Safety Benefits of Autonomous Driving Exercise

THE CHALLENGE

This project allows students to conduct online research to learn more about safety benefits accrued at each of the levels of autonomous driving as defined by the Society of Automotive Engineers (SAE). This is a topic related to transportation trends and technologies, further intended to educate an audience of their peers. Students are then to assemble in teams and present their understanding of each level of automation as well as pick the level of automation they believe will clearly provide the most safety benefits while minimizing driver confusion and challenges in adoption. The final product for this project is a group presentation to an audience that may include other students, teachers, and/or parents.

An additional exercise would be to have each team debate their position or preference to demonstrate their knowledge in a competitive setting with a winner declared in a playoff format.

GRADE LEVEL

This activity is geared toward high school students.

ACTIVITY DURATION

This research project requires that students arrange themselves into teams and develop a presentation through web-based research to highlight their understanding of the safety benefits at each of the SAE levels 0 through 5 (six levels in total).

Levels of Automation

- Level 0 – No Automation
- Level 1 – Driver Assistance
- Level 2 – Partial Automation
- Level 3 – Conditional Automation
- Level 4 – High Automation
- Level 5 – Full Automation

It is expected that student teams will require 60-90 minutes to complete this activity (after topic selection).

MATERIALS

Students will require computers with internet access and access to presentation development software.

SET UP

For this project, students should be assigned to teams of 2-4 students to develop their research projects. The instructor should describe each of the levels of automation and may want to show pictures of examples of automated vehicles, like the one below.


ACTIVITY

In their teams, students will perform online research (links to helpful websites are presented on the next page) to be able to do the following:

1. Present the safety benefits at each of the SAE levels 0 through 5 (six levels in total) demonstrating a good understanding of the levels and the differentiation between each level.

2. Prepare a 5-7-minute presentation that provides the following information about your topic and “sells” the trend to your audience (why should they be excited about this?):
   a. A detailed understanding of each level of automation so that someone completely unfamiliar with this topic will be able to understand what it is.
c. Identify the safety benefits, advantages, and disadvantages of each level of automation from the following perspectives:
   i. Driver assistance
   ii. Collision avoidance
   iii. Dynamic driving
   iv. Driver response and intervention
   v. Fully automated driving
   vi. Under varied driving conditions

3. Explain any policy or regulatory requirements or considerations related to each level of automation.

4. Conclude with the group’s preferred level of automation they believe will clearly provide the most safety benefits while minimizing driver confusion and challenges in adoption.

FOR DISCUSSION
The following sites may provide useful information to students participating in this activity:

- Society of Automotive Engineers
  https://www.sae.org/automated-unmanned-vehicles/
- Intelligent Transportation Systems Joint Program Office
- Institute of Electrical and Electronics Engineers
  https://www.ieee.org/.
- U.S. Automated Vehicle (AV) Proving Grounds
- National Highway Traffic Safety Administration
- National Highway Traffic Safety Administration
- U.S. Department of Transportation
  https://www.transportation.gov/av/additionalresources
- Automated Vehicle Research at the US Department of Transportation (USDOT)
  https://www.its.dot.gov/factsheets/pdf/AutomationUSDOT.pdf
- Florida Polytechnic University Advanced Mobility Institute
  https://floridapoly.edu/advanced-mobility-institute/#applications.
- Advantages and Disadvantages of Automation
- The Evolution of Automation Safety Technologies (Automotive Safety Council)

LEVEL OF DIFFICULTY

IMPORTANT: This project is suitable for high school students who are familiar with research concepts and developing research reports/presentations.

Increase difficulty by:
1. Requiring a team research paper in addition to a team presentation.
2. Requiring an individual presentation/paper.
3. An additional exercise would be to have each team debate their position or preference as a means of demonstrating their knowledge in a competitive setting with a winner declared in a playoff format.