Article-Based Observation on Self-Driving Cars

Directions: After reading the article "The future of cars," answer these questions:

1. **Though cars are not organisms with nervous systems, autonomous cars need to adapt and react to their environment. What are the basic goals of a self-driving car's sensory system? How do autonomous cars navigate their surroundings?**

2. **What are some factors that limit self-driving cars' abilities to respond to unexpected situations?**

3. **How does Chris Janssen's work as a cognitive scientist further research into self-driving cars? What is a possible hypothesis he could develop and study?**

4. **What ethical and social dilemmas must be considered in the design of the autonomous car? What basic tenet of human behavior did Iyad Rahwan mention as a potential obstacle?**

5. **Cybersecurity and hacking are a general concern in our interconnected, digital world. How might these threats affect the self-driving car, as described in the article?**

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Making Waves

Responses to Article-Based Observation on Self-Driving Cars

1. **Though cars are not organisms with nervous systems, autonomous cars need to adapt and react to their environment. What are the basic goals of a self-driving car's sensory system? How do autonomous cars navigate their surroundings?** Possible student response: Self-driving cars need sensors that can detect road features and hazards under any condition. Autonomous cars navigate by analyzing data from sensors and comparing it with existing maps. Some cars have onboard cameras that could update maps as surroundings change.

2. **What are some factors that limit self-driving cars' abilities to respond to unexpected situations?** Possible student response: Responding to unexpected encounters is a struggle for artificial intelligence. Rule-based programming will not always work for self-driving cars, because the coding would need to exist for every potential environment and condition. If an autonomous car isn't programmed to read the body signals of every pedestrian, for example, that pedestrian's safety is dependent on him or her correctly predicting the movements of the car.

3. **How does Chris Janssen's work as a cognitive scientist further research into self-driving cars? What is a possible hypothesis he could develop and study?** Possible student response: Chris Janssen studies where people put their attention and how they react when they are not giving their full attention to an activity. In the case of self-driving cars, he is studying when instructions should be given to a passenger to take over driving and how to give those instructions. One possible hypothesis: The earlier an alert for a change in behavior is given, the more quickly a person will respond.

4. **What ethical and social dilemmas must be considered in the design of the autonomous car? What basic tenet of human behavior did Iyad Rahwan mention as a potential obstacle?** Possible student response: Cognitive scientist Iyad Rahwan has found that people want to protect themselves, regardless of whether they are in the car or a pedestrian. Who will the cars prioritize? Who will be responsible when the cars fail? How the technology develops and how it is regulated will depend on the moral judgments of designers and consumers.

5. **Cybersecurity and hacking are a general concern in our interconnected, digital world. How might these threats affect the self-driving car, as described in the article?** Possible student response: According to Sean Smith, a computer scientist at Dartmouth College, "the more computing permeates into everyday objects, the harder it is going to be to keep track of the vulnerabilities." Self-driving cars will be no exception. Mechanical systems could be wirelessly controlled. Cars might be remotely programmed to crash or systems could be disabled and held for ransom.