VIRTUAL AI CAMP

TEACHING MATERIALS

ReadyAi

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Recommendations for Video Conferencing Tools

The best video conferencing tool for you might depend on what you have access to and are familiar with. Here is a features comparison table of the two most popular tools, Zoom and Google Meet. The information is updated as of May 2020.

Feature	Zoom	Google Meet
Number of participants	300	250(until Sept 2020, usually 50)
Screen Sharing	✓	✓
In-Conference Text Chat	✓	✓
In-Conference Private Chat	✓	
Live Captioning	✓	✓
Recordings	✓	✓*
File Transfer	✓	
Breaout Rooms	✓	
Whiteboard	✓	

* Available for G Suite Enterprise or G Suite Enterprise for Education

Data usage for either Zoom or Google Meet depends on the number of meeting participants and your meeting settings. For a benchmark on bandwidth requirements, check the following resources:

Zoom system requirements
Google Meet system requirements
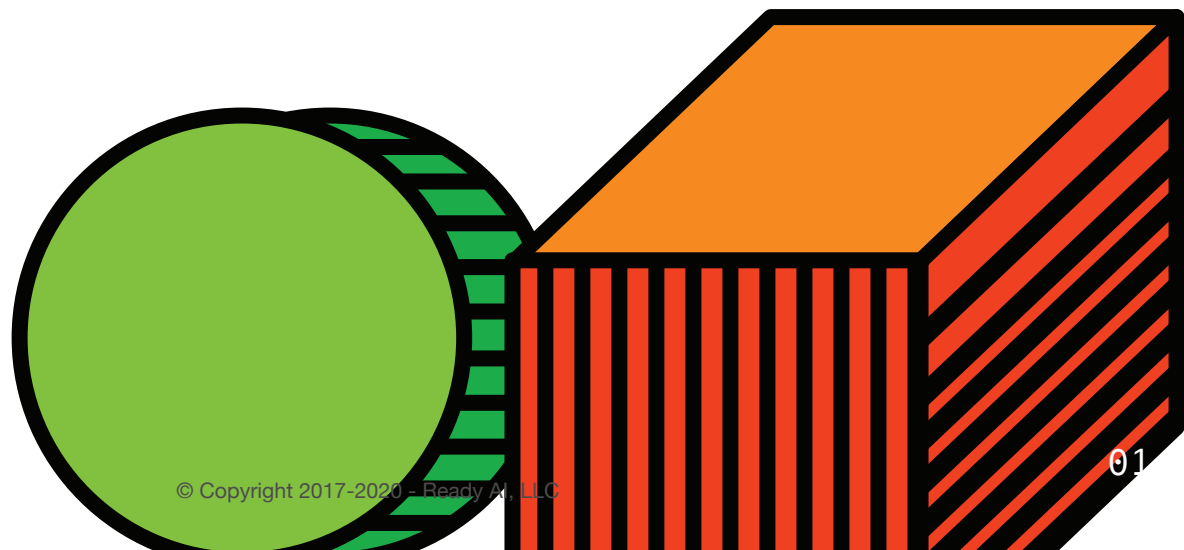
Virtual Classroom Best Practices

Preparation Before Class

- Check your internet speed.
- Turn your camera on and have your camera at eye level.
- Stay muted unless you're talking to reduce background noise.
- Make sure you sit in a well lit and quiet place.
- Be mindful of what's going on behind you. Think about having a solid wall behind you or turning on the virtual background.

Tips for running a virtual classroom

- It's hard to keep order in a virtual class when every student is unmuted and can talk at the same time. Instead, only unmute students when you ask a question.
- When asking questions, ask students to "raise hands" first then call on one student each time to answer the question.
- Consider recording the class (with students' consent) for any student who may miss a class
- If students are disruptive in Chat (i.e. sending irrelevant messages to everyone), disable the ability to send messages to everyone in settings prior to class.
- Embrace the pause. Take frequent pauses to ask questions and check students' video feed to see if they are following along.

List of Links

We highly recommend using Chrome for this camp. The speech recognition feature in Calypso and the speech recognition demo (both used in lesson 6) work only in the Chrome browser.

- All slides can be found here
- All recordings of virtual classes can be found here
- AI + Me: https://edu.readyai.org/courses/aime/
- Cloud Calypso: https://calypso-robotics.com
- Quick, Draw!: https://quickdraw.withgoogle.com/
- Teachable Machine: https://teachablemachine.withgoogle.com/

Lessons and Lesson Objectives
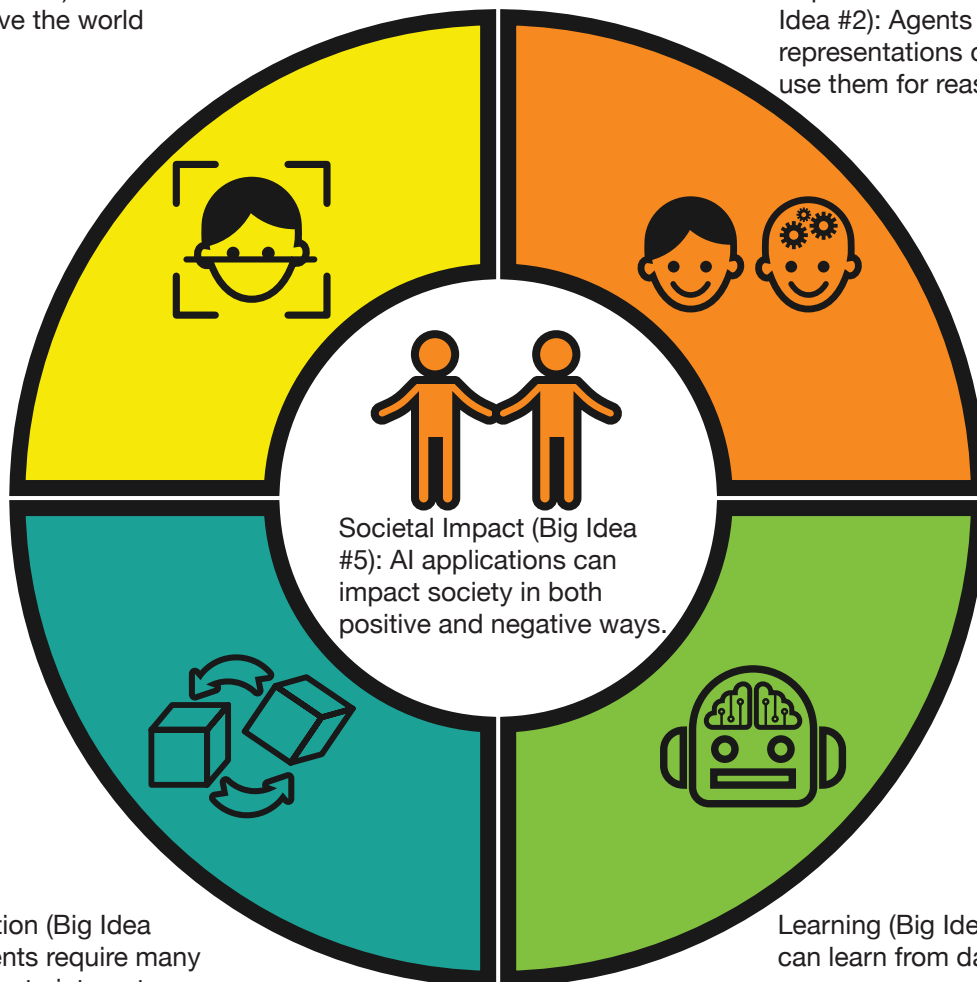
Lessons	Lesson Objectives
1 **AI+Me**	■ Understand the basics of the Five Big Ideas ■ Build an understanding of an AI technique (machine learning)
2 **Machine Learning**	■ Understand the concept of classification ■ Know how to use Teachable Machine to classify data
3 **Path Planning I**	■ Code in Calypso and get used to the commands ■ Understand of the concepts of Pursue, Consume, the First Law, and the Second Law
4 **Path Planning II Object Manipulation**	■ Code multiple characters ■ Use indentation to accomplish do two things at once ■ Use pages in Calypso to divide up complex behaviors
5 **Maze Solving**	■ Observe Cozmo navigate and plan the shortest path in real time ■ Make a customized map layout ■ Code a complex project using pages and rooms

Lessons	Lesson Objectives
6 **Speech Recognition**	■ Understand how speech recognition works at a high level ■ Program their AI units to recognize oral commands. ■ Create a scenario in which Cozmo employs speech recognition and speech generation.
7 **Project Proposal**	■ Analyze a problem in terms of the problem statement, solution, and steps needed to solve the problem ■ Produce a project proposal ■ Start coding their project
8 **Project Workshop I**	■ Apply their understanding of AI to project creation ■ Synthesize their technical and creative knowledge ■ Complete the coding portion of their projects
9 **Project Workshop II**	■ Troubleshoot problems in their projects ■ Make a presentation that articulates the main idea of their projects ■ Demonstrate what they learned about AI through their presentation rehearsals
10 **Mini-WAICY**	■ Demonstrate how AI can solve a real-world problem using representations

Five Big Ideas in AI

Perception (Big Idea #1): Computers perceive the world using sensors.

Representation & Reasoning (Big Idea #2): Agents maintain models/representations of the world and use them for reasoning.

Societal Impact (Big Idea #5): AI applications can impact society in both positive and negative ways.

Human-AI Interaction (Big Idea #4): Intelligent agents require many types of knowledge to interact naturally with humans.

Learning (Big Idea #3): Computers can learn from data.

AI Competency Framework

AI
Artificial Intelligence

CP
Computational Thinking & Programming

II
Innovation & Impact

10	1st Year College Level
9	
8	Advanced
7	
6	
5	Intermediate
4	
3	
2	Beginner
1	
0	
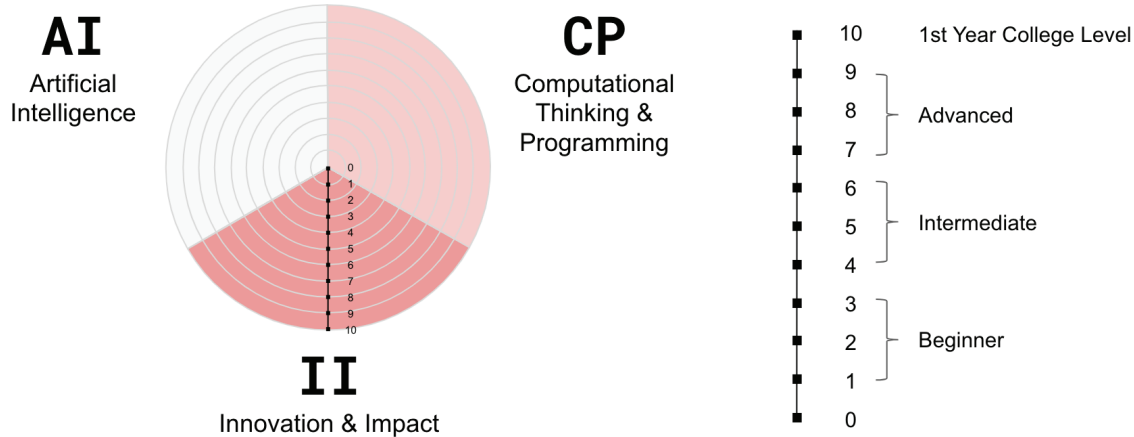
To assess students' understanding and use of AI, we use the AI Competency Framework. Competency in AI is complete with three parts. The first aspect, Artificial Intelligence, measures students' understanding of AI, such as the Five Big Ideas. Computational Thinking & Programming is about students' computer science and technical knowledge as they dive deeper into how AI works. Lastly, Innovation & Impact emphasizes the way students connect AI to social impacts; it also encourages students to take what they know to action and have a tangible impact on our society.

AI

CP

3,4,4

0,0,0

II
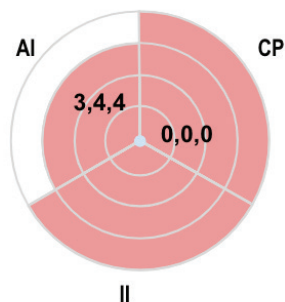
By the end of the camp, students will achieve 3 in AI, 4 in Computational Thinking & Programming, and 4 in Innovation & Impact.

01

AI+ME

Lesson Plans

Lesson 1: AI + ME

Overview

In this lesson, students will get to know each other and the instructor by playing an AI game as an icebreaker. Then, students will learn the Five Big Ideas in AI (Perception, Representation & Reasoning, Machine Learning, Human-AI Interaction, Societal Impact) by discussing everyday examples.

Objectives

Students will be able to
* Understand the basics of the Five Big Ideas
* Build an understanding of an AI technique (machine learning)

Agenda

* Introductions & Expectations (20 minutes)
* AI Games (30 minutes)
* Break (10 minutes)
* AI + Me (60 minutes)

Links

* Slides
* AI + Me

Teaching Guide

Introductions & Expectations (20 minutes)

When students arrive on Zoom, introduce yourself. Make sure to look at the webcam from time to time to make eye contact with the students.

Ask the students to introduce themselves, where they are, and a fun fact about themselves.

Take some time to set virtual classroom expectations.
- Ensure students are able to connect to audio and video on Zoom
- Tell students that they should be in a quiet room if possible
- Introduce students to the chat function to ask/answer questions
- Ensure students know how to mute/unmute themselves
- Introduce students to the "raise hand" function

AI Games (30 minutes)
Quick, Draw!

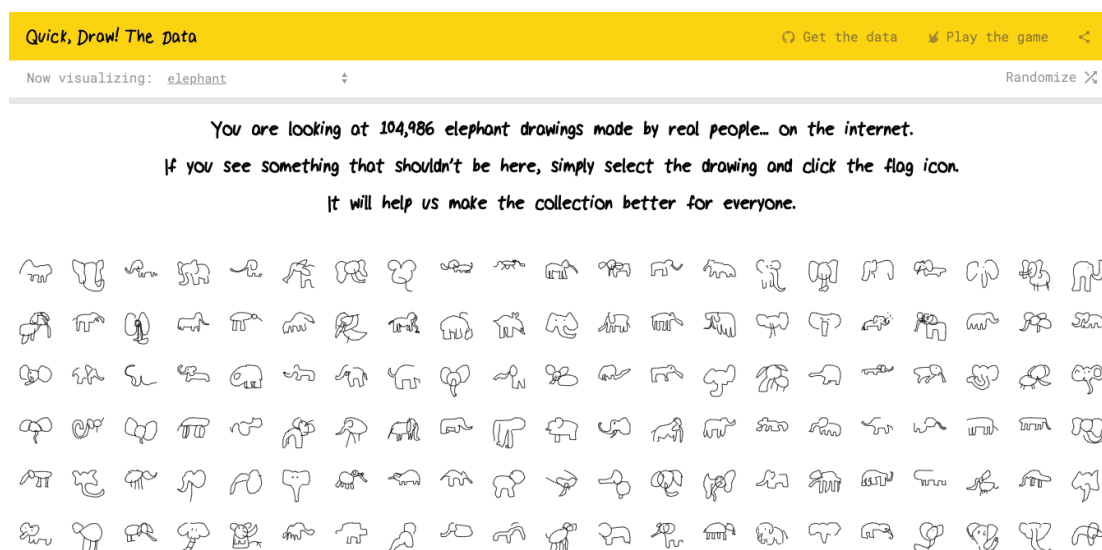**Activity:** Quick, Draw! can be described as Pictionary with a computer.

Send the link to Quick, Draw in Chat. Wait until students have opened the website.
Ask for a student volunteer to play first and share their screen. Students take turns playing the game.
After a few students have played the game in front of the class, take a pause here. Ask students: How you think the machine figures out what you are drawing?
Students may say that machines learn from what other people have drawn for that particular prompt. This is correct! Machines are learning from tons and tons of people's previous drawings to guess what object your new drawing is of.
Show students the doodling data. Have students pick one drawing and see a sample of drawings the machine learning model is being trained on.

Quick, Draw! The Data   ☊ Get the data   ✍ Play the game   ＜

Now visualizing: elephant   ⇕   Randomize ✕

You are looking at 104,986 elephant drawings made by real people... on the internet.

If you see something that shouldn't be here, simply select the drawing and click the flag icon.

It will help us make the collection better for everyone.

Direct students' attention to how different the drawings are. For example, some elephant drawings are the head of an elephant, and some are the entire body. Ask students: How does the machine recognize drawings so successfully even though they are so different?

The answer is that there are a TON data the model is trained on. Having seen enough examples of different styles of drawings and draw patterns from them, the machine is able to predict brand new drawings. There are over 100,000 elephant drawings in the database. How big is 100,000? Let's say your middle school has 600 students, 100,000 is more than 160 of your middle schools together!

Break (10 minutes)

AI + Me (60 minutes)

Activity: Introduce the next topic, the Five Big Ideas[1] in AI. The Five Big Ideas are the key concepts in AI that every student should know. This activity will be done using the self-paced course AI + Me.

Send the link to AI + Me in Chat: https://edu.readyai.org/courses/aime/. Pause until students have reached the site.

Students will need to create a free account to access the course. Direct them to click on "Sign up" and complete the registration process. Note: students do not need to use their email address, a username is also okay.

Once students are signed in, they can click on "Start Course". Share your screen and walk students through the slides one by one.

For an explanation of each of the Big Ideas, please see below[2].

Perception (Big Idea #1): Computers perceive the world using sensors.
- Perception is the process of extracting information from sensory signals. The ability of computers to "see" and "hear" well is one of the most significant achievements of AI. Students should understand that machine perception of spoken language or visual imagery requires extensive domain knowledge, e.g., for speech one must know not just the sounds of the language but also its vocabulary, grammar, and usage patterns. In the absence of such knowledge, speech recognition by machine cannot approach human-level accuracy.
- Many people will immediately think of cameras, but sensors may include recognition of faces within uploaded images such as what Facebook's software exemplifies. It may include speech recognition. Many phones have integrated speech recognition into them. It may include data that the system can perceive, such as x-rays, EKGs, thermometers, barometers, and so forth.
- Examples:
  - Speech recognition
  - Computer vision (such as surveillance cameras, inspection in manufacturing, navigation for autonomous vehicles)

Representation & Reasoning (Big Idea #2): Agents maintain models/representations of the world and use them for reasoning.
- AI systems are commonly described as intelligent agents that perceive and represent the world, deliberate, and produce outputs that affect the world. Representation is one of the fundamental problems of intelligence, both naturally and artificially. Students should understand the concept of a representation, e.g., the way a map represents a territory, or a diagram represents the state of a board game.

[1] "Five Big Ideas for AI" are K-12 AI guidelines designed by AI4K12, a joint initiative from AAAI and CSTA.
[2] Explanations quoted from *Envisioning AI for K-12: What should every child know about AI?* By David Touretzky, Christina Gardner-McCune, Fred Martin, Deborah Seehorn. 2019, Association for the Advancement of Artificial Intelligence.

- One of the representations might be that self-driving cars use maps to represent roads. S Other representations could be models of the human skeletal system, models of an individual patient's hip for a hip transplant surgery, models of our solar system. AI builds these models and uses them for complex decision making.
- Examples:
    - Path planning for self-driving cars (representation of roads, reasoning to find the best path)
    - Playing chess (representation of chess boards, reasoning to find the best next move)

Learning (Big Idea #3): Computers can learn from data.
- Machine learning algorithms allow computers to create their own representations by using training data that is either supplied by people or acquired by the machine itself. Many areas of AI have made significant progress in recent years. Thanks to machine learning technology, but for AI to succeed, tremendous amounts of data are needed. For example, the Open Image Dataset V4 contains 9 million training images and 30 million labels. Processing data at this scale requires computing power that was unavailable a few years ago. Care must be taken in the collection of this data to avoid introducing biases into the training set.
- However, datasets used to teach such systems may be flawed or be based on biased human collection, thus jeopardizing a supposed neutral system. To avoid such biases, learners must be encouraged to think about what kind of data they are sharing, what computers are asked to do with it, and whether there are safeguards that make humans to oversee the process objectively.
- Examples:
    - Youtube algorithms learning the type of content that you like
    - Facebook algorithms identifying you and your friends in photos

Human-AI Interaction (Big Idea #4): Intelligent agents require many types of knowledge to interact naturally with humans.
- Understanding people is one of the hardest problems faced by intelligent agents. This includes tasks such as conversing in natural language, recognizing emotional states, and inferring intentions from observed behavior. Students should understand that while computers can understand natural language to a limited extent, at present they lack the general reasoning and conversational capabilities of even a child.
- Graceful interaction with humans is especially important for robotic agents that will share our living and working spaces. We may want a robot assistant to stay close to us to help in time, but it shouldn't stick to us so closely that it's constantly in the way. Inferring a person's future intentions by observing his or her actions is challenging even for humans, not to mention how hard it is for Robots. Therefore, robots will need to acquire some of these skills to be welcomed in our lives.
- Examples:
    - Voice assistants (Alexa and Siri)
    - Conversational agents (chatbots)
    - Cognitive tutoring systems that provide for adaptive education

Societal Impact (Big Idea #5): AI applications can impact society in both positive and negative ways.
- Many people may have only seen AI in Hollywood's apocalyptic movie productions and think of only the negative possibilities, yet they do not realize that Google Maps on their phones is just one way that they benefit from AI every day. Using AI, however, has impacts beyond getting to a destination and avoiding the Terminator. AI will make our lives better in some ways, but it will have negative societal impacts as well. AI will put people out of work, yet it will enhance the way that many other people do their work. Moreover, the ethics need to be considered. For instance, if AI can replicate a human's voice, should it be allowed to pretend to be a human, then, such as what happened when the Google Assistant was tested? Students will design projects, then, that will benefit society as they contemplate the ethics of such integration.
- Examples:
    - What sorts of applications are desirable/permissible?
    - What are the likely impacts of AI technology on people? And who is affected?

Make it a Real AI Summer
for Your Students!

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https://edu.readyai.org/ai-summer-camp-package/

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