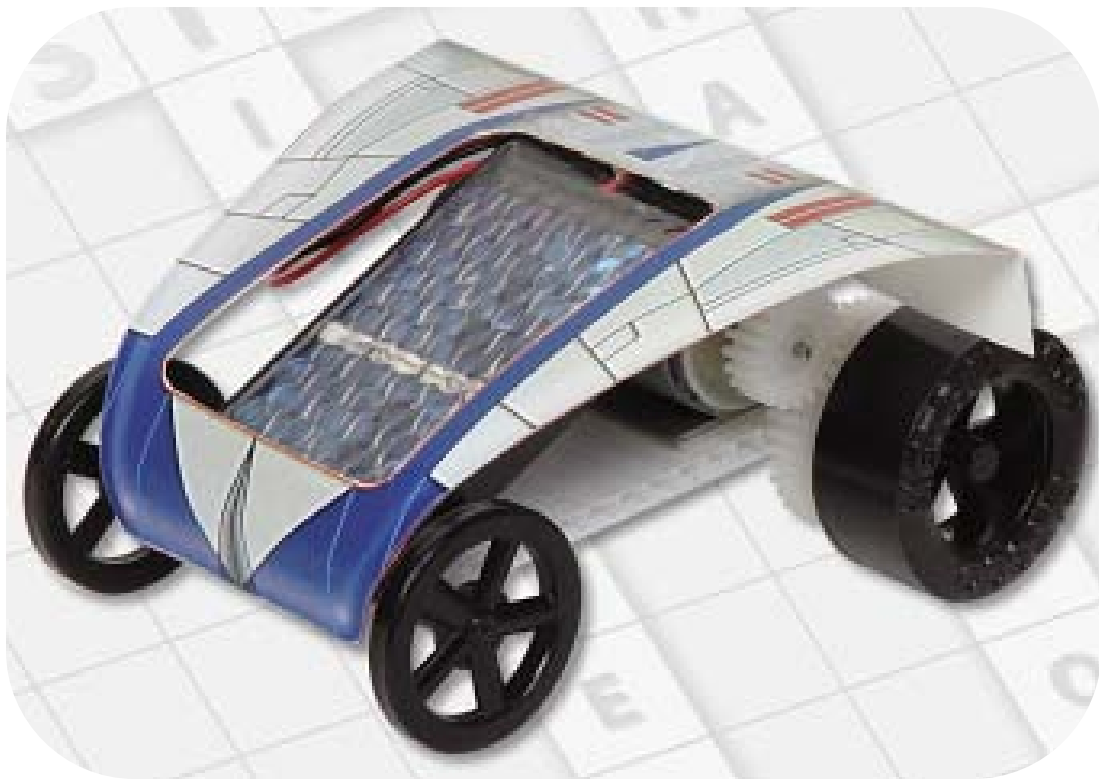


Science, Technology, Engineering, and Mathematics

(STEM) for Getting Started in:

ROBOTICS

GRADES 9-12



Unit Overview

This unit introduces high school students to 21st Century skills. This introductory unit will provide students with a deeper understanding of the importance of design, teamwork, problem solving, critical thinking, creative investigations and extended communication. Students will begin by understanding the importance of alternative fuels for energy efficiency and transportation. They will familiarize themselves with how vehicles operate on various alternative energy sources, making comparisons of fuel usage, costs and graphical designs. Additionally, students will engage in discussions, debates and presentations. Students will extend their skills presenting and using new vocabulary through group collaboration, presentations, demonstrations and notebooking.

Day	Time	Activity Process	Content Area	Activity
Lesson 1	60 minutes= 10 minutes- inquiry, brainstorm 20 minutes, 30 minutes	Pretest Activity 1 –Introduction to Unit and Essential Question Use of graphic organizer(s): Concept Map/KWL/Frayer Model Activity 2 –Vocabulary Introduction Activity 3 –Notebooking <i>Formative Assessment of Student Knowledge</i>	Science Math Vocabulary Reading/Writing Technology	Pre-Test a. Prior knowledge b. Use of computers and the Internet c. Learned knowledge d. Information synthesis *Notebooking
Lesson 2	60 minutes= 15 minutes, Introduction 45 minutes, Activity	Activity 1 –Student Article Presentation Activity 2 –Essential Question, Notebooking Activity 3 –Introduction of Reading Passages and Group Activity and Tasks Activity 4 –Notebooking <i>Formative Assessment of Student Knowledge</i>	Science Math Vocabulary Reading/Writing Technology	a. Learned knowledge information Synthesis b. Demonstration of understanding through tasks c. Design, construct, collect and analyze information *Notebooking
Lesson 3	60 minutes= Individual and group support	Activity 1 –Student Article Presentation Activity 2 –Essential Question, Notebooking Activity 3 –Introduction of Reading Passages and Group Activity and Tasks Activity 4 –Notebooking	Science Math Vocabulary Reading/Writing Technology	a. Design, construct, collect and analyze information b. Use of computers/Internet c. Collect and analyze information using d. Computers and the Internet *Notebooking

		Formative Assessment of Student Knowledge		
Lesson 4	60 minutes= Individual and group support	Activity 1 –Student Article Presentation Activity 2 –Essential Question Activity 3 –Introduction of Collaborative Group Research Projects Activity 4 –Notebooking <i>Formative Assessment of Student Knowledge</i>	Science Math Vocabulary Reading/Writing Technology	a. Design, construct, collect and analyze information b. Use of computers and the Internet c. Collect and analyze information using computers and the Internet *Notebooking
Lesson 5	60 minutes= Individual and group support	Activity 1 –Student Article Presentation Activity 2 –Essential Question Activity 3 –Introduction of Collaborative Group Research Projects Activity 4 –Notebooking <i>Formative Assessment of Student Knowledge</i>	Science Math Vocabulary Reading/Writing Technology	a. Design, construct, collect and analyze information b. Use of computers and the Internet c. Collect and analyze information using computers and the Internet *Notebooking
Lesson 6	60 minutes= Individual and group support	Activity 1 –Introduction and Assembly of SunEZoon Car Activity 2 –Group Collaborative Group Activity: Construction and design of car Activity 3 –Notebooking <i>Formative Assessment of Student Knowledge</i>	Science Math Vocabulary Reading/Writing Technology	a. Analyze and interpret information b. Construct simple graphs to organize, examine and evaluate information for presentation c. Apply learned knowledge in groups supported by verbal, pictorial and realia to construct and design product d. Information synthesis *Notebooking
Lesson 7	60 minutes= Individual and group support	Activity 1 –Continuation of Assembly of SunEZoon Car Activity 2 –Collaborative Group Activity: Construction and design of car Activity 3 –Notebooking <i>Formative Assessment of Student Knowledge</i>	Science Math Vocabulary Reading/Writing Technology	a. Analyze and interpret information b. Construct simple graphs to organize, examine and evaluate information for presentation. c. Apply learned knowledge in groups supported by verbal, pictorial and realia to construct and design product. d. Information synthesis *Notebooking

Lesson 8	60 minutes= Individual and group support	Activity 1 – Introduction to Group Advertisement Presentation of SunEZoon Car Activity 2 –Collaborative Group Activity: Construction and design of car Activity 3 –Notebooking <i>Formative Assessment of Student Knowledge</i>	Science Math Vocabulary Reading/Writing Technology	a. Analyze and interpret information b. Construct simple graphs to organize, examine and evaluate information for presentation c. Apply learned knowledge in groups supported by verbal, pictorial and realia to construct and design product d. Information synthesis *Notebooking
Lesson 9	60 minutes	Activity 1 –Group Presentation of advertisement: SunEZoon Car Activity 2 –Peer Review Activity 3 –Notebooking <i>Formative Assessment of Student Knowledge</i>	Science Math Vocabulary Reading/Writing Technology	a. Demonstration and application of learned knowledge b. Presenting information with graphs/charts, pictorial representation and product c. Information synthesis *Notebooking *Peer Review
Lesson 10	60 minutes	Activity 1 –Group Presentation of advertisement: SunEZoon Car Activity 2 –Peer Review Activity 3 –Notebooking <i>Formative Assessment of Student Knowledge</i> Post Assessment	Science Math Vocabulary Reading/Writing Technology	a. Demonstration and application of learned knowledge b. Presenting information with graphs/charts, pictorial representation and product c. Information synthesis *Peer Review

Materials

Florida Sunshine State Standards

Science, Technology, Engineering, and Mathematics SunEZoon Cars Teacher’s Guide (W759465)

SunEZoon Car Class Pack-Getting Started Pack

Computers and Internet Access

Teacher Materials/ Resources

Each STEM for Getting Started package of materials contains solar panel with alligator clamps, motor, wheels (colors may vary), steel axles, gear font, chassis parts (colors may vary), and a cut-and-fold cover. Construction requires scissors and hobby knife or sandpaper.

Computers needed for activities and tasks (computers in classrooms or media center).

Student notebooks, pencils, markers, colored pencils, tape, gallon size zip-lock plastic bags, glue, foil, regular white paper, graph paper (1 inch squares), toothpicks, construction paper, tag board (3 separate colors for constructing models), 2 tri-fold stands, mini CD's for videotaping, post-it notes, large post-it tablet for group activities.

Videoconferencing with a STEM ACADEMY high school.

Standards

Unit Content Standards	Unit Youth Development Standards
<p>STEM for Getting Started</p> <p>C. Scientific argumentation is a necessary part of scientific inquiry and plays an important role in the generation and validation of scientific knowledge.</p> <p>D. Scientific knowledge is based on observation and inference; it is important to recognize that these are very different things. Not only does science require creativity in its methods and processes, but also in its questions and explanations.</p> <p>The Practice of Science – Standard 1</p> <p>SC.912.N.1.2: Describe and explain what characterizes science and its methods.</p> <p>SC.912.N.1.5: Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.</p> <p>SC.912.N.1.6: Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.</p> <p>SC.912.N.1.7: Recognize the role of creativity in constructing scientific questions, methods and explanations.</p> <p>Nature of Science, Science and Society – Standard 4</p> <p>As tomorrow's citizens, students should be able to identify issues about which society could provide input, formulate scientifically investigable questions about those issues, construct investigations of their questions, collect and evaluate data from their investigations, and develop scientific recommendations based upon their findings.</p> <p>SC.912.N.4.1: Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.</p> <p>SC.912.N.4.2: Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.</p>	<p>Support</p> <ul style="list-style-type: none"> • 3-Other adult relationships: Young person receives support from three or more nonparent adults. • 5-Caring School Climate: School provides a caring, encouraging environment. <p>Empowerment</p> <ul style="list-style-type: none"> • 7-Community Values Youth: Young person perceives that adults in the community value youth. • 10-Safety: Young person feels safe at home, school, and in the neighborhood. <p>Boundaries and Expectations</p> <ul style="list-style-type: none"> • 12-School Boundaries: School provides clear rules and consequences. • 14-Adult Role Models: Parents and other adults model positive, responsible behavior. • 15-Positive Peer Influence: Young person's friends model responsible behavior. • 16-High Expectations: Both parents and teachers encourage the young person to do well. <p>Constructive Use of Time</p> <ul style="list-style-type: none"> • 18-Youth Programs: Young person spends three or more hours per week in sports, clubs, or organizations at school and/or in the community. <p>Commitment to Learning</p> <ul style="list-style-type: none"> • 21-Achievement Motivation: Young person is motivated to do well in school.

Unit Content Standards	Unit Youth Development Standards
<p>Physical Science, Energy – Standard 10</p> <p>SC.912.P.10.6: Create and interpret potential energy diagrams, for example: chemical reactions, orbits around a central body, motion of a pendulum.</p> <p>SC.912.P.10.13: Relate the configuration of static charges to the electric field, electric force, electric potential, and electric potential energy.</p> <p>SC.912.P.10.15: Investigate and explain the relationships among current, voltage, resistance, and power.</p> <p>SC.912.P.10.16: Explain the relationship between moving charges and magnetic fields, as well as changing magnetic fields and electric fields, and their application to modern technologies.</p> <p>SC.912.P.10.18: Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications.</p> <p>Motion – Standard 12</p> <p>B. Momentum is conserved under well-defined conditions. A change in momentum occurs when a net force is applied to an object over a time interval.</p> <p>C. The Law of Universal Gravitation states that gravitational forces act on all objects irrespective of their size and position.</p> <p>D. Gases consist of great numbers of molecules moving in all directions. The behavior of gases can be modeled by the kinetic molecular theory.</p> <p>SC.912.P.12.2: Analyze the motion of an object in terms of its position, velocity, and acceleration (with respect to a frame of reference) as functions of time.</p> <p>SC.912.P.12.4: Describe how the gravitational force between two objects depends on their masses and the distance between them.</p> <p>SC.912.P.12.5: Apply the law of conservation of linear momentum to interactions, such as collisions between objects.</p> <p>SC.912.P.12.9: Recognize that time, length, and energy depends on the frame of reference.</p> <p>SC.912.P.12.10: Interpret the behavior of ideal gases in terms of kinetic molecular theory.</p> <p>Algebra</p> <p>Real and Complex Number Systems – Standard 1</p> <p>MA.912.A.1.2: Compare real number expressions.</p> <p>MA.912.A.1.4: Perform operations on real numbers (including integer exponents, radicals, percents, scientific notation, absolute value, rational numbers, and irrational numbers) using multi-step and real-world problems.</p>	<ul style="list-style-type: none"> ● 22-School Engagement: Young person is actively engaged in learning. ● 24-Bonding to School: Young person cares about her or his school. <p>Positive Values</p> <ul style="list-style-type: none"> ● 26-Caring: Young person places high value on helping other people. ● 30-Responsibility: Young person accepts and takes responsibility. <p>Social Competence</p> <ul style="list-style-type: none"> ● 33-Interpersonal Competence: Young person has empathy, sensitivity, and friendship skills. ● 34-Cultural Competence: Young person has knowledge of and comfort with people of different cultural/racial/ethnic backgrounds. ● 35-Resistance Skills: Young person can resist negative peer pressure and dangerous situations. ● 36-Peaceful Conflict Resolution: Young person seeks to resolve conflict nonviolently. <p>Positive Identity</p> <ul style="list-style-type: none"> ● 37-Personal Power: Young person feels he or she has control over “things that happen to me.” ● 38-Self-Esteem: Young person reports having a high self-esteem. ● 39-Sense of Purpose: Young person reports that “my life has a purpose”. ● 40-Positive view of Personal Future: Young person is optimistic about her or his personal future.

Unit Content Standards	Unit Youth Development Standards
<p>MA.912.A.1.5: Use dimensional (unit) analysis to perform conversions between units of measure, including rates.</p> <p>Relations and Functions – Standard 2</p> <p>MA.912.A.2.1: Create a graph to represent a real-world situation.</p> <p>MA.912.A.2.2: Interpret a graph representing a real-world situation.</p> <p>MA.912.A.2.5: Graph absolute value equations and inequalities in two variables.</p> <p>MA.912.A.2.7: Perform operations (addition, subtraction, division, and multiplication) of functions algebraically, numerically, and graphically.</p> <p>MA.912.A.2.8: Determine the composition of functions.</p> <p>MA.912.A.2.13: Solve real-world problems involving relations and functions.</p> <p>MA.912.A.2.9: Recognize, interpret, and graph functions defined piecewise with and without technology.</p> <p>MA.912.A.2.13: Solve real-world problems involving relations and functions.</p> <p>Technology</p> <p>1. Creativity and Innovation</p> <p>a. Apply existing knowledge to generate new ideas, products, or processes.</p> <p>b. Create original works as a means of personal or group expression.</p> <p>c. Use models and simulations to explore complex systems and issues.</p> <p>d. Identify trends and forecast possibilities.</p> <p>2. Communication and Collaboration</p> <p>b. Communicate information and ideas effectively to multiple audiences using a variety of media and formats.</p> <p>c. Develop cultural understanding and global awareness by engaging with learners of other cultures.</p> <p>d. Contribute to project teams to produce original works or solve problems.</p> <p>3. Research and Information Fluency</p> <p>a. Plan strategies to guide inquiry.</p> <p>b. Locate, organize analyze, evaluate, synthesize, and ethically use information from a variety of sources and media.</p> <p>c. Evaluate and select information sources and digital tools based on the appropriateness to specific tasks.</p> <p>d. Process data and report results.</p> <p>4. Critical Thinking, Problem Solving and Decision Making</p> <p>a. Identify and define authentic problems and significant questions for investigation.</p> <p>b. Plan and manage activities to develop a solution or complete a project.</p>	

Unit Content Standards	Unit Youth Development Standards
<p>c. Collect and analyze data to identify solutions and/or make informed decisions.</p> <p>d. Use multiple processes and diverse perspectives to explore alternative solutions.</p> <p>5. Digital Citizenship</p> <p>a. Advocate and practice safe, legal and responsible use of information and technology.</p> <p>b. Exhibit a positive attitude toward using technology that supports collaboration, learning and productivity</p> <p>c. Demonstrates personal responsibility for lifelong learning.</p> <p>d. Exhibit leadership for digital citizenship.</p> <p>6. Technology Operations & Concepts</p> <p>d. Transfer current knowledge to learning of new technologies.</p>	

Extension Ideas

Lesson 1: Construct paper cars and investigate ways to make them more efficient.

Lesson 2 & 3: Find an article on biofuels, alternative fuels, solar cars, hybrid vehicles or another type of energy efficient vehicle you would like to share with the class.

Lesson 4 & 5: Find an article on renewable energy, biofuels, hydrogenated cars or compressed air cars.

Lesson 7, 8 and 9: Find an article and/or picture of an energy efficient car and explain its dynamic features that make it energy efficient.

ELL /ESE Modifications and Accommodations

- | | |
|--|-----------------------------------|
| 1. Manipulative and/or drawing | 12. Open book tests |
| 2. Student explains orally | 13. Graphic organizers |
| 3. Work cooperatively | 14. Sitting near teacher |
| 4. Modifications of grades | 15. Multiple choice |
| 5. Word banks for tests | 16. Matching, true/false |
| 6. Encourage to think aloud | 17. Prior knowledge |
| 7. Repeat, review and summary | 18. Computer instruction |
| 8. Modify amount of assigned work | 19. Multi-sensory experiences |
| 9. Use realia and demonstration for vocabulary | 20. Apply to real life situations |
| 10. Repeat, providing clear explanation | 21. Extra time for completion |
| 11. Peer tutoring | |

Pre/Post-Assessment-Addendum A & J

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Lesson 1: Introduction to Sunzcars

Pre-test

Essential Question

How does scientific knowledge and reasoning provide empirically-based perspectives to inform and affect society's decision when designing and constructing energy and fuel efficient vehicles?

Content Standards

SCIENCE, Science and Society – Standard 4

SC.912.N.4.1: Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.

SC.912.N.4.2: Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.

Vocabulary

- Energy
- Construct
- Interpret
- Fuels
- Solar-energy

PHYSICAL SCIENCE, Motion – Standard 12

SC.912.P.12.5: Apply the law of conservation of linear momentum to interactions, such as collisions between objects.

SC.912.P.12.9: Recognize that time, length, and energy depends on the frame of reference.

ALGEBRA, Relations and Functions – Standard 2

MA.912.A.1.2: Compare real number expressions.

MA.912.A.1.4: Perform operations on real numbers (including integer exponents, radicals, percents, scientific notation, absolute value, rational numbers, irrational numbers) using multi-step and real-world problems.

TECHNOLOGY, Creativity and Innovation – Standard 1

Students demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology.

- A. Apply existing knowledge to generate new ideas, products, or processes
- B. Create original works as a means of personal or group expression
- C. Use models and simulations to explore complex systems and issues
- D. Identify trends and forecast possibilities

TECHNOLOGY, Research and Information Fluency – Standard 3

Students apply digital tools to gather, evaluate, synthesize, and ethically use information from a variety of sources and media.

A. Plan strategies to guide inquiry

TECHNOLOGY, Digital Citizenship – Standard 5

Students understand human, cultural and societal issues related to technology and proactive legal and ethical behavior.

A. Advocate and practice safe, legal and responsible use of information and technology

B. Exhibit a positive attitude toward using technology that supports collaboration, learning and productivity

Youth Development Standards

Support

- 3-Other adult relationships: Young person receives support from three or more nonparent adults.
- 5-Caring School Climate: School provides a caring, encouraging environment.

Empowerment

- 7-Community Values Youth: Young person perceives that adults in the community value youth.
- 10-Safety: Young person feels safe at home, school, and in the neighborhood.

Boundaries and Expectations

- 12-School Boundaries: School provides clear rules and consequences.
- 14-Adult Role Models: Parents and other adults model positive, responsible behavior.
- 15-Positive Peer Influence: Young person's friends model responsible behavior.
- 16-High Expectations: Both parents and teachers encourage the young person to do well.

Constructive Use of Time

- 18-Youth Programs: Young person spends three or more hours per week in sports, clubs, or organizations at school and/or in the community.

Commitment to Learning

- 21-Achievement Motivation: Young person is motivated to do well in school
- 22-School Engagement: Young person is actively engaged in learning.
- 24-Bonding to School: Young person cares about her or his school.

Teacher Background Knowledge: Addendum AA

Materials

Student notebooks, graphic organizers, pencils, multi-colored markers, colored pencils, tape, glue, foil, regular white paper and paper cars.

Resources: Computers with Internet accessibility and printers.

Procedures

1. Introduction
2. Pretest
3. Introduce unit, vocabulary, expectations of class and notebooking.
4. Class discussion based on prior knowledge of energy efficient vehicles.
5. Have students work in groups researching and locating an energy efficient vehicle.
6. Write a summary of your finding of an energy efficient vehicle
7. Introduce next unit, give article assignments
8. Notebooking
9. Collect notebooks

Formative Assessment

The teacher will assess student knowledge of what students know and how students connect prior knowledge through dialogues and discussions. The teacher will facilitate discussion and encourage students to share information.

Lesson 2: Collaborative Group Reading Passage Activity

Essential Question

What are the components to consider when constructing energy efficient cars and vehicles with electrical, mechanical and solar panel systems?

Content Standards

PHYSICAL SCIENCE, Energy – Standard 10

SC.912.P.10.6: Create and interpret potential energy diagrams, for example: chemical reactions, orbits around a central body, motion of a pendulum.

SC.912.P.10.13: Relate the configuration of static charges to the electric field, electric force, electric potential, and electric potential energy.

SC.912.P.10.15: Investigate and explain the relationships among current, voltage, resistance, and power.

SC.912.P.10.16: Explain the relationship between moving charges and magnetic fields, as well as changing magnetic fields and electric fields, and their application to modern technologies.

SC.912.P.10.18: Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications.

ALEGBRA, Real and Complex Number Systems – Standard 1

MA.912.A.1.2: Compare real number expressions.

MA.912.A.1.4: Perform operations of real numbers (including integer exponents, radicals, percents, scientific notation, absolute value, rational numbers, and irrational numbers) using multi-step and real-world problems.

Relations and Functions – Standard 2

a. Draw and interpret graphs of relations.

b. Understand the notation and concept of a function, find domains and ranges, and link equations to functions.

MA.912.A.2.1: Create a graph to represent a real-world situation.

MA.912.A.2.2: Interpret a graph representing a real-world situation.

MA.912.A.2.9: Recognize, interpret, and graph functions defined piece-wise with and without technology.

MA.912.A.2.13: Solve real-world problems involving relations and functions.

Vocabulary

- Alternative
- Biomass
- Fossil fuel
- Hybrid car
- Electric

Youth Development Standards

Support

- 5-Caring School Climate: School provides a caring, encouraging environment.

Empowerment

- 7-Community Values Youth: Young person perceives that adults in the community value youth.
- 12-School Boundaries: School provides clear rules and consequences.
- 14-Adult Role Models: Parents and other adults model positive, responsible behavior.
- 15-Positive Peer Influence: Young person's friends model responsible behavior.
- 16-High Expectations: Both parents and teachers encourage the young person to do well.

Constructive Use of Time

- 18-Youth Programs: Young person spends three or more hours per week in sports, clubs, or organizations at school and/or in the community.

Commitment to Learning

- 21-Achievement Motivation: Young person is motivated to do well in school
- 22-School Engagement: Young person is actively engaged in learning.
- 24-Bonding to School: Young person cares about her or his school.

Positive Values

- 26-Caring: Young person places high value on helping other people.
- 30-Responsibility: Young person accepts and takes responsibility.

Teacher Background Knowledge: Addendum AA

Materials

Student notebooks, graphic organizers, pencils, multi-colored markers, colored pencils, tape, glue, foil, regular white paper and Reading Passage hand-outs.

Resources: Computers with Internet accessibility and printers.

Procedure

1. Student article presentation
2. Introduce Lesson
3. Front-load vocabulary
4. Collaborative Group Reading Passage Activity (Addendum D)
5. Students design, display and present a summary of their reading passage with pictorial representation on a large Post-It Tablet paper.
6. Introduce next unit, give article assignments for next lesson
7. Notebooking
8. Collect notebooks

Formative Assessment

The teacher will assess student knowledge of what students know and how students connect prior knowledge through dialogues and discussions. The teacher will facilitate discussion and encourage students to share information.

Lesson 3: Collaborative Group Reading Passage Activity

Essential Question

How can power created by solar cells in a car or vehicle be maximized?

Content Standards

PHYSICAL SCIENCE, Energy – Standard 10

SC.912.P.10.6: Create and interpret potential energy diagrams, for example: chemical reactions, orbits around a central body, motion of a pendulum.

SC.912.P.10.13: Relate the configuration of static charges to the electric field, electric force, electric potential, and electric potential energy.

SC.912.P.10.15: Investigate and explain the relationships among current, voltage, resistance, and power.

SC.912.P.10.16: Explain the relationship between moving charges and magnetic fields, as well as changing magnetic fields and electric fields, and their application to modern technologies.

SC.912.P.10.18: Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications.

ALGEBRA, Real and Complex Number Systems – Standard 1

MA.912.A.1.2: Compare real number expressions.

MA.912.A.1.4: Perform operations of real numbers (including integer exponents, radicals, percents, scientific notation, absolute value, rational numbers, and irrational numbers) using multi-step and real-world problems.

TECHNOLOGY, Relations and Functions – Standard 2

a. Draw and interpret graphs of relations.

b. Understand the notation and concept of a function, find domains and ranges, and link equations to functions.

MA.912.A.2.1: Create a graph to represent a real-world situation.

MA.912.A.2.2: Interpret a graph representing a real-world situation.

MA.912.A.2.9: Recognize, interpret, and graph functions defined piece-wise with and without technology.

MA.912.A.2.13: Solve real-world problems involving relations and functions.

Vocabulary

- Pollution
- Power
- Power outlet
- Recharge
- Reduce
- Smog

Youth Development Standards

Support

- 3-Other adult relationships: Young person receives support from three or more nonparent adults.
- 5-Caring School Climate: School provides a caring, encouraging environment.

Empowerment

- 10-Safety: Young person feels safe at home, school, and in the neighborhood.

Boundaries and Expectations

- 12-School Boundaries: School provides clear rules and consequences.
- 14-Adult Role Models: Parents and other adults model positive, responsible behavior.
- 15-Positive Peer Influence: Young person's friends model responsible behavior.

Constructive Use of Time

- 18-Youth Programs: Young person spends three or more hours per week in sports, clubs, or organizations at school and/or in the community.

Commitment to Learning

- 21-Achievement Motivation: Young person is motivated to do well in school
- 22-School Engagement: Young person is actively engaged in learning.
- 24-Bonding to School: Young person cares about her or his school.

Positive Values

- 26-Caring: Young person places high value on helping other people.
- 30-Responsibility: Young person accepts and takes responsibility.

Teacher Background Knowledge: Addendum AA

Materials

Student notebooks, graphic organizers, pencils, multi-colored markers, colored pencils, tape, glue, foil, regular white paper and Reading Passage hand-outs.

Resources: Computers with Internet accessibility and printers.

Procedure

1. Student article presentation
2. Introduce Lesson
3. Front-load vocabulary
4. Collaborative Group Reading Passage Activity (Addendum D)
5. Students design, display and present a summary of their reading passage with pictorial representation on a large Post-It Tablet paper.
6. Introduce next unit, give article assignments for next lesson
7. Notebooking
8. Collect notebooks

Formative Assessment

The teacher will assess student knowledge of what they know and how they connect information being learning through dialogues and discussions, group activities and task oriented projects (Collaborative Group Research and Inquiries). The teacher will support and interact with small collaborative groups of students ensuring students are focused and engaged in learning.

Lesson 4: Collaborative Group Research Projects

Essential Question

How are biofuels used to create fuel efficient transportation?

Content Standards

The Practice of Science – Standard 1

SC.912.N.1.2: Describe and explain what characterizes science and its methods.

SC.912.N.1.5: Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.

SC.912.N.1.6: Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

SC.912.N.1.7: Recognize the role of creativity in constructing scientific questions, methods and explanations.

PHYSICAL SCIENCE – Standard 12: Motion

B. Momentum is conserved under well-defined conditions. A change in momentum occurs when a net force is applied to an object over a time interval.

D. Gases consist of great numbers of molecules moving in all directions. The behavior of gases can be modeled by the kinetic molecular theory.

SC.912.P.12.2: Analyze the motion of an object in terms of its position, velocity, and acceleration (with respect to a frame of reference) as functions of time.

SC.912.P.12.4: Describe how the gravitational force between two objects depends on their masses and the distance between them.

SC.912.P.12.10: Interpret the behavior of ideal gases in terms of kinetic molecular theory.

ALGEBRA, Relations and Functions – Standard 2

a. Draw and interpret graphs of relations

b. Understand the notation and concept of a function, find domains and ranges, and link equations to functions

MA.912.A.2.1: Create a graph to represent a real-world situation.

MA.912.A.2.2: Interpret a graph representing a real-world situation.

MA.912.A.2.5: Graph absolute value equations and inequalities in two variables.

Vocabulary

- Renewable energy
- Biofuels
- Transportation
- Hydrogenated-Fuel Cells
- Photovoltaic

MA.912.A.2.7: Perform operations (addition, subtraction, division, and multiplication) of functions algebraically, numerically, and graphically.

MA.912.A.2.8: Determine the composition of functions.

MA.912.A.2.13: Solve real-world problems involving relations and functions.

MA.912.A.2.9: Recognize, interpret, and graph functions defined piece-wise with and without technology.

MA.912.A.2.13: Solve real-world problems involving relations and functions.

TECHNOLOGY, Communication and Collaboration – Standard 2

b. Communicate information and ideas effectively to multiple audiences using a variety of media and formats.

c. Develop cultural understanding and global awareness by engaging with learners of other cultures.

d. Contribute to project teams to produce original works or solve problems.

b. Locate, organize analyze, evaluate, synthesize, and ethically use information from a variety of sources and media.

c. Evaluate and select information sources and digital tools based on the appropriateness to specific tasks.

d. Process data and report results

Technology, Critical Thinking, Problem Solving and Decision Making – Standard 4

Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.

a. Identify and define authentic problems and significant questions for investigation

b. Plan and manage activities to develop a solution or complete a project

c. Collect and analyze data to identify solutions and/or make informed decisions

d. Use multiple processes and diverse perspectives to explore alternative solutions.

Youth Development Standards

Support

- 3-Other adult relationships: Young person receives support from three or more nonparent adults.
- 5-Caring School Climate: School provides a caring, encouraging environment.

Empowerment

- 10-Safety: Young person feels safe at home, school, and in the neighborhood.

Boundaries and Expectations

- 12-School Boundaries: School provides clear rules and consequences.
- 14-Adult Role Models: Parents and other adults model positive, responsible behavior.
- 15-Positive Peer Influence: Young person's friends model responsible behavior.

Constructive Use of Time

- 18-Youth Programs: Young person spends three or more hours per week in sports, clubs, or organizations at school and/or in the community.

Commitment to Learning

- 21-Achievement Motivation: Young person is motivated to do well in school
- 22-School Engagement: Young person is actively engaged in learning.
- 24-Bonding to School: Young person cares about her or his school.

Positive Values

- 26-Caring: Young person places high value on helping other people.
- 30-Responsibility: Young person accepts and takes responsibility.

Teacher Background Knowledge: Addendum AA**Materials**

Student notebooks, graphic organizers, pencils, multi-colored markers, colored pencils, tape, glue, foil, regular white paper and Collaborative Research hand-outs.

Resources: Computers with Internet accessibility and printers.

Procedure

1. Student article presentation
2. Introduce Lesson
3. Front-load vocabulary
4. Collaborative Research Groups (Addendum E)
5. Students design and a summary of their reading passage with pictorial representation on a large Post-It Tablet paper.
6. Gallery Walk
7. Introduce next unit, give article assignments for next lesson
8. Notebooking
9. Collect notebooks

Formative Assessment

The teacher will assess student knowledge of what they know and how they connect information being learning through dialogues and discussions, group activities and task oriented projects (Collaborative Group Research and Inquiries). The teacher will support and interact with small collaborative groups of students ensuring students are focused and engaged in learning.

Lesson 5: Collaborative Group Research Projects

Essential Question

Why is it important to understand the various types of fuel efficient vehicles for future possibilities?

Content Standards

The Practice of Science – Standard 1

SC.912.N.1.2: Describe and explain what characterizes science and its methods.

SC.912.N.1.5: Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.

SC.912.N.1.6: Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

SC.912.N.1.7: Recognize the role of creativity in constructing scientific questions, methods and explanations.

Motion – Standard 12

B. Momentum is conserved under well-defined conditions. A change in momentum occurs when a net force is applied to an object over a time interval.

D. Gases consist of great numbers of molecules moving in all directions. The behavior of gases can be modeled by the kinetic molecular theory.

SC.912.P.12.2: Analyze the motion of an object in terms of its position, velocity, and acceleration (with respect to a frame of reference) as functions of time.

SC.912.P.12.4: Describe how the gravitational force between two objects depends on their masses and the distance between them.

SC.912.P.12.10: Interpret the behavior of ideal gases in terms of kinetic molecular theory.

ALGEBRA, Relations and Functions – Standard 2

A. Draw and interpret graphs of relations

B. Understand the notation and concept of a function, find domains and ranges, and link equations to functions.

MA.912.A.2.1: Create a graph to represent a real-world situation.

MA.912.A.2.2: Interpret a graph representing a real-world situation.

MA.912.A.2.5: Graph absolute value equations and inequalities in two variables.

Vocabulary

- Hybrid
- Compressed air
- Emissions-free
- Combustion
- Infrastructure

MA.912.A.2.7: Perform operations (addition, subtraction, division, and multiplication) of functions algebraically, numerically, and graphically.

MA.912.A.2.8: Determine the composition of functions.

MA.912.A.2.9: Recognize, interpret, and graph functions defined piece-wise with and without technology.

MA.912.A.2.13: Solve real-world problems involving relations and functions.

TECHNOLOGY, Communication and Collaboration –Standard 2

B. Communicate information and ideas effectively to multiple audiences using a variety of media and formats.

C. Develop cultural understanding and global awareness by engaging with learners of other cultures

D. Contribute to project teams to produce original works or solve problems.

TECHNOLOGY, Research and Information Fluency – Standard 3

B. Locate, organize analyze, evaluate, synthesize, and ethically use information from a variety of sources and media.

C. Evaluate and select information sources and digital tools based on the appropriateness to specific tasks

D. Process data and report results

Technology, Critical Thinking, Problem Solving and Decision Making, Standard 4

Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.

A. Identify and define authentic problems and significant questions for investigation

B. Plan and manage activities to develop a solution or complete a project

C. Collect and analyze data to identify solutions and/or make informed decisions

D. Use multiple processes and diverse perspectives to explore alternative solutions.

Youth Development Standards

Support

- 3-Other adult relationships: Young person receives support from three or more nonparent adults.
- 5-Caring School Climate: School provides a caring, encouraging environment.

Empowerment

- 10-Safety: Young person feels safe at home, school, and in the neighborhood.

Boundaries and Expectations

- 12-School Boundaries: School provides clear rules and consequences.
- 14-Adult Role Models: Parents and other adults model positive, responsible behavior.
- 15-Positive Peer Influence: Young person's friends model responsible behavior.

Constructive Use of Time

- 18-Youth Programs: Young person spends three or more hours per week in sports, clubs, or organizations at school and/or in the community.

Commitment to Learning

- 21-Achievement Motivation: Young person is motivated to do well in school
- 22-School Engagement: Young person is actively engaged in learning.
- 24-Bonding to School: Young person cares about her or his school.

Positive Values

- 26-Caring: Young person places high value on helping other people.
- 30-Responsibility: Young person accepts and takes responsibility.

Social Competence

- **33-Interpersonal Competence:** Young person has empathy, sensitivity, and friendship skills.
- **34-Cultural Competence:** Young person has knowledge of and comfort with people of different cultural/racial/ethnic backgrounds.

Teacher Background Knowledge: Addendum AA**Materials**

Student notebooks, graphic organizers, pencils, multi-colored markers, colored pencils, tape, glue, foil, regular white paper and Collaborative Research hand-outs.

Resources: Computers with Internet accessibility and printers.

Procedure

1. Student article presentation
2. Introduce Lesson
3. Front-load vocabulary
4. Collaborative Research Groups (Addendum E)
5. Students design and a summary of their reading passage with pictorial representation on a large Post-It Tablet paper.
6. Gallery Walk
7. Introduce next unit, give article assignments for next lesson
8. Notebooking
9. Collect notebooks

Formative Assessment

The teacher will assess student knowledge of what they know and how they connect information being learning through dialogues and discussions, group activities and task oriented projects (Collaborative Group Research and Inquiries). The teacher will support and interact with small collaborative groups of students ensuring students are focused and engaged in learning.

Lesson 6: Introduction and Assembly of SunEZoon Car

Essential Question

What are the important components of understanding speed and velocity when constructing and designing energy efficient vehicles?

Content Standards

SC.912.N.1.5: Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.

SC.912.N.1.6: Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

SC.912.N.1.7: Recognize the role of creativity in constructing scientific questions, methods and explanations.

SC.912.N.4.1: Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.

SC.912.N.4.2: Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.

Vocabulary

- Current
- Voltage
- Photovoltaic cell
- Conductor
- Chassis
- Axle

PHYSICAL SCIENCE, ENERGY – Standard 10

SC.912.P.10.6: Create and interpret potential energy diagrams, for example: chemical reactions, orbits around a central body, motion of a pendulum.

SC.912.P.10.13: Relate the configuration of static charges to the electric field, electric force, electric potential, and electric potential energy.

SC.912.P.10.15: Investigate and explain the relationships among current, voltage, resistance, and power.

SC.912.P.10.16: Explain the relationship between moving charges and magnetic fields, as well as changing magnetic fields and electric fields, and their application to modern technologies.

SC.912.P.10.18: Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications.

Motion – Standard 12

B. Momentum is conserved under well-defined conditions. A change in momentum occurs when a net force is applied to an object over a time interval.

SC.912.P.12.2: Analyze the motion of an object in terms of its position, velocity, and acceleration (with respect to a frame of reference) as functions of time.

SC.912.P.12.4: Describe how the gravitational force between two objects depends on their masses and the distance between them.

SC.912.P.12.5: Apply the law of conservation of linear momentum to interactions, such as collisions between objects.

SC.912.P.12.9: Recognize that time, length, and energy depends on the frame of reference.

SC.912.P.12.10: Interpret the behavior of ideal gases in terms of kinetic molecular theory.

ALGEBRA

MA.912.A.2.13: Solve real-world problems involving relations and functions.

MA.912.A.1.5: Use dimensional (unit) analysis to perform conversions between units of measure, including rates.

TECHNOLOGY, Creativity and Innovation – Standard 1

Students demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology. Students:

- A.** Apply existing knowledge to generate new ideas, products, or processes.
- B.** Create original works as a means of personal or group expression
- C.** Use models and simulations to explore complex systems and issues

TECHNOLOGY, Communication and Collaboration – Standard 2

- B.** Communicate information and ideas effectively to multiple audiences using a variety of media and formats.
- C.** Develop cultural understanding and global awareness by engaging with learners of other cultures
- D.** Contribute to project teams to produce original works or solve problems.

TECHNOLOGY, Research and Information Fluency – Standard 3

Students apply digital tools to gather, evaluate, synthesize, and ethically use information from a variety of sources and media.

- A.** Plan strategies to guide inquiry
- B.** Locate, organize analyze, evaluate, synthesize, and ethically use information from a variety of sources and media.

Youth Development Standards

Constructive Use of Time

- 18-Youth Programs: Young person spends three or more hours per week in sports, clubs, or organizations at school and/or in the community.

Commitment to Learning

- 21-Achievement Motivation: Young person is motivated to do well in school
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- 26-Caring: Young person places high value on helping other people.
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Social Competence

- **33-Interpersonal Competence:** Young person has empathy, sensitivity, and friendship skills.
- **34-Cultural Competence:** Young person has knowledge of and comfort with people of different cultural/racial/ethnic backgrounds.

Teacher Background Knowledge: Addendum AA

Materials

Student notebooks, graphic organizers, pencils, multi-colored markers, colored pencils, tape, glue, foil, regular white paper. Each student group will obtain a kit containing solar panel with alligator clamps, motor, wheels steel axles, gear font, chassis parts (colors may vary), and a cut-and-fold cover. Construction requires scissors and hobby knife or sandpaper.

Resources: Computers with Internet accessibility and printers.

Procedure

1. Student article presentation
2. Introduce Lesson
3. Front-load vocabulary
4. Students will construct their SunEZoon Car
5. Setup the body (chassis).
6. Add the axle and wheels
7. Mount solar panels
8. Diagram the car
9. Write a summary brief about your car
10. Predict how the cars would win in a race based on the car design

Formative Assessment

The teacher will assess student knowledge of what they know and how they connect information being learning through dialogues and discussions, group activities and task

oriented projects (Collaborative Group Research and Inquiries). The teacher will support and interact with small collaborative groups of students ensuring students are focused and engaged in learning.

Lesson 7: Assembly of SunEZoon Car

Essential Question

In your opinion, what are the most important features of an energy efficient vehicle? Explain writing a minimum of 3 paragraphs.

Content Standards

SC.912.N.1.5: Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.

SC.912.N.1.6: Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

SC.912.N.1.7: Recognize the role of creativity in constructing scientific questions, methods and explanations.

SC.912.N.4.1: Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.

SC.912.N.4.2: Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.

Vocabulary

- Incandescent light
- Alligator clamps
- Motor
- Velocity
- Gears

PHYSICAL SCIENCE, ENERGY – Standard 10

SC.912.P.10.6: Create and interpret potential energy diagrams, for example: chemical reactions, orbits around a central body, motion of a pendulum.

SC.912.P.10.13: Relate the configuration of static charges to the electric field, electric force, electric potential, and electric potential energy.

SC.912.P.10.15: Investigate and explain the relationships among current, voltage, resistance, and power.

SC.912.P.10.16: Explain the relationship between moving charges and magnetic fields, as well as changing magnetic fields and electric fields, and their application to modern technologies.

SC.912.P.10.18: Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications.

Motion – Standard 12

B. Momentum is conserved under well-defined conditions. A change in momentum occurs when a net force is applied to an object over a time interval.

SC.912.P.12.2: Analyze the motion of an object in terms of its position, velocity, and acceleration (with respect to a frame of reference) as functions of time.

SC.912.P.12.4: Describe how the gravitational force between two objects depends on their masses and the distance between them.

SC.912.P.12.5: Apply the law of conservation of linear momentum to interactions, such as collisions between objects.

SC.912.P.12.9: Recognize that time, length, and energy depends on the frame of reference.

SC.912.P.12.10: Interpret the behavior of ideal gases in terms of kinetic molecular theory.

ALGEBRA

MA.912.A.2.13: Solve real-world problems involving relations and functions.

MA.912.A.1.5: Use dimensional (unit) analysis to perform conversions between units of measure, including rates.

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- B.** Create original works as a means of personal or group expression
- C.** Use models and simulations to explore complex systems and issues

TECHNOLOGY, Communication and Collaboration – Standard 2

- B.** Communicate information and ideas effectively to multiple audiences using a variety of media and formats.
- C.** Develop cultural understanding and global awareness by engaging with learners of other cultures
- D.** Contribute to project teams to produce original works or solve problems.

TECHNOLOGY, Research and Information Fluency – Standard 3

Students apply digital tools to gather, evaluate, synthesize, and ethically use information from a variety of sources and media.

- A.** Plan strategies to guide inquiry
- B.** Locate, organize analyze, evaluate, synthesize, and ethically use information from a variety of sources and media.

Youth Development Standards

Constructive Use of Time

- 18-Youth Programs: Young person spends three or more hours per week in sports, clubs, or organizations at school and/or in the community.

Commitment to Learning

- 21-Achievement Motivation: Young person is motivated to do well in school
- 22-School Engagement: Young person is actively engaged in learning.
- 24-Bonding to School: Young person cares about her or his school.

Positive Values

- 26-Caring: Young person places high value on helping other people.
- 30-Responsibility: Young person accepts and takes responsibility.

Social Competence

- **33-Interpersonal Competence:** Young person has empathy, sensitivity, and friendship skills.
- **34-Cultural Competence:** Young person has knowledge of and comfort with people of different cultural/racial/ethnic backgrounds.

Teacher Background Knowledge: Addendum AA

Materials

Student notebooks, graphic organizers, pencils, multi-colored markers, colored pencils, tape, glue, foil, regular white paper. Each student group will obtain a kit containing solar panel with alligator clamps, motor, wheels steel axles, gear font, chassis parts (colors may vary), and a cut-and-fold cover. Construction requires scissors and hobby knife or sandpaper.

Resources: Computers with Internet accessibility and printers.

Procedure

1. Student article presentation
2. Introduce Lesson
3. Front-load vocabulary
4. Students will construct their SunEZoon Car
5. Setup the body (chassis).
6. Add the axle and wheels
7. Mount solar panels
8. Diagram the car
9. Write a summary brief about your car
10. Predict how the cars would win in a race based on the car design

Formative Assessment

The teacher will assess student knowledge of what they know and how they connect information being learning through dialogues and discussions, group activities and task oriented projects (Collaborative Group Research and Inquiries). The teacher will support and interact with small collaborative groups of students ensuring students are focused and engaged in learning.

Lesson 8: Introduction and Group Advertisement & Presentation of SunEZoon Car

Essential Question

What are the important components of advertisement? Why?

Content Standards

The Practice of Science – Standard 1

SC.912.N.1.2: Describe and explain what characterizes science and its methods.

SC.912.N.1.5: Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.

SC.912.N.1.6: Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

SC.912.N.1.7: Recognize the role of creativity in constructing scientific questions, methods and explanations

PHYSICAL SCIENCE, ENERGY – Standard 10

SC.912.P.10.6: Create and interpret potential energy diagrams, for example: chemical reactions, orbits around a central body, motion of a pendulum.

PHYSICAL SCIENCE, Motion – Standard 12

SC.912.P.12.10: Interpret the behavior of ideal gases in terms of kinetic molecular theory.

ALGEBRA

MA.912.A.2.13: Solve real-world problems involving relations and functions.

MA.912.A.1.5: Use dimensional (unit) analysis to perform conversions between units of measure, including rates

Youth Development Standards

Boundaries and Expectations

- 15-Positive Peer Influence: Young person’s friends model responsible behavior.
- 16-High Expectations: Both parents and teachers encourage the young person to do well.

Constructive Use of Time

- 18-Youth Programs: Young person spends three or more hours per week in sports, clubs, or organizations at school and/or in the community.

Commitment to Learning

- 21-Achievement Motivation: Young person is motivated to do well in school
- 22-School Engagement: Young person is actively engaged in learning.

Vocabulary

- Review of unit word lists

- 24-Bonding to School: Young person cares about her or his school.

Positive Values

- 26-Caring: Young person places high value on helping other people.
- 30-Responsibility: Young person accepts and takes responsibility.

Social Competence

- 33-Interpersonal Competence: Young person has empathy, sensitivity, and friendship skills.
- 34-Cultural Competence: Young person has knowledge of and comfort with people of different cultural/racial/ethnic backgrounds.
- 35-Resistance Skills: Young person can resist negative peer pressure and dangerous situations.
- 36-Peaceful Conflict Resolution: Young person seeks to resolve conflict nonviolently.

Positive Identity

- 37-Personal Power: Young person feels he or she has control over “things that happen to me.”

Teacher Background Knowledge: Addendum AA

Materials

Student notebooks, graphic organizers, pencils, multi-colored markers, colored pencils, tape, glue, foil, regular white paper. Each student group will obtain a kit containing solar panel with alligator clamps, motor, wheels steel axles, gear font, chassis parts (colors may vary), and a cut-and-fold cover. Construction requires scissors and hobby knife or sandpaper.

Resources: Computers with Internet accessibility and printers.

Procedure

1. Student article presentation
2. Introduce Lesson on Advertisement
3. Front-load vocabulary
4. Students will construct their SunEZoon Car
5. Set up the body (chassis).
6. Add the axle and wheels
7. Mount solar panels
8. Diagram the car
9. Write a summary brief about your car
10. Predict how the cars would win in a race based on the car design

Formative Assessment

The teacher will assess student knowledge of what they know and how they connect information being learning through dialogues and discussions, group activities and task oriented projects (Collaborative Group Research and Inquiries). The teacher will support and

interact with small collaborative groups of students ensuring students are focused and engaged in learning.

Lesson 9: Group Advertisement & Presentation of SunEZoon Car

Essential Question:

What criteria did you use to promote and advertise your group's solar car?
Design a criteria list for advertising.

Content Standards

The Practice of Science – Standard 1

SC.912.N.1.2: Describe and explain what characterizes science and its methods.

SC.912.N.1.5: Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.

SC.912.N.1.6: Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

SC.912.N.1.7: Recognize the role of creativity in constructing scientific questions, methods and explanations

PHYSICAL SCIENCE, ENERGY – Standard 10

SC.912.P.10.6: Create and interpret potential energy diagrams, for example: chemical reactions, orbits around a central body, motion of a pendulum.

PHYSICAL SCIENCE, Motion – Standard 12

SC.912.P.12.10: Interpret the behavior of ideal gases in terms of kinetic molecular theory.

Algebra

MA.912.A.2.13: Solve real-world problems involving relations and functions.

MA.912.A.1.5: Use dimensional (unit) analysis to perform conversions between units of measure, including rates.

Youth Development Standards

Boundaries and Expectations

- 15-Positive Peer Influence: Young person's friends model responsible behavior.
- 16-High Expectations: Both parents and teachers encourage the young person to do well.

Constructive Use of Time

- 18-Youth Programs: Young person spends three or more hours per week in sports, clubs, or organizations at school and/or in the community.

Commitment to Learning

- 21-Achievement Motivation: Young person is motivated to do well in school

Vocabulary

- Review Word List

- 22-School Engagement: Young person is actively engaged in learning.
- 24-Bonding to School: Young person cares about her or his school.

Positive Values

- 26-Caring: Young person places high value on helping other people.
- 30-Responsibility: Young person accepts and takes responsibility.

Social Competence

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- 36-Peaceful Conflict Resolution: Young person seeks to resolve conflict nonviolently.

Positive Identity

- 37-Personal Power: Young person feels he or she has control over “things that happen to me.”

Teacher Background Knowledge: Addendum AA

Materials

Student notebooks, graphic organizers, pencils, multi-colored markers, colored pencils, tape, glue, foil, regular white paper. Each student group will obtain a kit containing solar panel with alligator clamps, motor, wheels steel axles, gear font, chassis parts (colors may vary), and a cut-and-fold cover. Construction requires scissors and hobby knife or sandpaper.

Resources: Computers with Internet accessibility and printers.

Procedure

1. Student article presentation
2. Continue Advertisement Lesson
3. Student’s Conduct Presentation

Formative Assessment

The teacher will assess student knowledge of what they know and how they connect information being learning through dialogues and discussions, group activities and task oriented projects (Collaborative Group Research and Inquiries). The teacher will support and interact with small collaborative groups of students ensuring students are focused and engaged in learning.

Lesson 10: Group Advertisement & Presentation

Essential Question

What were the features that you enjoyed most in this unit? Explain.

What were the features that you least enjoyed in this unit? Explain.

Content Standards

TECHNOLOGY, Digital Citizenship – Standard 5

Students understand human, cultural and societal issues related to technology and proactive legal and ethical behavior.

- a. Advocate and practice safe, legal and responsible use of information and technology
- b. Exhibit a positive attitude toward using technology that supports collaboration, learning and productivity
- c. Demonstrates personal responsibility for lifelong learning
- d. Exhibit leadership for digital citizenship

6. *Technology Operations and Concepts*

Students demonstrate a sound understanding of technology concepts, systems, and operations.

- d. Transfer current knowledge to learning of new technologies.

Youth Development Standards:

Boundaries and Expectations

- 15-Positive Peer Influence: Young person's friends model responsible behavior.
- 16-High Expectations: Both parents and teachers encourage the young person to do well.

Constructive Use of Time

- 18-Youth Programs: Young person spends three or more hours per week in sports, clubs, or organizations at school and/or in the community.

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Social Competence

- 33-Interpersonal Competence: Young person has empathy, sensitivity, and friendship skills.

Vocabulary

- Review Word List

- 34-Cultural Competence: Young person has knowledge of and comfort with people of different cultural/racial/ethnic backgrounds.
- 35-Resistance Skills: Young person can resist negative peer pressure and dangerous situations.
- 36-Peaceful Conflict Resolution: Young person seeks to resolve conflict nonviolently.

Positive Identity

- 37-Personal Power: Young person feels he or she has control over “things that happen to me.”

Teacher Background Knowledge: Addendum AA

Materials

Student notebooks, graphic organizers, pencils, multi-colored markers, colored pencils, tape, glue, foil, regular white paper. Each student group will obtain a kit containing solar panel with alligator clamps, motor, wheels steel axles, gear font, chassis parts (colors may vary), and a cut-and-fold cover. Construction requires scissors and hobby knife or sandpaper.

Resources: Computers with Internet accessibility and printers.

Procedure

1. Student article presentation
2. Continue Advertisement Lesson
3. Student’s Conduct Presentation

Formative Assessment

The teacher will assess student knowledge of what they know and how they connect information being learning through dialogues and discussions, group activities and task oriented projects (Collaborative Group Research and Inquiries). The teacher will support and interact with small collaborative groups of students ensuring students are focused and engaged in learning.

Addendums

**Science, Technology, Engineering, and Mathematics (STEM) for Getting Started in: ROBOTICS,
GRADES 9-12**

Teacher Background Knowledge

I. Overview

This Robotic Unit is an introductory class that introduces high school students to an integrative study of Science, Technology, Engineering and Mathematics (STEM) underpinned by a robotic theme. Students will be introduced to Robotics through explicit instruction, content maps, interactive dialogues and discussions. A **Pre-Assessment and Post Assessment** (*Addendum A and J*) will be administered determining student knowledge and academic progress within the constructs of the Robotics Program. Audio and video clips and web sites will be integrated providing in-depth information aligned to this unit. Students will gain understanding of the importance of energy efficiency, gain knowledge of fuels, understand society's concern about energy and efficiency. Students will gain the skills necessary to create and design Solar Vehicles noting the alternative fuels that can be utilized for transportation purposes, as compared to today's conventional vehicles.

During each lesson of sixty minutes, students will reflect on what they learned writing down personal thoughts, opinions, drawings and inquiries in their notebook. The class will call this **Notebooking** (*Addendum D*). Notebooking is a learning tool providing students with the time to think, reflect, take notes, hypothesize, write vocabulary words and definitions, and gather information and brainstorm. Students will be encouraged to add information that may extend the lesson compiling their own dialogues on the importance of being energy and fuel efficient.

An introduction to Robotics will begin with brainstorming with the class using a content map, front-loading vocabulary, defining vocabulary and interacting in group activities becoming familiar with terms and words. Students may work in groups aligning strips of words with definitions or organizing words in categories. Students will engage in group learning and academic conversation sharing information and determining the usage and definition to vocabulary words. Additionally, students will be provided with Reading Passages. They will work in collaborative learning groups answering reading passage questions, compare fuel costs, mileage efficiency and reliability of various vehicles and discuss operations of various types of alternative fuel systems. Introductory activities will include **Reading Passages** (*Addendum B*) for each student which includes a list of vocabulary words and terms students should know. Students will be assigned to student collaborative reading groups. After the groups are constructed, students will read passages, insert information, include data, design posters, and construct graphs presenting information to the whole class. In doing so, students will formulate theories and predict outcomes based on their group's reading passage. New vocabulary and terminology will be front-loaded and used within class discussions and dialogues, creating deeper understanding through esoteric conversations. Students will display posters, walk through gallery of student formulated ideas, adding information, questions and thoughts to each one of the poster displays.

Students will work in **Collaborative Research Groups** (*Addendum G*) gathering data, information and specific information about Gasoline, Cars, Pollution, Solar Cars, Solar Races, Electric and Hybrid Cars. Each group will research, study, write responses to questions and insert data in tables. Students will engage in discussions presenting research from articles and passages readings and research answering

questions about their group project. After obtaining data and information, students will graph research results from each group discussing, analyzing and synthesizing information for class display.

As students advance in their skills, they will develop, construct and design their group's Solar Vehicle. Students will design, construct, create and formulate the overall design developing an **Advertisement** (Addendum H) that would promote the sale of their solar vehicle. Student presentations will include **Peer Review Rubric** (Addendum E). This activity will provide students with the opportunity to describe and present their group advertisements. All advertisements will be displayed and students will conduct peer reviews of each presentation.

II. Addendums

Teacher Background Knowledge (Addendum AA)

Pre-Assessment (Addendum A)

Collaborative/Small Group Reading Passages (Addendum B)

Graphic Organizers: Concept Map, Frayer Model, KWL and Hold Your Thinking (Addendum C)

Notebooking (Addendum D)

Peer Review Rubric (Addendum E)

Gallery Walk (Addendum F)

Collaborative Research Groups (Addendum G)

Advertisement Rubric (Addendum H)

Vocabulary Words and Definitions (Addendum I)

Post-Assessment (Addendum J)

Answer Keys (Addendum K)

Internet and Web Sites (Addendum L)

III. Lessons and Activities

Lesson 1–Teacher Introduction of Robotics, Reading Passages and Notebooking

Teacher introduction (25 minutes), Reading Passages, (25 minutes) and Notebooking (10 minutes).

Essential Question: How does scientific knowledge and reasoning provide empirically-based perspectives to inform and affect society's decision when designing and constructing energy and fuel efficient vehicles?

The introduction to the unit will begin with an anticipatory set that includes using a content map, web sites, audio and video clips, group activities (Reading Passages) and dialogues and discussions. The introductory lesson will engage students in the subject as they understand the relevance and importance of energy and fuel efficiency. Upon closure of the lesson, inform students what they will be learning about in Lesson 2. Encourage students to bring information about solar vehicles. Allow students 10-15 minutes for Notebooking. Collect Notebooks and make comments to encourage students to engage in thoughtful and purposeful learning. Return notebooks at the beginning of Lesson 2.

Lesson 2—Student Article Presentation, Inquiry, Collaborative Group Reading Passage and Notebooking

Student presentation (10 minutes), Inquiry Activity (15 minutes), Collaborative Group Research, (25 minutes) and Notebooking, (10 minutes).

Essential Question: What are the components to consider when constructing energy efficient cars and vehicles with electrical, mechanical and solar panel systems?

The class will begin instruction beginning with student’s presenting information on solar vehicles. Students can obtain information from: 1) newspaper articles, 2) magazine articles, 3) research from the Internet, or 4) web sites.

After students have presented information, the teacher will prompt a class discussion on what students shared and presented requesting input, thoughts, ideas or inquiries. After a brief class discussion, the teacher will introduce the *essential question* and new *vocabulary* (Addendum I) using a *graphic organizer* (Addendum C) to engage students in dialogues and discussions. Classroom discussions will provide the teacher with information about what students know and what they need to learn making connections to concepts taught (Informal assessment).

Collaborative Group Reading Passage Activity (Addendum D)

After conducting Student Presentations and Vocabulary Activity, students will be provided time to read Reading Passages in collaborative groups. The teacher will guide and facilitate student groups in completing their Reading Passages (Addendum B). Students will work in a collaborative team constructing a presentation display. Students will share their group display with the class presenting a summary of information with a pictorial representation on a large Post-it Big Tablet paper.

Upon closure of the lesson, inform students what they will be learning about in Lesson 3. Encourage students to bring information about energy efficiency, as relative to renewable energy, biofuels, hydrogenated cars and/or compressed air cars. Students will share information obtained from: 1) newspaper articles, 2) magazine articles, 3) research from the Internet, or 4) web sites.

Allow students 10-15 minutes for Notebooking (*Addendum D*). Collect Notebooks and make comments to encourage students to engage in thoughtful and purposeful learning. Return notebooks at the beginning of Lesson 3.

Lesson 3—Student Article Presentation, Vocabulary Activity, Collaborative Group Reading Passage and Notebooking

Student presentation (10 minutes), Vocabulary Activity (15 minutes), Collaborative Group Research, (30 minutes) and Notebooking, (10 minutes)

Essential Question: How can power created by solar cells in a car or vehicle be maximized?

The class will begin instruction beginning with student’s presenting information on biofuels, alternative fuels, solar cars, hybrid vehicles and/or another type of energy efficient vehicle. Students can obtain information from: 1) newspaper articles, 2) magazine articles, 3) research from the Internet, or 4) web sites.

After students have presented information, the teacher will prompt class discussion on what students shared and presented requesting input, thoughts, ideas or inquiries. After a brief class discussion, the teacher will introduce the *essential question* and new *vocabulary* (Addendum I) using a *graphic organizer* (Addendum C) to engage students in dialogues and discussions. Classroom discussions will provide the teacher with information about what students know and what they need to learn making connections to concepts taught (Informal assessment).

Collaborative Group Reading Passage Activity (Addendum B)

After conducting Student Presentations and Vocabulary Activity, students will be provided time to read Reading Passages in collaborative groups. The teacher will guide and facilitate student groups in completing their Reading Passages (Addendum B). Students will work in a collaborative team constructing a presentation display. Students will share their group display with the class presenting a summary of information with a pictorial representation on a large Post-it Big Tablet paper.

Upon closure of the lesson, inform students what they will be learning about in Lesson 4. Encourage students to bring information about energy efficiency, as relative to renewable energy, biofuels, hydrogenated cars and/or compressed air cars. Students will share information obtained from: 1) newspaper articles, 2) magazine articles, 3) research from the Internet, or 4) web sites.

Allow students 10-15 minutes for Notebooking. Collect Notebooks and make comments to encourage students to engage in thoughtful and purposeful learning. Return notebooks at the beginning of Lesson 4.

Lesson 4—Student Article Presentation, Vocabulary Activity, Collaborative Research Groups and Notebooking

Student presentation (10 minutes), Vocabulary Activity (15 minutes), Collaborative Group Research, (30 minutes) and Notebooking, (10 minutes)

Essential Question: How are biofuels used to create fuel efficient transportation?

The class will begin instruction beginning with student's presenting information as related to energy efficiency on renewable energy, biofuels, hydrogenated cars or compressed air cars. Students will share information obtained from: 1) newspaper articles, 2) magazine articles, 3) research from the Internet, and/or 4) web sites.

After students have presented information, the teacher will prompt class discussion on what students shared and presented requesting input, thoughts, ideas or inquiries. After a brief class discussion, the teacher will introduce the *essential question* and new *vocabulary* (Addendum I) using a *graphic organizer* (Addendum C) and prior knowledge to engage students in dialogues and discussions. Classroom discussions will provide the teacher with information about what students know and what they need to learn making connections to concepts taught (Informal assessment).

Collaborative Research Groups (Addendum E)

After conducting Student Presentations and Vocabulary Activity, students will be provided time to conduct their **Collaborative Research Groups Activities**. The teacher will guide and facilitate student groups in completing their research activities. Students will work in collaborative groups researching and collecting data to insert into their research project. Students will display their group research providing a

synopsis of information with a pictorial representation on a large Post-it Big Tablet paper. After all information is displayed, students will conduct a Gallery Walk.

Upon closure of the lesson, inform students what they will be learning about in Lesson 4. Encourage students to bring information about energy efficiency, as relative to renewable energy, biofuels, hydrogenated cars and/or compressed air cars. Students will share information obtained from: 1) newspaper articles, 2) magazine articles, 3) research from the Internet, or 4) web sites.

Allow students 10-15 minutes for Notebooking. Collect Notebooks and make comments to encourage students to engage in thoughtful and purposeful learning. Return notebooks at the beginning of Lesson 5.

Lesson 5—Student Article Presentation, Vocabulary Activity, Collaborative Group Research and Notebooking

Student presentation (10 minutes), Vocabulary Activity (15 minutes), Collaborative Group Research, (30 minutes) and Notebooking, (10 minutes)

Essential Question: Why is it important to understand the various types of fuel efficient vehicles for future possibilities?

The class will begin instruction beginning with student's presenting information on renewable energy, biofuels, hydrogenated cars or compressed air cars. Students will share information obtained from: 1) newspaper articles, 2) magazine articles, 3) research from the Internet, and/or 4) web sites.

After students have presented information, the teacher will prompt class discussion on what students shared and presented requesting input, thoughts, ideas or inquiries. After a brief class discussion, the teacher will introduce the *essential question* and new *vocabulary (Addendum I)* using a *graphic organizer (Addendum C)* and prior knowledge to engage students in dialogues and discussions. Classroom discussions will provide the teacher with information about what students know and what they need to learn making connections to concepts taught (Informal assessment).

After conducting Student Presentations and Vocabulary Activity, allow students time to complete their Group Research Projects. Teacher will guide and support student groups in completing their research

Collaborative Research Groups (Addendum E)

After conducting Student Presentations and Vocabulary Activity, students will be provided time to conduct their Collaborative Research Groups Activities. The teacher will guide and facilitate student groups in completing their research activities. Students will work in collaborative groups researching and collecting data to insert into their research project. Students will display their group research providing a synopsis of information with a pictorial representation on a large Post-it Big Tablet paper. After all information is displayed, students will conduct a Gallery Walk.

Upon closure of the lesson, inform students what they will be learning about in Lesson 4. Encourage students to share information on fuel efficiency vehicles, as related to photovoltaic cells, chassis, voltage and current. Students will share information obtained from: 1) newspaper articles, 2) magazine articles, 3) research from the Internet, or 4) web sites.

Allow students 10-15 minutes for Notebooking. Collect Notebooks and make comments to encourage students to engage in thoughtful and purposeful learning. Return notebooks at the beginning of Lesson 6.

Lesson 6—Student Article Presentation, Vocabulary Activity, Introduction and Assembly of SunEZoon Car and Notebooking

Student presentation (10 minutes), Vocabulary Activity (10 minutes), Collaborative Group Research, (35 minutes) and Notebooking, (10 minutes)

Essential Question: What are the important components of understanding speed and velocity when constructing and designing energy efficient vehicles?

The class will begin instruction beginning with student’s presenting information on fuel efficiency vehicles, as related to photovoltaic cells, chassis, voltage and current. Students will share information obtained from: 1) newspaper articles, 2) magazine articles, 3) research from the Internet, and/or 4) web sites.

After students have presented information, the teacher will prompt class discussion on what students shared and presented requesting input, thoughts, ideas or inquiries. After a brief class discussion, the teacher will introduce the *essential question* and new *vocabulary (Addendum I)*.

After conducting Student Presentations and Vocabulary Activity, students will work in collaborative teams constructing and designing their solar car. The teacher will guide and support student groups in constructing their car.

- Upon closure of the lesson, inform students what they will be learning about in Lesson 7. Students will bring information on Incandescent light, speed and velocity of energy efficient cars. Students will share information obtained from: 1) newspaper articles, 2) magazine articles, 3) research from the Internet, or 4) web sites.

Allow students 10-15 minutes for Notebooking. Collect Notebooks and make comments to encourage students to engage in thoughtful and purposeful learning. Return notebooks at the beginning of Lesson 7.

Lesson 7– Student Article Presentation, Vocabulary Activity, Assembly of SunEZoon Car and Notebooking

Student presentation (10 minutes), Vocabulary Activity (10 minutes), Collaborative Group Research, (35 minutes) and Notebooking, (10 minutes)

Essential Question: In your opinion, what are the most important features of an energy efficient vehicle? Explain writing a minimum of 3 paragraphs.

The class will begin instruction beginning with student's presenting information on Incandescent light, velocity and gears, indicating the importance. Students will share information obtained from: 1) newspaper articles, 2) magazine articles, 3) research from the Internet, and/or 4) web sites.

After students have presented information, the teacher will prompt class discussion on what students shared and presented requesting input, thoughts, ideas or inquiries. After a brief class discussion, the teacher will introduce the *essential question* and new *vocabulary (Addendum I)*.

After conducting Student Presentations and Vocabulary Activity, students will work in collaborative teams constructing and designing their solar car. The teacher will guide and support student groups in constructing their car.

- Upon closure of the lesson, inform students what they will be learning about in Lesson 8. Students will bring information on Incandescent light, speed and velocity of energy efficient cars. Students will share information obtained from: 1) newspaper articles, 2) magazine articles, 3) research from the Internet, or 4) web sites.

Allow students 10-15 minutes for Notebooking. Collect Notebooks and make comments to encourage students to engage in thoughtful and purposeful learning. Return notebooks at the beginning of Lesson 8.

Lesson 8—Student Article Presentation, Vocabulary Activity, Assembly of SunEZoon Car and Notebooking

Student presentation (10 minutes), Vocabulary Activity (10 minutes), Collaborative Group Research, (35 minutes) and Notebooking, (10 minutes)

Essential Question: What are the important components of advertisement? Why?

The class will begin instruction beginning with student's presenting information on fuel efficiency vehicles, as related to photovoltaic cells, chassis, voltage and current. Students will share information obtained from: 1) newspaper articles, 2) magazine articles, 3) research from the Internet, and/or 4) web sites.

After students have presented information, the teacher will prompt class discussion on what students shared and presented requesting input, thoughts, ideas or inquiries. After a brief class discussion, the teacher will introduce the *essential question* and new *vocabulary (Addendum I)*.

After conducting Student Presentations and Vocabulary Activity, students will work in collaborative teams designing an advertisement for their solar car. The teacher will guide and support student groups in constructing their car.

Upon closure of the lesson, inform students what they will be learning about in Lesson 9. Students will bring information on an energy efficient vehicle of their choice. Students will share information obtained from: 1) newspaper articles, 2) magazine articles, 3) research from the Internet, or 4) web sites.

Allow students 10-15 minutes for Notebooking. Collect Notebooks and make comments to encourage students to engage in thoughtful and purposeful learning. Return notebooks at the beginning of Lesson 9.

Lesson 9– Group Advertisement & Presentation of SunEZoon Car

Student presentation (10 minutes), Vocabulary Activity (10 minutes), Collaborative Group Research, (35 minutes) and Notebooking, (10 minutes)

Essential Question: What criteria did you use to promote and advertise your group’s solar car? Design a criteria list for advertising.

The class will begin instruction beginning with student’s presenting information on an energy efficient vehicle of their choice Students will share information obtained from: 1) newspaper articles, 2) magazine articles, 3) research from the Internet, and/or 4) web sites.

After students have presented information, the teacher will prompt class discussion on what students shared and presented requesting input, thoughts, ideas or inquiries. After a brief class discussion, the teacher will introduce the *essential question* and new *vocabulary (Addendum I)*.

After conducting the above activities, students will begin presenting their advertisement on their solar car. Other students will be completing Peer Reviews.

Upon closure of the lesson, inform students what they will be learning about in Lesson 10. Students will bring information on an energy efficient vehicle of their choice. Students will share information obtained from: 1) newspaper articles, 2) magazine articles, 3) research from the Internet, or 4) web sites.

Allow students 10-15 minutes for Notebooking. Collect Notebooks and make comments to encourage students to engage in thoughtful and purposeful learning. Return notebooks at the beginning of Lesson 10.

Lesson 10– Group Advertisement & Presentation of SunEZoon Car

Student presentation (10 minutes), Vocabulary Activity (10 minutes), Collaborative Group Research, (35 minutes) and Notebooking, (10 minutes)

Essential Question: What were the features that enjoyed most in this unit? Explain.

What were the features that you least enjoyed in this unit? Explain.

The class will begin instruction beginning with student’s presenting information on an energy efficient vehicle of their choice Students will share information obtained from: 1) newspaper articles, 2) magazine articles, 3) research from the Internet, and/or 4) web sites.

After students have presented information, the teacher will prompt class discussion on what students shared and presented requesting input, thoughts, ideas or inquiries. After a brief class discussion, the teacher will introduce the *essential question* and new *vocabulary* (Addendum I).

After conducting the above activities, students will begin presenting their advertisement on their solar car. Other students will be completing Peer Reviews.

Upon closure of the lesson, inform students what they will be learning about in Lesson 10. Students will bring information on an energy efficient vehicle of their choice. Students will share information obtained from: 1) newspaper articles, 2) magazine articles, 3) research from the Internet, or 4) web sites.

Students will take a Post-Assessment (Addendum J).

Name _____

Student ID _____

I. Directions: Circle 1 word to complete the sentences, as listed below.

- 1) Usable power that produces heat and/or electricity is called
a. energy b. solar c. electricity
- 2) _____ is power generated by the action of the sun’s light.
a. Solar-energy b. Biomass c. Emission
- 3) When plant and animal waste is used as a source for fuel, it is called
a. biomass b. fuel c. biofuels
- 4) A car that uses 2 or more sources of energy is called a
a. hydrogenated car b. hybrid car c. electric car
- 5) When there is contamination in the air it is called _____.
a. smog b. pollution c. particles
- 6) _____ are hydrogen-fuel combustion engine that operates on one or two types of fuel.
a. Hydrogenated fuel cells b. Condensation cells c. Bio-Cells
- 7) A rapid chemical process produces heat and light is called
a. combustion b. solar energy c. compressed air
- 8) The frame and working parts of a car is called the
a. gears b. chassis c. drive shaft
- 9) _____ is the quickness of speed.
a. Velocity b. Power c. Alternative
- 10) _____ are substances that are discharged in the air.
a. Emissions b. Combustion c. Infrastructures

II. Choose one of the questions below and respond by writing at least a 2-3 paragraph response.

- 1) What are the components to consider when constructing energy efficient cars and vehicles with electrical, mechanical and solar panel systems?
- 2) How can power created by solar cells in a car or vehicle be maximized?
- 3) Why is it important to understand the various types of fuel efficient vehicles for future possibilities of fuel efficiency?

Reading Passage 1

Pike Research Report Projects 4 Million Fleet Hybrids Worldwide By 2015

Boulder-based Pike Research issued a report last week that projects 4 million fleet hybrids on streets worldwide by 2015. The report entitled “Hybrid Electric Vehicles for Fleet Markets” reviews market trends that will contribute to a 16% growth in fleet hybrid ownership in the next six years. Pike Research concluded that current hybrid fleet sales of 300,000 in 2009 will balloon to about 830,000 in 2015. Researchers cite the need for businesses, universities and government agencies to reduce fuel costs and emissions for this potential hybrid vehicle explosion.



North America is tabbed by Pike Research as the most likely site for growth in the fleet hybrid and plug-in vehicle markets.

The report notes that North America will experience the largest growth in hybrid sales with a projected increase of 8% from 2009 to 2015. Pike Research attributes some of this growth to a projected 10% growth in hybrid bus sales and comparable sales of hybrid trucks and commercial vehicles. The United States in particular will be the largest market for fleet hybrids by 2015 with 434,848 hybrid electric vehicles (HEVs) and 204,110 plug-in hybrid electric vehicles (PHEVs) in operation.

Pike Research indicates that while the percentage of fleet hybrid sales will increase the most in North America, Asia will be the region with the highest volume of sales. Japan, China and other Asian countries will acquire 420,000 fleet hybrids per year by 2015, which contributes more than 50% of Pike Research’s global sales projection. China places second to the United States in projected ownership by 2015 with 371,198 HEVs and 190,125 PHEVs running on Chinese streets. Asia will eclipse North America, Europe and other regions in terms of overall fleet vehicle sales, which diminishes the proportion of fleet hybrids sold.

“Hybrid Electric Vehicles for Fleet Markets” sounds great for hybrid and plug-in fans interested in increased penetration for this technology. Pike Research also encourages the enthusiasm of hybrid fans by showing a ripple effect from HEVs to PHEVs to all-electric vehicles over time. We should be careful not to make too much of this report, however, as it focuses on medium and heavy-duty commercial vehicles. The overall fleet hybrid projection for 2015 sounds great but these vehicles will be drowned out by traditional fleet vehicle sales. If Pike Research’s projections are accurate, however, HEVs and PHEVs will become commonplace worldwide and hopefully contribute to greater sales for passenger HEVs in time.

Peugeot Hybrid3 Evolution Scooter Concept

The automotive market is slowly but surely filling with hybrids, CNG vehicles and all-electrics from around the world. While this market will become more competitive over time, market niches like scooters and commercial vehicles remain woefully underdeveloped. French automaker is delving into the hybrid scooter niche with the HYbrid3 Evolution scooter presented at the Milan International Cycle and Motorbike Show. This three-wheel scooter builds on the design of the HYbrid3 model presented at the 2008 Paris Motor Show.



The Peugeot HYbrid3 Evolution is powered by a 30kW gas engine mounted near the rear wheel. The front wheels and rear wheel produce 3kW of power with lithium-ion batteries. Peugeot outfitted this concept scooter with a regenerative braking system to store energy in the batteries. These drive system components are connected electronically rather than mechanically to ensure responsive steering and acceleration. The HYbrid3 Evolution contains an anti-lock braking system

(ABS) connected to all three wheels to decrease braking distance significantly compared to traditional scooters. This hybrid scooter also offers an engine cutoff feature to eliminate emissions and fuel use at full stops.

Peugeot plans to use the HYbrid3 Evolution's drive system and styling for future vehicle models instead of promising a direct production version of this scooter. The feature in this concept Peugeot consumers should hope for in future scooters is the trio of drive modes offered with the push of a button. The Peugeot HYbrid3 Evolution starts out in all-electric mode, which offers emissions-free power at ignition and low speeds. Riders can switch to all-gas power to reach peak power while driving on the highway. Peugeot also features a gas/electric combination mode for power boosts and driving in adverse road conditions.

Peugeot noted at Milan that it will produce the HYbrid4 3008 starting in 2011, which will feature a rear-mounted electric motor and similar design to the HYbrid3. The elements combined in the HYbrid3 Evolution equal a great concept that will be used as a template for future models. The Peugeot HYbrid3 and HYbrid4 models may make bigger splashes in Europe but it presents a challenge to automakers worldwide to expand their boundaries. The automotive industry should focus not only on hybrid passenger vehicles but cleaner scooters, motorcycles, commercial vehicles and other conveyances that are overlooked.

Mercedes-Benz B-Class Fuel Cell Car

Mercedes-Benz announced last week the impending production of its B-Class F-Cell vehicle, a hydrogen fuel-cell sedan modeled on several test vehicles designed in the past five years. The B-Class F-Cell builds on the rudimentary drive system of the A-Class while drawing on design advancements from its combustion vehicles. The F-Cell will be limited to 200 units in its first round of production at the end of 2009 with vehicles delivered to customers in Hamburg and Southern California by spring 2010. The B-Class F-Cell demonstrates that Mercedes-Benz is succeeding in its parallel-track development of traditional and fuel-cell vehicles.



Mercedes-Benz packaged its 80kW fuel-cell stack with a 35kW lithium-ion battery pack to put the B-Class F-Cell in motion. The fuel-cell stack is capable of lasting 2,000 hours under optimal conditions, a considerable upgrade over previous test vehicles. The B-Class also houses an electric motor capable of 136 horsepower output when pressed to its limits. Mercedes-Benz was quick to point out the zero-emissions operations of the B-Class F-Cell as well as the fuel efficiency equivalent of 71 miles per gallon.

The B-Class F-Cell has been in the works since 2004 when the A-Class was used as a test vehicle by Mercedes-Benz. The A-Class F-Cell was considerably inferior to the current model in terms of range, starting capacity and motor output. Mercedes-Benz also built the B-Class F-Cell off the bulky F 600 Hygenius test vehicle created in 2005. The B-Class is a more refined version of the F 600 Hygenius with a body size 40% smaller than its predecessor. The latest fuel-cell model by Mercedes-Benz does not sacrifice power with its 30% increase in power output and 16% decrease in fuel usage.

The B-Class F-Cell benefits from small touches by Mercedes-Benz as well as extensive testing of the automaker's fuel-cell system. The B-Class houses features like a dehumidification system to ensure passenger comfort without creating unnecessary waste. Mercedes-Benz has tested the A-Class, B-Class and F 600 Hygenius over 2.7 million miles in the past five years thanks to the hard work of 100 test vehicles. The blockade to wider use of the B-Class outside of Europe and California is the lack of a substantial fuel cell infrastructure.

Toyota Adds Solar Panels to Prius Hybrid

The Toyota Prius has been the standard bearer for the hybrid vehicle market since the turn of the century. Toyota is not resting on its reputation for reliability and fuel efficiency among loyal customers in the 2009 and 2010 model years. The next generation of Prius sedans will feature solar panels from Kyocera that will offset energy used by internal systems.



Toyota announced that the panel-clad Prius might be added to showrooms as soon as spring 2009 to help relieve energy costs for consumers. These panels will generate enough energy to power air conditioning units that use between two and five kilowatts. The Japanese motor company is pioneering the use of solar panels among major automakers though smaller companies like Think have built prototypes using the technology.

Consumers interested in the next generation of this popular hybrid will be heartened to hear Toyota's production goals for 2009. The company states that it will manufacture 450,000 hybrids in 2009 which is a 60 percent increase over Prius production two years ago. Toyota is expanding current facilities, building a new battery factory and readjusting its production methods to ensure that these goals will be met.

The addition of solar panels to the Prius may be more important for its long-term consequences than savings realized by consumers in upcoming years. Toyota is showing a willingness to change the Prius formula to include tools like solar panels that might help consumers save money on fuel. The slight energy boost given by natural light may not seem like much to consumers accustomed to powerful vehicles but it shows forward thinking by a company that could have coasted on the popularity of the Prius.

Car companies around the world have approached changed conservatively in recent years due to the uncertainty of the global economy. Toyota's solar panels may not pack much of a punch but they are building blocks toward more creative (and cleaner) car design. These solar panels will give way to plug-in electric drive trains, improved regenerative braking and other innovations that need to be exposed to public testing before they become more advanced. Floundering companies like General Motors and Ford should be working on alternative fueling sources that break the gas-only tradition dominant in the first century of the automobile.

MDI's Compressed Air Powered AirPods

The development of compressed air vehicles often gets obscured by hybrid and all-electric vehicles created by major automakers. Moteur Development International (MDI) took the first step toward getting compressed air vehicles in the news with delivery of two AirPods to Dutch airline KLM two weeks ago. KLM will work with the facilities staff at Schiphol Airport in Amsterdam to incorporate a pair of AirPods into its transportation chain over the next three months. In addition to creating buzz for its green portfolio, KLM is also hoping to slowly but surely reduce emissions in its vehicle fleet.

The AirPods is powered by MDI's Compressed Air Engine, which manipulates compressed air to move the pistons based on driver needs. The automaker is using its air-only engine in the AirPods delivered to KLM, demonstrating the client's interest in reduced emissions. MDI has also developed a hybrid engine capable of running on compressed air and gasoline or biofuels. The AirPods used at Schiphol Airport feature an outboard air compressor while the hybrid AirPods contains a built-in compressor.



MDI touts the AirPods as the ideal vehicle for the day-to-day demands of an airport. The AirPods features three adult seats along with a small cargo area for light luggage and packages. The vehicle's 137-mile range is more than sufficient not only for Schiphol Airport but also neighborhood and campus travel. MDI notes that the AirPod can only reach speeds up to 28 miles per hour, which may limit its applicability outside of the NEV niche.

MDI's delivery to KLM dovetailed with a recent report by researchers at the University of California-Berkeley questioning the performance levels of compressed air vehicles. Representatives of the French automaker countered this report by pointing out the AirPod's merits compared to gas and electric versions of smart cars. The automaker has noted that the comparisons between the AirPod and various smart models are not apt given that its model is half the weight of its competitors. The compressed air tank on the AirPod is supposed to last up to 12,000 discharges, which MDI noted could last 30 years with daily use. The performance of AirPods used at Schiphol Airport in 2010 will ultimately eliminate or confirm the criticisms in the UC-Berkeley report.

Ohio State University Creates the Next EcoCar

The U.S. Department of Energy, the Canadian government and General Motors started the EcoCar: The NeXt Challenge competition earlier this year as a challenge to future auto engineers. This competition tasks 17 groups of university students throughout North America with turning the 2009 Saturn VUE into an emissions-neutral, fuel-efficient vehicle. Each group must keep the redesigned VUE as close to the original design and performance level as possible while using common elements like lithium-ion batteries, plug-in platforms and renewable fuels.

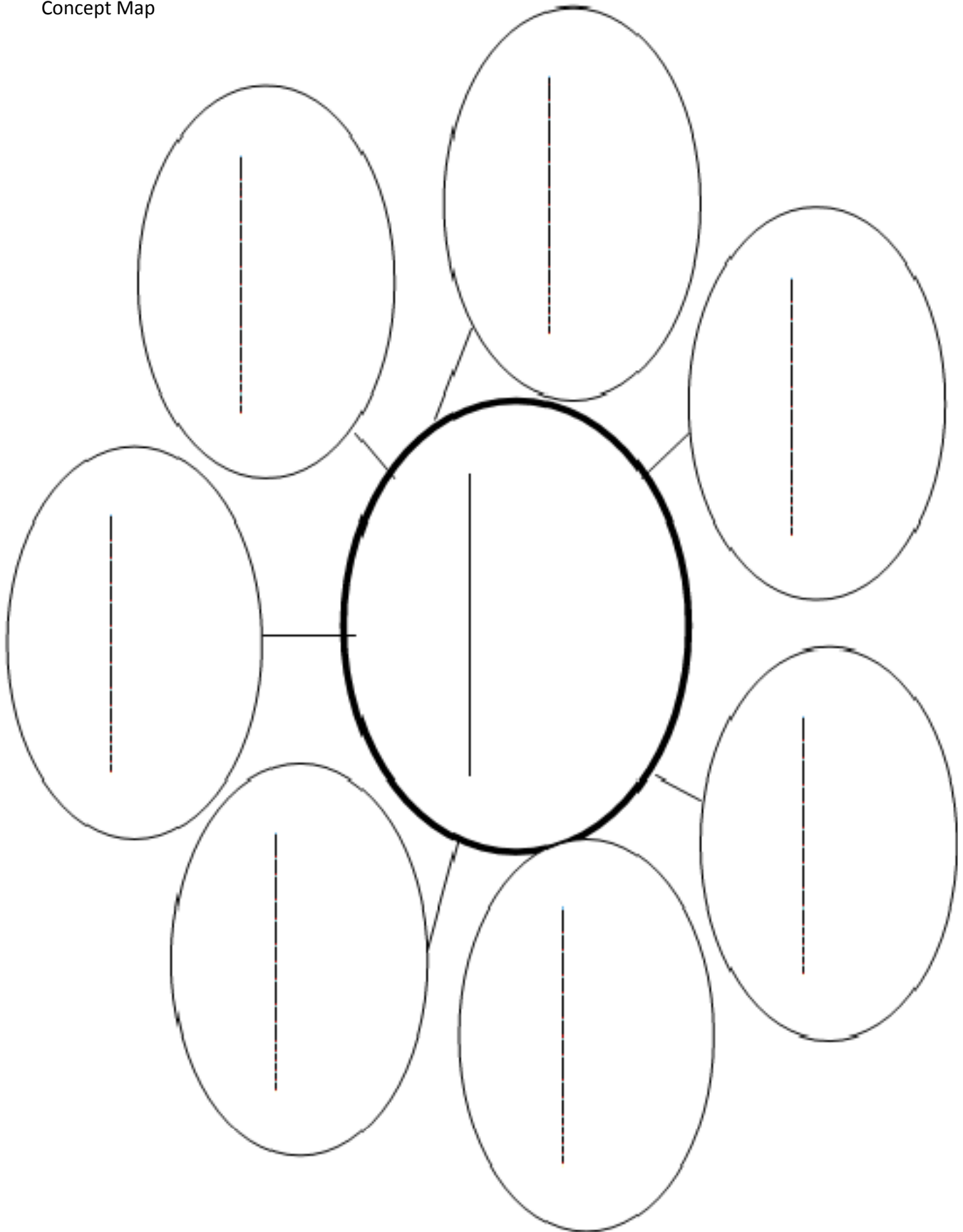
The Ohio State University was triumphant in the first round of EcoCar: The NeXt Challenge with its design for an ethanol-powered Saturn VUE. The first challenge for each university group was to come up with a design as well as computer modeling to demonstrate the vehicle's projected performance levels. The OSU E85 version of the VUE was projected to achieve fuel mileage ratings 300% higher than the traditional gas-powered VUE in computer modeling. The group used a 1.8-liter engine powered by E85 fuel as well as a few tweaks to the drive train to come out ahead in this preliminary round.



OSU's entry in the competition's first round ran ahead of ethanol-powered entries from the University of Victoria (E85) and Mississippi State University (B20 diesel). The University Of Ontario Institute Of Technology was the sole group that designed a Saturn VUE with a fully electric drive train. The University of Waterloo and Missouri University of Science and Technology created plug-in EVs with hydrogen fuel cells available for onboard recharging. The bulk of the competition's entries came from university groups with plug-in hybrid EVs with sizable lithium-ion batteries to reduce fuel consumption.

The competition will continue through 2011 as successive groups from each university build on the preceding group's designs. The second round of the EcoCar: The NeXt Challenge in 2010 will require implementation of first-round designs into an actual Saturn VUE for initial testing. The final round in 2011 will be spent refining the design and implementation of each group's design, harnessing the fuel efficiency and emissions promised in the initial computer model. While the Ohio State University may have won the first round of this competition, the consuming public stands to gain from the ideas presented in this competition in the next decade. The sponsoring organizations have the research resources, finances and connections to put successful designs into action in an increasingly eco-conscious market

Concept Map



Frayer Model

<p>Definition in your own words</p> <p>A quadrilateral is a shape with 4 sides.</p>	<p>Facts/characteristics</p> <ul style="list-style-type: none"> • 4 sides • may or may not be of equal length • sides may or may not be parallel
<p>Examples</p> <ul style="list-style-type: none"> • square • rectangle • trapezoid • rhombus 	<p>Nonexamples</p> <ul style="list-style-type: none"> • circle • triangle • pentagon • dodecahedron

Robotics

K What I Know	W What I Want to Know	L What I Learned

Hold Your Thinking

Name: _____

<p>TOPIC</p> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>	<p>ONE THING I REMEMBERED</p> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>
<p>WRITE A SENTENCE ABOUT WHAT YOU LEARNED</p> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>	<p>CONNECTIONS THAT HELPED YOU UNDERSTAND WHAT YOU LEARNED</p> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>

Notebooking

Students will use their notebook to record information, vocabulary, notes and illustrations based on their learning experiences. Students will be required to contemplate and ponder what they studied and learned, while writing their thoughts, illustrations and words in their notebook. In doing so, students will have notes for recall, review and information. As students collect information in their notebook, they will be able to view their accomplishments seen through their textual notes, drawings and paragraph writing. Additionally, students will have inserted information and collections of records and readings. Furthermore, students can add and include the following information:

- Writing assignments – responses, summaries, narrations, etc.
- Pictures – Drawings, sketches, photos, clipart, and collected illustrations.
- Notes and quotes
- Favorite websites – research and information
- Collections of handouts, sketches, and class shared information
- Timelines and expectations
- Projects – Notes and illustrations from class, projects, tasks and group planning
- Booklets created like those similar to ones you would find in a lap book
- Vocabulary study
- Diagrams and graphs
- Instruction sheets or worksheets
- Journal entries
- Book lists
- Primary sources
- Outlines
- Newspaper or magazine articles

Peer Review Rubric

Score		1	2	3	Total
		Low	Middle	Highest	
Nonverbal Skills	Eye Contact	Focuses on only part of the class.	Occasionally looks at someone.	Looks at someone or some groups at all times	
	Facial Expressions	Has no expression	Has some expression	Fully engages with class	
Voice	Enthusiasm	Shows negative feelings about the topic	Shows positive feelings about topic	Shows strong feelings about the topic	
	Vocalized Pauses (uh, well uh, um)	A lot of pauses	A few vocalized pauses	Little or no vocalized pauses	
Content	Topic	Does not stay on topic	Somewhat stays on topic	Clearly stays on topic	
	Time frame	Presentation is too short	Presentation is too long	Presentation stays within required time	
	Visual Aid	Adds nothing to presentation	Does not engage in topic with visuals	Engages in topic with visuals	
	Completeness of Content	Does not explain topic	Somewhat explains topic	Thoroughly explains topic	
					Total

Gallery Walk



1. The instructor prepares several discussion questions.

1. What was the most important concept you learned from the group's topic?
2. Write one question you have regarding the topic.
3. Write one comment regarding the topic.

2. Questions are posted.

3. Student teams walk around the classroom writing responses to the above questions.

4. Groups make comments, listing them on the group's poster.

5. Students circulate around the classroom, spending 5-7 minutes at each station.

6. After completing stations, students discuss information.

Group 1

Group 1: Model Solar Cars

This group will be assigned the task of finding all the parts necessary to make a model car. The group should identify the quantity of each part needed and the price recording the information in the Research Table. Students must:

- 1) Calculate the total cost of the model solar car
- 2) Calculate the cost for each group to build a car
- 3) Calculate the cost for each student in their class to build a car
- 4) Create a drawing of YOUR Group's model solar car design (Be creative).

MODEL SOLAR CARS

Just like toy and model cars, you can also build model solar cars. Solar cars have some parts that are like your family car, but solar cars do not use gasoline. Here is how they work:

- A solar panel changes energy from sunlight into electricity
- Electricity travels to the motor by a wire that makes the drive shaft turn
- When the drive shaft turns, the wheels spin
- The spinning wheels move the car forward

Collaborative Research Group 1: MODEL SOLAR CARS

A. Answer the questions listed below:

1. Where do solar cars get their electricity from?

2. What kind of fuel does your family car use?

3. How does electricity make the wheels of a solar car spin?

B. Research

Using the Internet and websites, identify all the parts needed to build an energy efficient solar car. List the price and quantities for each item needed.

Item or Part	Describe item	Price	How many?	Total Cost

C. Answer the following questions.

a) How much does a solar car cost in today's marketplace?

b) If your class was split into 4 groups and each group built a car, how much would it

Cost? 2 Groups?

c) If everyone in your class built a car, how much would it cost?

2. Draw a picture of YOUR Group's Solar Car (Be creative).

Group 2

Collaborative Research Group 2: Solar Car Races

This group will be assigned the task of researching solar cars and solar car races. The group will record information in the **Research Table**. This group will insert data and information reporting statistics on the top 3 vehicles in each race. The data will include:

- 1) Total miles traveled
- 2) List the top speed traveled (miles per hour)
- 3) List the length of the race (number of days)
List the statistics or facts that the group finds interesting.
- 4) Create a bar graph comparing one selected variable of each car researched, for example list the top speed of the car, the total miles traveled by each car, etc. (Insert data in the Research Table listed below.)

Answer

SOLAR RACE CARS

Solar Race Cars are constructed and designed in a variety of sizes allowing people choice. A race car is usually is larger than a traditional car having a powerful motor to compete in semi-professional and/or professional races. Solar Race Cars would require large solar panels that would provide the amount of energy/electricity to power the vehicle. Solar cars also use batteries. These solar batteries, sometimes called solar cells store the energy from the sun. When the race car speeds along the raceway, the motor or engine uses all of the power it can exert from the solar panel system. When the solar car runs out of solar energy, it relies on the battery cells for continued power and speed along the race track.

Names of students: _____

Collaborate Research Group 2: SOLAR CARS and RACES

Answer the questions listed below:

1. Why are batteries or cells used when solar cars enter competitive races?

2. When a solar race car exerts powerful, how does is the energy exerted?

3. When the solar panels loose power during a car race, explain how the solar car is able to operate, staying in the race?

B. Research

Using the Internet and websites find 3 SOLAR CAR RACES. Identify 3 SOLAR CARS WINNING THE RACE and list other information in the table, as listed below.

Car Race	Car Name	Total Miles of Race	Top speed of solar car (MPH)	Other Information

C. Winning Solar Cars

List 3 objectives and components that car designers have to consider when building a solar race car:

- a) _____

- b) _____

- c) _____

2. On a sheet of paper design a bar graph that compares the benefits and differences of each solar car. For example, design rows listing each comparable item as listed below:

Car Race	Car Name	Total Miles of Race	Top speed of solar car (MPH)
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Group 3

Collaborative Research Group 3: Electric and Hybrid Cars

This group will research 3 separate hybrid cars. The group will use the Internet and web sites to research each hybrid car. Students will record finding on the table listed below inserting the data and information on the form. Students will examine statistics of each car including mileage rating, the size of the battery bank, the price and any interesting information they learned in their research. Students should create a bar graph on a large sheet of paper that compares one selected variable of each car researched (such as the mileage rating, the price, etc.). Students should also answer the questions listed on their Form.

Answer

ELECTRIC AND HYBRID CARS

Electric cars and hybrid cars are somewhat like solar cars. Electric cars are not charged by using solar panels. Their energy sources come from batteries. Batteries provide the power and energy source to electric cars. When the energy of the batteries gets low, they must be recharged. Batteries are recharged plugging the car into a powerful electrical outlet. After driving an electric car through-out the day, it can be recharged over night, ready to drive the next day. Electric cars do not use gasoline, as traditional cars and vehicles, eliminating the effects of air pollution. Today, there are electric cars that operate on batteries and gasoline. *What are the benefits or discrepancies of an electric and gas-powered vehicle is?*

Collaborative Research Group 3: Electric and Hybrid Cars

A. Answer the questions:

1. How do electric cars get power and energy to operate?

2. When an electric car's batteries are low or no longer operate, what happens to the car?

3. What are some factors that eliminate an electric car from emitting air pollution?

B. Research on Hybrid and Electric Cars

Using the Internet or websites locate 3 hybrid and electric cars. Insert researched information in the table listed below.

Manufacturer	List the battery size	What is the mileage?	What is the cost?	Other

C. Hybrid and Electric Cars

Answer the questions listed below.

a) What are differences and commonalities of a hybrid car?

b) What are differences and commonalities of a hybrid car, as compared to a solar car?

2. On a sheet of paper, design a bar graph listing differences and commonalities of a hybrid car, as compared to a solar car. List categories of information and insert information in each row or column.

Group 4

Collaborative Research Group 4: Gasoline, Cars and Pollution

This group will be assigned to research gasoline-powered cars and their effect on air pollution listing in the Research Table in section C. The group will list 3 gasoline-powered cars including their mileage (miles per gallon) and pollutants that each car emits (nitrogen oxide and carbon dioxide). Students can obtain mileage information from car manufacturer websites. Usually the websites are simply the car manufacturer's name followed by ".com" (i.e. www.ford.com, www.toyota.com, etc.). Pollutant information and interactive calculators will be available on websites. The United States Environmental Protection Agency and similar environmental groups integrate various features on websites. Students will create a bar graph on a sheet of paper comparing one selected variable for each car researched (such as the mileage, the amount of nitrogen oxide emitted or the amount of carbon dioxide emitted).

Answer

GASOLINE, CARS AND POLLUTION

Gasoline-powered cars are much less efficient than electric cars. And since gasoline comes from a non-renewable energy source, such as oil, it cannot last forever. They also make air pollution, such as smog. Air pollution can be harmful to your health. It also can make the air become and look dirty. Air pollution can make it hard to see pretty sights like city skylines and mountain ranges.

Collaborative Research Group 4: Gasoline, Cars and Pollution

A. Answer the questions listed below.

1. What type of car/vehicle is most efficient, as it pertains to solar, gasoline or electric cars?

2. What is gasoline a renewable or non-renewable energy source? Describe.

3. What are the effects of air pollution?

B. Research on Gasoline Cars

Using the Internet and websites locate and research 3 gasoline cars listing the information in the table below.

Car Manufacturer	Miles Per Gallon	Nitroxide Oxide produced per mile	Carbon Dioxide produced per mile	Other

C. Gasoline Cars and Pollution

Answer the questions listed below.

1. What is nitrogen oxide (NO_x) and how can it be harmful to life?

2. What is carbon dioxide (CO₂) and how can it be harmful to life?

3. On a sheet of paper, make a bar graph of the pollutants produced by each car per mile?

Group 5

Group 5: Hydrogenised Cars and Vehicles

Hydrogenised Cars and Vehicles (Hybrid Hydrogen Oxygen)

This group will be assigned to research hydrogenised cars and vehicles inserting data and information in the Research Table in section below (Section C). The group will list 3 hydrogenised cars or vehicles including mileage and pollutants or non-pollutants that each car or vehicle emits (hydrogen-oxygen mix in the fuel system). Students will collect and gather information from various websites on the Internet that may include: 1) The United States Environmental Protection Agency, 2) car dealerships, or 3) HH Fuel Cells. Students will construct a bar graph on a sheet of paper comparing one selected variable for each car researched (such as the mileage, the amount of nitrogen oxide emitted or the amount of carbon dioxide emitted).

Answer

Hydrogenised Cars and Vehicles (HH Fuel Cells)

Hydrogenised-powered cars use HH Fuel Cells, or Hybrid Hydrogen Oxygen, as it provides gasoline to aid in combustion. The HH Fuel cells generate water and help burn gasoline. HH Cars reduce emissions and providing benefits that help vehicle engines last longer, gain more miles per gallon (MPG) and have cleaner emissions.

A. Hydrogenised Cars and Vehicles (Hybrid Hydrogen Oxygen)

Answer the questions listed below.

1. What type of car/vehicle is most efficient, as it pertains to solar, gasoline or hydrogenised cars?

2. How does the HH Fuel Cell reduce emissions?

3. What are some safety tips a person should be aware of when owning a hydrogenised car?

B. Research on Hydrogenised Cars and Vehicles (HH Fuel Cells)

Using the Internet and websites locate information of Hydrogenised Cars inserting that data in the Research Table Below.

Name of Hydrogenated Car Manufacturer	Miles Per Gallon	Benefits of an HHO Fuel Cell	Precautions of driving an Hydrogenated Car	Other

C. Hydrogenised Cars and Vehicles (HH Fuel Cells)

Answer the questions listed below.

1. What is an HH (hybrid hydrogen oxygen) Fuel Cell?

2. When are the benefits and/or detriments of breaking down carbon in HHO (hybrid hydrogen oxygen) Fuel Cells?

3. On a sheet of paper, make a bar graph for the following information. Be creative!

Name of Hydrogenated Car Manufacturer	Miles Per Gallon	Benefits of an HHO Fuel Cell	Precautions of driving an Hydrogenated Car	Other
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Advertisement Rubric

Score	1-high	2-low	Total
Information in the ad	Title of ad with information	Information missing	
Relevant Pictures	All pictures relate to topic	Some pictures relate to topic	
Appearance	The ad is easy to read	The ad has too many distractions	
Grammar	There are few, if any grammatical mistakes	There are a lot of grammatical mistakes	

Group and Individual Grade:

Score	1-high	2- low	Total
Cooperation	Students worked cooperatively with group	Students did not always work cooperatively with group	
Effort	Put a lot of effort in the construction of ad	Put little effort in the construction of ad	

Vocabulary Words and Definitions

Unit 1

1. **Energy** – usable power (as heat or electricity); *also* : the resources for producing such power
2. **Construct** – to set in logical order, to make
3. **Interpret** – to explain or tell the meaning of
4. **Fuels** – a heavy mineral oil
5. **Solar energy** – produced or operated by the action of the sun's light or heat

Unit 2

1. **Alternative** – different from the usual or conventional
2. **Biomass** – plant materials and animal waste used especially as a source of fuel, hydrocarbon deposit, such as oil, coal or natural gas, created from living matter
3. **Hybrid car** – a car that uses two or more sources of energy and power
4. **Electric** – related to, or operated by electricity

Unit 3

1. **Pollution** – environmental contamination in the air, the condition of being polluted
2. **Power** – ability to act or produce an effect or the capacity to work
3. **Power outlet** – a receptacle for the plug of an electrical device
4. **Recharge** – to charge again; *especially*: to restore anew the active materials in (a storage battery)
5. **Reduce** – to diminish in size, amount, extent, or number, to make less
6. **Smog** – a fog made heavier and darker by smoke and chemical fumes; *also* : a photochemical haze caused by the action of solar ultraviolet radiation on atmosphere polluted with hydrocarbons and oxides of nitrogen especially from automobile exhaust

Unit 4

1. **Renewable energy** – producing usable power capable of being replaced by natural ecological cycles
2. **Biofuels** – a combination of fuel(s), hydrocarbon deposit(s), such as oil, coal or natural gas, created from previous living matter with a heavy mineral oil
3. **Transportation** – means of conveyance or travel from one place to another
4. **Hydrogenated Fuel Cells** – a hydrogen-fueled internal combustion engine that operates on one or two or more types of fuel that are selected from hydrogenated fuel and a dehydrogenated product/hydrogen, obtained by dehydrogenating the hydrogenated fuel, its byproduct is H₂O (water).

Unit 5

1. **Hybrid** – something (as a power plant, vehicle, or electronic circuit) that has two different types of components performing essentially the same function
2. **Compressed Air** – an air distribution system that is pressed together reducing size and/or volume (as by pressure) with an air stream
3. **Emissions** – free-no substances discharged in the air
4. **Combustion** – a usually rapid chemical process (as oxidation) that produces heat and usually light
5. **Infrastructure** – the underlying foundation or basic framework

Unit 6

1. **Current** – used as a medium of exchange, as in the flow of electricity
2. **Voltage** – electric potential or potential difference expressed in volts
3. **Photovoltaic cell** – technology for converting sunlight directly into electricity, using two different semiconductors)
4. **Conductor** – a material or object that permits an electric current to flow easily, compare insulator, semiconductor, a material capable of transmitting another form of energy (as heat or sound)
5. **Chassis** – the frame and working parts (as of an automobile or electronic device) exclusive of the body of a car or vehicle
6. **Axle** – a pin or shaft on or with which a wheel or pair of wheels revolves *b (1):*a fixed bar or beam with bearings at its ends on which wheels (as of a cart) revolve *(2):*the spindle of such a beam

Unit 7

1. **Drive shaft** – steel tube that transfers mechanical power from the transmission to rear wheels of a car
2. **Incandescent light** – white, glowing, or luminous with intense heat
3. **Alligator clamps** – clamps with metal wires to grasp and hold onto attachments
4. **Motor** – a small compact engine, a rotating machine that transforms electrical 5. energy into mechanical energy
5. **Velocity** – quickness of motion: speed, as in the velocity of sound or the rapidity of movement
6. **Gears** – a circular device that meshes with other drive shafts to transmit power to the motor and distribute power to the wheels of a car to make it move

Name _____ Student ID _____

I. Directions: Circle 1 word to complete the sentences, as listed below.

- 1) Usable power that produces heat and/or electricity is called
 a. energy b. solar c. electricity
- 2) _____ is power generated by the action of the sun’s light.
 a. Solar-energy b. Biomass c. Emission
- 3) When plant and animal waste is used as a source for fuel, it is called
 a. biomass b. fuel c. biofuels
- 4) A car that uses 2 or more sources of energy is called a
 a. hydrogenated car b. hybrid car c. electric car
- 5) When there is contamination in the air it is called _____.
 a. a. smog b. pollution c. particles
- 6) _____ are hydrogen-fuel combustion engine that operates on one or two types of fuel.
 a. Hydrogenated fuel cells b. Condensation cells c. Bio-Cells
- 7) A rapid chemical process produces heat and light is called
 a. combustion b. solar energy c. compressed air
- 8) The frame and working parts of a car is called the
 a. gears b. chassis c. drive shaft
- 9) _____ is the quickness of speed.
 a. Velocity b. Power c. Alternative
- 10) _____ are substances that are discharged in the air.
 a. Emissions b. Combustion c. Infrastructures

II. Choose one of the questions below and respond by writing at least a 2-3paragraph response.

- 1) What is the component to consider when constructing energy efficient cars and vehicles with electrical, mechanical and solar panel systems?
- 2) How can power created by solar cells in a car or vehicle be maximized?
- 3) Why is it important to understand the various types of fuel efficient vehicles for future possibilities of fuel efficiency?

Name _____ Student ID _____

I. Directions: Circle 1 word to complete the sentences, as listed below.

- 1) Usable power that produces heat and/or electricity is called
 - a. **energy**
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- 8) The frame and working parts of a car is called the
 - a. gears
 - b. **chassis**
 - c. drive shaft
- 9) _____ is the quickness of motion and speed.
 - a. **Velocity**
 - b. Power
 - c. Alternative
- 10) _____ are substances that are discharged in the air.
 - a. Emissions
 - b. Combustion
 - c. Infrastructures

II. Choose one of the questions below and respond by writing at least a 2-3paragraph response. (See Reading Passage Responses, Addendum B)

- 1) What is the component to consider when constructing energy efficient cars and vehicles with electrical, mechanical and solar panel systems?
- 2) How can power created by solar cells in a car or vehicle be maximized?
- 3) Why is it important to understand the various types of fuel efficient vehicles for future possibilities of fuel efficiency?

Internet and Web Sites

Lesson 1 and Lesson 2

- Learn about solar cars and the way they operate.
http://www.futurecars.com/futurecars/solar_cars1.html
- Watch a webcast on how to make a solar-powered miniature car.
<http://www.wonderhowto.com/how-to/video/how-to-make-a-solar-powered-miniature-car-267274/>
- Watch a mini-video on solar power. <http://www.youtube.com/watch?v=l7ISqCDhv1Y>
- Mini videos on Hybrid cars
http://www.youtube.com/results?search_query=hybrid+cars&search_type=&aq=f
- Peugeot HYbrid3 Evolution Scooter
http://www.youtube.com/results?search_query=Peugeot+HYbrid3+Evolution+Scooter&search_type=&aq=f
- Mercedes-Benz B-Class Fuel Cell Car
http://www.youtube.com/results?search_query=Mercedes-Benz+B-Class+Fuel+Cell+Car&search_type=&aq=f
- Toyota Adds Solar Panels to Prius Hybrid
http://www.youtube.com/results?search_query=Toyota+Adds+Solar+Panels+to+Prius+Hybrid&search_type=&aq=f
- Air Powered AirPods
http://www.youtube.com/results?search_query=+Air+Powered+AirPods&search_type=&aq=f
- The Next Ecocar
http://www.youtube.com/results?search_query=Ohio+State+University+CreatesThe+Next+Ecocar&search_type=&aq=f

Lesson 3

- Experts discuss eco-ratings and mileage on hybrid cars that may or may not bring lawsuits against major car dealerships, such as Honda. <http://www.hybridcars.com/>
- This is a report that provides information from the National Research Council, Committee on Assessment of Resource Needs for Fuel Cell Cars. The federal government believes these long-term solutions will eradicate our nation's reliance on oil. <http://www.hybridcars.com/incentives-laws/hydrogen-backers-punch-back-plug-car-supporters-26319.html>
- A mini-hybrid Peugeot concept of cars and scooter webcast review. <http://www.tv-en.peugeot.com/News/HYbrid3-Evolution.html>
- Toyota Motor Corporation talks about installing solar panels on cars for energy efficiency. <http://uk.reuters.com/article/idUKT29871820080706>
- A former Aeronautics Engineer innovatively created a car that operates on compressed air creating AirPods. <http://www.wired.com/autopia/2008/11/passing-gaswill/>
- Read about the winning fuel economic 4-cylinder vehicle created by Ohio State. <http://www.theautochannel.com/news/2009/06/14/465828.html>

Lesson 4

- Learn more about biofuels <http://journeytoforever.org/biofuel.html>

Lesson 5

- Read about fuel efficient vehicles and the dynamics of their fuel efficiency. <http://www.fueleconomy.gov/FEG/bestworst.shtml>

Lesson 6

- Read about speed, velocity and best mileage. Learn about how much power it takes for mileage as compared with velocity. <http://auto.howstuffworks.com/fuel-efficiency/fuel-economy/question477.htm>

Lesson 7

- Explore various components of energy efficient vehicles. <http://www.csiro.au/science/EnergyEfficientVehicles.html>

Lesson 8

- Read about new types of energy efficiency vehicles and advertisements <http://www.automotiveguruz.com/kinds-energy-efficient-cars/>
- Read more about American dealerships and their thoughts about clean technologies and efficient vehicles. <http://www.csmonitor.com/Environment/Bright-Green/2008/1203/seeking-34-billion-from-congress-automakers-promise-electric-cars>

Lesson 9

- Read about solar-only cars, as compared to battery-powered vehicles. <http://www.solarelectricalsystems.com/solarvehicles.sh>