



CARS OF THE FUTURE
ARTIFICIAL INTELLIGENCE AND AUTOMATED VEHICLES

VIRTUAL FIELD TRIP

EDUCATOR GUIDE

Designed for grades 9–12, but appropriate for grades 6–8

INTRODUCTION

Technology is forever evolving. In the background of our everyday lives, scientists and engineers are constantly working on how to continue furthering technology...often in ways we never thought possible! Think back to the days without smart phones, for example. Did you ever think your phone would be able to do what it does today? Now just imagine: If our phones are capable of so much, what kind of technology will be coming next?

In this Virtual Field Trip, you and your students will explore the world of artificial intelligence, where computer systems and machines are learning how to perform tasks that previously required human intellect. Before and after the Virtual Field Trip, students will explore the idea of machine learning and even have the chance to try teaching a machine on their own. Students will also investigate and discuss the idea of artificial intelligence, including its vast possibilities and potential implications, in order to develop their own informed opinions. Classrooms will take a ride into the future as they get a glimpse into the technology of tomorrow!

Before the Virtual Field Trip

Prior to experiencing this Virtual Field Trip and engaging in the following activities, challenge your students to reflect on the role of technology in their lives. How present is technology in their day-to-day routines? What are the most positive effects of this technology? Does it bring any challenges? Depending on the needs of your class, students may reflect on this in writing or in small group discussions.

PRE-VIRTUAL FIELD TRIP ACTIVITY: WHAT'S YOUR ARTIFICIAL INTELLIGENCE INTELLIGENCE?

TIME

One 50-minute class period

OVERVIEW

In this introduction to the concepts that will be presented in the Virtual Field Trip, students will dive into the world of artificial intelligence as they use a four-quadrant approach to discuss their initial perceptions and opinions. They will then research the role of artificial intelligence in today's world in order to develop more informed opinions about the positive and/or negative effects of artificial intelligence on today's society.

OBJECTIVES

Students will be able to:

- Research the current state of artificial intelligence and analyze its effects on society
- Articulate and defend their perceptions of artificial intelligence, machine learning, and automated vehicles

MATERIALS

- Large chart paper and tape
- Markers
- Four Quadrant handout, one per group of 3–4 students
- Bingo chips, beans, plastic markers, etc.—one per student
- AI Discussion Notes—one per student
- Laptops or tablets, enough for students to work in pairs or individually

PROCEDURE:

1. Begin class by dividing students into groups of three or four. Distribute a chip to each student and a Four Quadrant sheet to each group.
2. Explain that over the course of the next several class periods, students will be learning about artificial intelligence (AI). To kick this off, you are going to read several statements aloud related to AI so students can discuss their initial perceptions. Once a statement has been read, it is up to each student to use their chip to demonstrate whether they strongly agree, agree, disagree, or strongly disagree with each of the statements. Note that there is no “I don't know”, so they must choose a side. Once everyone has placed their chip, students should clarify their thinking to their group members.
3. Read the following statements aloud one-by-one:
 - a. Artificial Intelligence affects our daily lives.
 - b. Machines should become more autonomous.
 - c. Machines are capable of learning.
4. Once the three statements have been read and discussed, tell students that in order to develop more informed opinions about artificial intelligence, they should know more about the field—and one prominent part of this field involves automated cars! Therefore, the first step in this process will be a bit of research.
5. Distribute the AI Research Notes sheet to each student. Review the sheet's directions and remind students that this research will be their first step in developing an informed opinion

about artificial intelligence. Tell students that after they research and take notes for 25–30 minutes, they will come back together and discuss their findings. (Note: Students may work on this individually or in small groups depending on the number of devices available. If students are working in groups to research, encourage them to still think for themselves!)

6. After 25–30 minutes have passed, bring students back into their original groupings. Tell students that they will now take turns presenting a more informed opinion on whether artificial intelligence and automated vehicles are a good or bad idea for society. Allow students a few minutes to review their notes, and then instruct each group member to share their thoughts. Encourage students to ask each other questions and challenge each other's opinions in a thoughtful and kind manner.
7. If time allows, students may share their thoughts in a larger class discussion. Tell students that they will soon be participating in a Virtual Field Trip that will give them an even deeper understanding of these topics...and, possibly, change their opinions once more!

STANDARDS

Common Core Standards: English Language Arts

CCSS.ELA-LITERACY.W.9-10.7

Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

CCSS.ELA-LITERACY.SL.9-10.1.C

Propel conversations by posing and responding to questions that relate the current discussion to broader themes or larger ideas; actively incorporate others into the discussion; and clarify, verify, or challenge ideas and conclusions.

CCSS.ELA-LITERACY.SL.9-10.1.D

Respond thoughtfully to diverse perspectives, summarize points of agreement and disagreement, and, when warranted, qualify or justify their own views and understanding and make new connections in light of the evidence and reasoning presented.

FOUR QUADRANTS: AI ADDITION

I strongly agree because...	I agree because...
I disagree because...	I strongly disagree because...

FOUR QUADRANTS: AI ADDITION

I strongly agree because...	I agree because...
I disagree because...	I strongly disagree because...

AI RESEARCH NOTES

Directions: Through online research, learn more about artificial intelligence and automated vehicles in order to develop an informed opinion about how they impact society. Be selective about the websites you use and be conscious of author biases as you read. As you perform your research, record notes that will help you develop this informed opinion below.

<p>Notes about the uses, effects, and/or consequences of the following:</p>	<p>+ , - , or +/- to indicate whether this would have a positive, negative or neutral effect on society</p>
<p>Artificial Intelligence</p>	
<p>Automated Vehicles</p>	

POST-VIRTUAL FIELD TRIP ACTIVITY: ARTIFICIAL INTELLIGENCE & ME

TIME

Two 45-minute class periods

OVERVIEW

Now that students have a more thorough understanding of artificial intelligence and machine learning, it's time to apply it! Students will first use the machine learning website presented in the Virtual Field Trip to do their best to teach a machine on their own. A discussion around the successes and complications of teaching a machine this one tiny task will then segue into a larger discussion about artificial intelligence. Using several discussion formats, students will be asked to draw upon the Virtual Field Trip, their research, and their personal experiences as they form their own conclusions.

OBJECTIVES

Students will be able to:

- Test and evaluate the best way to teach a machine
- Apply their experience with machine learning to a broader discussion around artificial intelligence
- Develop their own educated opinion about artificial intelligence
- Defend their opinion of artificial intelligence, while drawing upon their prior knowledge and considering the thoughts of their peers

MATERIALS

- Laptops or tablets, enough for students to work in pairs or individually
- Artificial Intelligence Discussion Guide— One Per Student

PROCEDURE

1. Engage students by having them visit teachablemachine.withgoogle.com/, which is the machine learning website that Cristy used during the Virtual Field Trip! (Note: Depending on the technology available, student may do this in groups or individually.)
2. Make sure the sound and camera on your devices are turned on. Once your students load the website, instruct them to click "Let's Go". They will be led through a tutorial in which they will learn how to teach a machine using their camera...without needing to code!
3. Once students have completed the tutorial, encourage them to experiment with techniques for helping their machine learn and function with the least amount of errors. If needed, have them consider:
 1. The number of images they record for each command
 2. Camera angles
 3. Movement and sound variations
4. Probe students to reflect on this experience. What worked well? What was difficult? Did the machine actually learn? Were there any complications or limitations? What implications does this have for artificial intelligence?
5. Reiterate that, as the Virtual Field Trip stated, this type of machine learning is just a tiny

fragment of what machines with artificial intelligence, like self-driving cars, must be able to do. Today, students will discuss artificial intelligence, drawing on what they learned from the Virtual Field Trip. Inform students that many of the discussion questions will be similar to what they explored leading up to the Virtual Field Trip, and they should consider whether their opinions have changed or stayed the same based on what they have learned.

6. Divide students into groups of three and explain that the groups will be discussing one question at a time. Groups will be granted a few minutes to discuss each question. When you indicate, each group will then pair with another group, with whom they will first share a quick summary of their original discussion and then dive deeper into a larger group conversation. From there, the entire class will continue the discussion for a few more minutes. As more students are brought into the discussion, additional viewpoints are presented and considered.
7. Pass out the Artificial Intelligence Discussion Guide and instruct students to read it to themselves. Explain that the most important discussion rules are as follows:
 1. All students must share at least once.
 2. Students should be able to speak without being interrupted.
 3. Questioning and debating is encouraged, as long as it is done respectfully!
8. Your role as the teacher will be to pose the questions listed in Step #9, keep track of the time, and circulate the room as the discussions occur. The recommended time for each discussion question is 2–3 minutes for the initial grouping, while adding a couple minutes as the groups get larger. However, please adapt the timing as necessary based on your students' participation and the time you have available.
9. Questions:
 1. Will automated vehicles have a positive or negative effect on society?
 2. Will artificial intelligence on a larger scale have a positive or negative effect on society? Important points to consider include privacy, individualism, efficiency, safety, trust in technology, and access to technology.
 3. To what extent would you feel comfortable having your life programmed and why?
10. Once students have a chance to adequately discuss the questions above in both small groups and as a full class, end with a final reflection through the form of a silent "Agree/Disagree" Line. Do this by designating one wall of the classroom as "100% agree" and the other end of the classroom as "100% disagree." Read the following statements aloud and ask students to silently take a position on the Agree/Disagree line based on their personal opinions. Warn them that they may recognize the first few statements, as they were discussed during the Pre-Virtual Field Trip Activity.

Agree/Disagree Statements:

 1. Artificial intelligence affects our everyday lives.
 2. Machines should become more autonomous.
 3. Machines are capable of learning.
 4. Artificial intelligence and machine learning will help us become a more efficient society.
 5. Artificial intelligence and machine learning will help us become a more intelligent society.
 6. Artificial intelligence will play a big role in my future.
 7. I would be comfortable letting AI machines take over a large part of my life.
11. **Optional Extension for another class period:** Artificial intelligence will not only change how we function, but it will likely also change the

design and layout of common machines. Have students consider these changes by designing the interior of an automated vehicle. What would passengers do if they're not driving? How would they sit? Would there be any other dramatic changes? Students who would like to take this one step further may also create redesigns of other aspects of our daily lives that have the potential to be aided by artificial intelligence: such as AI homes, classrooms, or public transportation.

STANDARDS

International Society for Technology in Education (ISTE)

Innovative Designer 4B

Students select and use digital tools to plan and manage a design process that considers design constraints and calculated risks.

Computational Thinker 5D

Students understand how automation works and use algorithmic thinking to develop a sequence of steps to create and test automated solutions.

Next Generation Science Standards

HS-ETS1-3

Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

HS-PS4-2

Evaluate questions about the advantages of using digital transmission and storage of information.

Common Core Standards: English Language Arts

CCSS.ELA-LITERACY.SL.9-10.1.C

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CCSS.ELA-LITERACY.SL.9-10.1.D

Respond thoughtfully to diverse perspectives, summarize points of agreement and disagreement, and, when warranted, qualify or justify their own views and understanding and make new connections in light of the evidence and reasoning presented.

ARTIFICIAL INTELLIGENCE DISCUSSION GUIDE

Discussions Speaking Protocols:

- ✓ Take a moment to gather your thoughts so you can speak clearly and concisely.
- ✓ Connect your thoughts to what the person before you shared.
- ✓ Justify your opinions with information from the Virtual Field Trip or your personal experiences.
- ✓ Don't be afraid to ask questions.
- ✓ Be respectful!

Discussion Listening Protocols:

- ✓ Focus on the speaker.
- ✓ Listen carefully to what the speaker is saying so you can make connections.
- ✓ Ask for clarification if needed but wait until the speaker has finished.
- ✓ Don't interrupt!

Discussion Questions:

Below are the questions you will be asked to discuss. Please do not skip ahead: Discuss one question at a time when you are instructed to do so.

1. Will self-driving cars have a positive or negative effect on society?
2. Will artificial intelligence on a larger scale have a positive or negative effect on society?
Important points to consider include privacy, individualism, efficiency, safety, trust in technology, and access to technology.
3. To what extent would you feel comfortable having your life programmed and why?

Note-Taking:

While not required, jotting notes can be a helpful way to organize your thoughts, remember something that a classmate said, or make sure you don't forget a point you'd like to bring up later.

Feel free to use the lines below to take notes!
