Name:	**School:**
Course: Artificial Intelligence and Transportation	**Room Number:**
Unit Title: **Lesson Title:** AI in Transportation: Computational Thinking, Decomposition, and Pattern Recognition	**Date:** **Class Length:** 60 minutes

Common Core State Standards:

ELA

- **CCSS.ELA-LITERACY.RI.3.1** – Ask and answer questions to demonstrate understanding of informational text, referring explicitly to the text as the basis for answers.
- **CCSS.ELA-LITERACY.RI.3.3** – Describe relationships between events, scientific ideas or concepts, or steps in technical procedures using language related to **time, sequence, and cause/effect**.
- **CCSS.ELA-LITERACY.W.3.2** – Write informative/explanatory texts to examine a topic and clearly convey ideas and information.
- **CCSS.ELA-LITERACY.SL.3.1** – Engage effectively in collaborative discussions with diverse partners, building on others' ideas and expressing one's own ideas clearly.
- **CCSS.ELA-LITERACY.SL.3.4** – Report on a topic or experience using appropriate facts and relevant, descriptive details while speaking clearly at an understandable pace.

Math

- **CCSS.MATH.CONTENT.3.OA.D.8** – Solve two-step word problems using the four operations and represent problems using equations with a letter or symbol for an unknown quantity.

CSTA Computer Science Standards

- **CSTA 1A-AP-10** – Develop programs with sequences and simple loops to express ideas or address a problem.
- **CSTA 1B-AP-11** – Decompose problems into smaller, manageable parts to make the development process easier.
- **CSTA 1B-AP-15** – Test and debug programs or algorithms to identify errors and improve their performance.
- **CSTA 1B-DA-06** – Organize and present collected data visually to highlight relationships and support a claim.

ISTE Standards for Students

- **ISTE 1.5 – Computational Thinker** – Students develop and employ strategies for understanding and solving problems in ways that leverage the power of technological methods to develop and test solutions.

Next Generation Science Standards (NGSS)

- **3-5-ETS1-1 – Engineering Design** – Define a simple design problem that reflects a need or want and includes specific criteria for success and constraints on materials, time, or cost.
- **3-5-ETS1-2 – Engineering Design** – Generate and compare multiple possible solutions to a problem based on how well each solution meets the criteria and constraints.
- **3-5-ETS1-3 – Engineering Design** – Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

Objective:

Students will:

- Understand how AI is used in public transportation, traffic management, and logistics.
- Explain how AI can improve transportation safety and efficiency.
- Explore how sensors, data, and algorithms support transportation decisions.
- Program a Sphero Indi to navigate obstacles and a model city.
- Identify patterns in a robot's movement and use observations to improve navigation.
- Explain how AI can use real time traffic data to manage traffic signals.
- Understand the purpose of route optimization in logistics.

Challenge Based Learning Alignment:

- **Big Idea:**

Smart Transportation Systems

AI can use data, sensors, patterns, and algorithms to help transportation systems become safer, more efficient, and more responsive.

- **Essential Question(s):**

- How is AI used in transportation?
- How can AI help vehicles navigate safely?
- How do sensors help transportation systems make decisions?
- How can AI improve traffic flow?
- How can AI determine a better delivery route?
- How can AI reduce transportation's environmental impact?

- **Challenge**

How can we design and improve a smart transportation system that moves people or goods safely and efficiently?

Students investigate navigation, traffic management, and logistics and use testing and observations to improve their transportation solutions.

Success Criteria:

Students will be able to:

- Identify at least three uses of AI in transportation.
- Explain how sensors collect information for transportation systems.
- Describe how AI can use real time data to adjust traffic or transportation decisions.
- Program a Sphero Indi using color tiles.
- Create a sequence of commands to navigate around obstacles.
- Identify a pattern in the robot's movement.
- Test and revise an unsuccessful navigation sequence.
- Explain how smart traffic lights can respond to traffic conditions.
- Define logistics in their own words.

Conceptual Understanding

Students should understand that:

- AI can make transportation systems smarter, safer, and more efficient.
- Public transportation can use real time data to adjust routes and schedules.
- Traffic management systems can use sensors and algorithms to respond to changing traffic conditions.
- Sensors provide information that helps an AI system understand its surroundings.
- Algorithms provide instructions for completing tasks.
- Transportation problems can be broken into smaller, manageable steps.
- Testing and revising a solution are important parts of computational thinking.
- Logistics involves moving goods and services efficiently.

Apple & AI tools:

Keynote – present transportation concepts, routes, and student findings.
Freeform – design model cities and brainstorm transportation routes.
Numbers – organize traffic, route, or observation data.
iPad – access digital activities, presentations, research, and reflection materials.

Teacher Tools:

- Presentation/Keynote
- Transportation video
- Sphero Indi
- Sphero color tiles
- Projector/display
- LogiTycoon
- Kahoot

Student Tools:

- Sphero Indi
- Color tiles
- Observation worksheet

Assessment Strategies:

Formative Assessment:

- Teacher questioning
- Cece story discussion
- Sphero programming observation
- Navigation observation worksheet
- Traffic management discussion
- Red Light/Green Light activity
- LogiTycoon decisions
- Student explanation of route optimization
- Group discussion

Closing Assessment:

- Kahoot
- Reflection worksheet
- Exit ticket
- Student explanation of one real world AI transportation application

• Reflection worksheet • Computer/tablet for LogiTycoon • City building materials	

Agenda:

1. Introduction to AI & Transportation – 5 minutes

- Transportation video
- Public transportation
- Traffic management
- Logistics

2. Cece and Max's Super Duper Smart Transportation Plan – 10 minutes

- Story
- Vocabulary
- Real world transportation technology

3. Sphero Indi Obstacle Course & City Navigation – 20 minutes

- Color-tile programming
- Obstacle navigation
- Observe patterns
- Revise program

4. Red Light, Green Light – Traffic Management – 10 minutes

- Traffic signals
- Sensors
- Real time AI decisions

5. AI & Logistics / LogiTycoon – 10 minutes

- Route optimization
- Inventory
- Environmental impact

6. Kahoot / Reflection – 5 minutes

General Modifications:

Equitable & Ethical AI Use:	**Real-World AI Connections:**	**Building Ethical Reasoning Use of AI:**	**Student Voice in Ethical AI Design:**
Students consider whether a transportation decision benefits everyone and recognize that transportation systems should account for: ● Drivers ● Passengers ● Pedestrians ● Public transportation riders ● Delivery workers	Students connect AI to: ● Buses ● Trains ● Self driving cars ● Smart traffic lights ● Traffic cameras and sensors ● Delivery trucks ● Route optimization ● Logistics ● Inventory management	Students evaluate transportation decisions by considering safety, efficiency, environmental impact, and how decisions affect drivers, passengers, and pedestrians. Students discuss whether the fastest route is always the best route and why humans must review AI decisions when safety or fairness may be affected.	Students act as transportation designers and determine rules their smart transportation system should follow. They decide how their system should respond to pedestrians, traffic, obstacles, delays, and environmental concerns and explain why their design choices make transportation safer and more responsible.

Check for AI Ethics Emphasis

Students consider:

- **Safety**
- **Human oversight**
- **Environmental impact**
- **Efficiency**
- **Public transportation**
- **Pedestrian safety**

ENGAGE:

Activity 1 – ENGAGE: How Is AI Changing Transportation?

Begin by asking:

- How did you get to school today?
- Have you ever used a bus, train, rideshare, or GPS?
- How does a traffic light know when to change?
- How could a delivery truck know the best route?
- Can a car make decisions?

Introduce three transportation areas:

Public Transportation
AI can use real time information to adjust bus and train schedules or routes.

Traffic Management
AI can use sensors and cameras to analyze traffic and adjust signals.

Logistics
AI can determine efficient routes for moving goods.

The guide introduces these three uses

INVESTIGATE:

Activity 2 – INVESTIGATE: Sphero Indi Smart City Challenge

Students become transportation engineers.

Step 1 — Learn the Commands

Introduce Sphero Indi color tiles.

For example:

- Green → Go
- Red → Stop
- Turn tiles → Change direction

Step 2 — Create an Algorithm

Students place tiles in an ordered sequence.

Step 3 — Test

Run the Sphero through the obstacle course.

Step 4 — Observe

Students record:

- Where the robot moved correctly.
- Where it failed.
- Patterns they noticed.

Step 5 — Revise

Students change their tile sequence.

ACT:

Activity 3 – ACT: Smart Traffic & Logistics Challenge

Part A — Red Light, Green Light

Students model traffic movement.

One student becomes the Traffic Light Controller.

Use:

Green → Move
Yellow → Slow
Red → Stop

After the activity, ask:

- Why are traffic lights necessary?
- How do traffic lights keep people safe?
- How could sensors tell a traffic light that many cars are waiting?
- Why might AI change a traffic light differently at different times?

Connect the activity to smart traffic systems that use real-time sensors and data.

Part B — Logistics

Introduce:

Route Optimization:
Finding an efficient route for transporting

Assessment:

Transportation AI Design Cycle

IDENTIFY PROBLEM → PLAN → PROGRAM → TEST → OBSERVE → IMPROVE

Students should demonstrate that they can:

- Identify a transportation problem.
- Develop a solution.
- Program or model the solution.
- Test the solution.
- Identify a failure point.
- Revise the solution.
- Explain why the change improved performance.

directly. Read Cece and Max's Super Duper Smart Transportation Plan and have students identify transportation technologies mentioned in the story.	**Step 6** — Retest Run the improved program. **Step 7** — Build a City Students create: ● Roads ● Buildings ● Obstacles ● Start point ● Destination Then program Sphero to navigate the city. **The guide explicitly uses this test → observe → analyze → adjust → retest process.**	goods. Students explore LogiTycoon or complete a paper based logistics simulation. Students make decisions about: ● Routes ● Deliveries ● Inventory ● Efficiency ● Environmental impact The guide explains that LogiTycoon simulates running a logistics company where students optimize routes, manage inventory, and make decisions affecting efficiency and environmental impact.	
Activity 1 (ENGAGE – 30 minutes): Students identify one example of AI in transportation and explain what problem it helps solve.	**Activity 2 (INVESTIGATE – 60 minutes):** Students explain what they changed after testing and why the new sequence worked better.	**Activity 3 (ACT – 60 minutes):** Students explain one transportation decision they made and how that decision improved safety, efficiency, or environmental impact.	**Assessment:** Students will design, test, and improve a transportation route using the Sphero Indi. Students must create a sequence of commands, test their route, identify problems or patterns in the results, and revise their program to improve navigation. Students will then explain how their testing and improvements relate to how AI supported transportation systems solve problems and navigate safely.

Details / Activities

Wrap Up/Reflection/Closure

Supportive Models:	**Reflective Practice:**	**Growth Mindset:**	**Assessment:**
• Cece transportation story • Transportation video • Sphero Indi • Color tile command chart • Model city • Teacher think-aloud • Sample route • Traffic-light simulation • Route optimization example • Observation worksheet • Reflection worksheet	Students reflect on: • Where they see AI in transportation. • What they learned from programming Sphero Indi. • What caused their first route to fail. • How they improved their program. • How traffic data can influence decisions. • What logistics means. • How AI can reduce environmental impact. • Which transportation application they found most interesting.	Emphasize that: • Engineers test solutions repeatedly. • An unsuccessful program provides useful information. • Debugging is part of engineering. • Students should revise rather than abandon an idea. • There may be several successful routes. • A solution can often become safer or more efficient.	Students complete a closing reflection or exit ticket explaining how AI is used in transportation and describing how testing, data, sensors, and algorithms can improve safety and efficiency. Students identify one real world transportation application and one responsible design consideration.

Closing Remarks:

"*Today, you explored how artificial intelligence is already helping move people and goods. You programmed a transportation system, examined how smart traffic signals make decisions, and explored how AI can improve logistics and reduce environmental impact. Transportation AI can help make systems safer and more efficient, but humans remain responsible for designing, testing, and improving these technologies so they work well for the people and communities that depend on them.***"**