
INITIATE Lesson Plan: AV Safety

Lesson plan at a glance...

Name: David Dowling
Course: Manufacturing Technology
Grade Level: 10
Prerequisites: N/A
Time: 180 minutes
Preparation: 30 Instruction: 150
Standard(s): 1.1.4. Describe the role and function of professional organizations, industry associations and organized labor and use networking techniques to develop and maintain professional Relationships. 1.1.6. Explain the importance of work ethic, accountability and responsibility and demonstrate associated behaviors in fulfilling personal, community and workplace roles. 1.1.7. Apply problem-solving and critical-thinking skills to work-related issues when making decisions and formulating solutions. 1.1.8. Identify the correlation between emotions, behavior and appearance and manage those to establish and maintain professionalism. 1.1.9. Give and receive constructive feedback to improve work habits. 1.1.10. Adapt personal coping skills to adjust to taxing workplace demands. 1.1.11. Recognize different cultural beliefs and practices in the workplace and demonstrate respect for them.

In this lesson plan...

- [Lesson Overview](#)
- [Driving Questions](#)
- [Materials and Equipment](#)
- [Preparation Tasks](#)
- [The Lesson](#)
- [Learning Objectives and Standards](#)
- [Additional Information and Resources](#)

Lesson Overview

In this lesson, students will analyze and evaluate current AV technology to determine if it is safe for commercial use.

Driving Questions

Overarching Driving Question for INITIATE Wide Project:

- How safe are autonomous vehicles?

Lesson Specific Question:

- What does “safe operation” mean and how is it measured?
- How does human interaction and perception impact safety?
- How safe are human drivers today?
- How safe are autonomous vehicles today?

- What are the potential threats to safety in AV's?
- What parts of the AV or it's software should be considered when answering the original question?

Materials and Equipment

<p>Lab</p> <ul style="list-style-type: none"> • Floor road template • Chromebook • GoPiGo33 cars • Race track & program 	<p>Class</p> <ul style="list-style-type: none"> • Chromebooks & headphones • PASS-OUT: Articles, guided notes, graphic organizers • GOOGLE: Slides, classroom, quiz • GOOGLE NOTES • Guided Note WS • VIDEO RESPONSE WS
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Preparation Tasks

Print materials / passout	10 minutes
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The Lesson

SPLIT Warm-up Activity: PREWrite - Driving questions / Race the AV	30
Activity 1: Philosophical Chairs- AV vs. NO AV	45
Activity 2: Research & Discuss - Defining safety for AV's	15
Activity 3: Research & Discuss - Data for human vs. AV	15
Activity 4: Research & Discuss - AV component safety and security	15
Wrap-up Activity: RE-Write & Discuss - Original opinions	15
Assessment: Q&A, Google Quiz	15

Warm-up Activity: PREWrite - Driving questions, race GoPiGo3 (30)

Activity Overview: In this activity, students will be introduced to the concepts of AV technology, raspberry pi, and the GoPiGo3 vehicles.

Activity:

- A. PREWRITE
 - a. Students will work in 2-3 to discuss driving questions and complete their answers on the WS.
- B. RACE
 - a. Students will use the “free drive” mode to compete against a pre-programmed GoPiGo3 car to see if they can be safer and faster than the AV.
 - b. Students will record the completion time and number of incidents per race per driver.
- C. CLASS DISCUSSION
 - a. Class discussion about each group’s answers to driving questions.
 - b. Review the results from the race.
 - c. Average out human and AV trials to compare data
 - i. Students should conclude that AV is safer and more efficient.

Activity 1: AVID Philosophical Chairs- AV vs. NO AV (45)

Activity Overview: In this activity, students will use philosophical chairs to research and develop their understanding of AV technology, but also they will practice social expectations and norms.

Activity:

- A. REVIEW ACTIVITY NORMS
 - a. Review expectations and rules of philosophical chairs
 - b. Watch video & demo expectations
 - c. Review peer evaluation form
 - d. Divide the class into 2 groups AV vs NO-AV
- B. R&D
 - a. Each group will use articles, YouTube, and other web-research to support their viewpoint.
- C. DEBATE
 - a. Each group will participate in a debate where opponents will be selected at random. Points awarded for following the expectations.
 - b. Students reflect on the learning in order to make connections between new and previous learning, their experiences, themselves, and/or their world.

Teaching Tips:

- *Demo activity multiple times.*
- *Students should conclude that AV’s are more efficient and safer than humans.*

Activity 2: Research & Discuss - Defining perception for AV’s / AV Components (30-60)

Activity Overview: In this activity, students will define who, how, and when safety is measured for AV’s and regular vehicles.

Activity:

- A. CLASS DISCUSSION
 - a. Discuss sub questions and record answers on the board and in notebooks
 - b. Review each component and speculate on if/how it impacts safety.
- B. VIDEOS

- a. Students record notes on video ws.
- C. CLASS Discussion
 - a. How does human interaction and perception impact safety?

Teaching Tips:

- *What experiences have you had with autonomous vehicles?*
- *How do you feel about AV's?*
- *How would you feel if you were on the road surrounded by AV's?*
- *What does "safe operation" mean and how is it measured?*
- *Connect to OSHA, CH 2.1, and other entities that are responsible for monitoring and regulating safety.*
- *Connect to measurement and calibration.*

Activity 3: Research & Discuss - Data for human vs. AV (15-30)

Activity Overview: In this activity, students will research current safety data and define how an AV works.

Activity:

- A. CLASS Discussion
 - a. What does "safe operation" mean and how is it measured?
- B. R&D
 - a. Each group will use articles, youtube, and other web-research to support their viewpoint.
- C. CLASS DISCUSSION
 - a. Class discussion about each group's answers to driving questions.
 - b. How does an AV work?
 - c. What parts of an AV impact safety?
 - d. What are potential threats to AV safety?

Teaching Tips:

- *What parts of an AV impact safety?*
- *What are potential threats to AV safety?*

Wrap-up Activity: Analysis and reflection (15 minutes)

Activity Overview: In this activity, students will review the information from the previous activities and examine how their original opinions and perceptions of AV's have or haven't changed.

Activity:

- A. CLASS DISCUSSION
 - a. Class discussion about each group's answers to driving questions.
- B. SUMMARY LECTURE
 - a. Summarize key points and review test information
- C. GOOGLE QUIZ
 - a. Students complete quiz.

Assessment: Google quiz

Learning Objectives and Standards

Learning Objectives	Standards
Students will be able to research and interpret information about autonomous vehicles and evaluate that data to form an opinion.	1.1.4., 1.1.6., 1.1.7., 1.1.8., 1.1.9., 1.1.10., 1.1.11.
Students will be able to collaborate and work together effectively in groups.	1.1.4., 1.1.6., 1.1.7., 1.1.8., 1.1.9., 1.1.10., 1.1.11.
Students will be able to analyze their findings and determine if autonomous vehicles are safe enough for public use.	1.1.4., 1.1.6., 1.1.7., 1.1.8., 1.1.9., 1.1.10., 1.1.11.

Additional Information and Resources

Project-based Learning Features

Feature	Where does this occur in the lesson?
Making Sense of Data	<i>This occurs in activities 1-4, where students are asked to research, discuss, and interpret data.</i>
Investigation & Problem Solving	<i>Occurs while students evaluate specific components for their safety value.</i>
Driving Questions	<i>Occurs in all activities.</i>
Computational Thinking	<i>Occurs in all activities.</i>
Collaborative Opportunities	<i>This occurs in activities 1-4, where students are asked to research, discuss, and interpret data.</i>
Assessment	<i>Informal assessment of responses and student work. Summative assessment via google quiz.</i>

Computational Thinking Concepts

Concept	Where does this occur in the lesson?
Decomposition	<i>Occurs as students analyze and discuss their findings to see if the data supports their opinion.</i>
Pattern Recognition	<i>Occurs while students evaluate specific components for their safety value.</i>
Abstraction	<i>Occurs while students evaluate specific values and debate their findings.</i>
Algorithm Design	<i>N/A</i>

Administrative Details

Contact info:

Sources:

Date Written: 6/27/19 DED

Template adapted from: <https://edu.google.com/resources/programs/exploring-computational-thinking/>