Picture Perfect AI
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Target Grade: 6th- 8th STEM

Time Required: 55 minutes

Standards

Next Generation Science Standards (NGSS):

- MS-ETS1-1: Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
- MS-ETS1-2: Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
- MS-ETS1-3: Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
- MS-ETS1-4: Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

Lesson Objectives

Students will be able to:

- Identify and express different emotions through facial expressions.
- Explain what artificial intelligence is and give examples of AI systems.
- Explain how artificial intelligence works and why it is helpful to identify images.
- Train an AI system to detect images and explain its possible purposes.
- Discuss potential issues teaching machines and identify ethical considerations and consequences of designing and using machines.
- Reflect on their learning by answering questions about AI, their AI system, biases, and potential limitations.

Central Focus

This lesson plan is to engage students in an interactive and thought-provoking learning experience that connects the concepts of emotions and artificial intelligence. By using fun activities, class discussions, and hands-on training of an AI system, students will gain a deeper understanding of how AI works, its possible purposes, and the ethical considerations that should be considered when designing and using

machines. This lesson plan is designed to foster critical, creative, and collaborative thinking in middle students and to explore the complex relationship between technology, humanity, and ethics.

Key terms: emotions and artificial intelligence, teaching AI, image detection, computer science, critical thinking, hands on, machine learning

Background Information

Artificial Intelligence (AI) is a branch of computer science that focuses on creating machines that can perform tasks that typically require human intelligence, such as understanding natural language, recognizing objects in images, and making decisions based on data.

AI systems can be trained using a process called machine learning, which involves feeding the machine large amounts of data and programming it to create an output based on that data. There are two main types of machine learning: supervised learning and unsupervised learning. In supervised learning, the machine is trained on a labelled dataset, where each input has a corresponding output. In unsupervised learning, the machine is trained on an unlabelled dataset, and uses algorithms to find patterns and relationships that have not been pre-identified in the data.

One potential issue with AI systems is machine biases. Biases can arise when the data used to train the machine are not representative of the real world, or when the machine is designed with certain assumptions or preferences. For example, a facial recognition system trained on a dataset with mostly white faces may not perform as well on faces of other races. Similarly, a chatbot trained on data from male users may not be as effective at communicating with female users. Biases can also arise when the machine is designed to optimize for certain outcomes, such as profit, at the expense of other values, such as fairness or privacy.

To mitigate the risk of machine biases, it is important to ensure that the data used to train the machine are diverse and representative of the real world. It is also important to involve diverse perspectives in the design and development of AI systems, and to regularly monitor and evaluate the performance of AI systems to ensure that they are aligned with ethical and social values.

In this lesson, students will train a machine to identify an image or sound. Students will use https://teachablemachine.withgoogle.com/ to create their product. Prior to the lesson, the teacher should test the website for familiarity.

Sections of this lesson plan were inspired by: https://www.digitaltechnologieshub.edu.au/teachers/lesson-ideas/ai-lesson-plans/can-ai-guess-your-emotion.

Materials

- Bag or container for drawing emotions
- Prize for the winning team (optional)

- Computers or tablets with internet access for accessing Teachable Machine website (https://teachablemachine.withgoogle.com/)
- Objects or people for testing the AI systems.
- Paper and writing utensils for students to record their responses to exit ticket questions.

Instruction

Introduction (15 minutes)

- Begin class by playing the emotions charades game.
- Have students draw emotions from a bag. The student will act out the emotion by picking a pose. The class will try to guess what the student is feeling.
  - o Ex: happy, sad, worried, angry, sick, surprised
  - o The teacher could make the activity more of a game by splitting the class into teams. Each time a team guesses an emotion correct; they get a point. The team with the most points at the end gets a prize.
- Once finished, lead a class discussion about how the students were able to identify what the emotion was.
- Lead a class discussion connecting the activity to artificial intelligence with following probing questions:
  - o What is artificial intelligence? What are examples?
  - o How does artificial intelligence work?
  - o What are the possible purposes of AI?
  - o How would artificial intelligence be able to identify emotions?
  - o Why might it be helpful for artificial intelligence to identify emotions?
  - o Why might it be helpful for a machine to identify images?
- If needed to build additional background information show the students examples of commonly used AI systems like chatGPT or show a brief video about AI.
  - o Example of video: https://www.youtube.com/watch?v=J4RqCSD--Dg

Activity (30 minutes)

- Similarly to how they detected emotions in their classmates, an AI system could be trained to identify emotions in humans. Explain that by providing a series of happy images marked as "happy" and a series of sad images marked as "sad" to the system, it could then be shown an image of a person and could identify whether that person is happy or sad.
- Explain to students that today, they will be training an AI system to detect images. Students will need to decide what they would like their AI to detect/what problem they want their AI to solve. Examples of potential AI systems are the following:
  - o Voice recognition: Train the AI system to distinguish between a student's and an adult's voice.
  - o Detecting Yoga Poses: Train the AI system to identify whether a yoga pose is performed correctly.

- Provide each student with the link and allow them to move around the classroom to begin teaching their machine: https://teachablemachine.withgoogle.com/
- Once most students are done, have select students test their machine for the class using a person/object that was not included in their database when they trained the machine.
- Lead a short class discussion to discuss potential issues teaching machines. Use the machines that the students presented to anchor the conversation. Tailor the following discussion prompts to best suit your classroom's conversation:
    - Why did some of the machines not work?
    - What ethical considerations should be considered when designing and using machines?
    - What are the potential consequences of relying too heavily on machines to perform tasks that were previously done by humans?
    - What is the role of people in making sure that machines work correctly and don't cause harm to others, and how can we teach people to do this effectively?

Closure (10 minutes)

- Project the following questions and have students record their responses on a piece of paper and submit as an exit ticket:
    - What is AI?
    - What are possible limitations in your AI system?
    - How could biases cause issues for your AI system?
    - When would it be helpful to use your AI system?
    - What could make your AI system better?

Differentiation

Encourage collaboration: For students who may struggle with the technical aspects of training an AI system, the teacher could encourage collaboration among students. Students could work in pairs or small groups to train their AI systems, with one student focusing on the technical aspects and the other focusing on the problem-solving aspects.

Provide extensions: For students who finish the activity early, the teacher could provide extension activities that allow them to explore more advanced topics related to AI. This could include researching current events related to AI, exploring more complex AI systems, or reflecting on the ethical considerations involved in developing and using AI systems.

Modify the activity: For students who may have physical or cognitive limitations that make it difficult to participate in the activity as outlined, the teacher could modify the activity to better suit their needs. For example, the teacher could provide alternative ways for students to act out emotions, such as using written descriptions or drawings instead of facial expressions.

Provide walkthrough: To better support students who may find it difficult to understand the process of training their AI, the teacher could walk them through the first step of training on Teachable Machine.

This can help students better understand the process and feel more confident in their ability to train their AI.

Assessments

Formative Assessments:

- Class discussions about identifying emotions and connecting the emotions activity to artificial intelligence encourage students to think critically and make connections between AI and human emotions.
- The short class discussion about potential issues teaching machines engages students in a conversation about the ethical considerations and potential consequences of designing and using machines.

Summative Assessment:

- The exit ticket allows teachers to gauge students' understanding and identify areas for further instruction.
- The activity in which students train an AI system to detect images assesses students' ability to apply their knowledge and skills to a real-world problem.