Instructional Lesson # 10. Days 21-23

Topic Description: The question "What is intelligence?" is addressed through discussion of the differences between humans and computers. Various models of machine learning are investigated along with the concept of natural language processing. The concepts of big data and the inherent bias that accompanies artificial intelligence are also introduced.

Objectives

The student will be able to:
- Explain the idea of intelligence especially as it relates to computers.
- Explain what it means for a machine to "learn."
- Make connections regarding the relationship of data to artificial intelligence.
- Examine the bias in the development of computing innovations that use artificial intelligence(AI) .

Outline of the Lesson:

Segment	Reason/Purpose
Day 1 Journal entry (10 minutes) Discussion of AI experience (10 minutes) Discover how AI works, intro to machine learning (35 min)	Consider the difference between human and artificial intelligence (AI), and connect AI to data.
Day 2 Journal entry (10 minutes) Deeper discussion of machine learning and complete a machine learning training activity (45 minutes)	Experience the training of an AI tool using machine learning with data
Day 3 Journal entry (10 minutes) Ethical concerns and bias (45 minutes) Journal entry (10 minutes)	Bias can be built into computing innovations using AI or built into the intended purpose for use of these innovations.

Student Activities

Day 1
- Complete journal entry.
- Discuss knowledge and experience with AI
- Discover how AI works, intro to machine learning

Day 2:
- Complete journal entry.
- Dive deeper into machine learning and train a tool using data (The Teachable Machine Activity)

Day 3:

- Complete journal entry.
- Investigate and discuss ethics and bias in relation to innovations using AI
- Complete journal entry.

Teaching/Learning Strategies:

Day 1
Journal Entry: *What is intelligence? Are computers intelligent? Why or why not?*

o Volunteers share their responses. Craft a definition with the class. If students need help with definitions, share definitions for intelligence vs artificial intelligence (AI).

Discussion**:**
- What do you know about AI?   Where have you experienced it? Do you know how it works?
- Teachers can create a collection of class answers on a poster or other media, and can help add more examples, such as coding IDEs, that students may not know yet.

Experiment with Machine Learning and AI tools
- Intro to how AI works: (See resources.)
    o Show this video about machine learning What is Machine Learning?.
    o AND this video about facial recognition in Snapchat: How Snapchat's filters work
    o Discuss the contents of datasets - what can be data? (Images, Measurements (time, views, inches, etc), Text, Video recordings!) Refer back to previous lessons that discussed data collection by computers.
    o Use an AI tool together with the class. Use Google's Quick Draw application, Quick, Draw!
    o Let students experiment individually, then have a few demonstrate to the class. It's fun!
    o Have students see the data collected by this app by clicking on the appropriate links in the app, or here: Quick, Draw! The Data
    o Take the opportunity to emphasize the importance of training and test data, an AI model, and outcomes of the model
    o Discuss how the dataset informs the AI tool to predict your drawing by employing human-like learning strategies within machine-learning algorithms.

Experiment with AI tools
- Students used an AI tool in the 'Telling a Story with Data' lesson, and in 'Quick, Draw!'. Now they will experience others.
- *Note: Replace these tools with other AI tools as needed. IT approval may be necessary*
- Students work in groups. Each group member explores one of the following tools and shares back to their groups. They may find information there about how the tools work or they may have to research outside of the tool. Students demonstrate and share how data and machine learning were used. They should answer "what about this tool makes it AI?" (See resources)
    o AutoDraw - Go to the Menu, Choose About to watch video about machine learning
    o Suno AI - (Music) Can research outside of the tool to learn how it works
    o Chat GPT - Can research outside of the tool to learn how it works (or ask it!)
    o Gemini - Google's Chatbot Choose Help and then FAQ
    o DALL·E 3 (Art)
    o Verse by Verse - (Poetry) Click on ⓘ to learn how machine learning was used

Day 2

- Journal Entry: *What training data is being used when building artificial intelligence (AI) tools?*

This is a check in to see if students are able to express their understanding to data, and expand to a discussion about the content of training data (leading to bias for Day 3)

- Machine Learning Activity
  - Machine Learning and Classification
  - Start by asking how a baby learns new information. Introduce the concept of classifying data when babies read books with animals, colors, etc. The more books they read that contain these, the easier they can recognize those animals and colors. (the more data they receive)
  - Next, find examples of classifying in technology. Some examples: filing systems for documents or emails, face detection, handwriting detection, filtering data sets, results of online searches
  - Machine learning involves classification. Students will now train an AI tool by classifying data.
  - Explain the Machine Learning Activity.
    - You will train your own facial recognition model!
    - Go to the Teachable Machine by Google site (see Resources) https://teachablemachine.withgoogle.com/
    - Scroll down to watch the video under "What is Teachable Machine?"
    - Scroll down to the steps:
      - 1. Gather data (read the directions and/or show the video)
      - 2. Train your model (read the directions and/or show the video)
      - 3. Export your model (read the directions and/or show the video)
      - Then click on "Get Started" to start training the face recognition model
        - Choose Image Project
        - Steps will pop up on the page instructing the users
        - Collect 2 sets of data by using 2 different faces (or a face and an object), then train the machine, then test it by switching the image to see what percentage correct the machine is after learning
      - Students can also train using 'sounds' and 'poses' if they wish.
    - Teachers may wish to demonstrate this activity for the class. *Note that everyone has to have a working camera on their device for this tool to work.*
  - Next, students answer questions about their experience.
    - Hit refresh. This time click "skip the tutorial." Train the same classifier with your face and hands.
    - Sample questions:
      - What happens when you only train one class?
      - What happens when you increase the number of images in your dataset?
      - If you've mainly been training with one hand up, try using the other hand. What happens when your test dataset is different from your training dataset?
  - Journal**:** Think about the data you provided to train the AI tool, the teachable machine. What training data do you think is provided to the AI tools you mentioned yesterday in our discussion? Where do you think that data comes from?

Day 3

Note to teachers:
Addressing inherent bias in AI requires a multi-faceted approach.
Human bias in all forms includes: Historical biases present in the data, Algorithmic Bias, Representation Bias, Feedback Loop Bias, and Deployment Bias.
Robust testing is needed for bias, as well as ongoing monitoring and ethical considerations.
Efforts to increase diversity and inclusion in AI research and development teams can help mitigate bias.

- Journal Entry**:** *Can computers be more intelligent than humans? Would you trust a computer to make all decisions? Why or why not?*

- Ethical Concerns and Bias
  - Students begin to learn about bias that is inherent in innovations in computer science, and how this occurs. They visited it in previous lessons like 'Telling a Story with Data' and will continue learning in the 'Culturally Situated Design Tools' lesson. They can connect what they learn and feel about this bias back to their identity portfolios as well, and they may choose this topic for their Final Project.
  - Show a video about Algorithmic Bias. (See resources.)
  - Jigsaw activity and Discussion:
    - Students will learn about historic issues with bias in computer science.
    - Find current articles or videos for the topics listed below. Each should preferably take 5-7 minutes to read/watch. Each group watches or reads one of the resources, records in their journals, then shares out class. ***What did you learn about? What do you think could be considered ethical concerns or bias for your reading?***
      - Options for topics: *(See Supplemental Resources for examples of articles.)*
        - AI's interpretations of language of underrepresented groups
        - Ai tools used in recruiting include bias against women or other underrepresented groups
        - The use of facial recognition and neighborhood data by police in America
        - AI tools used in rating employees or exams for entrance into schools
        - The effects of Deep Fake, AI therapists, AI relationships
        - Creativity and AI - examples of music and film industry fighting back against AI
        - The history of use of surveillance in China (and many other countries)
        - Tay, the chatbot that was quickly trained to be hostile and negative by users
  - Following the activity, you can host a discussion. Some prompts to use**:**
    - Where did we discuss bias with data before in this unit? (a: Telling a Story with Data)
    - What would happen if a machine learning algorithm was biased in some way?
    - How could a program be biased?
    - What possible impacts could there be on people who relied on the predictions made by the algorithm?
    - Connect to identity—are we representative (race, gender, what else is being discussed)

- Journal: *Write about the beneficial and harmful effects of AI and machine learning in your portfolios, thinking about your identity and any benefits or harm to that aspect as well.*

Resources:

- AutoDraw - https://www.autodraw.com/
- Suno AI - https://www.suno.ai/
- Chat GPT - https://chat.openai.com/
- Gemini - https://gemini.google.com/app
- DALL·E 3 https://openai.com/dall-e-3
- Verse by Verse - https://sites.research.google/versebyverse/
- What is Machine Learning? (video) (https://www.youtube.com/watch?v=QghjaS0WQQU)
- How Snapchat's filters work (video) (https://www.youtube.com/watch?v=Pc2aJxnmzh0)
- Quick, Draw! (application) (https://quickdraw.withgoogle.com/)
- Quick, Draw! The Data (application) https://quickdraw.withgoogle.com/data)
- What is artificial intelligence? BBC News (video) (https://www.bbc.com/news/av/technology-34224406)
- Algorithmic Bias and Fairness: Crash Course AI #18(10 min) https://www.youtube.com/watch?v=gV0_raKR2UQ
- Gender Shade (5)s https://www.youtube.com/watch?v=TWWsW1w-BVo
- Artificial Intelligence is Biased. She's Working to Fix It (5 min) https://www.youtube.com/watch?v=lyZxOA113Gw
- How I'm fighting bias in algorithms|Joy Buoalmwini(9 min) https://www.youtube.com/watch?v=UG_X_7g63rY&list=PLj62-wQeg_DhmYphxg70DhPEJcjfmnVEt&t=7s

Teacher Reflection Notes