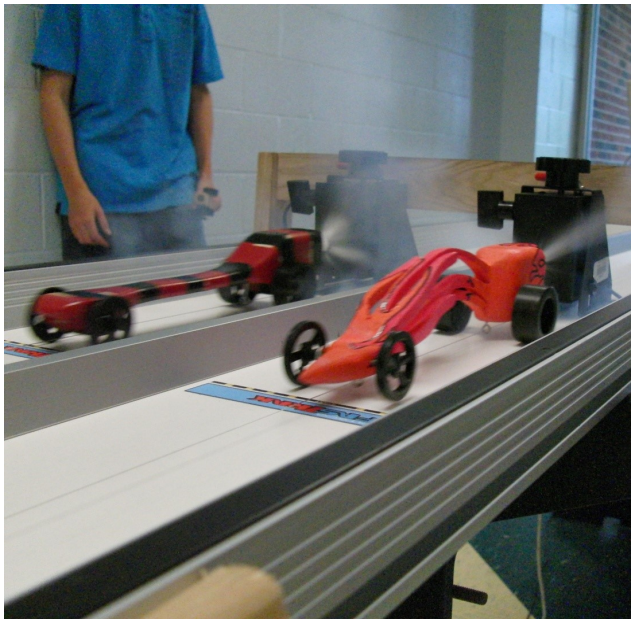
Unit Title *CO2*	**Grade Level *Eight***
Organizing Concepts **Transfer and Harness of energies**	
Subject/Topic Areas **Technology**	
Key Words:	
Unit Designer **Technology 8**	Time Frame **seven weeks**
School District	School **MS**



Stage 1

Rationale

As we continuously move foreword in the realm of vehicles, students need to be aware of the engineering design problems that are present and must be overcome to create a successful and competitive vehicle. Our 8th grade students study friction, acceleration, inertia, mass, aerodynamics, and the history of transportation. They will apply these concepts by building a CO2 vehicle. These students will get the chance to experience first hand how something is designed and then constructed.

This unit incorporates the following NYS standards and benchmarks
Technology 8; T1.1, T1.1a, T1.2a, T1.3, T1.3a, T1.3b, T1.4, T1.4a, T1.4b, T1.5, T1.5a, T1.5b

Students will use concepts previously gained from lessons across curriculum. This will help make the connections between academics and the real world. Skills gained from these units will expose and introduce students to potential future career paths and opportunities.

Desired Results

What enduring understandings are desired?

Design is a critical step that is used throughout the entire construction process

Successful output is dependent upon completion of all steps in the construction process

What essential questions will guide this unit and focus teaching and learning?

Is there a right and wrong design idea?

How is the design process used when creating a new product and who is involved with that process?

What key knowledge and skills will students acquire as a result of this unit?

Careers involved with multiple stages of the design process

CAD/Inventor skills

Students will sharpen their skills using woodworking equipment

Students will explore ways to reduce friction on a vehicle

Defining terms: friction, acceleration, inertia, mass, aerodynamics

Students will obtain information regarding the history of transportation

Students will use math skills to determine the proper scale of their vehicle

Students will use math skills to create predictor graphs

Students will apply Newton's three laws of motion to the design of their CO2 vehicle

Student will use language art skills to create a business letter that conveys technical information

Stage 2

Assessment Evidence

Role: Engineers **Audience**: American Society of Mechanical Engineers **Situation**: We have been given the job of creating a new high performance vehicle that will race in a 2020 circuit **Product:** Scaled working model of a CO2 powered vehicle

1. Students will research and complete a Web Quest directly relating to transportation
2. Students will use the design process to complete a CO2 vehicle
    - Brainstorm thumbnails
    - CAD/Inventor drawing
    - Construction
    - Test
    - Evaluate

What evidence will show that students understand?

Performance Tasks (summarized)

1) Students will be given a preprinted web quest packet which will be completed using the internet or any other available source, alone or with a peer (information treasure hunt). The knowledge gained through this web quest will be used as a review of prior knowledge and as an introduction to new information. This web quest will be used through the rest of this unit as a reference tool.

2) At the conclusion of each class, students will complete a journal entry that answers the day's specified question. This question will help the students elaborate and reflect and relate to the day's objective. This daily activity will be handed in as a pass out the door and reviewed by the teacher on a daily basis.

3) Students will use the CAD/Inventor program to complete an accurate orthographic projection of CO2 Vehicle that was designed to satisfy the given rubric. The orthographic drawing will include dimensions and labels of needed materials.

4) Students will create a check list to follow during the construction process

5) Students will construct a CO2 vehicle incorporating the safety lessons learned prior as well as information gained from class, web quest and rubric.

6) Students will test their completed device utilizing the criteria in the given rubric to determine their level of success.

7) Students will complete a quiz with 90% mastery utilizing the information obtained from Technology classes.

8) Students will write a business letter that communicates to others the design process followed the results of the technical evaluation of their design and finished product.

Unit Benchmarks

TOPIC: CO2
STATE STANDARDS

1. **Mathematics, Science, and Technology**

1. Analysis, Inquiry, and Design – Students will use mathematical analysis, scientific inquiry, and engineering design, as appropriate, to pose questions, seek answers, and develop solutions.
2. Information Systems – Students will access, generate, process, and transfer information using appropriate technologies
3. Mathematics – Students will understand mathematics and become mathematically confident by communicating and reasoning mathematically, by applying mathematics in real-world settings, and by solving problems through the integrated study of number systems, geometry, algebra, data analysis, probability, and trigonometry.
4. Science – Students will understand and apply scientific concepts, principles, and theories pertaining to the physical setting and living environment and recognize the historical development of ideas in science.
5. Technology – Students will apply technological knowledge and skills to design, construct, use, and evaluate products and systems to satisfy human and environmental needs.
6. Interconnectedness: Common Themes – Students will understand the relationships and common themes that connect mathematics, science, and technology and apply the themes to these and other areas of learning.
7. Interdisciplinary Problem Solving – Students will apply the knowledge and thinking skills of mathematics, science, and technology to address real-life problems and make informed decisions.

TOPIC:
BENCHMARKS

1. STUDENTS WILL UNDERSTAND HOW TECHNOLOGY PLAYS A VITAL ROLE IN SOCIETY
2. STUDENTS WILL UNDERSTAND AND DEMONSTRATE THE STEPS IN THE DESIGN PROCESS
3. STUDENTS WILL UNDERSTAND THE IMPORTANCE OF DESIGN BEFORE PRODUCTION
4. STUDENTS WILL ENHANCE SKILLS IN DESIGNING AND DRAFTING
5. STUDENTS WILL DEVELOP AN ORTHOGRAPHIC PROJECTION OF A CO2 VEHICLE
6. STUDENTS WILL UNDERSTAND THE IMPORTANCE OF ACCURATE DIMENSIONS WHEN DESIGNING
7. STUDENTS WILL DEMONSTRATE THE PRINCIPLE BEHIND "SCALE" AND HOW IT APPLIES IN WORKING DRAWINGS
8. STUDENTS WILL DESIGN AND CONSTRUCT A TRANSPORTATION VEHICLE BASED ON THE GIVEN PROBLEM SOLVING SITUATION
9. STUDENTS WILL UNDERSTAND AND RECALL THE DEFINITION OF TRANSPORTATION
10. STUDENTS WILL UNDERSTAND THE HISTORY AND INFLUENCE OF TRANSPORTATION
11. STUDENTS WILL UNDERSTAND THE PHYSICS BEHIND CO2 POWERED PROPULSION
12. STUDENTS WILL DEVELOP AN UNDERSTANDING OF AERODYNAMICS
13. STUDENTS WILL UNDERSTAND THE DEFINITION OF AESTHETICS AND HOW EFFECTS OVERALL DESIGN
14. STUDENTS WILL TEST AERODYNAMICS EFFICIENCY OF A CONSTRUCTED VEHICLE
15. STUDENTS WILL RECOGNIZE VARIOUS TOOLS USED IN THE CONSTRUCTION PROCESS
16. STUDENTS WILL DEMONSTRATE THE CORRECT AND SAFE USE OF TOOLS USED IN THE CONSTRUCTION PROCESS
17. STUDENTS WILL UNDERSTAND THE IMPORTANCE OF COMMITMENT, COOPERATION, AND SAFETY

18. STUDENTS WILL DEMONSTRATE THE CORRECT WAY TO COMMUNICATE TECHNICAL MATERIAL IN ORDER TO PROVIDE INFORMATION TO OTHERS AND TO UNDERSTAND VITAL INFORMATION FOR THEIR OWN BENEFIT.

Quizzes, Tests, Prompts, and Work Samples (summarized)

- Students will take a quiz to summarize information gained in Technology class
- Web quest
- CAD/Inventor Drawing
- Completed product
- Business Letter

Unprompted Evidence (e.g., observations and dialogues)

Class discussions, debates, open ended questions and construction progress will assist the teacher in determining current level of understandings

Student Self-Assessment

Students will self asses themselves via journal entries, rubric reflection and self-evaluation form

What desired understandings/content standards will be assessed through this task?

Intermediate Level Standards

MST Standards;

Standard 1: Analysis, Inquiry, and Design; Students will use mathematical analysis, scientific inquiry, and engineering design, as appropriate to pose questions, seek answers, and develop solutions.

Standard 2: Information Systems; Students will access, generate, process, and transfer information using appropriate technologies.

Standard 3: Mathematics; Students will understand mathematics and become mathematically confident by communicating and reasoning mathematically, by applying mathematics in real-world settings, and by solving problems through the integrated study of number systems, geometry, algebra, data analysis, probability, and trigonometry.

Standard 4: Science; Students will understand and apply scientific concepts, principles, and theories pertaining to the physical setting and recognize the historical development of ideas in science.

Standard 5: Technology; Students will apply technological knowledge and skills to design, construct, use, and evaluate products and systems to satisfy human and environmental needs.

Standard 6: Interconnectedness: Common Themes Students will understand the relationships and common themes that connect mathematics, science, and technology and apply the themes to these and other areas of learning.

Standard 7: Interdisciplinary Problem Solving; Students will apply the knowledge and thinking skills of mathematics, science, and technology to address real-life problems and make informed decisions.

ELA Standards

Standard 1: Language for Information and Understanding Students will listen, speak, read, and write for information and understanding. As listeners and readers, students will collect data, facts, and ideas; discover relationships, concepts, and generalizations; and use knowledge generated from oral, written, and electronically produced texts. As speakers and writers, they will use oral and written language that follows the accepted conventions of the English language to acquire, interpret, apply, and transmit information.

Standard 3: Language for Critical Analysis and Evaluation Students will listen, speak, read, and write for critical analysis and evaluation. As listeners and readers, students will analyze experiences, ideas, information, and issues presented by others using a variety of established criteria. As speakers and writers, they will use oral and written language that follows the accepted conventions of the English language to present, from a variety of perspectives, their opinions and judgments on experiences, ideas, information and issues.

Social Studies Standards

Standard 1: History of the United States and New York Students will use a variety of intellectual skills to demonstrate their understanding of major ideas, eras, themes, developments, and turning points in the history of the United States and New York.

CDOS Standards

Standard 2: Integrated Learning Students will demonstrate how academic knowledge and skills are applied in the workplace and other settings.

Standard 3a: Universal Foundation Skills Students will demonstrate mastery of the foundation skills and competencies essential for success in the workplace.

What is the purpose of this assessment task? ☒ Formative ☒ Summative

Through what authentic performance task will students demonstrate understanding?

Task Overview (including GRASPS: goal, role, audience, situation, product or performance, and standards)

See task description above

What student products/performances will provide evidence of desired understandings?

- CO2 vehicle

- Web Quest
- Journal

- Quiz
- Technical Drawing

By what criteria will student products/performances be evaluated?

- Rubrics
- Observation of peer discussion / debate
- Mastery of quiz
- Journals
-

What type of scoring tools will be used for evaluation? (Use a separate sheet for scoring tools.)

☒ Analytic rubric ☒ Holistic rubric ☒ Criterion (performance) list ☒ Checklist

What other assessment evidence will be collected during this unit?

What will be assessed?
☒ Knowledge ☐ List:
☒ Skill
☒ Understanding

How will evidence be collected?
☒ Quiz/Test ☒ Assignment
☒ Teacher notes ☒ Other: task

What type of assessment will be used?
☒ Selected response ☒ Observation
☐ Academic Prompt ☒ Work sample
☒ Brief constructed response ☐ Other: _____

What is the assessments purpose?
☒ Diagnostic ☒ Formative ☒ Summative

Describe the assessment and state the prompt (if applicable).

By what criteria will student responses be evaluated? (Complete if applicable)

-

What type of scoring tools will be used for evaluation? (Check if applicable)
☒ Analytic rubric ☒ Checklist
☒ Holistic rubric ☐ Answer key
☒ Criterion list

What will be assessed?
x Knowledge ☐ List:
x Skill
x Understanding

How will evidence be collected?
X Quiz/Test x Assignment
☐ Teacher notes x Finished Project

What type of assessment will be used?
☐ Selected response x Observation
☐ Academic Prompt x Work sample
☐Brief constructed response ☐ Other: _____

What is the assessments purpose?
☐ Diagnostic ☐ Formative ☐ Summative

Describe the assessment and state the prompt (if applicable).

By what criteria will student responses be evaluated? (Complete if applicable)

-

What type of scoring tools will be used for evaluation? (Check if applicable)
X Analytic rubric x Checklist
X Holistic rubric ☐ Answer key
X Criterion list

Stage 3

Learning Activities

What sequence of teaching and learning experiences will equip students to develop and demonstrate the desired understanding?

Consider the WHERE elements from the *student's* perspective.

- Post essential questions on the bulletin board
- Review all rubrics and necessary handouts with students prior to work time
- Begin unit with a problem solving scenario requiring the use of the problem solving process
- Class discussion / debate dealing with enduring understandings…Debate the following statement *What goes into a good vehicle design*
- Students will explore the history of transportation
- Students will work in groups to complete web quest and peer evaluations
- Students will take a quiz dealing with transportation
- Students will use the Inventor design program to complete an orthographic projection of their CO2 vehicle

1. **Teacher Constructed Activities:**

Activity	Benchmark	Standard	Application Level
a. **Web quest**	**7,9,10,12,13**	HPEHE: MST:**2,4,6,7** ELA: 1 Arts: LOTE: CDOS:	**1,2,3,4**

Materials: Web quest / internet		SS: 1	
b. **Journal entries** *Materials:* Journals	**1,2,3,9,10,11 13**	HPEHE: MST:**1,2,4,5,6** ELA:**1,3** Arts: LOTE: CDOS: SS:3	**1,2,3,5**
c. **Orthographic projection** *Materials:* Drawing tools / CAD	**3,4,5,7**	HPEHE: MST:**1,2,3,5** ELA: Arts: LOTE: CDOS: SS:	**1,2,5**
d. **Create check list** *Materials:*	**3,16**	HPEHE: MST: **1,2,5** ELA: Arts: LOTE: CDOS: SS:	**1,2,4**

Activity	**Benchmark**	**Standard**	**Application Level**
e. **construction of CO2 vehicle** *Materials:* Rubric, technology supplies	**6,7,8,12,13, 14,15,16,17**	HPEHE: MST:**1->7** ELA: Arts: LOTE: CDOS: SS:	**1,2,4,5**
f. **Business Letter**	**2,3,8,9, 11, 12, 18**	HPEHE: MST:**2,5,6,7** ELA: Arts: LOTE: CDOS: SS:	**2,5,6,7**

Materials: Computer, finished vehicles			
g. **Race Day** **Materials: Computer, track, schedule, CO2 cartridges, finished vehicles**	**3,14,16**	HPEHE: MST:1,5 ELA: Arts: LOTE: CDOS: SS:	**4,5**

Application Level

1: Knowledge
2: Apply in Discipline
3: Apply Across Disciplines
4: Apply to Real world Predictable Situations
5: Apply to Real World Unpredictable Situations