| **Subjects(s)/Course(s):** | STEAM or 6-8 Grade Science |
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| **Teacher(s):** |  |
| **Timeframe/Duration:** | 10 hour-long class periods + 3 optional lesson plans that incorporate 6th and 7th grade TN state science standards. |
| **Unit Title:** | Sustainable Transportation Paint Challenge |
| **Unit Summary:** | Students will explore the impact that different transportation modes have on the environment and predict why people don’t use sustainable forms of transportation more often such as walking and biking. Then, they will design and implement an improvement to their school’s campus using only paint that will make walking, biking, or taking the bus a more pleasant experience. |
| **Resources:** | Resources for each lesson can be found in the corresponding daily lesson plan. |

| **Universal Concept/Big Idea** |  | **Enduring Understanding(s)** |
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| Connectivity |  | Well planned physical connections allow us to access ideas, people, places, and resources. |



| **Essential Question(s)** |
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| How can we provide more efficient and sustainable transportation in our school’s neighborhood? |

| **Content** | |
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| **TN State Standards** | Optional lessons include the following TN State Science Standards:  6.ESS3.3 Assess the impacts of human activities on the biosphere including conservation, habitat management, species endangerment, and extinction.  6.ETS1.1 Evaluate design constraints on solutions for maintaining ecosystems and biodiversity.  7.ESS3.2 Engage in a scientific argument through graphing and translating data regarding human activity and climate. |
| **Interdisciplinary Connections** | **English**  7.SL. PKI.4  Present claims and findings, emphasizing salient points in a focused, coherent manner with pertinent descriptions, facts, details, and examples; use appropriate eye contact, adequate volume, and clear pronunciation.  7.SL.PKI.5  Include multimedia components and visual displays in presentations to clarify claims and findings and to emphasize major points.  7.W.RBPK.7  Conduct research to answer a question, drawing on multiple sources and generating additional related, focused questions for further research and investigation.  7.W.RBPK.9  Support interpretations, analyses, reflection, or research with evidence found in literature or informational texts, applying grade 7 standards for reading, assess whether the evidence is relevant or sufficient to support the claims.  7.W.RW.10  Write routinely over extended time frames and shorter time frames for a range of discipline-specific tasks, purposes, and audiences.  **Art**  7.VA.Cr1.B Develop criteria to guide art-making or design to meet an identified goal.  7.VA.Cr2.C Apply visual organizational strategies to design and produce a work of art, design, or media that clearly communicates information or ideas.  7.VA.R1.A Analyze multiple ways that images influence specific audiences.  **Social Studies**  SSP .04  Construct and communicate arguments by citing supporting evidence to demonstrate and defend an understanding of ideas, compare and contrast viewpoints, illustrate cause and effect, predict likely outcomes and devise new outcomes or solutions/  SSP .06  Develop a geographic awareness by using the geographic perspective to determine relationships, patterns, and diffusion across space at multiple scales, analyzing locations, conditions, and connections of places and use maps to investigate spatial relationships, analyzing interaction between humans and the physical environment and examining how geographic regions and perceptions of regions are fluid across time and space. |
| **Connections to the Real World** | This project is based on the real world issue of transportation related to carbon emissions. They will design a sustainable transportation improvement for their school’s campus that they will paint to be permanent. |
| **Connections to Career** | Students will learn about career paths through collaborations with design professional volunteers. |

| **Skills** | |
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| **Learning and Innovation Skills (4Cs)** | Collaboration - Demonstrate ability to work effectively and respectfully with diverse teams. - Assume shared responsibility for collaborative work, and value the individual contributions made by each team member. Critical Thinking - Analyze how parts of a whole interact with each other to produce overall outcomes in complex systems. - Reflect critically on learning experiences and processes. - Solve different kinds of non-familiar problems in both conventional and innovative ways. Communication - Articulate thoughts and ideas effectively using oral, written and nonverbal communication skills in a variety of forms and contexts. Creativity - Create new and worthwhile ideas. - Develop, implement, and communicate new ideas to others effectively. - Demonstrate originality and inventiveness in work and understand the real world limits to adopting new ideas. |
| **SEL Core Competencies/”I Can” Statements** | 1B.2 Identifies interaction between personal qualities and interests with academic activities and social opportunities  1D.1 Identifies areas of school and life that are within personal control  3A.2 Recognizes multiple points of view or perspectives in a situation  3B.3 Identifies roles they have that contribute to their school, home, and community  3B.4 Works collaboratively with peers to complete a job, task, or address a need  3C.2 Recognizes the similarities of different cultures and social groups  4A.2 Demonstrates ability to perform different roles in a cooperative group to achieve group goals  5B.1 Identifies and applies the steps of systematic decision-making |

| **Language Acquisition** | |
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| **Academic Vocabulary & Language** | Sustainability, CO2 emissions, carbon footprint, sidewalk, crosswalk, bike lane, bike rack, traffic calming, bulb-out, bus stop |
| **Language supports/scaffolds for comprehension of content standards** | Language acquisition will be scaffolded through group roles that allow varying levels of language ability, collaborative opportunities for assignments with language skill requirements, and visual representations of vocabulary words. |

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| **Final Product(s)/**  **Individual and Group Summative Assessment** | **Formative Assessment of concepts, content, skills, and language** | **Instructional Activities to make accessible for ALL learners (e.g., EL, EE, advanced)** | **Learning Progression of Content, Concepts, Language and Skills (Learning Targets)** |
| **Individual:**  Daily Reflections  Individual Group Roles  Project Reflection  **Group:**  Design and paint sustainable transportation improvement to their school’s campus. | Climate Change Jigsaw Handout | **Climate Change Jigsaw**  Students will engage with informational texts that explore climate change from a variety of angles with the intention of developing expertise in several domains through a jigsaw activity. Through this, students will gain a deeper understanding of how climate change in Nashville can be addressed through transportation. | **Optional Science Lesson 1**  I can teach my peers about a scientific principle related to transportation. |
| Verbal Reflection | **Graphing Nashville’s Temperature**  Students will explore the effects of climate change locally by analyzing temperature data for Nashville. They will create graphs with the data and compare trends of changing temperature over time. Students will be challenged to think about how large datasets are analyzed and interpreted by scientists. | **Optional Science Lesson 2**  I can graph data and analyze trends of the rise of local temperatures in Nashville.  I can reflect on how personal decisions might affect the local trends we see and what changes I can make. |
| Written Reflection | **Transportation Data Graphs**  Students will analyze data collected from the Transit Tracker with the intention of graphing the transit modes their classmates utilize. Through this, they will gain a deeper understanding of translating and visually representing data to use as support for solutions generated through the engineering process. | **Optional Science Lesson 3**  I can translate data to charts and graphs.  I can use charts and graphs as evidence to support my hypotheses. |
| Written Reflection | **Transportation Challenge**  To begin the project, students will complete a Transportation Challenge activity where they will explore the pros and cons of the types of transportation that students use to get to and from school. During the activity, they will measure speed, CO2 emissions, cost, and calories burned on their way to school. Then, they will begin to brainstorm ways to encourage healthier and more sustainable types of transportation for the students at their school. | **Day 1:**  I can determine the benefits and drawbacks of different types of transportation. |
| Written Reflection  Campus Observations Map | **Campus Observations**  Students will take a walk around the school’s campus to make observations about the transportation experience. Then, they will record information on a map that will later be used to help them find locations for their designs. | **Day 2:**  I can identify areas where walking, biking, or taking the bus could be improved on my school’s campus. |
| Written Reflection | **Sustainable Transportation Design**  Students will learn sustainable transportation vocabulary and look at examples of design that use paint to improve sustainable transportation. | **Day 3:**  I can use sustainable transportation vocabulary.  I can analyze examples of sustainable transportation design. |
| Project Proposal  Design Draft | **Design Drafts**  Students will create a draft of their design. | **Day 4:**  I can work with a group to create a sustainable transportation design for my school’s campus.  I can prepare to present my design to an audience. |
| Written Reflection | **Design Review**  Students will present their design drafts to a team of volunteers from the community and MNPS Facilities staff for feedback. Then, the class will vote on their favorite ideas for their design. | **Day 5:**  I can work with my group to present our design. |
| Final Design Drawings    Evaluation Plan | **Final Design and Evaluation Plan**  Students will divide into groups to work on their final design with artwork and an evaluation plan. | **Day 6:**  I can create a final design that represents the class priorities.  I can create an evaluation plan to measure the effectiveness of our design. |
| Career Exploration Day Reflection | **Career Exploration Day**  Students will generate questions for the volunteers who have been working with them. Then, they will interview them about their careers. | **Day 7:**  I can learn about careers related to sustainable transportation. |
| Painted Design | **Paint Days**  Students will paint their design on the school’s campus. | **Days 8-9:**  I can work with my classmates to paint our design on our school’s campus. |
| Project Reflection | **Evaluation and Reflection**  Students will evaluate how their design is impacting students at their school and reflect on the project. | **Day 10:**  I can evaluate how my class’s design impacted students. |

| **Reflection** | |
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| **Daily/Regular Reflection** | **Academic Concepts and Skills:**  Written reflections will act as formative assessments of students’ progress in understanding and addressing Nashville’s sustainable transportation needs. They will assess skill-acquisition, content comprehension, and project progression. |
| **Summative Reflection** | **Academic Concepts and Skills:**  Students will complete a summative reflections that will about key learning in the project. |