial or harmful.

Learning Objectives

CSP Objectives

- *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.
  - LO IOC-1.C - Describe issues that contribute to the digital divide.
  - LO IOC-1.E - Explain how people participate in problem-solving processes at scale.

Math Common Core Practice:

- MP3: Construct viable arguments and critique the reasoning of others.

Common Core ELA:

- RST 12.1 - Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
- RST 12.2 - Determine central ideas and conclusions in the text
- RST 12.6 - Analyze the author's purpose in providing an explanation, describing a procedure
- WHST 12.1 - Write arguments on discipline specific content
- WHST 12.4 - Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience

NGSS Practices:

- 1. Asking questions (for science) and defining problems (for engineering)
- 7. Engaging in argument from evidence

Key Concepts

- Innovations have positive and negative impacts.
- The digital divide can significantly influence the impact and utility of a given innovation for different groups of people.
- The movement towards Open Access and open-source software is decreasing the width of the "digital divide."
- In order to understand the impact of a given innovation, it is necessary to consider if and how the innovation affects different groups of people in the world and whether that impact is beneficial or harmful to that group.

Outcomes

Students will:

- Discuss the ethical concerns that arise from a given computing innovation.
- Describe the ways in which the digital divide affects individuals and groups of people.
- Analyze the impact of a given computing innovation with respect to a specific group of people and categorizing the impact as beneficial or harmful.

Essential Questions

- 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**

For the Student

- Journal

- Copy of Find My Friends App article (if not reading online): http://www.news.com.au/technology/gadgets/these-smartphone-users-share-how-tracking-app-find-my-friend-has-saved-them/story-fn6vihic-1226752063613 (http://www.news.com.au/technology/gadgets/these-smartphone-users-share-how-tracking-app-find-my-friend-has-saved-them/story-fn6vihic-1226752063613)
- Copy of Analyzing Impacts of Digital Innovations worksheet (Lesson1_5.docx in lesson resources folder)
- Copy of Lesson 1.5 Homework worksheet (Lesson1_5hw.docx in lesson resources folder)

For the Teacher

- Access to a web browser to show YouTube videos:
  - Is Developing Artificial Intelligence (AI) Ethical? | Idea Channel | PBS Digital Studios: https://www.youtube.com/watch?v=95KhuSbYJGE (https://www.youtube.com/watch?v=95KhuSbYJGE)
  - PBS News Hour segment about the digital divide: https://www.youtube.com/watch?v=X537MiN6COI (https://www.youtube.com/watch?v=X537MiN6COI)
- Access to a web browser to pull up links:
  - https://www.youtube.com/watch?v=7AF18DUIH1Y (https://www.youtube.com/watch?v=7AF18DUIH1Y)
  - http://computer.howstuffworks.com/napster.htm (http://computer.howstuffworks.com/napster.htm)http://www.internetlivestats.com/internet-users-by-country/ (http://www.internetlivestats.com/internet-users-by-country/)
  - http://data.worldbank.org/indicator/IT.NET.USER.P2?view=map (http://data.worldbank.org/indicator/IT.NET.USER.P2?view=map)
  - http://www.bbc.com/news/technology-34780127 (http://www.bbc.com/news/technology-34780127)

In the Lesson Resources folder:

- Presentation (Lesson1_5)
- Analyzing Impacts of Digital Innovations Worksheet (Lesson1_5wkst)
- Homework (Lesson1_5hw)

Lesson Plan

Getting Started (5 min)

Present "Lesson1_5" PowerPoint slides (in the Lesson Resources folder).

- **Slide 2:** Students will respond to the following prompt in their journals: List three questions you could ask to decide if an innovation is "ethical".
- When the students finish, have them discuss their answers. *(Possible answers: does it cause physical, emotional, cultural, environmental, economic or social harm?)*

Guided Presentation (20 min)

Analyzing the Ethics of an Innovation (Slides 3 – 10) :

- **Slide 3:** Show students the definition of “ethics”.
- **Slide 4:** Have students vote as to whether or not “ethical” and “legal” are the same. This is especially relevant with respect to innovations because laws cannot be made about a specific technology before it exists. I.e. laws governing the use of a specific technology must be made after its emergence.
- Say: As programs grow large and they are used and relied upon by more and more users. Often they have impacts that the programmers never intended. We are going to look at two such cases. First, read the first three paragraphs of The Coming Software Apocalypse (https://www.theatlantic.com/technology/archive/2017/09/saving-the-world-from-code/540393/) published by the Atlantic on September 26, 2017.
- Ask:
    - What impact did the designer or programmers never consider?
    - Should they have considered it?
    - Could they consider all possible impacts?
- **Slide 5:** Present the necessary considerations for analyzing the impacts of an innovation, focusing on the first point about whether or not a given impact is negative or positive.
- **Slides 6-9:** Present the background information on Napster and the legal proceedings that resulted from copyright infringement issues. It is important to establish the state of online music sharing/streaming in the late 1990’s when Napster emerged so that students understand the controversy surrounding its creation and implementation. Mention the conflict with the Digital Millennium Copyright Act (DMCA) and how not having access to information/data under the DMCA can be harmful as well as beneficial.
- **Slide 10:** Have students analyze whether or not they think Napster was an ethical innovation by writing down the beneficial and harmful impacts of its creation and use. **Slide 11** provides some possible answers to the prompt.

The Digital Divide (Slides 12 - 17):

- **Slide 12:** Revisit the necessary considerations for analyzing the impacts of an innovation, emphasizing the second point about geography and socioeconomic factors influencing the impact a given innovation has on a specific person or group of people.
- **Slide 13**: Some students have little/no understanding of how other people live in the world and the factors that limit impact or increase the divide among various groups of people based on geography, culture, and socioeconomic status. Have students discuss their thoughts on the factors in a person's life that would cause Napster's creation and use to have no impact. **Slide 14** gives specific reasons as to why a given person would be unaffected by a music-sharing (or any Internet-based) technology.
- **Slides 15-17**: Ask students if they’ve heard of the digital divide. Then present these slides, which define the term “digital divide” and discuss factors that contribute to it in the United States and on a global level. The slides contain several links and videos to supplement the information:
    - Table showing the estimated number of Internet users in each country in 2016: http://www.internetlivestats.com/internet-users-by-country/ (http://www.internetlivestats.com/internet-users-by-country/)
    - A PBS News Hour segment about the digital divide from 2013 (Show 0:00 – 3:27): https://www.youtube.com/watch?v=X537MiN6COI (https://www.youtube.com/watch?v=X537MiN6COI) – Video emphasizes that digital divide also includes digital literacy in

addition to having access as well as how socioeconomic factors, age, race, etc. correspond to digital literacy and access.
    - Map showing percentage of Internet users by country in 2014: http://data.worldbank.org/indicator/IT.NET.USER.P2?view=map (http://data.worldbank.org/indicator/IT.NET.USER.P2?view=map) – Could ask students which regions of the world have the highest and lowest percentage of internet users per country.
    - An article from 2015 about technologies that Google and Facebook are separately developing in order to provide Internet access to places in the world that do not have the infrastructure – includes a short video (1:07): http://www.bbc.com/news/technology-34780127

      (http://www.bbc.com/news/technology-34780127)
- **Slide 18: Reducing the Divide (The Open Movement)**
    - Students describe the factors that lead to the digital divide.
    - Discuss the concepts of Open Access, Creative Commons licensing, and open-source software. Ask the students to consider how public access to scientific results improves people's lives and reduces the gap between "haves" and "have-nots".

Independent Analysis (20 min)

For this portion of the lesson, students will be analyzing the impacts of two innovations: artificial intelligence and the Find My Friends App. A worksheet for this activity ("Analyzing Impacts of Digital Innovations") can be found in the lesson resources folder (Lesson1_5wkst.docx).

- **Slide 19 (Innovation #1):** Students will be watching this video about artificial intelligence (0:00 – 5:12) https://www.youtube.com/watch?v=95KhuSbYJGE (https://www.youtube.com/watch?v=95KhuSbYJGE) . Point out the example on the worksheet table that has been given as a model of how to fill out the table. Give students time to fill out the front of the worksheet as they watch the video and a few minutes after watching the video to write down more of their thoughts. Then share out in groups and as a class. The specific contents of the video are as follows:
    - Basic assumption: It's unethical NOT to develop artificial intelligence.
    - Robots that learn, problem-solve, and are creative have been around since mid-20th century.
    - People are threatened: why hire people if you can have a robot?
    - Robots for everything: Google self-driving car, Watson going for diagnostic medicine, Perry Mastron for legal needs
    - Robots can do so much: not just boring, repetitive, dangerous, but also complex thinking jobs
    - Is it ethical to stop improvement? The ethic of truths: we need things like cheaper, better medical care.
    - The printing press challenged the status quo. Old inventions caused problems, too.
    - Ethics of progress: does the possibility of atrocity (nuclear bomb) mean we shouldn't develop nuclear power?
    - Is it unethical to stop the development of artificial intelligence?
    - (STOP at 5:12) after that, it's about emotion. (skip it)
- **Slide 20 (Innovation #2):** Have students fill out the back of the worksheet as they read the article about the Find My Friends App: http://www.news.com.au/technology/gadgets/these-

smartphone-users-share-how-tracking-app-find-my-friend-has-saved-them/story-fn6vihic-1226752063613 (http://www.news.com.au/technology/gadgets/these-smartphone-users-share-how-tracking-app-find-my-friend-has-saved-them/story-fn6vihic-1226752063613) (If doing this lesson without a computer, you'll need to print out copies of the article for students to read.) Allow students to discuss their findings with a partner or in groups. Get a few responses from groups if time permits.

Wrap Up (5 min)

- **Slide 21:** Students journal about the following prompt: If you come up with an innovation that solves a problem, what concerns do you need to consider before releasing it to the world? (Possible answers: Whom will it benefit or harm? Are there people it won't reach at all?)

Homework:

Students will analyze the innovation of 3D printing in the same manner they did for AI and the Find My Friends App, except they will be finding at least one online source on their own from which to draw their information. Provide students with the "Lesson 1.5 Homework" found in the lesson resource folder (Lesson1_5hw.docx) and provide them with the instructions given on **Slide 22.**

This assignment gives students practice analyzing the impacts of an innovation on their own, as well as attributing facts to a resource and the information to include for that resource for the Explore Performance Task. (The Explore PT is introduced later in the curriculum.) The worksheet Lesson1_5hw (in curriculum resources folder) can be used to support students, or they can write this information on a blank piece of paper, etc. The worksheet does not specify which innovation they are researching, so you could reuse it for future research related to the impacts of innovations.

Options for Differentiated Instruction

For students who require more time for processing and writing down the impacts of AI, show the video a second time (the narrator in the video talks quickly).

If time is limited, split students up so that half of them are analyzing AI and the other half are analyzing the Find My Friends App. Have students review their findings with another student who analyzed the same innovation. Then have them jigsaw (https://www.teachervision.com/group-work/cooperative-learning/48532.html (https://www.teachervision.com/group-work/cooperative-learning/48532.html)) with students who analyzed the other innovation to share what they found.

Guided notes would be helpful for ELL or SpED.

Evidence of Learning

Formative Assessment

Journal:

- Have students respond to the following prompt:
  - If you come up with an innovation that solves a problem, what concerns do you need to consider before releasing it to the world?

Homework:

- Research the impacts of 3D printing.

Summative Assessment

Explore Performance Task

(http://www.umbc.edu/)


(http://www.umd.edu/)


(http://www.nsf.gov/)

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