



FOR EXCELLENCE IN MIAMI-DADE PUBLIC SCHOOLS

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ROBOTICS

**Self Driving
to Success**

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Lesson Plan: Introduction to Self-Driving Vehicles

Grade Level: 6-12

Objective: Students will understand the concept of self-driving vehicles, their uses, advantages, and limitations. They will also learn about the technology behind self-driving cars and gain hands-on experience by assembling and programming a self-driving robot car using the ELEGOO Smart Robot Car Kit V4.0.

Materials:

- ELEGOO Smart Robot Car Kit V4.0 (one per small group)
- Computers or laptops with internet access
- Cell phone or tablet for programming app (Elegoo Kit)
- Projector or smartboard
- Whiteboard or flip chart
- Markers
- Handouts or printed resources about self-driving vehicles (see resources section)

Duration: Approximately 3-4 hours (can be divided into multiple sessions)

Lesson Plan:

- 1. Introduction to Self-Driving Vehicles (30 minutes)**
 - Begin the lesson by asking students if they have heard about self-driving vehicles and what they know about them.
 - Use a projector or smartboard to show videos or images of self-driving cars in action.
 - Facilitate a brief discussion about the potential uses and advantages of self-driving vehicles, such as improved safety, increased efficiency, and accessibility.
- 2. Technology Behind Self-Driving Vehicles (45 minutes)**
 - Explain the key technologies used in self-driving vehicles, including sensors (LiDAR, cameras, radar), GPS, mapping, and artificial intelligence (AI) algorithms.
 - Discuss how these technologies work together to enable a car to navigate, sense its environment, and make decisions autonomously.
 - Use diagrams and illustrations to make complex concepts more accessible.
- 3. Hands-On Activity: Assembling the ELEGOO Smart Robot Car (90 minutes)**
 - Divide the students into small groups (3-4 students per group) and provide each group with an ELEGOO Smart Robot Car Kit V4.0.
 - Give them the assembly instructions included with the kit and allow them to work collaboratively to build the self-driving robot car.
 - Assist and guide the groups as needed.
- 4. Programming the Self-Driving Robot Car (1-2 class periods)**
 - Once the robot cars are assembled, introduce the programming aspect of the activity.

- Students can use the Elegoo Kit App or Arduino IDE or any compatible programming platform to write code that enables the car to move.
 - Introduce tasks in attachment below to facilitate the activity
 - Provide coding examples and explanations to help students get started.
 - Encourage creativity and experimentation with different coding approaches.
5. **Testing and Debugging (30 minutes)**
- Allow each group to test their self-driving robot car and identify any issues or bugs in the code.
 - Facilitate a discussion on problem-solving strategies, debugging techniques, and the importance of trial and error in the learning process.
6. **Real-World Applications (30 minutes)**
- Gather the students and present real-world applications of self-driving vehicles, such as transportation, delivery services, and agriculture.
 - Discuss the potential impact of self-driving technology on various industries and society.
7. **Reflection and Discussion (15 minutes)**
- Engage the students in a reflective discussion about their experience with the ELEGOO Smart Robot Car Kit and what they learned about self-driving vehicles.
 - Encourage them to share their insights and observations from the hands-on activity.

Resources:

1. **What Are Self-Driving Cars?**
<https://www.techtarget.com/searchenterpriseai/definition/driverless-car>
2. **National Highway Traffic Safety Administration (NHTSA): Automated Vehicles**
<https://www.nhtsa.gov/technology-innovation/automated-vehicles-safety>
3. **TED-Ed: How Do Self-Driving Cars See?** https://youtu.be/PRg5RNU_JLk
4. **The ethical dilemma of self-driving cars** <https://youtu.be/ixIoDYVfKA0>
5. **YouTube example videos:**
 - [How to assemble](#)
 - [How to use](#)
 - [How to program](#)
6. Hands-On Worksheet "[Autonomous Vehicle Tasks](#)"

Assessment:

1. **Formative assessment:** Observe students' engagement and participation during the hands-on activity and discussions. Provide feedback and support as needed.

2. **Summative assessment:** Assign a short written or oral presentation where students explain the uses, advantages, and limitations of self-driving vehicles, and discuss their experience with the ELEGOO Smart Robot Car Kit V4.0.

Note: Always prioritize safety during the hands-on activity and ensure appropriate adult supervision.

Lesson Plan 2: Introduction to Self-Driving Vehicles (more in-depth lessons)

Objective: Students will learn about the concept of self-driving vehicles, their uses, benefits, and challenges. They will also engage in a hands-on activity using the ELEGOO Smart Robot Car Kit V4.0 to understand the basic principles of autonomous driving.

Grade Level: 9-12

Duration: 3-4 class periods (45 minutes each)

Materials:

- ELEGOO Smart Robot Car Kit V4.0
- Computers or tablets with internet access
- Projector or smartboard (optional)
- Whiteboard and markers
- Handouts and worksheets (see resources section)
- Safety precautions (if needed)

Lesson Plan:

Day 1: Introduction to Self-Driving Vehicles

1. **Warm-Up (10 minutes):** Start the class by asking students about their knowledge of self-driving vehicles. Encourage a short discussion about what they think self-driving vehicles are and what they can do.
2. **Presentation (20 minutes):** Use a projector or smartboard to present a slide show or video explaining the concept of self-driving vehicles. (See resources)
 - Cover topics such as:
 - Definition and principles of self-driving vehicles
 - Key components and technologies involved (e.g., sensors, AI, GPS)
 - Benefits and potential applications in various industries (e.g., transportation, logistics, delivery, public services)
 - Challenges and concerns (e.g., safety, ethical considerations)
3. **Class Discussion (15 minutes):** Engage the students in a discussion about the presented material. Ask questions to assess their understanding and encourage critical thinking. Address any misconceptions and encourage open dialogue.

Day 2-3: Hands-on Activity - Building the Smart Robot Car

1. **Introduction to the ELEGOO Smart Robot Car Kit V4.0 (15 minutes):** Show the ELEGOO Smart Robot Car Kit V4.0 to the students and briefly explain its components and capabilities. Emphasize that they will be building a basic version of a self-driving vehicle using this kit.

2. **Group Work** - Assembling the Smart Robot Car (90 Minutes): Divide the class into small groups and provide each group with a kit. Instruct them to follow the provided instructions to build the car step by step. Circulate among the groups to assist and ensure safety.

Day 4: Hands-on Activity - Programming the Smart Robot Car

1. **Introduction to Programming (15 minutes)**: Briefly explain the basics of programming and how it is used to control the behavior of self-driving vehicles. Introduce the programming environment that comes with the ELEGOO kit.
2. **Group Work**: Programming the Smart Robot Car (60 minutes): Instruct the students to write a simple program to make the robot car perform basic autonomous functions. For example, they can program the car to move forward, avoid obstacles, and stop at a specific distance. See [Autonomous Vehicles Tasks](#) below.

Day 5: Resources and Wrap-Up

1. **Resource Exploration (30 minutes)**: Provide the students with a list of online resources (articles, videos, and documentaries) related to self-driving vehicles. Allow them time to explore these resources individually or in small groups. They can take notes on interesting findings and prepare to share them with the class.
2. **Presentations and Discussion (15 minutes)**: Invite students to present their findings from the online resources they explored. Encourage discussions about the potential impact of self-driving vehicles on society, the environment, and various industries.
3. **Conclusion (10 minutes)**: Summarize the key points covered throughout the lesson. Ask the students what they have learned and how they feel about self-driving vehicles. Address any remaining questions or concerns.

Assessment:

1. **Formative assessment**: Observe students' engagement and participation during the hands-on activity and discussions. Provide feedback and support as needed.
2. **Summative assessment**: Assign a short written or oral presentation where students explain the uses, advantages, and limitations of self-driving vehicles, and discuss their experience with the ELEGOO Smart Robot Car Kit V4.0.

Resources:

1. What Are Self-Driving Cars?

<https://www.techtarget.com/searchenterpriseai/definition/driverless-car>

2. National Highway Traffic Safety Administration (NHTSA): Automated Vehicles

<https://www.nhtsa.gov/technology-innovation/automated-vehicles-safety>

3. TED-Ed: How Do Self-Driving Cars See? https://youtu.be/PRg5RNU_JLk

4. The ethical dilemma of self-driving cars <https://youtu.be/ixIoDYVfKA0>

5. **YouTube example videos:**

- [How to assemble](#)
- [How to use](#)
- [Howto program](#)

6. **Hands-On Worksheet "Autonomous Vehicle Tasks"**

Note: The resources provided above were available at the time of this publication in November 2023. Please ensure they are still relevant and accessible before using them in the classroom.