AI is no longer Sci-fi

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Target Grade: 6th-12th, STEM, Computer Science

Time Required: 90 minutes

Standards

Next Generation Science Standards (NGSS):

- 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.
- HS-ETS1-4: Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

Lesson Objectives

Students will:

- Research artificial intelligence (AI) in order to develop a working definition of AI that includes both examples and non-examples.
- Simulate training a computer program to recognize specific images.

Central Focus

This lesson is intended to be an introduction to artificial intelligence (AI) where students gain a clear understanding of what artificial intelligence is, how AI benefits society, and how AI works. Students with no prior knowledge or experience with the topic will have the opportunity to train a computer program to recognize images. By training the computer, students will learn how AI can be used to help solve the real-world problem of cleaning the oceans.

Key terms: digital, design, robot, simulation, problem solving, machine learning

Background Information

Simply put, artificial intelligence (AI) is the ability of machines to think. There are many misconceptions about what AI is and is not. Many think that AI has to be anthropomorphic, meaning it resembles humans in form or language (ex. customer service chatbots or Siri), but anthropomorphic AI represents just one of many types of AI. Most of us interact with AI multiple times a day but do not realize it. Here

is a list of some examples of AI that many use in their every days lives: Netflix recommendations, targeted ads, suggested friends on social media platforms, Google navigation, search predictions, recommended responses in email, email filters, music recommendations in music streaming services, facial recognition, fraud prevention, and non-playable characters (NPCs) in video games.

Because AI is such an integral part of our lives and because it will likely become even more ubiquitous in the future, it is important to have a basic understanding of how it works. AI is only as smart as the data it is given and it needs to be trained by humans. Because humans are doing the training, it is possible that human bias can be integrated into an AI system. Students should understand that while AI does benefit our lives and has the potential to continue to improve our lives greatly, we still must look at AI and its application in a critical way to determine the pros and cons of each type of AI that we use and create.

True AI currently does not exist, but what we have today is called Machine Learning. Machine Learning is how computers recognize patterns and make decisions without explicit programming. Instead of programming a computer step by step, machine learning can be programed to learn through trial and error and practice. For a machine to learn from "experience" it will need lots of data to identify patterns. Once it learns to recognize a given pattern, it can begin to make predictions. In this activity, students will help train a computer to identify patterns in fish. By the end of the simulation, students will be asked to train the AI system to identity fish that are weird, happy, sad, etc. This will allow students to begin understanding programming bias. Prior to the lesson, it is recommended the teacher goes through the simulation to have a clear view of what the student will be doing.

Materials

- Computers or iPads (1 per student)
- https://www.tidio.com/blog/ai-test/
- https://studio.code.org/s/oceans/lessons/1/levels/1
- 1 copy of the attached Frayer Model handout (attached) per group of 2-3 students
- 1 copy of exit ticket (attached) per student

Instruction

- Hook: Have the students go to the following website https://www.tidio.com/blog/ai-test/ and take the quiz "Human vs AI Test: Can we tell the difference anymore?" Then, have them reflect on their results either on paper or in a think-pair-share format (approximately 10-15 minutes). They should consider the following questions:
  - How well did you do at identifying items created by AI versus human?
  - Did you do better or worse than you expected?
  - Which results surprised you the most and why?
- Allow students to share their reflections in a whole class discussion (5 minutes).
- Pass the modified Frayer model (attached) to student groups (2 or 3 per group) and have them (in pencil) try to fill in the Frayer model with their background knowledge by attempting to

define AI, identify its uses, and come up with both examples and non-examples of AI (10-15 minutes).

- Once each team has attempted to fill in the Frayer model using only their background knowledge, let them search online for more information to enhance their Frayer Model (10-15 minutes).
    - o Alternatively, you could give students a word bank or card sort that includes examples and non-examples and have them sort those depending on students' skill level.
- Once students have had sufficient time to complete their Frayer model, lead a whole class discussion on their findings. Specifically, have students share what new and/or surprising answers they found in their search or what lingering questions they still have (10 minutes).
- Go to the AI training simulation "AI for oceans" found at https://studio.code.org/s/oceans/lessons/1/levels/1 and work through levels 1-3 with your class. Then, have students work through the remaining levels on their own device (30 minutes).
    - o Note: this includes videos and embedded activities which some students will likely move through much more quickly than others. It is not crucial that every student complete every level, so you may stop students before they are completely finished or you may have them complete it as homework. The final level allows students to build a variety of models that recognize fish with different descriptive adjectives, so if a student finishes early, you may have him or her try to create another model with a different word.
- Reflection: Have students complete a 3,2,1 Exit Ticket (template attached) where they write three things they learned today, 2 questions they still have, and 1 thing that made them say "Wow!"

Extension/Follow-up Lesson Idea

Students can create their own AI using https://teachablemachine.withgoogle.com/train which they can train to recognize poses, images, or even classify sounds. Once students practice by creating their own AI, have them present their AI to the class. As a whole class, brainstorm ideas for how they could develop AI that could be used to solve a problem. Time permitting, let them develop one or more ideas from the brainstorming session.

Differentiation

There are several opportunities for differentiation and scaffolding within this lesson.

- Timing/pacing can be adjusted to meet students' needs.
- The extension activity could be used for students progressing as a quicker pace through the lesson.
- Students may be provided with a word bank to help them develop their Frayer model if open-ended online exploration is not structured enough for your students. Additionally, the examples and non-examples part of the Frayer model could be turned into a card sort.
- Any or all sections of the "AI for oceans" can be tailored to your class in that students can either progress entirely at their own pace or could be led by the instructor.

Assessment

Students will be assessed through a variety of means. Formative assessments include students' responses and participation in whole class and group discussions, an accurate completion of the Frayer Model handout, completion of the AI for oceans activity, as well as, through the exit ticket.

Additionally, students' ability to design and create their own AI that accurately identifies an image or sound of their choosing in the follow-up extension activity could serve as a summative assessment.

Frayer Model

DEFINITION	USES/BENEFITS

ARTIFICIAL INTELLIGENCE

EXAMPLES/MODELS	NON-EXAMPLES

Frayer Model Example

DEFINITION	USES/BENEFITS
Artificial Intelligence Machine with intelligence Computer Code Imitating Human Behavior	Voice Recognition Self-Driving Cars Robotics Healthcare

ARTIFICIAL INTELLIGENCE

EXAMPLES/MODELS	NON-EXAMPLES
Siri Alexa Tesla Cars Robot Assisted Surgeries	Online ad Matching- This is not imitating human behavior it is performed by an algorithm. Chatbots (for most companies) - It is just pulling info from automated responses.

Exit ticket template

Name:

_____

Date:

_____

Period/Subject:

_____

3 **2** **1**

3   things you learned today…

2   questions you still have…

1   thing that made you say, "WOW!"

Name:

_____

Date:

_____

Period/Subject:

_____

3 **2** **1**

3   things you learned today…

2   questions you still have…

1   thing that made you say, "WOW!"

Note: The exit ticket is a modified version of a free exit ticket template provided by Microsoft Word