

## Autonomous Vehicles and Human Behavior

---

Students analyze how autonomous vehicles will change daily human behavior and city infrastructure. For grades 11-12.

### INTRODUCTION

Culminating Activity:

*You are an urban planner for a consulting firm in a city of your choice. The City government has come to you to find out if any major changes to their transportation infrastructure are necessary to accommodate autonomous vehicles. Based on your knowledge of the City's current infrastructure and necessities of autonomous transport, prepare a multiple-page paper describing any changes the City needs to make and your conclusions from the research.*

#### Checking for Understanding & Engagement

- What role will you be placed in for this lesson?
- What problem or situation does the culminating scenario activity center on?
- What aspect of this activity interests you the most?

#### Objectives (Students Will Be Able To...)

- Students will describe the impact of autonomous vehicles on a city's infrastructure.

### ACTIVITIES IN THIS LESSON

#### Engagement

##### *Group Work*

#### Activity

This lesson plan incorporates the 5E method developed by BCSC and described on p. 110 of *The Art and Science of Lesson Design*. This activity is Step 1, Engagement.

*Engagement—connect past and present learning experiences, expose prior conceptions, and organize students' thinking toward the learning outcomes of current activities.*

The following Questions for Engagement (QFE) drive this portion of the lesson:

### Questions for Engagement

- How does driving limit a person's ability to be productive compared to their passengers?
- What type of activities can a driver today do, besides driving, compared to their passengers?
- How do drivers today keep entertained while driving?
- How will cities be able to collect ticket revenue for their public services if all cars follow the law?
- What is the relationship between autonomous vehicle cost and citizen safety?

Once completed, the instructor can ask the following questions to check for understanding.

### Checking for Understanding

- In your own words, describe what we mean by an *autonomous vehicle*
- Describe three ways in which driving, rather than riding as a passenger, affects a person's daily routine.
- What effect will autonomous vehicles have on parking lots?
- What effect will autonomous vehicles have on a resident's ability to access a city's services?

### Exploration

#### Group Work

#### Activity

This activity is Step 2, Exploration:

*Exploration—assign lab activities that help students use prior knowledge to generate new ideas, explore questions and possibilities, and design and conduct a preliminary investigation.*

The instructor asks students to offer keywords that could help find articles that describe the impact autonomous vehicles will have on human behavior.

Using a think-aloud, the instructor performs a search for an article using Google Scholar to demonstrate this skill. The instructor asks students to perform their own searches through Google Scholar for three articles relevant to the culminating activity. Possible articles to use:

- “Planning for Cars That Drive Themselves: Metropolitan Planning Organizations, Regional Transportation Plans, and Autonomous Vehicles”

- “Autonomous Vehicles for Smart and Sustainable Cities: An In-Depth Exploration of Privacy and Cybersecurity Implications”
- “Preparing a Nation for Autonomous Vehicles: Opportunities, Barriers and Policy Recommendations”
- For each article, students note important statements they will want to remember. They also identify the main point and conclusion for each article.

### Checking for Understanding & Engagement

- How did I go about finding a scholarly article?
- What kind of strategies did I use to create a better search results?
- Pick one of your articles and tell us something in it related to the culminating activity that you found useful.
- How would you describe an autonomous vehicle in your own words?
- By which year are autonomous vehicles projected to be main vehicle in the country?
- Instructor checks each of the students’ three articles to gauge its relevance to the activity.
- What would be the impact of autonomous vehicles on the local police force?
- Which feature of autonomous vehicles do you think will have the biggest impact on society?

### Explanation

#### *Group Work*

#### Activity

This activity is Step 3, Explanation

*Explanation—focus students’ attention on a particular aspect of their engagement and exploration experiences and provide them opportunities to demonstrate their conceptual understanding, process skills, or behaviors.*

Working in informal groups, students complete a Venn diagram that summarizes the most salient points of each article.

### Checking for Understanding & Engagement

- The instructor examines each student’s Venn diagram, then asks them to describe its contents.

- Which article did you find was the hardest to read and why?

## Elaboration

### Group Work

#### Activity

This activity describes Step 4 of the 5E method, Elaboration:

*Elaboration—challenge and extend students’ conceptual understanding and skills through additional activities that compel students to apply their understanding of the concept.*

Students examine the layout of the city of their choosing. They identify the most important features of the city, including its parks, businesses, transportation centers, schools, and residences.

They then examine the city’s streets and parking lots. Working in groups, they evaluate the impact that autonomous vehicles will have on streets and parking lots and, in the long term, the location of parks, businesses, transportation centers, schools, and residences.

#### Questioning for Engagement

- Pick one major change that, as an urban planner, you would predict would happen to your city if autonomous vehicles become the most-used vehicle type.
- What would be the impact of autonomous vehicles on oil prices?
- In your own words, describe the impact autonomous vehicles will have on major car companies.

## Evaluation

### Group Work

#### Activity

This activity describes Step 5 of the 5E method, Evaluation:

*Evaluation—encourage students to assess their understanding and abilities and provide opportunities to evaluate their progress toward achieving the educational objectives.*

Students answer the following questions to raise their engagement levels and promote metacognition.

#### Question for Engagement

- Which parts of your Venn diagram are you the most confident about?

- Which parts of your Venn diagram concern you the most?
- Did you disagree with your teammates on any part of the Venn diagram when completing it?
- Is there an aspect of autonomous vehicles that interests you that you were unable to analyze in this activity? If so, how could you go about analyzing this aspect on your own?
- What is the most important change that autonomous vehicles bring to cities?
- What choice would you make when deciding whether or not autonomous vehicles work for your city?
- What is the relationship between the autonomous vehicle cost and citizen safety?

## Career Exploration

### *Group Work*

### Activity

Students explore the urban planner career field online. They peruse the Wikipedia entry for urban planner, then the CareerExplorer, and the U.S. Bureau of Labor & Statistics website entries.

### Checking for Understanding & Engagement

- Who hires regional and urban planners?
- How much do regional and urban planners make?
- What kind of skills do regional and urban planners use?
- Tell me one important job function of a regional and urban planner.
- Does the regional and urban planner career interest you? Why or why not?

## Vocabulary Development

### *Lecture*

### Activity

Using the Frayer Model, the instructor develops student vocabulary centered on the terms *autonomous* and *urban*, with most attention devoted to their spelling.

## Checking for Understanding

- Say *autonomous* out loud.
- Write two sentences containing the word *autonomous* and *urban*.
- What term is the antonym of *urban*?

## SUMMATIVE ASSESSMENT

### Assessment Type: Writing Samples

Instructor checks each student's graphic organizer to ensure that it contains adequate content, that the content is factually correct, and that the content is organized reasonably.

Using the completed graphic organizer, students write their multi-page report as a homework exercise.

Note that this assignment is scored only for its content and how the content is organized. Issues related to sentence- or word-level writing conventions are marked only down to the sixth line, per Writing Across the Curriculum guidelines. The only exception is the proper spelling of *autonomous* and *urban*, which form the Communicative Knowledge of the expanded Knowledge Dimension.

NOTE: Throughout the lesson students will log their confidence and concerns using a Metacog Log, as described on page 112 of *The Art and Science of Lesson Design* by John Walkup and Stephon Squire.

#### Lesson Times

**Engagement:** 5 minutes  
**Exploration:** 15 minutes  
**Explanation:** 25 minutes  
**Elaboration:** 20 minutes  
**Evaluation:** 20 minutes  
**Career Exploration:** 10 minutes  
**Vocabulary Development:** 5 minutes

#### Industries / Subjects / Grades

##### Industries / Pathways

- Transportation

##### K-12 Subjects

- English-Language Arts

##### Grade Levels

- 11, 12

## Standards and Objectives

**Standards**

## California's 2013 CTE Standards

- **CTE.T.A.7.1** Identify the infrastructure needed to move people, goods, and equipment from one location to another (highways, bridges, waterways, railways).
- **CTE.T.A.7.4** Explain the importance of infrastructure in transporting vehicles, goods, and/or equipment in our everyday lives
- **CTE.T.KPAS.3.1** Identify personal interests, aptitudes, information, and skills necessary for informed career decision making
- **CTE.T.KPAS.3.4** Research the scope of career opportunities available and the requirements for education, training, certification, and licensure
- **CTE.T.KPAS.5.1** Identify and ask significant questions that clarify various points of view to solve problems
- **CTE.T.KPAS.5.4** Interpret information and draw conclusions, based on the best analysis, to make informed decisions

**Author:** Zachary Carter

**First Authored:** December 17, 2019

**Last Revised:** December 18, 2019