<table>
<tr><td>Content: Science:
Technology</td><td>Grade: 4th</td><td>Timeline: 45 minutes
03/14/16-03/18/16</td></tr>
<tr><td colspan="3">Science Standard(s):

4.1.3 Differentiate between evidence gathered through observations and inferences, and use the evidence to develop a line of reasoning.

4.5.1 Describe how the use of technology has changed the way people live on Guam and around the world.

CCSS ELA Standards:

4.W.7 Conduct short research projects that build knowledge through investigation of different aspects of a topic.
4.W.10 Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences</td></tr>
<tr><td>Lesson Overview:

In this lesson, students will consider both the benefits and the hazards of technology in today's world through the lens of the environment. Students will realize that, while human inventions have made our lives infinitely more healthy, convenient and enjoyable, they have also introduced new threats, such as toxic pollution, that affect both human health and the health of our environment. The challenge confronting our society – and our students – is identifying the proper use of technology to improve our lives while still protecting the quality of the natural world.</td><td colspan="2">Lesson Objective(s):
In this lesson, students will be able to:

• Explain the steps of the scientific investigation
• Apply the scientific method to plan and conduct a study/experiment.
• Improve performance in a task through improved communication and cooperation.
• Form and support a hypothesis.
• Develop a standard operating procedure.
• Reflect on learning
• Learn about engineering design
• Students will compare and contrast how the use of technology has changed human behavior over time</td></tr>
<tr><td>Vocabulary:
question, hypothesis, data, collect, analyze, conclusion, prediction, investigation, experiment, support, observation, inference, variable, measure, compare, scientific method, classify, technology, impact, support</td><td colspan="2">Focus Question(s):
• How do the various levels of technological development affect different cultures?
• How does technology impact our lives?
• How will technology change our future lives?
• Consider how we can maximize the benefits of technology
• Reflect on how modern electronics are changing how we relate to the natural world</td></tr>
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Description of Lesson (including instructional strategies):

Day 1: 03/14/16 Monday What is Technology?

- I can explain what is technology.

Anticipatory Set:

Ask students,

- "What is technology?"
- Why is technology always changing?
- Why do people want to make daily chores easier?
- Why do you think the pioneers did not travel by airplane or train?
- How else might you travel across the country on land or in the air today?
- Why do you think the railroad lines were so important?
- How have planes changed? Bicycles? Trains? Boats/ships?

Instruction and Strategies:

After discussing the meaning of technology, present and discuss the following definitions. The Merriam-Webster Dictionary actually has two separate meanings for the word:

1 : the use of science in solving problems (as in industry or engineering)
2 : a technical method of doing something

1. Ask your students to consider advances in technology over the past several hundred years, and discuss with them ways in which these advances have benefited human beings. Examples you might start out with are the electricity, the telephone, the automobile and airplane, and of course, the computer.
2. Before continuing the discussion, begin a chart on the chalkboard with three column headings: "Increasing Production of Goods and Services, "Reducing Amount of Labor Needed to Produce Goods and Services," and "Providing Higher Living Standards." Tell students that as they continue discussing the benefits of technology, they will be classifying the benefits under these headings.
3. As students discuss the benefits of technology, list them on the chart. For example, if students say that the telephone has made it easier to talk to friends, list "telephone" under "Providing Higher Living Standards." If they say that the dishwasher has made it easier to wash dishes, list "dishwasher" under "Reducing Amount of Labor Needed to Produce Goods and Services." Students may decide to include some technologies under more than one heading.

Homework: Students should understand that inventions make everyday life easier. They should be able to classify objects as belonging to the past or present. Brainstorm with children the various household appliances in their homes. Students will make a collage using drawing paper to draw or cut out and paste pictures of household appliances in their homes that have made everyday life easier. Students should be able to explain how these tools and appliances have changed how families live today.

Description of Lesson (including instructional strategies):
Day 2: 03/15/16 Tuesday Technology in the Classroom

- I can explain the importance technology plays in the classroom.

Students develop their understanding of the role technology plays in their lives by considering how it is commonly used in the classroom.

Instruction and strategies:
1. Once your class has settled on the meaning of the word, have students examine the classroom to find examples of technology. Have them consider both electronics and also the products that were manufactured through applied science (also technology). List their discoveries on the board. Challenge students to think beyond their most immediate examples of technology. Technology actually has been used in the manufacture of virtually everything in the room.

2. Ask students if they know how these classroom examples were manufactured. Might their production have emitted pollution in the air, water, or soil (e.g. through smokestacks, transportation exhaust, or pipes dumping waste in waterways)? Does anyone know the environmental impact caused by the manufacture of the items in the room? How aware are most people about the environmental impact of common objects and behaviors?

3. Technology is also applied in the generation and distribution of energy. Ask your students to identify all of the features in the room that require, or that have required, the use of energy. Answers will include, of course, the lights, computers, and other appliances being powered by electricity, along with any cell phones and other electronics. In addition, energy was used in the manufacture of basically everything in the room. Do your students know how the room's electricity is being generated?

Guided Practice:
4. Follow up with a discussion about energy. The simplest definition of energy is "the ability to do work". Energy is how things change and move. It's everywhere around us and takes all sorts of forms. It takes energy to cook food, to drive to school, and to jump in the air. How is energy generated in the United States? Examples will include the power generated from hydroelectric, wind, solar, geothermal and nuclear sources and from the burning of coal, petroleum and natural gas. What do your students know about the environmental impact of utilizing these energy sources? Typically, renewable energy sources, such as
solar and wind, have a substantially smaller environmental impact compared to non-renewable energy sources, such as fossil fuels (coal, oil and natural gas)

Description of Lesson (including instructional strategies):
Day 3: 03/16/16 Wednesday The Promise of Technology

- I can compare and contrast how technology has helped change our lives over time.

Students should consider differences in societies and compare both the technological advancements and the environmental quality of both.

Instruction and strategies:

1. Have students consider two types of societies. Society A is similar to what we envision long ago or in various parts of the world today – it uses simpler forms of technology and lacks many of the large-scale systems in place today, such as sanitation systems or the internet. In Society A, if a citizen wants a drink of water, s/he must walk to the closest freshwater source to fill their container with enough water to last until the next time s/he is able to walk the distance. This is a society where people do not have the same conveniences many people have today. They live closely with nature and have simpler tools. Society B is quite different from the first, and more similar to the students' own lives – full of the many technological inventions and modern conveniences. If a citizen of this society desires a drink of water, s/he walks over to the faucet, turns it on, and clean water immediately flows out. Ask students to use their imagination or prior knowledge to fill out Reproducible #1 – A Tale of Two Societies Worksheet, considering the technology available to each person. They will compare the following:

- Heating the living quarters
- Making tools for hunting, procuring food, and sewing clothing
- Obtaining clean drinking water
- Getting rid of wastes and garbage
- Diagnosing and curing illness
- Transporting people and goods

Guided Practice:

2. Now, ask students to compare the peoples' connections with the environment in Society A
compared with Society B. Would either group know more about:

- Where drinking water would come from?
- Where food would come from?
- What would happen to wastes?
- What would be required to make tools?
- Where cures for illness would come from?

Most of human history was based around a society that functioned more like Society A. Previous to industrialization, all humans were directly involved with collecting water, making tools, transporting goods, etc. They would know where their water and food came from because they would have gathered such resources themselves. They would have disposed of their own wastes, made their own tools, and found the medicinal plants needed to cure afflictions. In contrast, many of us live somewhere akin to Society B, mostly removed from these activities. We don't see where our food is grown and processed, we watch our trash disappear on trucks, our sewage disappear down the toilet, and we buy tools and medicines that were made somewhere else. The upshot is

that most of us have a greater amount of free time and efficiency in our lives.

3. What would be various pros and cons to living in each of these societies? Answers will vary but may include the following. Inhabitants of Society A spend much of their day taking care of individual needs and daily tasks. They have less leisure time or time for additional activities. Yet, they have the benefit of intimate knowledge about the natural world around them and are more likely to get fresh air and exercise. Inhabitants of Society B have many daily tasks organized or taken care of through increased efficiency and advanced technology, leaving them more time to invest in other activities. They have more conveniences, comforts, and shelter, yet they lack intimate knowledge about their natural world.

4. The class can wrap up the activity by considering the following questions in a class discussion:

- How do Societies A and B relate to human experiences past and present? Think about the experiences of prehistoric people versus modern humans. Society B may be most familiar to many of us today and Society A is more representative of much of human history before the last few centuries. Many areas of the world today fall somewhere in between these two examples, but it is difficult to find a society living completely in isolation of modern technology and its effects.
- How clean was the prehistoric environment compared with the world today? What chemicals were in the air, water, and soil during prehistoric times? What chemicals were in the prehistoric people themselves? Did prehistoric people have to worry about toxic chemicals? Were they concerned with nuclear waste? Was there any significant pollution at all? *Answers will vary, but there were many fewer chemicals, waste and pollution in prehistoric times.*

A Tale of Two Societies

Name: Date:

Activity	**Society A**	**Society B**
Heat the living quarters:		
Make tools for hunting, get food and create clothing:		
Obtain drinking water:	Walk to the closest freshwater source, fill container with enough water to last until next time, and carry it home.	Turn on the faucet.
Get rid of wastes and garbage:		
Diagnose and cure illness:		
Transport people and goods:		
Explain natural phenomena (experiences):		

Description of Lesson (including instructional strategies):
Day 4: 03/17/16 Thursday Technology Poster

- I can create an illustration describing the benefits of modern technology.

Art Integration: Have students illustrate pictures that show the benefits of modern technology into our daily lives. Then ask students to include a description on their illustrations and explain what is happening in their picture and the effect(s) it may have on the environment. At the end, students are to present their illustrations to the class.

Description of Lesson (including instructional strategies):
Day 5: 03/18/16 Friday Review of Technology

Review the lessons of the week.

Questions to prompt *discussion with the students:*

- What is technology?
- What important role does technology play in our lives today?

Technology can be an important solution in helping humans reduce our impact on the environment and use resources more wisely and efficiently. Have students brainstorm, discuss, illustrate or present on ideas of technology (already in existence or not) that might be solutions to many of the environmental problems we face today (for example, clean energy technology, innovations in efficiency, improved methods of transportation, etc.). Encourage creativity! Make sure students weigh the benefits of these inventions against their consequences of production, transport, energy use and output.

Closure:
The lesson helped students consider the impact that technology is having on the environment, as well as their lives.

Independent Practice:
Integration with Art: Students are to create a visual illustrating the benefits of modern technology to our daily lives.

Formative Assessment:
Q&A and the completion of a visual illustrating benefits of modern technology. Provide feedback based on their understanding of the lesson learned. (Marzano: Providing Feedback).

Resources:
Harcourt Science- 4th Grade, paper, pencil, a Tale of Two Societies worksheet

Accommodations:
Cooperative groups will consist of students of various levels so they can help each other.

If needed, there can be a small group of students on which the teacher focuses his/her attention. Have ESL students learn new words by selecting words in the dictionary and using them in sentences.

A Tale of Two Societies

Name: Date:

Activity	Society A	Society B
Heat the living quarters:		
Make tools for hunting, get food and create clothing:		
Obtain drinking water:	Walk to the closest freshwater source, fill container with enough water to last until next time, and carry it home.	Turn on the faucet.
Get rid of wastes and garbage:		
Diagnose and cure illness:		
Transport people and goods:		
Explain natural phenomena (experiences):		

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STEM/Electricity and Magnetism</td><td>Grade: 4th</td><td>Timeline: 45 minutes
03/28/16-04/1/16</td></tr>
<tr><td colspan="3">Science Standard(s):
4.1.2 Form and support a hypothesis after collecting information and gathering specimens or observing an experiment.

CCSS ELA Standards:

4.RI.3 Explain events, procedures, ideas or concerts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text.
4.W.7 Conduct short research projects that build knowledge through investigation of different aspects of a topic.
4.W.10 Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.</td></tr>
<tr><td>Lesson Overview:

In this lesson, students will be able to explain their understanding of the scientific method and design an experiment utilizing this method. Through project-based learning, students are encouraged to find their own answers and draw their own conclusions.
Electricity and magnetism are examples of energy in use. Magnets and electric circuits both cause motion or otherwise change their surroundings. Technology uses electricity and magnetism to produce light, heat, sound, and motion.</td><td colspan="2">Lesson Objective(s):
In this lesson, students will be able to:

• Explain the steps of the scientific investigation
• Apply the scientific method to plan and conduct a study/experiment.
• Improve performance in a task through improved communication and cooperation.
• Form and support a hypothesis.
• Develop a standard operating procedure.
• Reflect on learning
• Learn about engineering design
• Students will compare and contrast how the use of technology has changed human behavior over time</td></tr>
<tr><td>Vocabulary:

question, hypothesis, data, collect, analyze, conclusion, prediction, investigation, experiment, support, observation, inference, variable, measure, compare, scientific method, classify, technology, impact, support, charge, static electricity, electric field, electric current, circuit, electric cell, conductor, insulator, resistor, series circuit, parallel circuit, magnet, magnetic pole, magnetic field, electromagnet</td><td colspan="2">Focus Question(s):
• Explain the steps of the scientific method. • Apply the scientific method to plan and conduct a study/experiment.
• Improve your performance in a task through improved communication and cooperation
• Form and support a hypothesis • Develop a standard operating procedure • Reflect on your learning
• How do the various levels of technological development affect different cultures?
• How does technology impact our lives?
• How will technology change our future lives?
• Consider how we can maximize the benefits of technology
• Reflect on how modern electronics are changing</td></tr>
</table>

	how we relate to the natural world

Description of Lesson (including instructional strategies):
Day 1: 03/28/16 Monday What is Static Electricity?

- I can explain what causes an electric field.

Anticipatory Set:
Have students scan the chapter. Guide them in identifying the lesson titles and major headings and use them to outline the chapter.

Instruction and Strategies:
Help students focus on the supporting facts and details for the main idea: Objects become electrically charged when they gain or lose negative charges.

- Teacher will lead a whole class discussion; ask the class, What are some ways you use electricity? (Light, turn on TV, etc.)
- Have students complete the Investigation on p. F4.
  Investigate: **Balloons Rubbed with Different Materials**
  Materials: two small, round balloons, string, tape, paper towel, plastic wrap
- Preview the vocabulary terms on p. F6.
- Read as a class pages F6-F9.
- Students will take notes as teacher discusses and lectures.
- Teacher will ask comprehension questions throughout the lesson.
- Students will copy and define the vocabulary terms on p. F6.
- Have students copy and answer the review questions on p. F9.
- Hands-On Activity: **Modeling the Movement of Changes** p. F7 (TE)

Description of Lesson (including instructional strategies):
Day 2: 03/29/16 Tuesday What is an Electric Current?
I can recognize that electrical energy can be converted to other forms of energy, such as heat, light, and motion.

Anticipatory Set:
Have students scan the chapter. Guide them in identifying the lesson titles and major headings and use them to outline the chapter.

Instruction and Strategies:
Help students focus on the supporting facts and details for the main idea: Electric current is a flow of charges through a path called a circuit.

- Teacher will lead a whole class discussion; ask the class, What does a battery do? (A battery changes stored chemical energy into electrical energy.)
- Have students complete the investigation on p. F10.
  Investigate: **Making a Bulb Light Up**
  Materials: D-cell battery, insulated electric wire, miniature light bulb, masking tape
- Preview the vocabulary terms on p. F12
- Read as a class pp. F10-F15.
- Students will take notes as teacher discusses and lectures.

- Teacher will ask comprehension questions throughout the lesson.
- Students will copy and define the vocabulary terms on p. F12.
- Have students copy and answer the review questions on p. F15.
- Hands-On Activity: **Observing Parts of a Circuit** p. F13 (TE)

Description of Lesson (including instructional strategies):
Day 3: 03/30/16 Wednesday What is a Magnet?
I can recognize that magnets have two poles, labeled north and south, and that like poles repel each other, while unlike poles attract each other.

Anticipatory Set:
Have students scan the chapter. Guide them in identifying the lesson titles and major headings and use them to outline the chapter.

Instruction and Strategies:
Help students focus on the supporting facts and details for the main idea: Magnets are objects that attract materials such as iron. Every magnet has two magnetic poles.

- Teacher will lead a whole class discussion; ask the class, <u>What would happen if you placed an iron nail beside a piece of magnetite?</u> (The nail would be pulled toward the magnetite.)
- Have students use the Motion and Matter: FOSS Science Resources book to complete the investigation. Have students complete the investigation on p. 4.
  Investigate: **Magnets**
  <u>Materials:</u> 3 magnets
- Preview the vocabulary terms on p. F12
- Read as a class pp. F18-F21.
- Students will take notes as teacher discusses and lectures.
- Teacher will ask comprehension questions throughout the lesson.
- Students will copy and define the vocabulary terms on p. F18.
- Have students copy and answer the review questions on p. F21.
- Hands-On Activity: Motion and Matter: FOSS Science Resources book p.7
  Materials: 3 magnets, straw

Description of Lesson (including instructional strategies):
Day 4: 03/31/16 Thursday What is an Electromagnet?
I can recognize that electric currents produce electric fields.

Anticipatory Set:
Have students scan the chapter. Guide them in identifying the lesson titles and major headings and use them to outline the chapter.

Instruction and Strategies:
Help students focus on the supporting facts and details for the main idea: Wires carrying an electric current become magnets.

- Teacher will lead a whole class discussion; ask the class, <u>How can a magnetic field make something move?</u> (It can pull a magnet to it or push a magnet away.)
- Have students complete the investigation on p. F22.

Investigate: **How Magnets and Electricity Can Interact**
Materials: bar magnet, small compass, sheet of cardboard, tape, insulated wire, D-cell battery

- Preview the vocabulary terms on p. F24
- Read as a class pp. F22-F29.
- Students will take notes as teacher discusses and lectures.
- Teacher will ask comprehension questions throughout the lesson.
- Students will copy and define the vocabulary terms on p. F24.
- Have students copy and answer the review questions on p. F29.

Description of Lesson (including instructional strategies):
Day 5: 04/01/16 Friday Science Through Time: Discovering Electromagnetism
I can connect chapter concepts with the history of science.

Anticipatory Set:
Have students scan the chapter. Guide them in identifying the lesson title and then to outline the article.

Instruction and Strategies:
Help students focus on the supporting facts and details for the main idea: Many scientists have contributed to our current knowledge of electromagnetism.

- Read as a class pages F30-F31.
- Students will take notes as teacher discusses and lectures.
- Teacher will ask comprehension questions throughout the lesson.
- Have students copy and answer the Think About It questions on p. F31.

Formative Assessment:
Students will complete the review questions from each lesson.

Closure:
Students will share with the rest of the class their understanding of electricity and magnetism.

Independent Practice:
Students will work independently to complete the review questions pages for each lesson.

Formative Assessment:
Q&A and the review questions from each lesson. Provide feedback based on their understanding of the lesson learned. (Marzano: Providing Feedback).

Resources:
Harcourt Science- 4th Grade, Motion and Matter: FOSS Science Resources, paper, pencil, bar magnet, small compass, sheet of cardboard, tape, insulated wire, D-cell battery, D-cell battery, insulated electric wire, miniature light bulb, masking tape, two small, round balloons, string, tape, paper towel, plastic wrap

Accommodations:
Cooperative groups will consist of students of various levels so they can help each other.
If needed, there can be a small group of students on which the teacher focuses his/her attention.
Have ESL students learn new words by selecting words in the dictionary and using them in sentences.

Content: Science: STEM/Forces at Work	**Grade:** 4th	**Timeline:** 45 minutes 04/04/16-04/08/16

Science Standard(s):
4.1.2 Form and support a hypothesis after collecting information and gathering specimens or observing an experiment.

CCSS ELA Standards:

4.RI.3 Explain events, procedures, ideas or concerts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text.
4.W.7 Conduct short research projects that build knowledge through investigation of different aspects of a topic.
4.W.10 Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Lesson Overview:

In this lesson, students will be able to explain their understanding of the scientific method and design an experiment utilizing this method. Through project-based learning, students are encouraged to find their own answers and draw their own conclusions.
Forces are part of all the motions of everyday life. The interactions among gravity, friction, and masses are a vital part of these everyday motions.

Lesson Objective(s):
In this lesson, students will be able to:

- Explain the steps of the scientific investigation
- Apply the scientific method to plan and conduct a study/experiment.
- Improve performance in a task through improved communication and cooperation.
- Form and support a hypothesis.
- Develop a standard operating procedure.
- Reflect on learning
- Learn about engineering design
- Students will compare and contrast how the use of technology has changed human behavior over time

Vocabulary:

question, hypothesis, data, collect, analyze, conclusion, prediction, investigation, experiment, support, observation, inference, variable, measure, compare, scientific method, classify, technology, impact, support, position, motion, frame of reference, relative motion, speed, force, acceleration, newton, gravity, weight, friction

Focus Question(s):

- Explain the steps of the scientific method.
- Apply the scientific method to plan and conduct a study/experiment.
- Improve your performance in a task through improved communication and cooperation
- Form and support a hypothesis • Develop a standard operating procedure • Reflect on your learning
- How do the various levels of technological development affect different cultures?
- How does technology impact our lives?
- How will technology change our future lives?
- Consider how we can maximize the benefits of technology
- Reflect on how modern electronics are changing how we relate to the natural world.

Description of Lesson (including instructional strategies):
Day 1: 04/04/16 Monday What is Motion?

- I can identify ways to describe motion.

Anticipatory Set:
Have students scan the chapter. Guide them in identifying the lesson titles and major headings and use them to outline the chapter.

Instruction and Strategies:
Help students focus on the supporting facts and details for the main idea: Motion is any change from one position to another.

- Teacher will lead a whole class discussion; ask the class,
  How do you know when something is in motion?
  What is speed?
- Have students complete the Investigation on p. F38.
  Investigate: **Giving Directions**
  Materials: paper, pencil
- Preview the vocabulary terms on p. F40.
- Read as a class pages F36-F43.
- Students will take notes as teacher discusses and lectures.
- Teacher will ask comprehension questions throughout the lesson.
- Students will copy and define the vocabulary terms on p. F40.
- Have students copy and answer the review questions on p. F43.

Description of Lesson (including instructional strategies):
Day 2: 04/05/16 Tuesday What effects do forces have on objects?
I can define force.

Anticipatory Set:
Have students scan the chapter. Guide them in identifying the lesson titles and major headings and use them to outline the chapter.

Instruction and Strategies:
Help students focus on the supporting facts and details for the main idea: A force is a push or pull. Starting, stopping, slowing down, and turning are all changes in motion, or kinds of acceleration.

- Teacher will lead a whole class discussion; ask the class,
  What is motion?
  What are some ways you can describe motion?
- Preview the vocabulary terms on p. F46
- Read as a class pp. F44-F53.
- Students will take notes as teacher discusses and lectures.
- Teacher will ask comprehension questions throughout the lesson.
- Students will copy and define the vocabulary terms on p. F46.
- Have students copy and answer the review questions on p. F53.

- Hands-On Activity: **Observing the effects of friction** p. F47 (TE)

Description of Lesson (including instructional strategies):
Day 3: 04/06/16 Wednesday What are some forces in nature?
I can recognize the relationship between gravity and weight.

Anticipatory Set:
Have students scan the chapter. Guide them in identifying the lesson titles and major headings and use them to outline the chapter.

Instruction and Strategies:
Help students focus on the supporting facts and details for the main idea: Forces in nature include gravity and friction.

- Teacher will lead a whole class discussion; ask the class, What is gravity and why is it important? (Gravity is a pulling force between two objects, and it draws them toward each other.)
- Have students complete the investigation on p.F54.
  Investigate: **Forces on a Sliding Box**
  Materials: shoe box, spring scale, books
- Preview the vocabulary terms on p. F56.
- Read as a class pp. F54-F59.
- Students will take notes as teacher discusses and lectures.
- Teacher will ask comprehension questions throughout the lesson.
- Students will copy and define the vocabulary terms on p. F56.
- Have students copy and answer the review questions on p. F59.

Description of Lesson (including instructional strategies):
Day 4: 10/22/15 Science Technology: High Speed Human Powered Vehicles
I can evaluate the impact of research and technology on scientific thought, society, and the environment.
I can identify careers related to science.

Anticipatory Set:
Have students scan the chapter. Guide them in identifying the lesson title and then to outline the article.

Instruction and Strategies:
Help students focus on the supporting facts and details for the main idea: Knowledge of forces and acceleration have helped people design and manufacture human powered vehicles.

- Read as a class pages F60-F61.
- Students will take notes as teacher discusses and lectures.
- Teacher will ask comprehension questions throughout the lesson.
- Have students copy and answer the Think About It questions on p. F61.

Description of Lesson (including instructional strategies):
Day 5: 04/08/16 Friday People in Science: Ellen Ochoa-Astronaut
I can connect chapter concepts with the contributions of scientists.

Anticipatory Set:
Have students scan the chapter. Guide them in identifying the lesson title and then to outline the article.

Instruction and Strategies:

- Read as a class pages F62.
- Students will take notes as teacher discusses and lectures.
- Teacher will ask comprehension questions throughout the lesson.
- Have students copy and answer the Think About It questions on p. F62.
- Marbles on a Ramp: Which Marbles go Faster? P.F63
  Materials: masking tape, 2 metersticks, books, meter tape or ruler, 10 marbles, stopwatch

Formative Assessment:
Students will complete the review questions from each lesson.

Closure:
Students will share with the rest of the class their understanding of motion-forces at work.

Independent Practice:
Students will work independently to complete the review questions pages for each lesson.

Formative Assessment:
Q&A and the review questions from each lesson. Provide feedback based on their understanding of the lesson learned. (Marzano: Providing Feedback).

Resources:
Harcourt Science- 4th Grade, Motion and Matter: FOSS Science Resources, paper, pencil, shoe box, spring scale, books, masking tape, 2 metersticks, books, meter tape or ruler, 10 marbles, stopwatch

Accommodations:
Cooperative groups will consist of students of various levels so they can help each other.
If needed, there can be a small group of students on which the teacher focuses his/her attention.
Have ESL students learn new words by selecting words in the dictionary and using them in sentences.

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STEM/Simple Machines</td><td>Grade: 4th</td><td>Timeline: 45 minutes
04/11/16-04/15/16</td></tr>
<tr><td colspan="3">Science Standard(s):
4.1.2 Form and support a hypothesis after collecting information and gathering specimens or observing an experiment.
4.5.1 Describe how the use of technology has changed the way people live on Guam and around the world.

CCSS ELA Standards:

4.RI.3 Explain events, procedures, ideas or concerts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text.
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Forces are part of all the motions of everyday life. The interactions among gravity, friction, and masses are a vital part of these everyday motions.</td><td colspan="2">Lesson Objective(s):
In this lesson, students will be able to:

• Explain the steps of the scientific investigation
• Identify and describe the parts of a lever.
• Identify the parts of a wheel and axle.
• Describe the parts of the different type of pulleys.
• Describe how an inclined plane makes work easier.
• Connect chapter concepts with the history in science.
• Students will compare and contrast how the use of technology has changed human behavior over time.
• Consider how we can maximize the benefits of technology.
• Reflect on how modern electronics are changing how we relate to the natural world.</td></tr>
<tr><td>Vocabulary:

question, hypothesis, data, collect, analyze, conclusion, prediction, investigation, experiment, support, observation, inference, variable, measure, compare, scientific method, classify, technology, simple machine, lever, fulcrum, effort force, work, pulley, wheel and axle, inclined</td><td colspan="2">Focus Question(s):

• How do the various levels of technological development affect different cultures?
• How does technology impact our lives?
• How will technology change our future lives?</td></tr>
</table>

plane, efficiency, screw, wedge	

Description of Lesson (including instructional strategies):
Day 1: 04/11/16 Monday What is Motion?

- I can identify and describe the parts of a lever.

Anticipatory Set:
Have students scan the chapter. Guide them in identifying the lesson titles and major headings and use them to outline the chapter.

Instruction and Strategies:
Help students focus on the supporting facts and details for the main idea: The basic machines that make up all other machines are simple machines.

- Teacher will lead a whole class discussion; ask the class,
  How is it possible for one person to lift up a car?
  What do machines do?
  What are simple machines?
- Have students complete the Investigation on p. F68.

Investigate: **Experimenting with a lever.**
Materials: 2 rulers, 2 identical rubber bands (long), safety goggles

- Preview the vocabulary terms on p. F70.
- Read as a class pages F66-F75.
- Students will take notes as teacher discusses and lectures.
- Teacher will ask comprehension questions throughout the lesson.
- Students will copy and define the vocabulary terms on p. F70.
- Have students copy and answer the review questions on p. F75.
- Hands-On Activity: **Identifying Lever Parts** p. F72 (TE)

Description of Lesson (including instructional strategies):
Day 2: 04/12/16 Tuesday How Do a Pulley and a Wheel and Axle Help Us Do Work?

- I can identify the parts of a wheel and axle.
- I can describe the parts of the different type of pulleys.

Anticipatory Set:
Have students scan the chapter. Guide them in identifying the lesson titles and major headings and use them to outline the chapter.

Instruction and Strategies:
Help students focus on the supporting facts and details for the main idea: A pulley is a simple machine similar to a lever. A wheel and axle is a simple machine in which an effort force on a large wheel makes a larger resulting force on a smaller wheel, or axle.

- Teacher will lead a whole class discussion; ask the class,
  What is a simple machine?
  How do simple machines help people do work?

- Preview the vocabulary terms on p. F78
- Read as a class pp. F78-F81.
- Students will take notes as teacher discusses and lectures.
- Teacher will ask comprehension questions throughout the lesson.
- Students will copy and define the vocabulary terms on p. F78.
- Have students copy and answer the review questions on p. F81.
- Motion and Matter: FOSS Science Resources pp. 16-17.

Description of Lesson (including instructional strategies):
Day 3: 04/13/16 Wednesday How do some other simple machines help us do work?

- I can describe how an inclined plane makes work easier.

Anticipatory Set:
Have students scan the chapter. Guide them in identifying the lesson titles and major headings and use them to outline the chapter.

Instruction and Strategies:
Help students focus on the supporting facts and details for the main idea: An inclined plane is a simple machine used to move things to a different height.

- Teacher will lead a whole class discussion; ask the class,
  Why is it easier for a wheelchair to move up a ramp than to move up stairs?
  Which simple machine do you think made the first elevator possible?
  What are some examples of simple machines?
- Preview the vocabulary terms on p. F84.
- Read as a class pp. F84-F89.
- Students will take notes as teacher discusses and lectures.
- Teacher will ask comprehension questions throughout the lesson.
- Students will copy and define the vocabulary terms on p. F84.
- Have students copy and answer the review questions on p. F89.

Description of Lesson (including instructional strategies):
Day 4: 04/14/16 Science Through Time: Simple Machines and Water Transportation

- I can connect chapter concepts with the history of science.

Anticipatory Set:
Have students scan the chapter. Guide them in identifying the lesson title and then to outline the article.

Instruction and Strategies:
Help students focus on the supporting facts and details for the main idea: This article focuses on some of the simple machines used aboard boats and ships.

- Read as a class pages F90-F91.
- Students will take notes as teacher discusses and lectures.
- Teacher will ask comprehension questions throughout the lesson.

- Have students copy and answer the Think About It questions on p. F91.

Description of Lesson (including instructional strategies):
Day 5: 04/15/16 Friday People in Science: Wilbur and Orville Wright - Inventors

- I can connect chapter concepts with the contributions of scientists.

Anticipatory Set:
Have students scan the chapter. Guide them in identifying the lesson title and then to outline the article.

Instruction and Strategies:

- Read as a class pages F92.
- Students will take notes as teacher discusses and lectures.
- Teacher will ask comprehension questions throughout the lesson.
- Have students copy and answer the Think About It questions on p. F92.
- Make a Screw: How are screws and inclined planes related? P.F93

Materials: ruler, sheet of paper, scissors, unsharpened pencil, tape

Formative Assessment:
Students will complete the review questions from each lesson.

Closure:
Students will share with the rest of the class their understanding of simple machines.

Independent Practice:
Students will work independently to complete the review questions pages for each lesson.

Formative Assessment:
Q&A and the review questions from each lesson. Provide feedback based on their understanding of the lesson learned. (Marzano: Providing Feedback).

Resources:

Harcourt Science- 4th Grade, Motion and Matter: FOSS Science Resources, paper, pencil, ruler, sheet of paper, scissors, unsharpened pencil, tape, 2 rulers, 2 identical rubber bands (long), safety goggles

Accommodations:
Cooperative groups will consist of students of various levels so they can help each other.
If needed, there can be a small group of students on which the teacher focuses his/her attention.
Have ESL students learn new words by selecting words in the dictionary and using them in sentences.

<table>
<tr><td>Content: Science:
Motion and Matter: Forces</td><td>Grade: 4th</td><td>Timeline: 45 minutes
04/18/16-04/22/16</td></tr>
<tr><td colspan="3">Science Standard(s):
4.1.2 Form and support a hypothesis after collecting information and gathering specimens or observing an experiment.
4.5.1 Describe how the use of technology has changed the way people live on Guam and around the world.

CCSS ELA Standards:

4.RI.3 Explain events, procedures, ideas or concerts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text.
4.W.7 Conduct short research projects that build knowledge through investigation of different aspects of a topic.
4.W.10 Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.</td></tr>
<tr><td>Lesson Overview:

In this lesson, students will be able to explain their understanding of the scientific method and design an experiment utilizing this method. Through project-based learning, students are encouraged to find their own answers and draw their own conclusions.
Forces are part of all the motions of everyday life. The interactions among gravity, friction, and masses are a vital part of these everyday motions.</td><td colspan="2">Lesson Objective(s):
In this lesson, students will be able to:

• Explain the steps of the scientific investigation
• Identify and describe the parts of a lever.
• Identify the parts of a wheel and axle.
• Describe the parts of the different type of pulleys.
• Describe how an inclined plane makes work easier.
• Connect chapter concepts with the history in science.
• Students will compare and contrast how the use of technology has changed human behavior over time.
• Consider how we can maximize the benefits of technology.
• Reflect on how modern electronics are changing how we relate to the natural world.</td></tr>
<tr><td>Vocabulary:
question, hypothesis, data, collect, analyze, conclusion, prediction, investigation, experiment, support, observation, inference, variable, measure, compare, scientific method, classify, technology, simple machine, gravity, force, magnetism, magnets, attract, repel, magnetic force, magnetic field, strength</td><td colspan="2">Focus Question(s):

• How do the various levels of technological development affect different cultures?
• How does technology impact our lives?
• How will technology change our future lives?
• What makes the use of the scientific method universal?</td></tr>
</table>

Description of Lesson (including instructional strategies):

Anticipatory Set: Review the Scientific Method.

- Ask a question.
- Do research.
- Construct a hypothesis.
- Test your hypothesis by doing an experiment.
- Analyze your data and draw a conclusion.
- Communicate your results.

Day 1: ***Day 1: 04/18/16 Monday Two Forces***

Explain to students that they will be conducting an experiment. Encourage them to form a hypothesis (I think ___ because ___.) Have students write down their data as they observe and conduct each experiment.

Teacher will use the Motion and Matter: Investigations Guide TE pp. 88-95.

I have some objects for you to investigate. Everyone will have a round, black object and a cup of paper clips to share in your group. (Do not identify the black object as a magnet.)

Teacher will ask the students the following question: <u>What happens when magnets interact with other magnets and with paper clips?</u>

Instruction and Strategies:

Help students focus on the supporting facts and details for the main idea: Magnets stick only to other magnets and a select few metals.

<u>Materials:</u> magnets, paper clips, cups, tongue depressors, rubber bands, pieces of string, straws, containers

Questions to prompt *discussion with the students:*

- ✓ What is the black object? A magnet.
- ✓ What can the magnet do? Stick to paper clips, stick to another magnet, push or pull on another magnet.

Distribute a copy of Magnetic Force Checklist. Have students investigate the magnetic force. Distribute a Magnetic-Force Activities sheet. Teacher will describe the six things students might try as they continue to explore magnetic interactions.

Answer the focus question by drawing a model in students' notebooks. Review the focus question: <u>What happens when magnets interact with other magnets and with paper clips?</u>

Description of Lesson (including instructional strategies):

Day 2: 04/19/16 Tuesday Two Forces Continuation

Instruction and Strategies:

Teacher will continue the lesson. Review the vocabulary. Have students review the models they drew to answer the focus question. Read Magnetism and Gravity pp. 3-7. Discuss the reading.

Questions to prompt *discussion with the students:*

- ✓ What are the two forces discussed in the reading? Magnetism and Gravity.
- ✓ How are magnetism and gravity the same? How are they different? Both are forces that act on objects. Gravity acts on all objects; magnetism acts on only some objects. Magnetism can push or pull; gravity always pulls.
- ✓ Why don't magnets need to be touching in order to push or pull? They are surrounded by a magnetic field. Only the magnetic fields need to be touching.

Formative Assessment: Q & A of the outcome of their investigations. Provide feedback based on their understanding of the lesson learned. (Marzano: Providing Feedback).

- What causes the magnets to be spaced on the straw?
  The magnetic force is acting against gravity, pushing the magnets apart. The force is acting at a distance. The magnets are pushing on ach other, but they are not touching.
- Explain (using cause and effect statements) how balanced and unbalanced forces affect the motion of the paper clip.
  If the forces are balanced, there is no change of motion; if the forces are unbalanced, a change in motion occurs.

Closure:
Groups will share with the rest of the class their understanding of their classroom observations on the interactions of magnetic poles.

Independent Practice:
Students will work independently to make a prediction about forces and create models of the investigation.

Description of Lesson (including instructional strategies):
Day 3: 04/20/16 Wednesday Magnetic-Force Investigation
Explain to students that they will be conducting an experiment. Encourage them to form a hypothesis (I think ___ because ___.) Have students write down their data as they observe and conduct each experiment.

Teacher will use the Motion and Matter: Investigations Guide TE pp. 96-103.

Today we will collect data in order to predict the distance at which two magnets will attract a paper clip.

Teacher will ask the students the following question: How is the magnetic field affected when more magnets are added?

Instruction and Strategies:
Help students focus on the supporting facts and details for the main idea: Many magnets together create a stronger magnetic field.

Materials: 6 magnets doughnut shaped, 2 paper clips, meter tape (optional)

Have students conduct the investigation in pairs/groups. Discuss results of the investigations.

Distribute a copy of Force at a Distance. Review the procedure with the students.

Answer the focus question by drawing a model in students' notebooks. Review the focus question: How is the magnetic field affected when more magnets are added? Many magnets together create a stronger magnetic field.

Description of Lesson (including instructional strategies):
Day 4: 04/21/16 Magnetic Force Investigation Continued
Instruction and Strategies:
Teacher will continue the lesson. Review the vocabulary. Have students review the models they drew to answer the focus question. Read What Scientists Do pp. 8-9. Discuss the reading.

Questions to prompt *discussion with the students:*

- ✓ How do scientists choose the questions they want to study further? Their questions are based on observations and sometimes investigations they have completed.
- ✓ How did you use your data to predict the distance when two magnets were used? The paper clips snapped fairly close to one magnet and farther away with three magnets.
- ✓ How do you think scientists share their results of their investigations? They can talk to each other, write reports that others can read, and give talks at conferences.

Formative Assessment: Q & A of the outcome of their investigations. Provide feedback based on their understanding of the lesson learned. (Marzano: Providing Feedback).

- Have students discuss their investigations in terms of cause and effect relationshipps. Students describe the relationship between snap distance and the strength of attraction between the magnet and the paper clip. Students describe the relationship between number of magnets used and strength of the magnetic field or the distance from which the paper clip was attracted.

Closure:
Groups will share with the rest of the class their understanding of their classroom observations on magnetic forces.

Independent Practice:
Students will work independently to make a prediction about magnetic forces and create models of the investigation.

Description of Lesson (including instructional strategies):
Day 5: 04/22/16 Friday More About Forces
Explain to students that they will be conducting an experiment. Encourage them to form a hypothesis (I think ___ because ___.) Have students write down their data as they observe and conduct each experiment.

Teacher will use the Motion and Matter: Investigations Guide TE pp. 103-114.

Review forces at work. Questions to prompt *discussion with the students:*

- ✓ Who remembers what we call a push or pull? A force.
- ✓ What force causes the paper clip to move down? Gravity pulls the paper clip down-toward the center of the earth.

Teacher will ask the students the following question: What causes changes of motion?

Instruction and Strategies:

Help students focus on the supporting facts and details for the main idea: Any change of motion of an object, such as starting, stopping, change of speed, or change of direction, requires a force.
.
Materials: magnet, paper clip, string 30 cm, chair

Review balanced and unbalanced forces. Introduce a different kind of force. Identify forces. Investigate another example.

Answer the focus question by drawing a model in students' notebooks. Review the focus question: What causes changes of motion?

Any change of motion of an object, such as starting, stopping, change of speed, or change of direction, requires a force.

Resources:
Motion and Matter: FOSS Science Resources, paper, pencil, ruler, sheet of paper, scissors, magnets, paper clips, cups, tongue depressors, rubber bands, pieces of string, straws, containers, 6 magnets doughnut shaped, 2 paper clips, meter tape (optional), string 30 cm, 1 chair

Accommodations:
Cooperative groups will consist of students of various levels so they can help each other.
If needed, there can be a small group of students on which the teacher focuses his/her attention.
Have ESL students learn new words by selecting words in the dictionary and using them in sentences.

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04/25/16-04/29/16</td></tr>
<tr><td colspan="3">Science Standard(s):
4.1.2 Form and support a hypothesis after collecting information and gathering specimens or observing an experiment.
4.5.1 Describe how the use of technology has changed the way people live on Guam and around the world.

CCSS ELA Standards:

4.RI.3 Explain events, procedures, ideas or concerts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text.
4.W.7 Conduct short research projects that build knowledge through investigation of different aspects of a topic.
4.W.10 Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.</td></tr>
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In this lesson, students will be able to:

• Explain the steps of the scientific investigation
• Identify and describe the parts of a lever.
• Identify the parts of a wheel and axle.
• Describe the parts of the different type of pulleys.
• Describe how an inclined plane makes work easier.
• Connect chapter concepts with the history in science.
• Students will compare and contrast how the use of technology has changed human behavior over time.
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• How do the various levels of technological development affect different cultures?
• How does technology impact our lives?
• How will technology change our future lives?
• What makes the use of the scientific method universal?</td></tr>
</table>

Description of Lesson (including instructional strategies):
Anticipatory Set: Review the Scientific Method.

- Ask a question.
- Do research.
- Construct a hypothesis.
- Test your hypothesis by doing an experiment.
- Analyze your data and draw a conclusion.
- Communicate your results.

Day 1: ***04/25/16 Monday More About Forces Continuation***
Explain to students that they will be conducting an experiment. Encourage them to form a hypothesis (I think ___ because ___.) Have students write down their data as they observe and conduct each experiment.

Teacher will use the Motion and Matter: Investigations Guide TE pp. 110-113.

Teacher will continue the lesson. Review the vocabulary. Read Changes of Motion pp. 10-15. Discuss the reading.

Questions to prompt *discussion with the students:*

- ✓ How do you get an object to start moving? Apply a force (a push or a pull).
- ✓ How do you get an object to stop? Apply a force in the opposite direction.
- ✓ Starting and stopping are two changes of motion. Can you think of others? You can change the speed (faster or slower) and you can change direction. Any change requires a force.

Have student complete the concept-definition map for Gravity.

Teacher will ask the students the following question: What causes changes of motion?

Unbalanced forces cause change of motion.

Formative Assessment: Q & A of the outcome of their investigations. Provide feedback based on their understanding of the lesson learned. (Marzano: Providing Feedback).

Closure:
Groups will share with the rest of the class their understanding of their classroom observations on forces.

Independent Practice:
Students will work independently to make a prediction about forces and create models of the investigation.

Description of Lesson (including instructional strategies):
Day 2: 04/26/16 Tuesday Wheel-and-Axle Systems
Explain to students that they will be conducting an investigation. Encourage them to form a hypothesis (I think ___ because ___.) Have students write down their data as they observe and conduct each experiment.

Teacher will use the Motion and Matter: Investigations Guide TE pp. 126-133.

Teacher will ask the students the focus question: How can we change the motion of the wheels rolling down ramps?

Instruction and Strategies:
Help students focus on the supporting facts and details for the main idea: **The wheels will roll in a straight line and will go the same distance when the axle rotates.**

If the wheels are different sizes, the smaller wheel will travel a shorter distance than the larger wheel with each rotation of the axle causing the system to roll in a curved path.

Materials: 8 large plastic disks, 8 small plastic disks, 4 plastic shafts, 2 cardboard ramps, 8 clothespins

Have students conduct the investigation in pairs/groups. Discuss results of the investigations.

Questions to prompt *discussion with the students:*

Hold the wheel at the top of the ramp.

- ✓ What forces are working on the wheel right now? Gravity pulling down, the ramp pushing up, and your hand holding the wheel so it does not roll.
- ✓ Are the forces balanced or unbalanced? Why do you think that? Balanced. There is no motion because all three forces are acting with equal strength.

Release the wheel so it rolls down the ramp.

- ✓ Are the forces balanced now? Why do you think that? No. There is a change of motion. The force of gravity pulls the wheel down.

Introduce friction.

- ✓ Why does the wheel eventually stop rolling? **Friction** is a force that slows things down, until they come to a stop.

Introduce patterns of motion. Introduce axle. Explore building a variety of systems. Share results.

Description of Lesson (including instructional strategies):
Day 3: 04/27/16 Wednesday Wheel-and-Axle Systems Continuation
Instruction and Strategies:
Teacher will continue the lesson. Review the vocabulary. Share results. Have students review the models they drew to answer the focus question.

Answer the focus question by drawing a model in students' notebooks. Review the focus question: How can we change the motion of the wheels rolling down ramps?

The wheels will roll in a straight line and will go the same distance when the axle rotates.

If the wheels are different sizes, the smaller wheel will travel a shorter distance than the larger wheel with each rotation of the axle causing the system to roll in a curved path.

Formative Assessment: Q & A of the outcome of their investigations. Provide feedback based on their understanding of the lesson learned. (Marzano: Providing Feedback).

- Have students pair up with a partner to share the systems they built and the patterns of motion they observed. Ask tem to explain how they could use these patterns of motion to predict how other systems might move on a ramp.

Closure:
Groups will share with the rest of the class their understanding of their classroom observations on wheel-and-axle systems.

Independent Practice:
Students will work independently to make a prediction about wheel-and-axle systems and create models of the investigation.

Description of Lesson (including instructional strategies):
Day 4: 04/28/16 Predicting Motion of New Systems
Explain to students that they will be conducting an experiment. Encourage them to form a hypothesis (I think ___ because ___.) Have students write down their data as they observe and conduct each experiment.

Teacher will use the Motion and Matter: Investigations Guide TE pp. 134-141.

Questions to prompt *discussion with the students:*

- ✓ What do you predict the motion of this cup will be if I were to let it roll down a ramp?

Have students make a prediction/hypothesis.

Introduce the focus question: <u>What rules help predict where a rolling cup will end up?</u>

Instruction and Strategies:
Help students focus on the supporting facts and details for the main idea: A paper cup placed on its side on a sloped surface will roll away in a curved path, acting like a wheel and axle system with two different sized wheels.

<u>Materials:</u> paper cups, ramps, clothespins

Let the students complete the investigations.

Review cup rolling. Questions to prompt *discussion with the students:*

Ask students to roll the cups.

- ✓ Why did the cup roll in a curved path instead of straight? <u>There is a big circle (wheel) at one end and a small one on the other.</u>
- ✓ What determines which direction the cup will roll? <u>Cups roll in the direction of the bottom (smaller) circle.</u>
- ✓ What else did you discover about rolling cups from your investigations?
- ✓ How does a rolling cup compare to a wheel and axle system.

Introduce the park under park under the ramp challenge. Challenge students to determine how to roll cups in straight lines. Distribute weights and tape. Have students share their results.

Answer the focus question by drawing a model in students' notebooks. Review the focus question: What rules help predict where a rolling cup will end up?

A paper cup placed on its side on a sloped surface will roll away in a curved path, acting like a wheel and axle system with two different sized wheels.

Description of Lesson (including instructional strategies):
Day 5: 04/29/16 Friday Predicting Motion of New Systems Continuation
Teacher will use the Motion and Matter: Investigations Guide TE pp. 140-141.

Teacher will continue the lesson. Review the vocabulary. Read Patterns in Motion pp. 16-17. Discuss the reading.

Questions to prompt *discussion with the students:*

- ✓ Name some things that roll?
- ✓ Why does a wheel and axle system with wheels that are different sizes roll in a curved pattern? The large wheel travels farther with one rotation than a small wheel. The system rolls in a curved pattern as a result of the different distances.
- ✓ How do you think these objects might roll? An ice cream cone, a carrot, a football, a flowerpot, a flashlight. If the parts that touch the surface represent circles that different sizes, the object will roll in a curved pattern. If the sizes are the same, the object will roll straight.

Have students share their answers to the focus question.

Formative Assessment: Q & A of the outcome of their investigations. Provide feedback based on their understanding of the lesson learned. (Marzano: Providing Feedback).

Closure:
Groups will share with the rest of the class their understanding of their classroom observations on patterns of motioin.

Independent Practice:
Students will work independently to make a prediction about patterns of motion and create models of the investigation.

Resources:
Motion and Matter: FOSS Science Resources, paper, pencil, ruler, sheet of paper, scissors, doughnut shaped magnets, paper clips, string 30 cm, 1 chair, 8 large plastic disks, 8 small plastic disks, 4 plastic shafts, 2 cardboard ramps, 8 clothespins, paper cups, ramps, clothespins

Accommodations:
Cooperative groups will consist of students of various levels so they can help each other.
If needed, there can be a small group of students on which the teacher focuses his/her attention.
Have ESL students learn new words by selecting words in the dictionary and using them in sentences.

Content: Science: Motion & Matter: Forces and Engineering	**Grade:** 4th	**Timeline:** 45 minutes 05/02/16-05/06/16

Science Standard(s):
4.1.2 Form and support a hypothesis after collecting information and gathering specimens or observing an experiment.
4.5.1 Describe how the use of technology has changed the way people live on Guam and around the world.

CCSS ELA Standards:

4.RI.3 Explain events, procedures, ideas or concerts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text.
4.W.7 Conduct short research projects that build knowledge through investigation of different aspects of a topic.
4.W.10 Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Lesson Overview:

In this lesson, students will be able to explain their understanding of the scientific method and design an experiment utilizing this method. Through project-based learning, students are encouraged to find their own answers and draw their own conclusions. Forces are part of all the motions of everyday life. The interactions among gravity, friction, and masses are a vital part of these everyday motions. Tops exhibit rotational motion when torque is applied to the axial shift; variables affect top performance. Research on a problem should be carried out before beginning to design a solution.

Lesson Objective(s):
In this lesson, students will be able to:

- Explain the steps of the scientific investigation
- Plan and carry out investigations
- Analyze and interpret data
- Students will compare and contrast how the use of technology has changed human behavior over time.
- Consider how we can maximize the benefits of technology.
- Reflect on how modern electronics are changing how we relate to the natural world.

Vocabulary:
question, hypothesis, data, collect, analyze, conclusion, prediction, investigation, experiment, support, observation, inference, variable, measure, compare, scientific method, classify, technology, simple machine, gravity, force, standard, outcome, centimeter, meter, metric system, standard unit, bearing, constraint, criterion, engineer, solution, axis, rotate, top

Focus Question(s):

- How does technology impact our lives?
- How will technology change our future lives?
- What makes the use of the scientific method universal?

Description of Lesson (including instructional strategies):

Anticipatory Set: Review the Scientific Method.

- Ask a question.
- Do research.
- Construct a hypothesis.
- Test your hypothesis by doing an experiment.
- Analyze your data and draw a conclusion.
- Communicate your results.

Day 1: ***05/02/16 Monday Tops***

Explain to students that they will be conducting an investigation. Encourage them to form a hypothesis (I think ___ because ___.) Have students write down their data as they observe and conduct each experiment.

Teacher will use the Motion and Matter: Investigations Guide TE pp. 152-161. Review motion and forces. Discuss tops.

Questions to prompt *discussion with the students:*

- ✓ What is a top?

Instruction and Strategies:

Help students focus on the supporting facts and details for the main idea: **Tops exhibit rotational motion (spinning) when torque is applied to the axial shaft.**

Explain that they will be building tops and use them to observe motion.

Materials: 1 spinning designs, 8 Large plastic disks, 8 small plastic disks, 4 plastic shafts, 4 paper clips, scissors, 4 drawing tops

Have students conduct the investigation in pairs/groups. Discuss results of the investigations.

Questions to prompt *discussion with the students:*

- ✓ What did you use to make your top?
- ✓ How do you get your top to stop moving?
- ✓ How does a top move when it is working?
- ✓ What kind of motion does a top make when it is going?

  Remind students, When something turns in circles or goes around and around a lot of times, we say it is spinning or rotating. Tops **rotate** on an **axis** (in this case, the axis is the shaft.)

Teacher will ask the students the focus question: What is the best design for a top?

Questions to prompt *discussion with the students:*

- ✓ What is the best design for a top that spins a long time?
- ✓ What is the best design for a top that spins fast? Spins slowly?
- ✓ Does it make a difference if you use the big or small disks?

Invite students to investigate the refined focus question by making, investigating, and evaluating different tops. Discuss and share results.

Description of Lesson (including instructional strategies):
Day 2: 05/03/16 Tuesday Tops Continuation
Teacher will continue the lesson. Review the vocabulary.

Answer the focus question by drawing a model in students' notebooks. Review the focus question: What is the best design for a top?

Tops exhibit rotational motion (spinning) when torque is applied to the axial shaft.

Add colorful designs to tops. Distribute spinning design sheets. Observe the path of a spinning top.

Read What Goes Around pp. 18-21. Discuss the reading.

Questions to prompt *discussion with the students:*

- ✓ Name some things that spin?
- ✓ What do all tops have in common? An axis to rotate around and a mass of some sort to provide stability while spinning.
- ✓ After reading this story, how would you design a top, and what would be your goal for its spinning motion (slow spinner, fast spinner, long-time spinner, etc.)? If you want a top to spin for a long time, you need a fairly heavy mass near the bottom of the shaft and a means for getting the system rotating really fast.

Have students share their answers to the focus question.

Formative Assessment: Q & A of the outcome of their investigations. Provide feedback based on their understanding of the lesson learned. (Marzano: Providing Feedback).

- Have students pair up with a partner to share the systems they built and the patterns of motion they observed while constructing the different tops.

Closure:
Groups will share with the rest of the class their understanding of their classroom observations on tops.

Independent Practice:
Students will work independently to make a prediction about tops and create models of the investigation.

Description of Lesson (including instructional strategies):
Day 3: 05/04/16 Wednesday From Here to There
Explain to students that they will be conducting an experiment. Encourage them to form a hypothesis (I think ___ because ___.) Have students write down their data as they observe and conduct each experiment.

Teacher will use the Motion and Matter: Investigations Guide TE pp. 174-180.

Questions to prompt *discussion with the students:*

- ✓ Can anyone tell me what engineers' do?

Guide the discussion to bring forward the idea that engineers are people who use scientific knowledge, mathematics, and creative thinking to solve problems or meet specific challenges.

Instruction and Strategies:
Tell the students that they will be given an engineering challenge. The challenge is to create a cart that will roll from here to there. The only **criterion (condition)** for the design must be able to roll from a starting place to another place when given a push or a pull. The **constraints (limitations)** are that you are given 30 minutes and can only use the materials given.

Have students work in groups and begin building. Students are given 30 minutes to construct their design.

Materials: 8 large plastic disks, 8 small plastic disks, 4 plastic shafts, 4 tongue depressors, 8 craft sticks, 4 jumbo straws, 8 binder clips, scissors, transparent/masking tape, index cards

Let the students complete the investigations. Introduce bearing. A **bearing** is a part of a machine that supports or guides a rotating part. Share each groups investigation.

Teacher will ask the students the focus question: What are some important features of a cart that will roll from here to there?

Have students copy the focus question in their notebooks and record the constraints from this challenge.

Answer the focus question. The wheel, axle, and bearings work together to allow the cart to move.

Description of Lesson (including instructional strategies):
Day 4: 05/05/16 From Here to There Continuation
Teacher will continue the lesson. Review the focus question: What are some important features of a cart that will roll from here to there?

The wheel, axle, and bearings work together to allow the cart to move.

Read What Engineers Do pp. 22-27. Discuss the reading.

Questions to prompt *discussion with the students:*

- ✓ What do engineers do?
- ✓ What problems do train design engineers work on today? Why are solutions to these problems important? Traction on rails; braking time; energy efficiency.
- ✓ Why must engineers think about criteria and constraints for their designed solutions? Engineers must be clear about what problem needs to be solved, and what a solution needs to be able to do to be considered successful. Constraints are important to consider because they limit things such as amount of time to build, amount of money they can spend, and what materials are available.

Read about different kids of engineers. (pp. 28-31) Discuss engineering practices. (pp. 32-33)

Formative Assessment: Q & A of the outcome of their investigations. Provide feedback based on their understanding of the lesson learned. (Marzano: Providing Feedback).

- Have students pair up with a partner to share the systems they built and the patterns of motion they observed while constructing the cart.

Closure:
Groups will share with the rest of the class their understanding of their classroom observations on carts.

Independent Practice:
Students will work independently to make a prediction about tops and create models of the investigation.

Description of Lesson (including instructional strategies):
Day 5: 05/06/16 Friday Distance Challenge
Explain to students that they will be conducting an investigation. Encourage them to form a hypothesis (I think ___ because ___.) Have students write down their data as they observe and conduct each experiment.

Teacher will use the Motion and Matter: Investigations Guide TE pp. 181-189. Tell students that they will get a chance to respond to a new cart challenge. This time they will run their carts down ramps and will also need to measure how far their cart travels. Review measuring distance.

Questions to prompt *discussion with the students:*

- ✓ If you have to measure the distance between these two pieces of tape are these straws. Could you use these straws to determine the distance here and then recreate it over there with two new pieces of tape? [Hand two straws of the same length to a student volunteer measure the distance in straw units.]
- ✓ Are there straws placed end to end, no overlaps or gaps?
- ✓ Is the student keeping count of how many straw units it takes to move from one piece of tape to the other?

Instruction and Strategies:
Introduce meter. Introduce centimeter. Distribute meter tapes and have students use them to measure the distance.

Teacher will ask the students the focus question: How can you improve the design of your cart?

Explain that they will be designing and testing new carts and use them to observe distance challenge.

Materials: 8 large plastic disks, 8 small plastic disks, 4 plastic shafts, 4 tongue depressors, 8 craft sticks, 4 jumbo straws, 8 binder clips, scissors, transparent/masking tape, index cards, 2 cardboard ramps, 8 clothespins, 2 meter tapes

Have students conduct the investigation in pairs/groups. Set a new distance challenge. Discuss results of the investigations.

Questions to prompt *discussion with the students:*

- ✓ Are the axles able to turn freely in the bearing?
- ✓ Is there anything you could do with the start position on the ramp that might help the cart meet the distance challenge?
- ✓ Is there anywhere that a piece of tape or something else might be rubbing and creating friction that slows the cart down?

Present solutions to the class. Review vocabulary. Answer the focus question: How can you improve the design of your cart?

Resources:
Motion and Matter: FOSS Science Resources, paper, pencil, ruler, sheet of paper, 1 spinning designs, 8 Large plastic disks, 8 small plastic disks, 4 plastic shafts, 4 paper clips, scissors, 4 drawing tops, 8 large plastic disks, 8 small plastic disks, 4 plastic shafts, 4 tongue depressors, 8 craft sticks, 4 jumbo straws, 8 binder clips, scissors, transparent/masking tape, index cards, 2 cardboard ramps, 8 clothespins, 2 meter tapes

Accommodations:
Cooperative groups will consist of students of various levels so they can help each other.
If needed, there can be a small group of students on which the teacher focuses his/her attention.
Have ESL students learn new words by selecting words in the dictionary and using them in sentences.

Content: Science: Motion & Matter: Forces and Engineering	**Grade:** 4th	**Timeline:** 45 minutes 05/09/16-05/13/16

Science Standard(s):
4.1.2 Form and support a hypothesis after collecting information and gathering specimens or observing an experiment.
4.5.1 Describe how the use of technology has changed the way people live on Guam and around the world.

CCSS ELA Standards:

4.RI.3 Explain events, procedures, ideas or concerts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text.
4.W.7 Conduct short research projects that build knowledge through investigation of different aspects of a topic.
4.W.10 Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Lesson Overview:

In this lesson, students will be able to explain their understanding of the scientific method and design an experiment utilizing this method. Through project-based learning, students are encouraged to find their own answers and draw their own conclusions. Forces are part of all the motions of everyday life. The interactions among gravity, friction, and masses are a vital part of these everyday motions. Tops exhibit rotational motion when torque is applied to the axial shift; variables affect top performance. Research on a problem should be carried out before beginning to design a solution.

Lesson Objective(s):
In this lesson, students will be able to:

- Explain the steps of the scientific investigation
- Plan and carry out investigations
- Analyze and interpret data
- Students will compare and contrast how the use of technology has changed human behavior over time.
- Consider how we can maximize the benefits of technology.
- Reflect on how modern electronics are changing how we relate to the natural world.

Vocabulary:
question, hypothesis, data, collect, analyze, conclusion, prediction, investigation, experiment, support, observation, inference, variable, measure, compare, scientific method, classify, technology, simple machine, gravity, force, standard, outcome, centimeter, meter, metric system, standard unit, bearing, constraint, criterion, engineer, solution, axis, rotate, top

Focus Question(s):

- How does technology impact our lives?
- How will technology change our future lives?
- What makes the use of the scientific method universal?

Description of Lesson (including instructional strategies):

Anticipatory Set: Review the Scientific Method.

- Ask a question.
- Do research.
- Construct a hypothesis.
- Test your hypothesis by doing an experiment.
- Analyze your data and draw a conclusion.
- Communicate your results.

Description of Lesson (including instructional strategies):

Day 1: 05/09/16 Distance Challenge Continuation

Teacher will continue the lesson. Review the focus question: What are some important features of a cart that will roll from here to there?

The wheel, axle, and bearings work together to allow the cart to move.

Read Soap Box Derby pp. 34-37. Discuss the reading.

Questions to prompt *discussion with the students:*

- ✓ Why do you think the Soap Box Derby Committee that sets the rules decided to set some standards? To keep the competition fair.
- ✓ What pattern did you notice on the table of Speed Challenge derby winners? There is no linear pattern, but in general, the time is decreasing.
- ✓ What did you find most interesting in this article?
- ✓ Have you ever competed in a Soap Box Derby?

Read about "The Metric System" (pp. 38-39) Discuss the reading.

Formative Assessment: Q & A of the outcome of their investigations. Provide feedback based on their understanding of the lesson learned. (Marzano: Providing Feedback).

- Have students pair up with a partner to share the systems they built and the patterns of motion they observed while constructing the cart.

Closure:

Groups will share with the rest of the class their understanding of their classroom observations on carts.

Independent Practice:

Students will work independently to make a prediction about carts and create models of the investigation.

Description of Lesson (including instructional strategies):
Day 2: 05/10/16 Tuesday Investigating Start Position
Explain to students that they will be conducting an experiment. Encourage them to form a hypothesis (I think ___ because ___.) Have students write down their data as they observe and conduct each experiment.

Teacher will use the Motion and Matter: Investigations Guide TE pp. 190-197.

Teacher will review what the class did in the Distance Challenge to modify their carts.

Today we're gong to take a closer look at the variable of start position. We're going to learn more about the science so we can apply it to our engineering.

Instruction and Strategies:
Tell the students that they will be given an engineering challenge. Explain to the students that they are going to plan and conduct an investigation to determine how the starting position on the ramp affects how far the cart travels.

Students will create their own student-created question. Demonstrate the ramp setup. Discuss recording data. Let the investigation begin.

Have students work in groups and begin the investigation.
Materials: zip bag with cart and miscellaneous materials, three colors of self-stick notes, ramps, clothespins, meter tapes, masking tape

Assess student progress and guide their progress as needed. Discuss the investigation. Critique each others' procedures.

Summarize the activity. Questions to prompt *discussion with the students:*

- ✓ What is important to remember when doing an investigation like this, where we are trying to find out the effect of one variable? Make sure other variables aren't changed, measure accurately, do multiple trials, set up data tables to keep data organized, use data to develop a claim, and use data as evidence.
- ✓ What are some things you did well in this investigation?
- ✓ What was the hardest part about doing this investigation?
- ✓ Did you run into any problems? How did you solve them?

Answer the focus question. Students record the answer to their own focus question.

Questions to prompt *discussion with the students:*

- ✓ What pattern did you discover in your starting position investigation?
- ✓ If you had a longer ramp and could start your cart at 40 cm, can you predict how far the cart might roll?

Description of Lesson (including instructional strategies):
Day 3: 05/11/16 Wednesday Investigating Start Position Continued
Teacher will continue the lesson. Review the student created focus questions. Read How Engineers and Scientists Work Together pp. 40-41. Discuss the reading.

Questions to prompt *discussion with the students:*

- ✓ How do scientists and engineers help each other? Engineers base their work on the work of scientists, and scientists need engineers to develop tools and methods to answer questions.
- ✓
- ✓ Did the students in the article gets results like the ones you got doing the same investigation? Students should agree that they got similar results.
- ✓ How would you set up an investigation to find out how slope affects how far a cart travels? Keep all the variables the same, except for the slope.

Formative Assessment: Q & A of the outcome of their investigations. Provide feedback based on their understanding of the lesson learned. (Marzano: Providing Feedback).

Closure:
Groups will share with the rest of the class their understanding of their classroom observations on investigating start position.

Independent Practice:
Students will work independently to make a prediction about tops and create models of the investigation.

Description of Lesson (including instructional strategies):
Day 4: 05/12/16 Cart Tricks
Explain to students that they will be conducting an experiment. Encourage them to form a hypothesis (I think ___ because ___.) Have students write down their data as they observe and conduct each experiment.

Teacher will use the Motion and Matter: Investigations Guide TE pp. 198-206.

Teacher will introduce the focus question to prompt *discussion with the students:*

- ✓ How can you use magnets to do cart tricks?

Have students copy the focus question in their notebooks. Teacher will describe the initial cart tricks. **Trick 1, Trick 2, Trick 3.**

Instruction and Strategies:
Tell the students that they will be given an engineering challenge. The challenge is to combine their knowledge of magnets and carts to do cart tricks.

Have students' design and test carts. Teacher will facilitate engineering conferences. Provide

design time for new trick.

Have students work in groups and begin building.

Materials: two zip bags with carts and miscellaneous materials, two ramps, eight clothespins, eight magnets, index cards, and paper clips

Let the students complete the investigations. Teacher will facilitate a class conference.

Answer the focus question: How can you use magnets to do cart tricks?

Have students copy the focus question in their notebooks.

Description of Lesson (including instructional strategies):
Day 5: 05/13/16 Cart Tricks Continuation
Teacher will continue the lesson. Review the focus question: How can you use magnets to do cart tricks?

Read Magnets at Work pp. 42-45. Discuss the reading. Review the vocabulary. Have students use the froyer model to record some vocabulary terms. Review the focus questions for Investigation 3.

Questions to prompt *discussion with the students:*

- ✓ What are some important features of a car that will roll from here to there?
- ✓ How can you improve the design of your cart?
- ✓ How can you use magnets to do tricks?

Formative Assessment: Q & A of the outcome of their investigations. Provide feedback based on their understanding of the lesson learned. (Marzano: Providing Feedback).

Closure:
Groups will share with the rest of the class their understanding of their classroom observations on carts and magnet tricks.

Independent Practice:
Students will work independently to make a prediction about tops and create models of the investigation.

Resources:
Motion and Matter: FOSS Science Resources, paper, pencil, ruler, sheet of paper, two zip bags with carts and miscellaneous materials, two ramps, eight clothespins, eight magnets, index cards, and paper clips, three colors of self-stick notes, ramps, clothespins, meter tapes, masking tape

Accommodations:
Cooperative groups will consist of students of various levels so they can help each other.
If needed, there can be a small group of students on which the teacher focuses his/her attention.
Have ESL students learn new words by selecting words in the dictionary and using them in sentences.