Lesson Plan Title: Future of Transportation

Teacher's Name: Hart
Subject/Course: Tech/Eng - Transportation
Unit: Transportation
Grade Level: Middle School

Overview of and Motivation for Lesson:
After a brief overview of modes of transportation and future of transportation, each student will design a concept car of the future which will use an alternative power source.

Stage 1-Desired Results

Standard(s):

- 6.MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution. Include potential impacts on people and the natural environment that may limit possible solutions.*
- 6.MS-ETS1-5(MA). Create visual representations of solutions to a design problem. Accurately interpret and apply scale and proportion to visual representations.*
- 7.MS-ETS3-3(MA). Research and communicate information about how transportation systems are designed to move people and goods using a variety of vehicles and devices. Identify and describe subsystems of a transportation vehicle, including structural, propulsion, guidance, suspension, and control subsystems.

Aim/Essential Question:

- How does our community use various modes of transportation to meet our needs (e.g. food, clothing, emergencies)?
- Why is it important to innovate modes of transportation?
- How are some modes of transportation similar/different?

Understanding(s):
Students will understand that . . .

- different modes of transportation depending on what is being moved, how far it needs to go, and how fast it needs to get there.
- vehicles are a common mode of transportation which can serve different purposes.

Content Objectives:
Students will be able to . . .

- identify differences between modes of transportation.
- identify the subsystems of a vehicle (structural, propulsion, guidance, suspension, and control subsystems)
- identify differences in ways in which vehicles are propelled
- develop an understanding of innovation in transportation

Key Vocabulary

- Tier 1: bus, car, water, train, space, land
- Tier 2: modes, propulsion, guidance, control, differentiate
- Tier 3: innovation, artificial intelligence, autonomy, subsystem

Stage 2-Assessment Evidence

Performance Task or Key Evidence

- Future of Transportation activity

Key Criteria to measure Performance Task or Key Evidence

- demonstrate mastery of standards (vehicle subsystems, modes of transportation, etc) through future of transportation activity

Stage 3- Learning Plan

Learning Activities:

Do Now/Bell Ringer/Opener:

- THINK: If there is one feature you could put in a vehicle, what would it be?

Learning Activity 1: Lecture and Discussion: (~8 minutes)

- go through Future of Transportation presentation
    - review of Modes of Transportation
    - discussion of the Future of Transportation
        - show Business Insider's Why we don't have self-driving cars? video
            - while watching the video, pay attention to the 3 main reasons why we don't have self-driving cars today
            - have a full class discussion of these 3 reasons.
                1. Infrastructure
                2. Networking
                3. Laws and Policies

Learning Activity 2: Think Pair Share: (~7 minutes)

- introduce the Future of Transportation activity
- go over expectations
- Pair: split students into pairs or groups of 3
- have them brainstorm features (subsystems) of their concept vehicle
- Share: bring class back together and have students share their ideas

Summary/Closing: Exit Ticket

- open up a poll: "Today's lesson had 3 objectives, which of the 3 do you think was most successfully reached?" *multiple choice question w/ content objectives as answer choices*

Multiple Intelligences Addressed:

☐ Linguistic	☐ Logical-Mathematical	☐ Musical	☐Bodily-kinesthetic

☐ Spatial ☐ Interpersonal ☐Intrapersonal ☐Naturalistic

Student Grouping

☐ Whole Class ☐ Small Group ☐ Pairs ☐ Individual

Instructional Delivery Methods

☐ Teacher Modeling/Demonstration ☐ Lecture ☐ Discussion
☐ Cooperative Learning ☐ Centers ☐ Problem Solving
☐ Independent Projects

Accommodations	**Modifications**
- large font, dim lights - peer role models - preferential seating - frequent check-ins	- Option 1 to write

Homework/Extension Activities:

- Transportation vocab
- Crumple Zones Gizmo

Materials and Equipment Needed:

- Future of Transportation activity
- Future of Transportation presentation

Adapted from Grant Wiggins and Jay McTighe-*Understanding by Design*

4/23

DO NOW:

THINK: If you could have any feature in a vehicle, what would it be?

AGENDA:

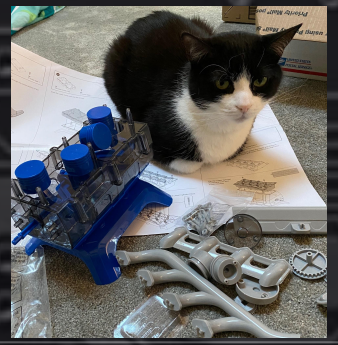
- review of Modes of Transportation
- discussion of the Future of Transportation
- work on Future of Transportation activity
  - Think Pair Share

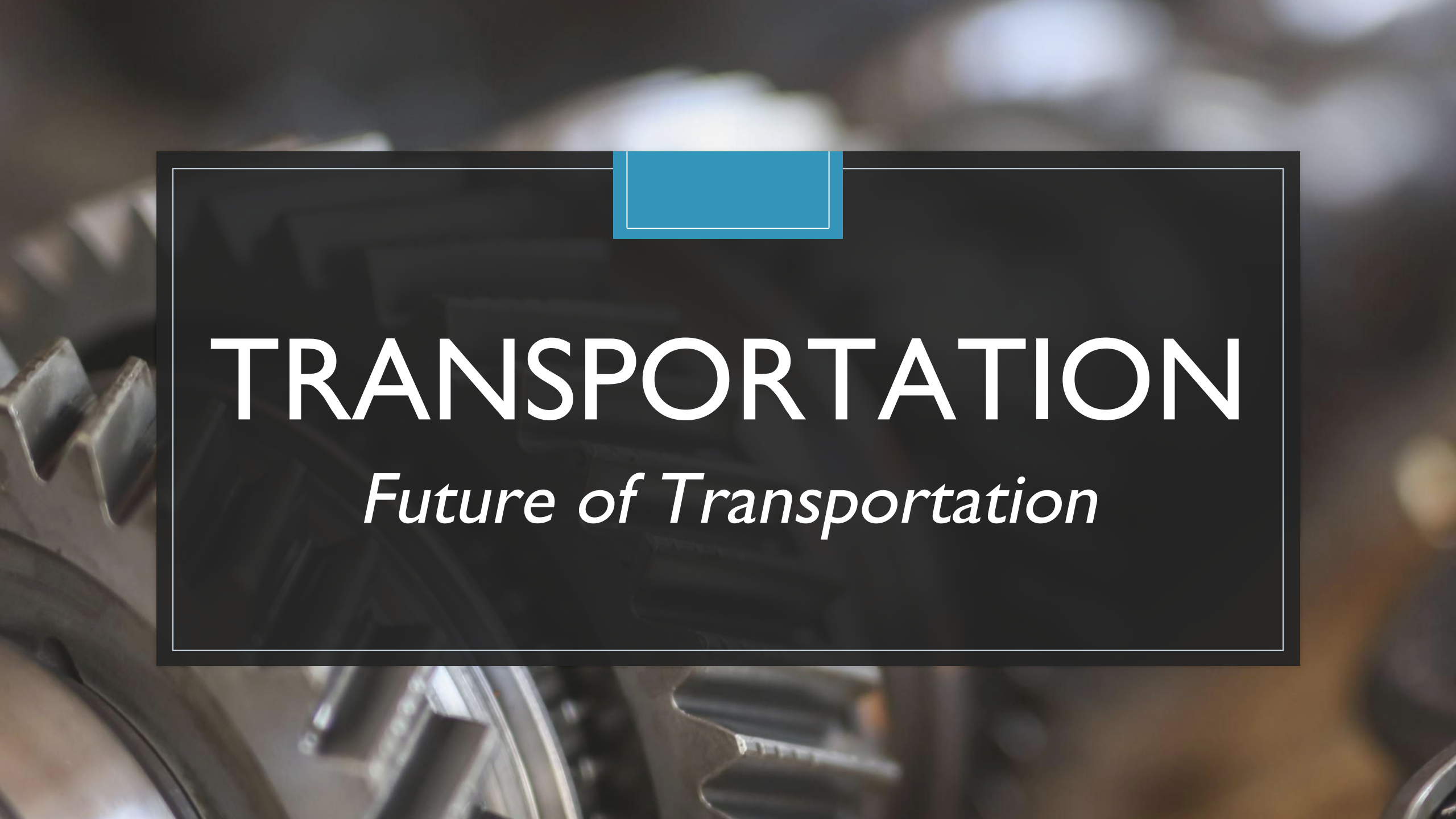
STUDENTS WILL BE ABLE TO:

- differentiate (tell the difference) between land, air, water, and space transportation
- identify differences between modes (ways) of transportation
- identify the subsystems of a vehicle (structural, propulsion, guidance, suspension, and control subsystems)
- develop an understanding of innovation in transportation

Daily Quote:

"Whether you think you can or think you can't, you're right." – Henry Ford





TRANSPORTATION

Future of Transportation

WHAT IS TRANSPORTATION?

TRANS•POR•TA•TION

the process of moving people and materials from one place to another

MODES OF TRANSPORTATION

MODE OF TRANSPORTATION

a way or method to move people and materials from one place to another

- Land
  - Road: cars, trucks, tractor trailers, delivery trucks, emergency vehicles
  - Rail: trains (passenger and cargo)
- Water: cargo/merchant ships, cruise ships
- Air: commercial airplanes, fighter jets, helicopters, gliders, parachutes
- Space: space shuttles, exploratory vehicles, International Space Station

FUTURE OF TRANSPORTATION

ELECTRIC & HYBRID CARS

- batteries are becoming *smaller* and *longer lasting*, so electric vehicles are becoming more popular

AUTONOMOUS VEHICLES

- an autonomous vehicle is a self-driving, robotic vehicle that can travel, without human input, from one place to another
- they are equipped with cameras, lasers, radar, global positioning systems (GPS), and computers
- over 90% of accidents in traditional vehicles are due to human error → autonomous vehicles have the potential to be much safer

https://www.youtube.com/watch?v=SE3gXRKBNHc&feature=emb_logo

AUTONOMOUS VEHICLES

WHY DON'T WE HAVE SELF-DRIVING VEHICLES TODAY?

1. INFRASTRUCTURE (roads, markings)
2. INTERCONNECTIVITY (communication, signage)
3. LAWS & POLICIES (liability, insurance)

FUTURE OF TRANSPORTATION

CONCEPT or PROTOTYPE VEHICLES

- a vehicle made to showcase new styling and/or new technology
- often shown at motor shows to gauge customer reaction to new and radical designs which may or may not be mass-produced in the future

VW Bulli

Toyota FT-4X

Bentley EXP 100 GT

Audi AI Trail

FUTURE OF TRANSPORTATION *ACTIVITY*

It is now the year 2050 and petroleum-based fuels (gas, diesel, and jet fuel) are scarce and expensive. It is up to you to figure out what the transportation of the future is going to be.

Your Task (3 days): Design your own concept of a vehicle of the future!

Make sure to include the following criteria in your concept vehicle.

- Select one of the following modes of transportation: land, air, water, or space.
- Select one of the following sources of power for your vehicle: wind, solar, magnetic, pedal-powered, hydrogen fuel cell, or create a new source of power that has yet to be invented.
- Label all components of your vehicle so that it is clear to the viewer what each part is.
- Optional: Name your vehicle, develop a company logo, come up with a slogan

THINK PAIR SHARE

Today's Task: *BRAINSTORM* features that you would like to include in your concept vehicle with your partner(s).

- Select one mode: land, air, water, or space
- **Discuss** features (or subsystems) that you want to include in your concept vehicle.
  - Guidance: How's it going to be guided? (Will it have a steering wheel?)
  - Control: How's it going to be controlled? (Will it have a braking system?)
  - Propulsion: How's it going to be propelled? (What kind of engine will it have? wind, solar, magnetic, pedal-powered, hydrogen fuel cell, or create a new source of power that has yet to be invented)
  - Structural: What's the structure going to look like? (What materials will it be made out of?)
  - Suspension: How's it going to be "cushioned" from rough terrain? (You want your vehicle to ride smoothly, will it have shock absorbers or a different way to ride smooth?)

Today's lesson had 4 objectives, which of the 4 do you think was most successfully reached?

STUDENTS WILL BE ABLE TO:

1. differentiate (tell the difference) between land, air, water, and space transportation
2. identify differences between modes (ways) of transportation
3. identify the subsystems of a vehicle (structural, propulsion, guidance, suspension, and control subsystems)
4. develop an understanding of innovation in transportation

Daily Quote:

"Whether you think you can or think you can't, you're right." – Henry Ford

Name: _____

Block #: _____

Date: _____

It is now the year 2050 and petroleum-based fuels (gas, diesel, and jet fuel) are scarce and expensive. It is up to you to figure out what the transportation of the future is going to be.

For this activity, you have a choice. You can either

Option 1: Create a vision for a transportation system of the future or,

Option 2: Design a concept of a new vehicle of the future

For Option 1: follow these guidelines to create a vision of your future transportation system:

- Write or draw a representation of what this future looks like.
- Include the mode(s) of transportation people are using to travel.
- Include the fuel or source of power. Consider options in wind, solar, magnetic, pedal-powered, or create a new source of power that has yet to be invented.
- Include any rules related to transportation (e.g., no idling, speed limit).
- Include a representation of infrastructure that would be needed for these sources of transportation (e.g., roads, bridges, waterways)

For Option 2: make sure to include the following criteria in your concept vehicle.

- Select one of the following modes of transportation: land, air, water, or space.
- Select one of the following sources of power for your vehicle: wind, solar, magnetic, pedal-powered, hydrogen fuel cell, or create a new source of power that has yet to be invented.
- Illustrate the following subsystems of your vehicle: structural, propulsion, guidance, suspension, and control subsystems.
- Label all components of your vehicle so that it is clear to the viewer what each part is.
- Optional: Name your vehicle, develop a company logo, come up with a slogan