Grade 8 Science  
Science 8

Scientific Process and Inquiry

Stage 1: Desired Results

Catholic Standards

Targeted Standards

OH Grade 8 OH: English Language Arts 6-12

Speaking & Listening

Comprehension and Collaboration 1. Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others ideas and expressing their own clearly and persuasively.

SL.8.1. Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others ideas and expressing their own clearly.

SL.8.1a. Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.

SL.8.1b. Follow rules for collegial discussions and decision-making, track progress toward specific goals and deadlines, and define individual roles as needed.

SL.8.1c. Pose questions that connect the ideas of several speakers and respond to others questions and comments with relevant evidence, observations, and ideas.

SL.8.1d. Acknowledge new information expressed by others, and, when warranted, qualify or justify their own views in light of the evidence presented.

Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.

SL.8.2. Analyze the purpose of information presented in diverse media and formats (e.g., visually, quantitatively, orally) and evaluate the motives (e.g., social, commercial, political) behind its presentation.

Evaluate a speakers point of view, reasoning, and use of evidence and rhetoric.

SL.8.3. Delineate a speakers argument and specific claims, evaluating the soundness of the reasoning and relevance and sufficiency of the evidence and identifying when irrelevant evidence is introduced.

Presentation of Knowledge and Ideas 4. Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.

SL.8.4. Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation.

Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations.

SL.8.5. Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.

Adapt speech to a variety of contexts and communicative tasks, demonstrating command of formal English when indicated or appropriate.

SL.8.6. Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate.

OH Grade 8 OH: Science (2011)

Science Inquiry and Application

Theme: Order and Organization This theme focuses on helping students use scientific inquiry to discover patterns, trends, structures and relationships that may be described by simple principles. These principles are related to the properties or interactions within and between systems. During the years of grades 5-8 all students must use the following scientific processes to construct their knowledge and understanding in all science content areas:

Identify questions that can be answered through scientific investigations;

Design and conduct a scientific investigation;

Use appropriate mathematics, tools and techniques to gather data and information;

Analyze and interpret data;

Develop descriptions, models, explanations and predictions;

Think critically and logically to connect evidence and explanations;

Recognize and analyze alternative explanations and predications; and

Communicate scientific procedures and explanations.

OH Grades 6-8 OH: Literacy in History/Social Studies, Science, & Technical Subjects 6-12

Reading: Science & Technical Subjects

Key Ideas and Details 1. Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.

RST.6-8.1. Cite specific textual evidence to support analysis of science and technical texts.

Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.

RST.6-8.2. Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.

Analyze how and why individuals, events, or ideas develop and interact over the course of a text.

RST.6-8.3. Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

Craft and Structure 4. Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

RST.6-8.4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 68 texts and topics.

Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole.

RST.6-8.5. Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic.

Assess how point of view or purpose shapes the content and style of a text.

RST.6-8.6. Analyze the authors purpose in providing an explanation, describing a procedure, or discussing an experiment in a text.

Integration of Knowledge and Ideas 7. Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words.

RST.6-8.7. Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).

Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence.

RST.6-8.8. Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.

Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

RST.6-8.9. Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.

Read and comprehend complex literary and informational texts independently and proficiently.

RST.6-8.10. By the end of grade 8, read and comprehend science/technical texts in the grades 68 text complexity band independently and proficiently.

Capacities of the Literate Individual

Students Who are College and Career Ready in Reading, Writing, Speaking, Listening, & Language

They demonstrate independence.

Writing

Text Types and Purposes 1. Write arguments to support claims in an analysis of substantive topics or texts using valid reasoning and relevant and sufficient evidence.

WHST.6-8.1. Write arguments focused on discipline-specific content.

WHST.6-8.1a. Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.

WHST.6-8.1b. Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.

WHST.6-8.1c. Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.

WHST.6-8.1d. Establish and maintain a formal style.

WHST.6-8.1e. Provide a concluding statement or section that follows from and supports the argument presented.

Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.

WHST.6-8.2. Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

WHST.6-8.2a. Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.

WHST.6-8.2b. Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.

WHST.6-8.2c. Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts.

WHST.6-8.2d. Use precise language and domain-specific vocabulary to inform about or explain the topic.

WHST.6-8.2e. Establish and maintain a formal style and objective tone.

WHST.6-8.2f. Provide a concluding statement or section that follows from and supports the information or explanation presented.

Production and Distribution of Writing 4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

WHST.6-8.4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.

WHST.6-8.5. With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.

Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.

WHST.6-8.6. Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.

Research to Build and Present Knowledge 7. Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.

WHST.6-8.7. Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.

Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.

WHST.6-8.8. Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.

Draw evidence from literary or informational texts to support analysis, reflection, and research.

WHST.6-8.9. Draw evidence from informational texts to support analysis reflection, and research.

Range of Writing 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 tasks, purposes, and audiences.

WHST.6-8.10. Write routinely over extended time frames (time for 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.

Catholic Identity

DOC All Grades Catholic Identity

Catholic Social Justice Teachings

Life and Dignity of the Human Person

Rights and Responsibilities

Call to Family, Community, and Participation

Solidarity

Care for God's Creation

The Rights of Children

1. THE RIGHT TO A CATHOLIC COMMUNITY that witnesses to Christ and the Gospel by protecting them from child abuse, including sexual abuse and neglect.

2. THE RIGHT TO A SAFE ENVIRONMENT that promotes care, protection, and security.

3. THE RIGHT TO BE RESPECTED AS INDIVIDUALS with human dignity.

4. THE RIGHT TO WORK ACTIVELY TOWARD THEIR OWN EMPOWERMENT through the development of their gifts and talents.

5. THE RIGHT TO A LEARNING ENVIRONMENT THAT VALUES COOPERATION and challenges its members to critical and reflective thinking in their search for truth.

6. THE RIGHT TO DEVELOP POSITIVE, RESPONSIBLE AND CARING ATTITUDES AND BEHAVIORS TOWARD OTHERS and to recognize the rights of others to be safe and free from harassment and abuse.

7. THE RIGHT TO LEARN THE SKILL OF SELF PROTECTION by identifying safe and unsafe situations.

8. THE RIGHT TO LEARN RESPONSIBILITY for themselves and their actions.

9. THE RIGHT TO MAKE RESPONSIBLE DECISIONS founded on religious conviction.

10. THE RIGHT TO GUIDANCE FROM THE CHURCH in their development as loving people.

Content

**Understanding about scientific inquiry and the ability to conduct inquiry is essential for living in the 21st century.**

1. How to read, record, organize and interpret scientific data
2. How to choose questions that will be answered through scientific investigations
3. How to design and conduct scientific experiments
4. How to communicate scientific findings to others
5. Sample size
6. Control
7. Quantitative data
8. Description and explanation
9. Appropriate tools/instruments
10. Safety procedures
11. Mathematical applications
12. Importance of objectivity
13. Bias affecting outcomes

Skills

1. Construct questions that can be answered through scientific investigations.
2. Design and conduct open-ended scientific investigations.
3. Identify and use tools and techniques needed to gather, organize, analyze, and interpret data collected from a moderately complex scientific investigation.
4. Design and conduct an open-ended scientific investigation to answer a question that includes a control and appropriate variables.
5. Synthesize information to determine cause and effect relationships between evidence and explanations.
6. Recognize possible sources of bias and error, alternative explanations, and questions for further exploration.
7. Use evidence from data set to determine cause and effect relationships that explain a phenomenon.
8. Draw a conclusion that establishes a cause and effect relationship supported by evidence.
9. Describe the concepts of sample size and control.
10. Explain how sample size and control affect scientific experiments.
11. Apply appropriate math skills to interpret quantitative data.
12. Distinguish between description and explanation.
13. Identify appropriate tools and instruments to complete scientific experiments and use them properly.
14. Demonstrate proper safety procedures when completing scientific experiments.
15. Implement appropriate math functions and formulas to express scientific findings.
16. Communicate scientific understanding using descriptions, explanations, and models.
17. Distinguish between bias and unbiased records.
18. Identify a faulty interpretation of data that is due to bias or experimental error.
19. Describe how scientific developments have positive and negative effects on everyday life and society.
20. Acknowledge and respect living things in their natural environment.

**Common Core Literacy Skills**

1. Read closely and comprehend scientific text.
2. Cite evidence from text.
3. Draw conclusions from text.
4. Use correct scientific terms.
5. Analyze the structure of text.
6. Analyze the author's purpose.
7. Integrate quantitative and technical information within a text.

**Common Core Writing Content**

1. Write arguments focused on discipline-specific content.
2. Write informative/explanatory text.
3. Produce clear and coherent writing, appropriate to task, purpose, and audience.
4. Edit and revise writing samples.
5. Use technology to produce and publish writing.
6. Conduct research projects.
7. Gather relevant sources.
8. Draw evidence from text.

Write routinely for a range of discipline-specific tasks, purposes, and audiences.

**Common Core Speaking and Listening**

1. Engage effectively in a range of collaborative discussions.
2. Come to discussions prepared, having read or studied required material.
3. Follow rules for collegial discussions.
4. Pose and respond to specific questions with elaboration and detail.
5. Review the key ideas expressed and demonstrate understanding of multiple perspectives through reflection and paraphrasing.
6. Interpret information presented in diverse media and formats.
7. Delineate a speakers argument and specific claims.
8. Present claims and findings, sequencing ideas logically and using pertinent descriptions, facts, and details.
9. Use appropriate eye contact, adequate volume, and clear pronunciation.
10. Include multimedia components and visual displays.
11. Adapt speech to a variety of contexts and tasks, demonstrating command of formal English.

Essential Questions

1. How is scientific knowledge generated and validated?
2. How do you measure the unquantifiable?
3. What tools, skills, knowledge, and dispositions are needed to conduct scientific inquiry?
4. What roles do models, laws, and theories play in science?
5. How do science and technology impact each other?
6. How do we decide which scientific claims to believe? What is the evidence?

Standards Vocabulary

1. scientific inquiry
2. hypothesis
3. variables
4. observation
5. inference
6. interpret
7. independent variables
8. dependent variables
9. controlled variables
10. density
11. mass
12. Metric System
13. U.S. Customary System
14. analyze
15. data
16. communicate
17. bias
18. unbiased
19. experiment
20. scientific method
21. technology

Stage 2: Assessment Evidence

Scientific Method

Formative: Lab Assignment

Working in cooperative groups, students will research, plan, and implement a valid (carry out three times) scientific investigation utilizing the scientific method while including formulating a hypothesis and controlling variables. When completed, groups will analyze their results and then compare their results with the results of the other groups. Finally, they will write a description of their plan, include testing data, and present their conclusions. What assessment tools/strategies will you use to assess student work? (checklists, rubrics, self-assessment tools, etc.)

Observation/Inference/Prediction

Formative: Class Discussion

Given a photograph, chart and/or table, students will make at least three observations, state inferences based on observations, and make predictions about what is and what might happen based on their observations and inferences. They will explain three observations, write about what experiences or knowledge they used to make the inferences and provide evidence for the basis of their predictions. Students will share their work in a class discussion. What assessment tools/strategies will you use to assess student work? (checklists, rubrics, self-assessment tools, etc.)

Scientific Tools

Formative: Class Work

Working with a partner, students will practice using various scientific tools, making scientific measurements, creating-reading-analyzing various data graphs. They will explain their work and justify the use of proper measurements and tools. What assessment tools/strategies will you use to assess student work? (checklists, rubrics, self-assessment tools, etc.)

Stage 3: Learning Plan

Learning Experiences

1. Class Activity. Using various strategies, have students review the science safety rules and the proper use of scientific equipment. Create a science safety contract with the students and have them share the contract with their parents and ask parents and students to sign the contract.
2. Scientific Investigation. Working with a partner, have students plan and implement a valid (carry out three times) scientific investigation utilizing the scientific method. Have them follow the steps in the scientific process as follows:  
   a. **INQUIRY** - What do I want to find out? (Asks a question to guide the investigation.)  
   b. **HYPOTHESIS** - What do I think I'll find out? (A statement about how the inquiry question could be answered.)  
   c. **PROCEDURE** - How do I find out? (Identifies/lists steps or sequence.)  
   d. **SCIENCE SKILLS MATERIALS** - What science tools will/did I use (ruler, scale, magnet, thermometer, hand lens, etc. for measuring, observing, inferring, predicting, recording data, etc.)  
   e. **RESULTS** - What happened? (tables, graphs, charts; drawings; qualitative quantitative data, etc.)  
   f. **CONCLUSIONS** - What did I learn from this activity? (written, graphic, oral, etc.)  
   When completed, have each group analyze their results and then compare their results with the results of the other groups.
3. Independent Work. Given a photograph, chart and/or table, have students make at least three observations, state inferences based on observations, and make predictions about what is and what might happen based on their observations and inferences. Have them explain three observations, write about what experiences or knowledge they used to make the inferences and provide evidence for the basis of their predictions. Have students share their work in a class discussion.
4. Working with a partner, have students practice using various scientific tools, making scientific measurements, creating-reading-analyzing various data graphs. Have them explain their work and justify the use of proper measurements and tools.

Resources

* Science Resources (<http://edutechdatabase.wikispaces.com/Science+6-8>)

Resources

Resources

1. iPad Resources  
   iPad - Graphs
2. Literature Connection  
   *Duck Rabbit* by Amy Krauss Rosenthal and Tom Lichtenfeld Skill: How we construct knowledge  
   *No David* by David Shannon - Skill: observations, inferences and predictions  
   *Measuring Penny* by Loreen Leedy Skill: Measuring  
   *How Long, How Wide* by Brian Cleary Skill: Measuring  
   *Babar Visits Another Planet* by Laurent de Brunhoff - Skill: Asking questions  
   *Egg Drop* by Mini Grey Skill: Planning and carrying out investigation  
   *Why Mosquitoes Buzz in People's Ears* by Verna Aardema Skill: Finding evidence
3. Internet Websites

Resources

* Science Spot Variables ([http://www.google.com/url?sa=trct=jq=esrc=ssource=webcd=1ved=0CCwQFjAAurl=http%3A%2F%2Fmrdispenza.com%2Fyahoo\_site\_admin%2Fassets%2Fdocs%2Fobservation.308111416.pdfei=W6jJUZP8C8abyQHzw4GgCgusg=AFQjCNGv34xMiowk6lUnT-1nlwKrjRobMQbvm=bv.48293060,d.aWc](http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CCwQFjAA&url=http%3A%2F%2Fmrdispenza.com%2Fyahoo_site_admin%2Fassets%2Fdocs%2Fobservation.308111416.pdf&ei=W6jJUZP8C8abyQHzw4GgCg&usg=AFQjCNGv34xMiowk6lUnT-1nlwKrjRobMQ&bvm=bv.48293060,d.aWc))

Grade 8 Science  
Science 8

ESS: Earth's Interior

Stage 1: Desired Results

Catholic Standards

Targeted Standards

OH Grade 8 OH: English Language Arts 6-12

Speaking & Listening

Comprehension and Collaboration 1. Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others ideas and expressing their own clearly and persuasively.

SL.8.1. Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others ideas and expressing their own clearly.

SL.8.1a. Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.

SL.8.1b. Follow rules for collegial discussions and decision-making, track progress toward specific goals and deadlines, and define individual roles as needed.

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SL.8.2. Analyze the purpose of information presented in diverse media and formats (e.g., visually, quantitatively, orally) and evaluate the motives (e.g., social, commercial, political) behind its presentation.

Evaluate a speakers point of view, reasoning, and use of evidence and rhetoric.

SL.8.3. Delineate a speakers argument and specific claims, evaluating the soundness of the reasoning and relevance and sufficiency of the evidence and identifying when irrelevant evidence is introduced.

Presentation of Knowledge and Ideas 4. Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.

SL.8.4. Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation.

Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations.

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Adapt speech to a variety of contexts and communicative tasks, demonstrating command of formal English when indicated or appropriate.

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OH Grade 8 OH: Science (2011)

Earth and Space Science (ESS)

Topic: Physical Earth

The composition and properties of Earths interior are identified by the behavior of seismic waves.

OH Grades 6-8 OH: Literacy in History/Social Studies, Science, & Technical Subjects 6-12

Reading: Science & Technical Subjects

Analyze how and why individuals, events, or ideas develop and interact over the course of a text.

RST.6-8.3. Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

Craft and Structure 4. Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

RST.6-8.4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 68 texts and topics.

Capacities of the Literate Individual

Students Who are College and Career Ready in Reading, Writing, Speaking, Listening, & Language

They demonstrate independence.

Writing

Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.

WHST.6-8.2. Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

Catholic Identity

DOC All Grades Catholic Identity

Catholic Social Justice Teachings

Life and Dignity of the Human Person

Rights and Responsibilities

Call to Family, Community, and Participation

Solidarity

Care for God's Creation

The Rights of Children

1. THE RIGHT TO A CATHOLIC COMMUNITY that witnesses to Christ and the Gospel by protecting them from child abuse, including sexual abuse and neglect.

2. THE RIGHT TO A SAFE ENVIRONMENT that promotes care, protection, and security.

3. THE RIGHT TO BE RESPECTED AS INDIVIDUALS with human dignity.

4. THE RIGHT TO WORK ACTIVELY TOWARD THEIR OWN EMPOWERMENT through the development of their gifts and talents.

5. THE RIGHT TO A LEARNING ENVIRONMENT THAT VALUES COOPERATION and challenges its members to critical and reflective thinking in their search for truth.

6. THE RIGHT TO DEVELOP POSITIVE, RESPONSIBLE AND CARING ATTITUDES AND BEHAVIORS TOWARD OTHERS and to recognize the rights of others to be safe and free from harassment and abuse.

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9. THE RIGHT TO MAKE RESPONSIBLE DECISIONS founded on religious conviction.

10. THE RIGHT TO GUIDANCE FROM THE CHURCH in their development as loving people.

Content

1. e. The thicknesses of each layer of Earth can vary and be transitional, rather than uniform and distinct.

**The composition and properties of Earths interior are identified by the behavior of seismic waves.**

a. The refraction and reflection of seismic waves as they move through one type of material to another is used to differentiate the layers of Earths interior.  
b. Earth has an inner and outer core, an upper and lower mantle, and a crust.

c. The formation of the planet generated heat from gravitational energy and the decay of radioactive elements, which are still present today.  
d. Heat released from Earths core drives convection currents throughout the mantle and the crust.

Skills

1. Define seismic waves and the rock cycle.
2. Explain the phenomena of how scientists know about the interior structure and composition of the Earth citing evidence from seismic data, graphics, charts, digital displays and cross sections of the Earth's interior.
3. Recognize that actual data from the refraction and reflection of seismic waves are used to demonstrate how scientists have determined the different layers of Earths interior.
4. Identify the different composition and consistency of each layer of Earths interior (inner and outer core, upper and lower mantle, crust).
5. Explain how Earth and other planets in the solar system formed as heavier elements coalesced in their centers.
6. Recall the property of density.
7. Use the concept of density to further understand that more dense materials will sink to the center of a planet while less dense materials rise to the surface resulting in different layers of the Earth (planetary differentiation).
8. Recognize that a major period of planetary differentiation occurred approximately 4.6 billion years ago.
9. Recognize that the history of the formation of Earth and the relationship of energy transfer, transformation and convection currents within the mantle and crust are essential in understanding sources of energy.
10. Appreciate the Earth God has given us.

**Common Core Literacy Skills**

1. Read closely and comprehend scientific text.
2. Cite evidence from text.
3. Draw conclusions from text.
4. Use correct scientific terms.
5. Analyze the structure of text.
6. Analyze the author's purpose.
7. Integrate quantitative and technical information within a text.

**Common Core Writing Content**

1. Write arguments focused on discipline-specific content.
2. Write informative/explanatory text.
3. Produce clear and coherent writing, appropriate to task, purpose, and audience.
4. Edit and revise writing samples.
5. Use technology to produce and publish writing.
6. Conduct research projects.
7. Gather relevant sources.
8. Draw evidence from text.

Write routinely for a range of discipline-specific tasks, purposes, and audiences.

**Common Core Speaking and Listening**

1. Engage effectively in a range of collaborative discussions.
2. Come to discussions prepared, having read or studied required material.
3. Follow rules for collegial discussions.
4. Pose and respond to specific questions with elaboration and detail.
5. Review the key ideas expressed and demonstrate understanding of multiple perspectives through reflection and paraphrasing.
6. Interpret information presented in diverse media and formats.
7. Delineate a speakers argument and specific claims.
8. Present claims and findings, sequencing ideas logically and using pertinent descriptions, facts, and details.
9. Use appropriate eye contact, adequate volume, and clear pronunciation.
10. Include multimedia components and visual displays.
11. Adapt speech to a variety of contexts and tasks, demonstrating command of formal English.

Essential Questions

1. How do scientists know about Earth's interior?
2. How does the formation of the planet generate heat and energy that is still present today?
3. What clues to the past does the earth hold?

Standards Vocabulary

1. refraction/reflection
2. seismic waves
3. earth's interior
4. inner core
5. outer core
6. upper mantle
7. lower mantle
8. crust
9. seismic data
10. digital displays
11. cross sections
12. planetary differentiation
13. convection currents
14. source of energy
15. rock cycle
16. density

Stage 2: Assessment Evidence

Earthquake Resistant Structure

Formative: Cooperative Group Work

Working in cooperative groups, have students design and build a model of an earthquake-resistant structure (e.g., bridge, building, home). Have them draw a blueprint of the plan or design and provide data to validate the choice of their design. Have them test results using a shake table or another quantifiable measuring device. Have each group write a report and share their findings with the class. What assessment tools/strategies will you use to assess student work? (checklists, rubrics, self-assessment tools, etc.)

Seismograph

Summative: Lab Assignment

Working with a partner, students will design and build a simple seismograph that can measure movement of Earths lithosphere. Using a drawing of their seismograph, they will explain how it works. What assessment tools/strategies will you use to assess student work? (checklists, rubrics, self-assessment tools, etc.)

Interpreting Seismic Data

Summative: Class Work

Using real seismic data (wave velocities), students will use a digital tool to create or interpret a cross section of Earth and explain the change of appearance in the section as the rock type or consistency of the rock changes. They will share their work with the class. What assessment tools/strategies will you use to assess student work? (checklists, rubrics, self-assessment tools, etc.)

Stage 3: Learning Plan

Learning Experiences

1. Working in cooperative groups, have students design and build a model of an earthquake-resistant structure (e.g., bridge, building, home). Have them draw a blueprint of the plan or design and provide data to validate the choice of their design. Have them test results using a shake table or another quantifiable measuring device. Have each group write a report and share their findings with the class.
2. Scientific Investigation. Working with a partner, have students design and build a simple seismograph that can measure movement of Earths lithosphere. Using a drawing of their seismograph, have them explain how it works.
3. Independent Work. Using real seismic data (wave velocities), have students use a digital tool to create or interpret a cross section of Earth and explain the change of appearance in the section as the rock type or consistency of the rock changes. Have them share their work with the class.

Resources

* Ohio Dept. of Education - Science Model Curriculum (<http://education.ohio.gov/Topics/Academic-Content-Standards/Science>)

Resources

1. iPad Resources
2. Literature Connection  
   *The Explosive World of Volcanoes with Max Axiom, Super Scientist* by Christopher L. Harbo  
   *The Earth-Shaking Facts about Earthquakes with Max Axiom, Super Scientist* by Katherine Krohn  
   *Structure: Exploring Earth's Interior* by Roy A. Gallant

Resources

* Interior of Earth Lesson ([http://www.google.com/url?sa=trct=jq=esrc=ssource=webcd=1ved=0CCwQFjAAurl=http%3A%2F%2Fwww.iris.edu%2Fhq%2Ffiles%2Fprograms%2Feducation\_and\_outreach%2Flessons\_and\_resources%2Fdocs%2FREVEarthStructure%2FEarthStructure\_TeacherGuide.pdfei=VwDLUaXCD-2yygGXtIBQusg=AFQjCNEAUI2hDnufF0rsiS\_FtgnOQdbi\_wbvm=bv.48340889,d.aWc](http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CCwQFjAA&url=http%3A%2F%2Fwww.iris.edu%2Fhq%2Ffiles%2Fprograms%2Feducation_and_outreach%2Flessons_and_resources%2Fdocs%2FREVEarthStructure%2FEarthStructure_TeacherGuide.pdf&ei=VwDLUaXCD-2yygGXtIBQ&usg=AFQjCNEAUI2hDnufF0rsiS_FtgnOQdbi_w&bvm=bv.48340889,d.aWc))

Grade 8 Science  
Science 8

ESS: Plate Tectonics

Stage 1: Desired Results

Catholic Standards

Targeted Standards

OH Grade 8 OH: English Language Arts 6-12

Speaking & Listening

Comprehension and Collaboration 1. Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others ideas and expressing their own clearly and persuasively.

SL.8.1. Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others ideas and expressing their own clearly.

SL.8.1a. Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.

SL.8.1b. Follow rules for collegial discussions and decision-making, track progress toward specific goals and deadlines, and define individual roles as needed.

SL.8.1c. Pose questions that connect the ideas of several speakers and respond to others questions and comments with relevant evidence, observations, and ideas.

SL.8.1d. Acknowledge new information expressed by others, and, when warranted, qualify or justify their own views in light of the evidence presented.

Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.

SL.8.2. Analyze the purpose of information presented in diverse media and formats (e.g., visually, quantitatively, orally) and evaluate the motives (e.g., social, commercial, political) behind its presentation.

Evaluate a speakers point of view, reasoning, and use of evidence and rhetoric.

SL.8.3. Delineate a speakers argument and specific claims, evaluating the soundness of the reasoning and relevance and sufficiency of the evidence and identifying when irrelevant evidence is introduced.

Presentation of Knowledge and Ideas 4. Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.

SL.8.4. Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation.

Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations.

SL.8.5. Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.

Adapt speech to a variety of contexts and communicative tasks, demonstrating command of formal English when indicated or appropriate.

SL.8.6. Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate.

OH Grade 8 OH: Science (2011)

Earth and Space Science (ESS)

Topic: Physical Earth

The composition and properties of Earths interior are identified by the behavior of seismic waves.

OH Grades 6-8 OH: Literacy in History/Social Studies, Science, & Technical Subjects 6-12

Reading: Science & Technical Subjects

Key Ideas and Details 1. Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.

RST.6-8.1. Cite specific textual evidence to support analysis of science and technical texts.

Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.

RST.6-8.2. Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.

Analyze how and why individuals, events, or ideas develop and interact over the course of a text.

RST.6-8.3. Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

Craft and Structure 4. Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

RST.6-8.4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 68 texts and topics.

Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

RST.6-8.9. Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.

Capacities of the Literate Individual

Students Who are College and Career Ready in Reading, Writing, Speaking, Listening, & Language

They demonstrate independence.

Writing

Text Types and Purposes 1. Write arguments to support claims in an analysis of substantive topics or texts using valid reasoning and relevant and sufficient evidence.

WHST.6-8.1. Write arguments focused on discipline-specific content.

WHST.6-8.1a. Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.

WHST.6-8.1b. Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.

WHST.6-8.1c. Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.

WHST.6-8.1d. Establish and maintain a formal style.

WHST.6-8.1e. Provide a concluding statement or section that follows from and supports the argument presented.

Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.

WHST.6-8.2. Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

WHST.6-8.2a. Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.

WHST.6-8.2b. Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.

WHST.6-8.2c. Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts.

WHST.6-8.2d. Use precise language and domain-specific vocabulary to inform about or explain the topic.

WHST.6-8.2e. Establish and maintain a formal style and objective tone.

WHST.6-8.2f. Provide a concluding statement or section that follows from and supports the information or explanation presented.

Production and Distribution of Writing 4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

WHST.6-8.4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.

WHST.6-8.5. With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.

Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.

WHST.6-8.6. Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.

Research to Build and Present Knowledge 7. Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.

WHST.6-8.7. Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.

Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.

WHST.6-8.8. Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.

Draw evidence from literary or informational texts to support analysis, reflection, and research.

WHST.6-8.9. Draw evidence from informational texts to support analysis reflection, and research.

Range of Writing 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 tasks, purposes, and audiences.

WHST.6-8.10. Write routinely over extended time frames (time for 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.

Catholic Identity

DOC All Grades Catholic Identity

Catholic Social Justice Teachings

Life and Dignity of the Human Person

Rights and Responsibilities

Call to Family, Community, and Participation

Solidarity

Care for God's Creation

The Rights of Children

1. THE RIGHT TO A CATHOLIC COMMUNITY that witnesses to Christ and the Gospel by protecting them from child abuse, including sexual abuse and neglect.

2. THE RIGHT TO A SAFE ENVIRONMENT that promotes care, protection, and security.

3. THE RIGHT TO BE RESPECTED AS INDIVIDUALS with human dignity.

4. THE RIGHT TO WORK ACTIVELY TOWARD THEIR OWN EMPOWERMENT through the development of their gifts and talents.

5. THE RIGHT TO A LEARNING ENVIRONMENT THAT VALUES COOPERATION and challenges its members to critical and reflective thinking in their search for truth.

6. THE RIGHT TO DEVELOP POSITIVE, RESPONSIBLE AND CARING ATTITUDES AND BEHAVIORS TOWARD OTHERS and to recognize the rights of others to be safe and free from harassment and abuse.

7. THE RIGHT TO LEARN THE SKILL OF SELF PROTECTION by identifying safe and unsafe situations.

8. THE RIGHT TO LEARN RESPONSIBILITY for themselves and their actions.

9. THE RIGHT TO MAKE RESPONSIBLE DECISIONS founded on religious conviction.

10. THE RIGHT TO GUIDANCE FROM THE CHURCH in their development as loving people.

Content

**Earths crust consists of major and minor tectonic plates that move relative to each other.**

a. Historical data and observations such as fossil distribution, paleomagnetism, continental drift and sea-floor spreading contributed to the theory of plate tectonics.  
b. The rigid tectonic plates move with the molten rock and magma beneath them in the upper mantle.

c. Convection currents in the crust and upper mantle cause the movement of the plates.  
d. The energy that forms convection currents comes from deep within the Earth.

e. There are three main types of plate boundaries: divergent, convergent and transform.  
f. Each type of boundary results in specific motion and causes events (such as earthquakes or volcanic activity) or features (such as mountains or trenches) that are indicative of the type of boundary.

**A combination of constructive and destructive geologic processes formed Earths surface.**

a. Earths surface is formed from a variety of different geologic processes, including but not limited to plate tectonics.

Skills

1. Describe the general history of the plate tectonics, including early observations, discoveries, and ideas that combined, and eventually led to the modern theory of plate tectonics.
2. Describe the properties of the interior of the Earth.
3. Identify the forces that cause earthquakes, volcanoes, and the formation of mountains and ocean basin.
4. Use physical world maps, cross sections, models (virtual or 3D) to identify plate boundaries, movement at the boundary and the resulting feature or event.
5. Explain the movement of Earths crust.
6. Explore the relationship between heat from Earths core, convection in the magma and plate movement.
7. Explain the relationship of erosional events to the interactions between the hydrosphere and lithosphere.
8. Distinguish between major geologic processes (e.g., tectonic activity, erosion, deposition) and the resulting feature on the surface of Earth.
9. Identify the standard geologic features or events that occur at each of the plate boundaries.
10. Identify plate boundaries and movements citing data from physical world maps, cross sections and models.
11. Apply the concept energy from the core (convection currents) to plate movements.
12. Model the different types of plate movement and direction to show their resulting features or events (earthquakes, tsunamis, geysers, hot springs, faults, oceanic vents, island arcs and rift valleys).
13. Locate on a map areas of tectonic activity and differentiate between the types of plate boundaries to identify patterns (Ring of Fire, San Andreas Fault, Mid-Atlantic Ridge, Mariana Trench, Hawaiian Islands, and New Madrid Fault System).

Investigate the Theory of Continental Drift.

Explain the Theory of Plate Tectonics.

Differentiate between plate tectonics and continental drift.

Explain how volcanic activity, earthquakes, tsunamis, geysers, hot springs, faults, oceanic vents, island arcs, hot spots and rift valleys are used in the identification of plates and plate boundaries.

Identify examples of destructive geologic processes (e.g., flooding, mass wasting, volcanic activity, glacial movement, earthquakes, tsunamis).

Explain that plate boundary identification (converging, diverging, transform) is based on the resulting features or events.

Demonstrate how movement in the lithosphere could cause movement of the Earths plates.

Use Plate Tectonics to explain the forces causing earthquakes.

1. Recall the characteristics of rocks and soils (grade 6).
2. Describe how landforms are created through a combination of destructive (weathering and erosion) and constructive processes (crustal deformation, volcanic eruptions and deposition of sediments).
3. Make observations from topographic, physical and aerial maps, cross sections,remote sensing, satellite data, LANDSAT, and virtual settings to demonstrate the structure and formation of geologic features.
4. Prove that landforms are created from patterns and features associated with geologic processes (flood plains, glaciers, tectonic activity, coastlines and deserts).
5. Appreciate the Earth God has given to us.

**Common Core Literacy Skills**

1. Read closely and comprehend scientific text.
2. Cite evidence from text.
3. Draw conclusions from text.
4. Use correct scientific terms.
5. Analyze the structure of text.
6. Analyze the author's purpose.
7. Integrate quantitative and technical information within a text.

**Common Core Writing Content**

1. Write arguments focused on discipline-specific content.
2. Write informative/explanatory text.
3. Produce clear and coherent writing, appropriate to task, purpose, and audience.
4. Edit and revise writing samples.
5. Use technology to produce and publish writing.
6. Conduct research projects.
7. Gather relevant sources.
8. Draw evidence from text.

Write routinely for a range of discipline-specific tasks, purposes, and audiences.

**Common Core Speaking and Listening**

1. Engage effectively in a range of collaborative discussions.
2. Come to discussions prepared, having read or studied required material.
3. Follow rules for collegial discussions.
4. Pose and respond to specific questions with elaboration and detail.
5. Review the key ideas expressed and demonstrate understanding of multiple perspectives through reflection and paraphrasing.
6. Interpret information presented in diverse media and formats.
7. Delineate a speakers argument and specific claims.
8. Present claims and findings, sequencing ideas logically and using pertinent descriptions, facts, and details.
9. Use appropriate eye contact, adequate volume, and clear pronunciation.
10. Include multimedia components and visual displays.
11. Adapt speech to a variety of contexts and tasks, demonstrating command of formal English.

Essential Questions

1. How does the theory of plate tectonics explain changes that occur on Earth?
2. How does human activity impact the surface of the earth?
3. How are living things affected by the movement of plate tectonics?
4. How do geologic processes shape the Earth?

Standards Vocabulary

1. plate tectonics
2. Magellan
3. paleontological data
4. paleoclimate data
5. paleomagnetic data
6. continental drift
7. Alfred Wegener
8. convection theory
9. Arthur Holmes
10. sea floor spreading
11. Harry Hess
12. divergent boundary
13. convergent boundary
14. transform boundary
15. geologic features
16. plate boundaries
17. convection currents
18. earthquakes
19. tsunami
20. geysers
21. hot springs
22. faults
23. oceanic vents
24. island arcs
25. rift valleys
26. ring of fire
27. San Andreas Fault
28. Mid- Atlantic Ridge
29. Mariana Trench
30. Hawaiian Islands
31. New Madrid Fault System
32. weathering
33. erosion
34. crustal deformation
35. volcanic eruptions
36. deposition of sediments
37. topographic map
38. physical map
39. aerial map
40. cross section
41. remote sensing
42. satellite data
43. LANDSAT
44. flood plains
45. glaciers
46. tectonic activity
47. coastline
48. desert

Stage 2: Assessment Evidence

Earthquake Resistant Structure

Summative: Cooperative Group Work

Working in cooperative groups, students will design and build a model of an earthquake-resistant structure (e.g., bridge, building, home). They will draw a blueprint of the plan or design and provide data to validate the choice of their design. Groups will test their design using a shake table or another quantifiable measuring device. Each group will write a report and share their findings with the class. What assessment tools/strategies will you use to assess student work? (checklists, rubrics, self-assessment tools, etc.)

Where Will America Be?

Summative: Research Project

Working with a partner, students will research the most recent measurements of North America. Using this data and the movement of North America throughout geologic time, they will predict where North America will be in 600 million years or more. Students will use technology to create a model to demonstrate that movement and share their prediction with the class. What assessment tools/strategies will you use to assess student work? (checklists, rubrics, self-assessment tools, etc.)

Reversing Magnetism in Earth's Core

Summative: Research Project

Using magnetic data from new technology and the rock record, students will investigate the pattern of reversing magnetism within Earths core. They will generate a chart or graph to represent findings, and using the historical data, predict a time range for when the next reversal could occur. They will share findings with the class and be prepared to discuss what impact the reversal could have for humans. What assessment tools/strategies will you use to assess student work? (checklists, rubrics, self-assessment tools, etc.)

Mapping Earthquakes and Volcanoes

Not Available: Cooperative Group Work

Working in cooperative groups and using a world map, students will mark the locations of all earthquakes and volcanoes that are recorded each week for at least one month. They will use a different color or pattern so that earthquakes and volcanoes can be differentiated and outline the boundaries of where the concentrations are located.They will compare/contrast this map with a map of plate boundaries answering the following questions:a. What types of boundaries are found in the volcano areas?b. What types are found in earthquake areas?They will discuss their findings with the class. What assessment tools/strategies will you use to assess student work? (checklists, rubrics, self-assessment tools, etc.)

Karst Topography

Summative: Report

Working with a partner, students will put together a model of karst topography enabling a 3-D view of a cave or sinkhole. They will research and prepare a digital presentation explaining the processes that must occur to form karst topography. They will share their presentation with the class. What assessment tools/strategies will you use to assess student work? (checklists, rubrics, self-assessment tools, etc.)

Stage 3: Learning Plan

Learning Experiences

1. Scientific Investigation. Working in cooperative groups, have students design and build a model of an earthquake-resistant structure (e.g., bridge, building, home). Have them draw a blueprint of the plan or design and provide data to validate the choice of their design. Have them test results using a shake table or another quantifiable measuring device. Have each group write a report and share their findings with the class.
2. Working with a partner, have students research the most recent measurements of North America. Using this data and the movement of North America throughout geologic time, have them predict where North America will be in 600 million years or more. Have students use technology to create a model to demonstrate that movement and share their prediction with the class.
3. Independent Work. Using magnetic data from new technology and the rock record, have students investigate the pattern of reversing magnetism within Earths core. Have them generate a chart or graph to represent findings, and using the historical data, predict a time range for when the next reversal could occur. Share findings with the class and be prepared to discuss what impact the reversal could have for humans.
4. Working in cooperative groups and using a world map, have students mark the locations of all earthquakes and volcanoes that are recorded each week for at least one month. Have them use a different color or pattern so that earthquakes and volcanoes can be differentiated and outline the boundaries of where the concentrations are located. Have them compare/contrast this map with a map of plate boundaries answering the following questions:

a. *What types of boundaries are found in the volcano areas?*  
*b. What types are found in earthquake areas?*  
Have them discuss their findings with the class.

Working with a partner, have students put together a model of karst topography enabling a 3-D view of a cave or sinkhole. (See Links) Have them research and prepare a digital presentation explaining the processes that must occur to form karst topography. Have them share their presentation with the class.

Resources

* Ohio Dept. of Education - Science Model Curriculum (<http://education.ohio.gov/Topics/Academic-Content-Standards/Science>)

Resources

1. iPad Resources
2. Literature Connection  
   *Alfred Wegener: Uncovering Plate Tectonics: Earth and Space Science* by Greg Young M.S. Ed.  
   *The Island That Moved* by Meredith Hooper and Lucia deLeiris  
   *What Is the Theory of Plate Tectonics?* by Craig Saunders I*nvestigating Plate Tectonics: Earth and Space Science* by Greg Young M.S. Ed.  
   *DK Eyewitness Books: Great Scientists* by Jacqueline Fortey *U.S. Geological Society* (SEE LINK)

Resources

* Plate Tectonics Activities (<http://orgs.up.edu/totle/index.php?q=plate_tectonics_earthquakes/Lesson+Plans>)

Grade 8 Science  
Science 8

ESS: Geologic Processes and Time Scale

Stage 1: Desired Results

Catholic Standards

Targeted Standards

OH Grade 8 OH: English Language Arts 6-12

Speaking & Listening

Comprehension and Collaboration 1. Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others ideas and expressing their own clearly and persuasively.

SL.8.1. Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others ideas and expressing their own clearly.

SL.8.1a. Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.

SL.8.1b. Follow rules for collegial discussions and decision-making, track progress toward specific goals and deadlines, and define individual roles as needed.

SL.8.1c. Pose questions that connect the ideas of several speakers and respond to others questions and comments with relevant evidence, observations, and ideas.

SL.8.1d. Acknowledge new information expressed by others, and, when warranted, qualify or justify their own views in light of the evidence presented.

Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.

SL.8.2. Analyze the purpose of information presented in diverse media and formats (e.g., visually, quantitatively, orally) and evaluate the motives (e.g., social, commercial, political) behind its presentation.

Evaluate a speakers point of view, reasoning, and use of evidence and rhetoric.

SL.8.3. Delineate a speakers argument and specific claims, evaluating the soundness of the reasoning and relevance and sufficiency of the evidence and identifying when irrelevant evidence is introduced.

Presentation of Knowledge and Ideas 4. Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.

SL.8.4. Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation.

Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations.

SL.8.5. Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.

Adapt speech to a variety of contexts and communicative tasks, demonstrating command of formal English when indicated or appropriate.

SL.8.6. Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate.

OH Grade 8 OH: Science (2011)

Earth and Space Science (ESS)

Topic: Physical Earth

The composition and properties of Earths interior are identified by the behavior of seismic waves.

OH Grades 6-8 OH: Literacy in History/Social Studies, Science, & Technical Subjects 6-12

Reading: Science & Technical Subjects

Key Ideas and Details 1. Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.

RST.6-8.1. Cite specific textual evidence to support analysis of science and technical texts.

Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.

RST.6-8.2. Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.

Analyze how and why individuals, events, or ideas develop and interact over the course of a text.

RST.6-8.3. Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole.

RST.6-8.5. Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic.

Assess how point of view or purpose shapes the content and style of a text.

RST.6-8.6. Analyze the authors purpose in providing an explanation, describing a procedure, or discussing an experiment in a text.

Integration of Knowledge and Ideas 7. Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words.

RST.6-8.7. Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).

Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence.

RST.6-8.8. Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.

Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

RST.6-8.9. Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.

Read and comprehend complex literary and informational texts independently and proficiently.

RST.6-8.10. By the end of grade 8, read and comprehend science/technical texts in the grades 68 text complexity band independently and proficiently.

Capacities of the Literate Individual

Students Who are College and Career Ready in Reading, Writing, Speaking, Listening, & Language

They demonstrate independence.

Writing

Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.

WHST.6-8.2. Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

WHST.6-8.2b. Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.

WHST.6-8.2c. Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts.

WHST.6-8.2d. Use precise language and domain-specific vocabulary to inform about or explain the topic.

WHST.6-8.2e. Establish and maintain a formal style and objective tone.

WHST.6-8.2f. Provide a concluding statement or section that follows from and supports the information or explanation presented.

Production and Distribution of Writing 4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

WHST.6-8.4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.

WHST.6-8.8. Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.

Draw evidence from literary or informational texts to support analysis, reflection, and research.

WHST.6-8.9. Draw evidence from informational texts to support analysis reflection, and research.

Range of Writing 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 tasks, purposes, and audiences.

WHST.6-8.10. Write routinely over extended time frames (time for 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.

Catholic Identity

DOC All Grades Catholic Identity

Catholic Social Justice Teachings

Life and Dignity of the Human Person

Rights and Responsibilities

Call to Family, Community, and Participation

Solidarity

Care for God's Creation

The Rights of Children

1. THE RIGHT TO A CATHOLIC COMMUNITY that witnesses to Christ and the Gospel by protecting them from child abuse, including sexual abuse and neglect.

2. THE RIGHT TO A SAFE ENVIRONMENT that promotes care, protection, and security.

3. THE RIGHT TO BE RESPECTED AS INDIVIDUALS with human dignity.

4. THE RIGHT TO WORK ACTIVELY TOWARD THEIR OWN EMPOWERMENT through the development of their gifts and talents.

5. THE RIGHT TO A LEARNING ENVIRONMENT THAT VALUES COOPERATION and challenges its members to critical and reflective thinking in their search for truth.

6. THE RIGHT TO DEVELOP POSITIVE, RESPONSIBLE AND CARING ATTITUDES AND BEHAVIORS TOWARD OTHERS and to recognize the rights of others to be safe and free from harassment and abuse.

7. THE RIGHT TO LEARN THE SKILL OF SELF PROTECTION by identifying safe and unsafe situations.

8. THE RIGHT TO LEARN RESPONSIBILITY for themselves and their actions.

9. THE RIGHT TO MAKE RESPONSIBLE DECISIONS founded on religious conviction.

10. THE RIGHT TO GUIDANCE FROM THE CHURCH in their development as loving people.

Content

**Evidence of the dynamic changes of Earths surface through time is found in the geologic record.**

a. Earth is approximately 4.6 billion years old.  
b. Earth history is based on observations of the geologic record and the understanding that processes observed at present day are similar to those that occurred in the past (uniformitarianism).  
c. There are different methods to determine relative and absolute age of some rock layers in the geologic record.  
d. Within a sequence of undisturbed sedimentary rocks, the oldest rocks are at the bottom (superposition).  
e. The geologic record can help identify past environmental and climate conditions.

f. Environmental and climate conditions also can be documented through the cryosphere as seen through ice cores.

Skills

1. Research the different methods used to determine the age of the Earth.
2. Cite evidence from the geologic time scale to demonstrate the age of the Earth.

Describe the methods used by scientists to determine that the age of Earth is approximately 4.6 billion years.

Recognize the immensity of the geologic time scale.

1. Apply the concept of index fossils in terms of relative dating.
2. Determine relative age of fossils by using the processes of superposition, cross cutting relationships and index fossils.
3. Explore radiometric dating and its important role in absolute age.
4. Define uniformitarianism in relation to environmental conditions that existed throughout Earth's history and present day.
5. Prove that geologic history and the fossil record can help identify the environment and organisms that existed in Earth's history.
6. Appreciate the Earth God has given to us.

**Common Core Literacy Skills**

1. Read closely and comprehend scientific text.
2. Cite evidence from text.
3. Draw conclusions from text.
4. Use correct scientific terms.
5. Analyze the structure of text.
6. Analyze the author's purpose.
7. Integrate quantitative and technical information within a text.

**Common Core Writing Content**

1. Write arguments focused on discipline-specific content.
2. Write informative/explanatory text.
3. Produce clear and coherent writing, appropriate to task, purpose, and audience.
4. Edit and revise writing samples.
5. Use technology to produce and publish writing.
6. Conduct research projects.
7. Gather relevant sources.
8. Draw evidence from text.
9. Write routinely for a range of discipline-specific tasks, purposes, and audiences.

**Common Core Speaking and Listening**

1. Engage effectively in a range of collaborative discussions.
2. Come to discussions prepared, having read or studied required material.
3. Follow rules for collegial discussions.
4. Pose and respond to specific questions with elaboration and detail.
5. Review the key ideas expressed and demonstrate understanding of multiple perspectives through reflection and paraphrasing.
6. Interpret information presented in diverse media and formats.
7. Delineate a speakers argument and specific claims.
8. Present claims and findings, sequencing ideas logically and using pertinent descriptions, facts, and details.
9. Use appropriate eye contact, adequate volume, and clear pronunciation.
10. Include multimedia components and visual displays.
11. Adapt speech to a variety of contexts and tasks, demonstrating command of formal English.

Essential Questions

1. What does the principle of uniformitarianism pose and how does it relate to geology?
2. How does the law of superposition determine the relative age of sedimentary rock?
3. If you found a fossilized shell on a mountaintop, what could you infer about how Earth's surface and climate have changed since the shell was formed?
4. What evidence was used to make the geologic time scale and why are scientists constantly refining it?

Standards Vocabulary

1. geologic record
2. uniformitarianism
3. absolute age
4. superposition
5. cross cutting relationships
6. index fossils
7. relative age
8. radiometric dating
9. absolute age
10. fossil record
11. geologic maps

Stage 2: Assessment Evidence

Analysis of Geologic Record

Summative: Class Discussion

Working with a partner, students will use technology to investigate the geologic record virtually in order to collect data and conduct scientific investigations through 60-70 million years of geologic time. They will analyze the data and document all changes verified by the data. Partners will share their findings and conclusions with the entire class. What assessment tools/strategies will you use to assess student work? (checklists, rubrics, self-assessment tools, etc.)

Geologic Time Period

Summative: Report

Working with a partner, students will choose a specific geologic time period and location on Earth that has geologic rock record data. Using technology, they will represent the geologic time period graphically and include specific formation information. Partners will share their final product with the class. What assessment tools/strategies will you use to assess student work? (checklists, rubrics, self-assessment tools, etc.)

Energy from Geologic Processes

Summative: Research Project

Working in cooperative groups, students will research a specific area with active geologic processes or events and evaluate the different possible types of energy available at the event or location. They will develop a plan to harness the available energy (e.g., heat from magma, water movement) from the process. Using their plan, the groups will build a working model using specific data from the location, including the geologic record. Groups will present their findings and recommendations and the model they built to the class. What assessment tools/strategies will you use to assess student work? (checklists, rubrics, self-assessment tools, etc.)

Resources

Stage 3: Learning Plan

Learning Experiences

1. Working with a partner, have students use technology to investigate the geologic record virtually in order to collect data and conduct scientific investigations through 60-70 million years of geologic time. Have them analyze the data and document all changes verified by the data. Discuss conclusions and findings with the entire class.
2. Working with a partner, have students choose a specific geologic time period and location on Earth that has geologic rock record data. Using technology, have them represent the geologic time period graphically and include specific *formation* information. Have them share their final product with the class.

Working in cooperative groups, have students research a specific area with active geologic processes or events and evaluate the different possible types of energy available at the event or location. Have them develop a plan to harness the available energy (e.g., heat from magma, water movement) from the process. Using their plan, have the students build a working model using specific data from the location, including the geologic record. Have the groups present their findings and recommendations and the model they built to the class.

Resources

* Ohio Dept. of Education - Science Model Curriculum (<http://education.ohio.gov/Topics/Academic-Content-Standards/Science>)

Resources

Resources

1. iPad Resources
2. Literature Connection  
   *Break the Fossil Record* by Annie Barrows  
   *What Fossils Tell Us: The History of Life* by Bridget Anderson

Resources

* Fossil Lesson ([http://www.google.com/url?sa=trct=jq=esrc=ssource=webcd=2ved=0CDEQFjABurl=http%3A%2F%2Fwww.pbs.org%2Famericanfieldguide%2Fteachers%2Ffossils%2Ffossils.pdfei=SAfLUefyM6bUyQHbrYGgCAusg=AFQjCNF0wLsDLmP42BJiXgAoQyE5TXeYqAbvm=bv.48340889,d.aWc](http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&ved=0CDEQFjAB&url=http%3A%2F%2Fwww.pbs.org%2Famericanfieldguide%2Fteachers%2Ffossils%2Ffossils.pdf&ei=SAfLUefyM6bUyQHbrYGgCA&usg=AFQjCNF0wLsDLmP42BJiXgAoQyE5TXeYqA&bvm=bv.48340889,d.aWc))

Grade 8 Science  
Science 8

LS: Species and Reproduction

Stage 1: Desired Results

Catholic Standards

Targeted Standards

OH Grade 8 OH: English Language Arts 6-12

Speaking & Listening

Comprehension and Collaboration 1. Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others ideas and expressing their own clearly and persuasively.

SL.8.1. Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others ideas and expressing their own clearly.

SL.8.1a. Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.

SL.8.1b. Follow rules for collegial discussions and decision-making, track progress toward specific goals and deadlines, and define individual roles as needed.

SL.8.1c. Pose questions that connect the ideas of several speakers and respond to others questions and comments with relevant evidence, observations, and ideas.

SL.8.1d. Acknowledge new information expressed by others, and, when warranted, qualify or justify their own views in light of the evidence presented.

Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.

SL.8.2. Analyze the purpose of information presented in diverse media and formats (e.g., visually, quantitatively, orally) and evaluate the motives (e.g., social, commercial, political) behind its presentation.

Evaluate a speakers point of view, reasoning, and use of evidence and rhetoric.

SL.8.3. Delineate a speakers argument and specific claims, evaluating the soundness of the reasoning and relevance and sufficiency of the evidence and identifying when irrelevant evidence is introduced.

Presentation of Knowledge and Ideas 4. Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.

SL.8.4. Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation.

Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations.

SL.8.5. Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.

Adapt speech to a variety of contexts and communicative tasks, demonstrating command of formal English when indicated or appropriate.

SL.8.6. Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate.

OH Grade 8 OH: Science (2011)

Life Science (LS)

Topic: Species and Reproduction

Diversity of species occurs through gradual processes over many generations. Fossil records provide evidence that changes have occurred in number and types of species.

OH Grades 6-8 OH: Literacy in History/Social Studies, Science, & Technical Subjects 6-12

Reading: Science & Technical Subjects

Key Ideas and Details 1. Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.

RST.6-8.1. Cite specific textual evidence to support analysis of science and technical texts.

Analyze how and why individuals, events, or ideas develop and interact over the course of a text.

RST.6-8.3. Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence.

RST.6-8.8. Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.

Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

RST.6-8.9. Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.

Capacities of the Literate Individual

Students Who are College and Career Ready in Reading, Writing, Speaking, Listening, & Language

They demonstrate independence.

Writing

Text Types and Purposes 1. Write arguments to support claims in an analysis of substantive topics or texts using valid reasoning and relevant and sufficient evidence.

WHST.6-8.1. Write arguments focused on discipline-specific content.

WHST.6-8.1a. Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.

WHST.6-8.1b. Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.

WHST.6-8.1c. Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.

Research to Build and Present Knowledge 7. Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.

WHST.6-8.7. Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.

Draw evidence from literary or informational texts to support analysis, reflection, and research.

WHST.6-8.9. Draw evidence from informational texts to support analysis reflection, and research.

Range of Writing 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 tasks, purposes, and audiences.

WHST.6-8.10. Write routinely over extended time frames (time for 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.

Catholic Identity

DOC All Grades Catholic Identity

Catholic Social Justice Teachings

Life and Dignity of the Human Person

Rights and Responsibilities

Call to Family, Community, and Participation

Solidarity

Care for God's Creation

The Rights of Children

1. THE RIGHT TO A CATHOLIC COMMUNITY that witnesses to Christ and the Gospel by protecting them from child abuse, including sexual abuse and neglect.

2. THE RIGHT TO A SAFE ENVIRONMENT that promotes care, protection, and security.

3. THE RIGHT TO BE RESPECTED AS INDIVIDUALS with human dignity.

4. THE RIGHT TO WORK ACTIVELY TOWARD THEIR OWN EMPOWERMENT through the development of their gifts and talents.

5. THE RIGHT TO A LEARNING ENVIRONMENT THAT VALUES COOPERATION and challenges its members to critical and reflective thinking in their search for truth.

6. THE RIGHT TO DEVELOP POSITIVE, RESPONSIBLE AND CARING ATTITUDES AND BEHAVIORS TOWARD OTHERS and to recognize the rights of others to be safe and free from harassment and abuse.

7. THE RIGHT TO LEARN THE SKILL OF SELF PROTECTION by identifying safe and unsafe situations.

8. THE RIGHT TO LEARN RESPONSIBILITY for themselves and their actions.

9. THE RIGHT TO MAKE RESPONSIBLE DECISIONS founded on religious conviction.

10. THE RIGHT TO GUIDANCE FROM THE CHURCH in their development as loving people.

Content

**Diversity of species occurs through gradual processes over many generations. Fossil records provide evidence that changes have occurred in number and types of species.**

a. Fossils provide important evidence of how life and environmental conditions have changed.

b. Changes in environmental conditions can affect how beneficial a trait will be for the survival and reproductive success of an organism or an entire species.

c. Throughout Earths history, extinction of a species has occurred when the environment changes and the individual organisms of that species do not have the traits necessary to survive and reproduce in the changed environment.  
d. Most species (approximately 99 percent) that have lived on Earth are now extinct.

**Reproduction is necessary for the continuation of every species.**

a. Every organism alive today comes from a long line of ancestors who reproduced successfully every generation.  
b. Reproduction is the transfer of genetic information from one generation to the next.  
c. Reproduction can occur with mixing of genes from two individuals (sexual reproduction).  
d. Reproduction can occur with the transfer of genes from one individual to the next generation (asexual reproduction).  
e. The ability to reproduce defines living things.

**The characteristics of an organism are a result of inherited traits received from parent(s).**

a. Expression of all traits is determined by genes and environmental factors to varying degrees.  
b. Many genes influence more than one trait, and many traits are influenced by more than one gene.

c. During reproduction, genetic information (DNA) is transmitted between parent and offspring.  
d. In asexual reproduction, the lone parent contributes DNA to the offspring.  
e. In sexual reproduction, both parents contribute DNA to the offspring.

**The Catholic Church teaches that "from the moment of conception, the life of every human being is to be respected in an absolute way because man is the only creature on earth that God has 'wished for himself' and the spiritual soul of each man is 'immediately created by God'; his whole being bears the image of the Creator.** (CDF, DV, February 22, 1987, Introduction; #5)

Skills

1. Cite evidence of why reproduction is necessary for the continuation of species.

Explain why genetic variation is a survival advantage.

Describe the features of sexual and asexual reproduction related to the transfer of genetic information from parent to offspring.

1. Provide examples of organisms that reproduce asexually emphasizing that genes come from a single parent.
2. Recall and explain the process of mitosis.
3. Investigate meiosis.
4. Describe and illustrate the stages of meiosis.
5. Compare the genetics of the offspring to parent in sexual and asexual reproduction.
6. Define the fossil record.
7. Explain how the Earths living history can be interpreted by combining data from the geologic record and the fossil record.

Describe how to determine the relative age of fossils found in sedimentary rock.

1. Analyze data and evidence from the fossil record in relation to earth's history, extinction, biodiversity and the diversity of species.
2. Explain how diversity can result from sexual reproduction.
3. Connect the ideas that sexual reproduction may result in a diversity of genes that are favorable or unfavorable to the species in an environment.
4. Explain how the sorting and combination of genes results in different genetic combinations, which allow offspring to be similar to, yet different from, their parents and each other.
5. Recognize that diversity in a species increases the likelihood that some individuals will have characteristics suitable to survive under changed conditions.
6. Using the fossil record justify that organisms have changed and adapted to the environment over many generations.
7. Recognize that the variations that exist in organisms can accumulate over many generations, so organisms can be very different in appearance and behavior from their distant ancestors.

Explain why variation within a population can be advantageous for a population of organisms.

Recognize that reproduction is necessary for the continuation of every species.

1. Apply knowledge of reproduction to understand that traits are inherited from previous generations.

Describe how genes, chromosomes and inherited traits are connected.

1. Illustrate the relationship of the structure and function of DNA to genes and alleles.
2. Recognize the development of genetics (Gregor Mendel).
3. Compare and Contrast - Dominant/Recessive, Genes/Alleles/Traits, Homozygous/Heterozygous, Phenotype/Genotype.
4. Demonstrate the understanding that crossing genotypes results in a predictable probability.
5. Create family pedigrees using knowledge of dominant and recessive traits.
6. Describe the relationship between phenotypes that appear in resulting generations and the genotypes of the offspring.
7. Compare the exchange of genetic information during sexual and asexual reproduction.
8. Describe the characteristics and transfer of dominant and recessive traits.
9. Reflect on the teachings of the Catholic Church on reproduction and the dignity of life.
10. Appreciate and respect the miracle of life provided to us by God.

**Common Core Literacy Skills**

1. Read closely and comprehend scientific text.
2. Cite evidence from text.
3. Draw conclusions from text.
4. Use correct scientific terms.
5. Analyze the structure of text.
6. Analyze the author's purpose.
7. Integrate quantitative and technical information within a text.

**Common Core Writing Content**

1. Write arguments focused on discipline-specific content.
2. Write informative/explanatory text.
3. Produce clear and coherent writing, appropriate to task, purpose, and audience.
4. Edit and revise writing samples.
5. Use technology to produce and publish writing.
6. Conduct research projects.
7. Gather relevant sources.
8. Draw evidence from text.
9. Write routinely for a range of discipline-specific tasks, purposes, and audiences.

**Common Core Speaking and Listening**

1. Engage effectively in a range of collaborative discussions.
2. Come to discussions prepared, having read or studied required material.
3. Follow rules for collegial discussions.
4. Pose and respond to specific questions with elaboration and detail.
5. Review the key ideas expressed and demonstrate understanding of multiple perspectives through reflection and paraphrasing.
6. Interpret information presented in diverse media and formats.
7. Delineate a speakers argument and specific claims.
8. Present claims and findings, sequencing ideas logically and using pertinent descriptions, facts, and details.
9. Use appropriate eye contact, adequate volume, and clear pronunciation.
10. Include multimedia components and visual displays.
11. Adapt speech to a variety of contexts and tasks, demonstrating command of formal English.

Essential Questions

1. How does life create life?
2. How are plant and animals cells organized to carry on the processes of life?
3. Why do some organisms reproduce sexually and asexually?
4. How does the fossil record show a long variable history of life on earth?
5. How does natural selection explain how organisms have changed over time?
6. How are genes and chromosomes related to genetics?
7. What makes me who I am, and could I be changed?
8. What impact does the advancement in genetics make in today's society (e.g., pet cloning, DNA profiling, genetic engineering, radiation treatments, selective breeding)?
9. What does the Catholic Church teach me about life and the reproduction of life?

Standards Vocabulary

1. organism
2. reproduction
3. parent/offspring
4. mitosis/meiosis
5. Gregor Mendel
6. geologic/fossil record
7. evolution
8. extinction
9. biodiversity
10. earth's living history
11. environmental conditions
12. diversity of species
13. DNA
14. genes
15. traits
16. alleles
17. dominant
18. recessive
19. codominant
20. pedigree
21. Punnett Square
22. characteristics
23. phenotypes
24. genotypes
25. generations
26. asexual reproduction
27. sexual reproduction

Stage 2: Assessment Evidence

Food Cloning

Summative: Research Project

Working with a partner, students will research cloning in the food industry. They will select one practice and determine whether or not it is an environmentally healthy practice. Students will prepare a digital presentation citing their evidence and justifying their position and share their research with the class. What assessment tools/strategies will you use to assess student work? (checklists, rubrics, self-assessment tools, etc.)

Plant Investigation

Summative: Cooperative Group Work

Working with a partner, students will examine offspring in plants that are produced sexually. They will note and record variations that appear and determine how the variations may help an organism to survive if the environment should change. Partners will create a poster illustrating the plant and summarizing their findings. They will share their work in a class discussion. What assessment tools/strategies will you use to assess student work? (checklists, rubrics, self-assessment tools, etc.)

GMO Analysis

Summative: Persuasive Writing

Working in cooperative groups, students will research a genetically modified organism (e.g., Bt corn) and make a recommendation whether or not it is harmful to the environment. They will provide peer-reviewed scientific evidence to support their answer. In a debate setting, groups will evaluate the validity of the scientific claims made by both proponents and opponents of using genetically modified organisms for food. What assessment tools/strategies will you use to assess student work? (checklists, rubrics, self-assessment tools, etc.)

Fossil Timeline

Summative: Writing Assignment

Using various research materials, students will create a timeline that illustrates the relative ages of fossils of a particular organism in sedimentary rock layers. What assessment tools/strategies will you use to assess student work? (checklists, rubrics, self-assessment tools, etc.)

Biome Biodiversity Graph

Summative: Writing Assignment

Working with a partner, students will graph data that indicates how the biodiversity in a particular biome or continent has changed over time. They will analyze the data and write a summary report. What assessment tools/strategies will you use to assess student work? (checklists, rubrics, self-assessment tools, etc.)

Designer Dogs

Summative: Report

Working in cooperative groups, students research designer dogs. They will investigate several generations of a number of breeds and explain the benefits and drawbacks of mixing the breeds in order to determine the stability of the resulting hybrids. They will prepare a digital report which they will share with the class. What assessment tools/strategies will you use to assess student work? (checklists, rubrics, self-assessment tools, etc.)

Predicting Pedigrees

Summative: Class Work

Working with a partner, students will design and implement an investigation to predict the genotype and phenotypes of offspring between plants of known heritage (e.g., Wisconsin Fast Plants). They will prepare a digital report to share with the class. What assessment tools/strategies will you use to assess student work? (checklists, rubrics, self-assessment tools, etc.)

Punnett Squares

Summative: Report

Given the genetic characteristics of the parents, students will use a Punnett square to predict the outcome of the offspring produced. They will prepare a visual report and explain their findings to the class. What assessment tools/strategies will you use to assess student work? (checklists, rubrics, self-assessment tools, etc.)

Stage 3: Learning Plan

Learning Experiences

1. Working with a partner, have students research cloning in the food industry. Have them select one practice and determine whether or not it is an environmentally healthy practice. Have students prepare a digital presentation citing their evidence and justifying their position. Have them share their research with the class.
2. Scientific Investigation. Working with a partner, have students examine offspring in plants that are produced sexually. Have them note and record variations that appear and determine how the variations may help an organism to survive if the environment should  
   change. Have them create a poster illustrating the plant and summarizing their findings. Have students share their work in a class discussion and then display the posters.
3. Working in cooperative groups, have students research a genetically modified organism (e.g., Bt corn) and make a  
   recommendation whether or not it is harmful to the environment. Have them provide peer-reviewed scientific evidence to support their answer. In a debate, have the groups evaluate the validity of the scientific claims made by both proponents and opponents of using genetically modified organisms for food.
4. Using various research materials, have students create a timeline that illustrates the relative ages of fossils of a particular organism in sedimentary rock layers.
5. Working with a partner, have students graph data that indicates how the biodiversity in a particular biome or continent has changed over time. Analyze the data and write a summary report.
6. Scientific Investigation. Working in cooperative groups, have students research designer dogs. Designer dogs are developed to meet human needs. Have them investigate several generations of a number of breeds and explain the benefits and drawbacks of mixing the breeds in order to determine the stability of the resulting hybrids. Have them prepare a digital report which they will share with the class.
7. Scientific Investigation. Working with a partner, have students design and implement an investigation to predict the genotype and phenotypes of offspring between plants of known heritage (e.g., Wisconsin Fast Plants). Have them prepare a digital report to share with the class.
8. Class Activity. Given the genetic characteristics of the parents, have students use a Punnett square to predict the outcome of the offspring produced. Have students prepare a visual report and explain their findings to the class.

Resources

* Ohio Dept. of Education - Science Model Curriculum (<http://education.ohio.gov/Topics/Academic-Content-Standards/Science>)

Resources

Resources

1. iPad Resources
2. Literature Connection  
   *Grandfathers Nose: Why We All Look Alike or Different* by Dorothy Hinshaw  
   *Exploring Heredity by* Ella Hawley  
   *Nature Close UP - Plant Clones* by Dwight Kuhn  
   *Fossils Tell of Long Ago* by Aliki  
   *Gregor Mendel the Friar Who Grew Peas* by Cheryl Bardoe  
   *Kingfisher Knowledge: Genes and DNA* by Richard Walker

Resources

* Reproduction (<http://www.teachersdomain.org/resource/tdc02.sci.life.repro.lp_reproduce/>)

Grade 8 Science  
Science 8

PS: Forces

Stage 1: Desired Results

Catholic Standards

Targeted Standards

OH Grade 8 OH: English Language Arts 6-12

Speaking & Listening

Comprehension and Collaboration 1. Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others ideas and expressing their own clearly and persuasively.

SL.8.1. Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others ideas and expressing their own clearly.

SL.8.1a. Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.

SL.8.1b. Follow rules for collegial discussions and decision-making, track progress toward specific goals and deadlines, and define individual roles as needed.

SL.8.1c. Pose questions that connect the ideas of several speakers and respond to others questions and comments with relevant evidence, observations, and ideas.

SL.8.1d. Acknowledge new information expressed by others, and, when warranted, qualify or justify their own views in light of the evidence presented.

Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.

SL.8.2. Analyze the purpose of information presented in diverse media and formats (e.g., visually, quantitatively, orally) and evaluate the motives (e.g., social, commercial, political) behind its presentation.

Evaluate a speakers point of view, reasoning, and use of evidence and rhetoric.

SL.8.3. Delineate a speakers argument and specific claims, evaluating the soundness of the reasoning and relevance and sufficiency of the evidence and identifying when irrelevant evidence is introduced.

Presentation of Knowledge and Ideas 4. Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.

SL.8.4. Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation.

Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations.

SL.8.5. Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.

Adapt speech to a variety of contexts and communicative tasks, demonstrating command of formal English when indicated or appropriate.

SL.8.6. Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate.

OH Grade 8 OH: Science (2011)

Physical Science (PS)

Topic: Forces and Motion

Some forces between objects act when the objects are in direct contact or when they are not touching.

OH Grades 6-8 OH: Literacy in History/Social Studies, Science, & Technical Subjects 6-12

Reading: Science & Technical Subjects

Key Ideas and Details 1. Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.

RST.6-8.1. Cite specific textual evidence to support analysis of science and technical texts.

Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.

RST.6-8.2. Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.

Analyze how and why individuals, events, or ideas develop and interact over the course of a text.

RST.6-8.3. Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

Craft and Structure 4. Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

RST.6-8.4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 68 texts and topics.

Integration of Knowledge and Ideas 7. Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words.

RST.6-8.7. Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).

Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence.

RST.6-8.8. Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.

Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

RST.6-8.9. Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.

Read and comprehend complex literary and informational texts independently and proficiently.

RST.6-8.10. By the end of grade 8, read and comprehend science/technical texts in the grades 68 text complexity band independently and proficiently.

Capacities of the Literate Individual

Students Who are College and Career Ready in Reading, Writing, Speaking, Listening, & Language

They demonstrate independence.

Writing

Text Types and Purposes 1. Write arguments to support claims in an analysis of substantive topics or texts using valid reasoning and relevant and sufficient evidence.

WHST.6-8.1a. Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.

Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.

WHST.6-8.2. Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

WHST.6-8.2a. Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.

WHST.6-8.2b. Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.

WHST.6-8.2d. Use precise language and domain-specific vocabulary to inform about or explain the topic.

WHST.6-8.2f. Provide a concluding statement or section that follows from and supports the information or explanation presented.

Production and Distribution of Writing 4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

WHST.6-8.4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.

WHST.6-8.6. Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.

Research to Build and Present Knowledge 7. Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.

WHST.6-8.7. Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.

Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.

WHST.6-8.8. Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.

Draw evidence from literary or informational texts to support analysis, reflection, and research.

WHST.6-8.9. Draw evidence from informational texts to support analysis reflection, and research.

Catholic Identity

DOC All Grades Catholic Identity

Catholic Social Justice Teachings

Life and Dignity of the Human Person

Rights and Responsibilities

Call to Family, Community, and Participation

Solidarity

Care for God's Creation

The Rights of Children

1. THE RIGHT TO A CATHOLIC COMMUNITY that witnesses to Christ and the Gospel by protecting them from child abuse, including sexual abuse and neglect.

2. THE RIGHT TO A SAFE ENVIRONMENT that promotes care, protection, and security.

3. THE RIGHT TO BE RESPECTED AS INDIVIDUALS with human dignity.

4. THE RIGHT TO WORK ACTIVELY TOWARD THEIR OWN EMPOWERMENT through the development of their gifts and talents.

5. THE RIGHT TO A LEARNING ENVIRONMENT THAT VALUES COOPERATION and challenges its members to critical and reflective thinking in their search for truth.

6. THE RIGHT TO DEVELOP POSITIVE, RESPONSIBLE AND CARING ATTITUDES AND BEHAVIORS TOWARD OTHERS and to recognize the rights of others to be safe and free from harassment and abuse.

7. THE RIGHT TO LEARN THE SKILL OF SELF PROTECTION by identifying safe and unsafe situations.

8. THE RIGHT TO LEARN RESPONSIBILITY for themselves and their actions.

9. THE RIGHT TO MAKE RESPONSIBLE DECISIONS founded on religious conviction.

10. THE RIGHT TO GUIDANCE FROM THE CHURCH in their development as loving people.

Content

**Forces between objects act when the objects are in direct contact or when they are not touching.**

a. Magnetic, electrical and gravitational forces can act at a distance.   
b. An object is thought to have a region of influence, called a field, surrounding it.  
c. A field model can be used to explain how two objects can exert forces on each other without touching.  
d. Electric fields exist around objects with charge.  
e. Magnetic fields exist around magnetic objects.  
f. Gravitational fields exist around objects with mass.  
g. Every object exerts a gravitational force on every other object with mass.  
h. Electric force, magnetic force, and gravitational force weaken rapidly with increasing distance.

**Forces have magnitude and direction.**

a. The motion of an object is always measured with respect to a reference point.

b. Forces can be added. The net force on an object is the sum of all of the forces acting on the object. The net force acting on an object can change the objects direction and/or speed.

c. When the net force is greater than zero, the objects speed and/or direction will change.

d. When the net force is zero, the object remains at rest or continues to move at a constant speed in a straight line.

1. Newton's Laws of Motion
2. Coulomb's Law

Resources

Skills

1. Use a field model to explain how two objects can exert forces on each other without touching (electric, magnetic, gravitational).

Use the field model to explain why an apple will fall toward Earth.

1. Design an experiment where an electric field is created using static electricity (i.e., rubbing a balloon against another object) to determine what objects are attracted or repelled.
2. Create a diagram to explain the relationship between electricity and magnetism.
3. Describe the basic principles of an electromagnet.
4. Recognize that a force is described by its strength (magnitude) and in what direction it is acting.
5. Explain balanced forces.
6. Recognize that an unbalanced force acting on an object changes that objects speed and/or direction.
7. Explain how the force of gravity can be acting on a book at rest on a table and yet the book does not change its motion.
8. Explain why a heavy cabinet does not change its motion, even though a strong pushing force is applied.
9. Recognize that free fall results from the gravitational attraction between Earth and an object.
10. Recall that an unbalanced force acting on an object changes that objects speed and/or direction.
11. Create a model to demonstrate the changing forces in a magnetic field in relation to proximity of objects.
12. Explain kinetic friction as a force that occurs when two objects in contact interact by sliding past one another.
13. Explain drag as a force that opposes the motion of an object when an object moves through a fluid (e.g., gas, liquid).

Recognize that the electrical force increases as the electrical charges increase.

Recognize that the electrical force decreases when the distance between the charges increases.

Create a chart to distinguish among the earths magnetic field and fields that surround a magnet and an electromagnet.

Explain the difference between mass and weight.

1. Connect the concepts of gravity and weight using examples from Earth compared to other planets or the moon.
2. Determine the relationship among the mass of objects, the distance between these objects, and the amount of gravitational attraction.
3. Identify factors that influence the amount of gravitational force between objects.
4. Recognize that gravity is the force that controls the motion of objects in the solar system.
5. Explain how the motion of objects in the solar system is affected by gravity.
6. Illustrate how gravity controls the motion of objects in the solar system.
7. Demonstrate how an electric current is related to a magnetic field by constructing an electromagnet.
8. Differentiate between direct currents and alternating currents in generators.
9. Build an electric motor using simple materials.
10. Develop a logical argument about how objects can be either moving or not moving depending on your reference point.
11. Explain Newton's First and Second Law of Motion.
12. Create force diagrams showing the net force from two different objects with opposite forces.
13. Show various ways of applying balanced and unbalanced forces on objects (to explain Newton's Third Law of Motion).
14. Compare the various types of friction in slowing down or stopping objects.
15. Realize God, the almighty, is our ultimate source of energy and strength.

**Common Core Literacy Skills**

1. Read closely and comprehend scientific text.
2. Cite evidence from text.
3. Draw conclusions from text.
4. Use correct scientific terms.
5. Analyze the structure of text.
6. Analyze the author's purpose.
7. Integrate quantitative and technical information within a text.

**Common Core Writing Content**

1. Write arguments focused on discipline-specific content.
2. Write informative/explanatory text.
3. Produce clear and coherent writing, appropriate to task, purpose, and audience.
4. Edit and revise writing samples.
5. Use technology to produce and publish writing.
6. Conduct research projects.
7. Gather relevant sources.
8. Draw evidence from text.

Write routinely for a range of discipline-specific tasks, purposes, and audiences.

**Common Core Speaking and Listening**

1. Engage effectively in a range of collaborative discussions.
2. Come to discussions prepared, having read or studied required material.
3. Follow rules for collegial discussions.
4. Pose and respond to specific questions with elaboration and detail.
5. Review the key ideas expressed and demonstrate understanding of multiple perspectives through reflection and paraphrasing.
6. Interpret information presented in diverse media and formats.
7. Delineate a speakers argument and specific claims.
8. Present claims and findings, sequencing ideas logically and using pertinent descriptions, facts, and details.
9. Use appropriate eye contact, adequate volume, and clear pronunciation.
10. Include multimedia components and visual displays.
11. Adapt speech to a variety of contexts and tasks, demonstrating command of formal English.

Essential Questions

1. How can a field model be used to explain how two objects can exert forces on each other without touching?
2. In what ways is electricity related to magnetism?
3. To what extent can force affect motion?
4. How do the different types of friction affect motion?

Standards Vocabulary

1. field model
2. field
3. property
4. electric field
5. electric force
6. magnetic field
7. gravitational field
8. attract
9. repel
10. gravitational force
11. mass
12. weight
13. gravity
14. electromagnet
15. generators
16. motors
17. motion
18. reference point
19. force
20. magnitude
21. Newton's First Law of Motion
22. Newton's Second Law of Motion
23. Newton's Third Law of Motion
24. Coulomb's Law
25. net force
26. unbalanced forces
27. balanced forces
28. friction
29. kinetic friction (sliding friction)
30. drag (fluid friction)
31. rolling friction
32. acceleration
33. induction
34. conduction

Stage 2: Assessment Evidence

Coulombs Law

Formative: Online Learning

Working in cooperative groups, students will use the simulation titled Coulombs Law to plan and implement a scientific investigation to determine the relationship between either distance and force or charge and force for two charges. They will represent the data graphically and analyze it to determine patterns and trends. Using their analysis, students will formulate a conclusion about the relationship and support the conclusion with evidence from the simulation. Groups will share their conclusions with the class. What assessment tools/strategies will you use to assess student work? (checklists, rubrics, self-assessment tools, etc.)

Experimentation with Magnets

Formative: Lab Assignment

Working with a partner, students will use iron filings, magnetic objects and different sized magnets to determine magnet strength at different distances and how much size of a magnet affects force. They will create a table or chart to show the results of their various tests. Using the data collected, students will write a summary statement about the relationship between size of magnets, distance between objects, and the magnetic force applied. They will share their summary with the class and discuss possible explanations for any variations in the findings. What assessment tools/strategies will you use to assess student work? (checklists, rubrics, self-assessment tools, etc.)

Spring Scale Labs

Formative: Lab Assignment

Working in cooperative groups, students will use spring scales a) to measure the pull force of a variety of differently massed objects and b) to measure the amount of friction caused by pulling an object over a surface, with wheels and then through water. Groups will prepare a report that they will share in a class discussion. What assessment tools/strategies will you use to assess student work? (checklists, rubrics, self-assessment tools, etc.)

Friction Simulator

Formative: Online Learning

Students will examine the effect of different frictional surfaces using the online simulation (See Links). They will formulate a hypothesis on which surface the wind-up toy will move the quickest and slowest. They will then test the toy and see if their hypothesis was correct and write a paragraph explaining how successful their predictions were and why or why not the toy moved as predicted. What assessment tools/strategies will you use to assess student work? (checklists, rubrics, self-assessment tools, etc.)

Seatbelt Effectiveness

Summative: Lab Assignment

Working in cooperative groups, students will design and build a simple model to demonstrate the benefits of seat belts using Newton's First Law of Motion. They will use the models to compare the effectiveness of shoulder and lap belts vs. lap belts alone. Groups will prepare a digital presentation to explain the results of their experimentation and share it with the class. What assessment tools/strategies will you use to assess student work? (checklists, rubrics, self-assessment tools, etc.)

Resources

Stage 3: Learning Plan

Learning Experiences

Working in cooperative groups, have students use the simulation titled *Coulombs Law* to plan and implement a scientific investigation to determine the relationship between either distance and force or charge and force for two charges. Have them represent the data graphically and analyze it to determine patterns and trends. Using their analysis, have the students formulate a conclusion about the relationship and support the conclusion with evidence from the simulation. Have the groups share their conclusions with the class.

1. Working with a partner, have students use iron filings, magnetic objects and different sized magnets to determine magnet strength at different distances and how much size of a magnet affects force. Have them create a table or chart to show the results of their various tests. Using the data collected, have them write a summary statement about the relationship between size of magnets, distance between objects, and the magnetic force applied. Have them share their summary with the class and discuss possible explanations for any variations in the summaries.
2. Working in cooperative groups, have students use spring scales a) to measure the pull force of a variety of differently massed objects and, b) to measure the amount of friction caused by pulling an object over a surface, with wheels and then through water. Have the groups prepare a report that they will share in a class discussion.
3. Independent Work. Have students examine the effect of different frictional surfaces using the online simulation. (See Links) Have them formulate a hypothesis on which surface the wind-up toy will move the quickest and slowest. Test the toy and see if their hypothesis was correct and write a paragraph explaining how successful their predictions were and why or why not the toy moved as predicted.
4. Working in cooperative groups, have students design and build a simple model to demonstrate the benefits of seat belts using Newton's First Law of Motion. Have them use the models to compare the effectiveness of shoulder and lap belts vs. lap belts alone. Have groups prepare a digital presentation to explain the results of their experimentation and share it with the class.

Resources

* Weight on Different Planets Simulator (<http://scratch.mit.edu/projects/451227/>)

Resources

Resources

1. iPad Resources
2. Literature Connection  
   *Magnets and Electromagnetism* by Alfred J. Smuskiewicz and Tony Imbimbo  
   *Forces In Nature: Understanding Gravitational, Electrical, And Magnetic Force* by Liz Sonneborn  
   *What Are Newton's Laws of Motion?* by Denyse O'Leary  
   *Sir Isaac Newton: Using the Laws of Motion to Solve Problems* by Kerri O'Donnell  
   *Friction and Gravity: Snowboarding Science* by Marcus Figorito  
   *Friction and Resistance* by Chris Oxlade  
   *Why Do Moving Objects Slow Down?: A Look at Friction* by Jennifer Boothroyd

Resources

* Forces in Action Interactive Simulation (<http://www.bbc.co.uk/bitesize/ks2/science/physical_processes/forces_action/play/>)

Grade 8 Science  
Science 8

PS: Potential Energy

Stage 1: Desired Results

Catholic Standards

Targeted Standards

OH Grade 8 OH: English Language Arts 6-12

Speaking & Listening

Comprehension and Collaboration 1. Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others ideas and expressing their own clearly and persuasively.

SL.8.1. Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others ideas and expressing their own clearly.

SL.8.1a. Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.

SL.8.1b. Follow rules for collegial discussions and decision-making, track progress toward specific goals and deadlines, and define individual roles as needed.

SL.8.1c. Pose questions that connect the ideas of several speakers and respond to others questions and comments with relevant evidence, observations, and ideas.

SL.8.1d. Acknowledge new information expressed by others, and, when warranted, qualify or justify their own views in light of the evidence presented.

Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.

SL.8.2. Analyze the purpose of information presented in diverse media and formats (e.g., visually, quantitatively, orally) and evaluate the motives (e.g., social, commercial, political) behind its presentation.

Evaluate a speakers point of view, reasoning, and use of evidence and rhetoric.

SL.8.3. Delineate a speakers argument and specific claims, evaluating the soundness of the reasoning and relevance and sufficiency of the evidence and identifying when irrelevant evidence is introduced.

Presentation of Knowledge and Ideas 4. Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.

SL.8.4. Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation.

Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations.

SL.8.5. Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.

Adapt speech to a variety of contexts and communicative tasks, demonstrating command of formal English when indicated or appropriate.

SL.8.6. Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate.

OH Grade 8 OH: Science (2011)

Physical Science (PS)

Topic: Forces and Motion

Some forces between objects act when the objects are in direct contact or when they are not touching.

OH Grades 6-8 OH: Literacy in History/Social Studies, Science, & Technical Subjects 6-12

Reading: Science & Technical Subjects

Key Ideas and Details 1. Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.

RST.6-8.1. Cite specific textual evidence to support analysis of science and technical texts.

Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.

RST.6-8.2. Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.

Analyze how and why individuals, events, or ideas develop and interact over the course of a text.

RST.6-8.3. Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

Craft and Structure 4. Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

RST.6-8.4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 68 texts and topics.

Integration of Knowledge and Ideas 7. Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words.

RST.6-8.7. Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).

Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence.

RST.6-8.8. Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.

Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

RST.6-8.9. Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.

Read and comprehend complex literary and informational texts independently and proficiently.

RST.6-8.10. By the end of grade 8, read and comprehend science/technical texts in the grades 68 text complexity band independently and proficiently.

Capacities of the Literate Individual

Students Who are College and Career Ready in Reading, Writing, Speaking, Listening, & Language

They demonstrate independence.

Writing

Text Types and Purposes 1. Write arguments to support claims in an analysis of substantive topics or texts using valid reasoning and relevant and sufficient evidence.

WHST.6-8.1a. Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.

WHST.6-8.1b. Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.

WHST.6-8.1c. Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.

WHST.6-8.1d. Establish and maintain a formal style.

WHST.6-8.1e. Provide a concluding statement or section that follows from and supports the argument presented.

Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.

WHST.6-8.2. Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

WHST.6-8.2a. Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.

WHST.6-8.2b. Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.

WHST.6-8.2c. Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts.

WHST.6-8.2d. Use precise language and domain-specific vocabulary to inform about or explain the topic.

WHST.6-8.2e. Establish and maintain a formal style and objective tone.

WHST.6-8.2f. Provide a concluding statement or section that follows from and supports the information or explanation presented.

Production and Distribution of Writing 4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

WHST.6-8.4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.

WHST.6-8.6. Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.

Research to Build and Present Knowledge 7. Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.

WHST.6-8.7. Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.

Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.

WHST.6-8.8. Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.

Draw evidence from literary or informational texts to support analysis, reflection, and research.

WHST.6-8.9. Draw evidence from informational texts to support analysis reflection, and research.

Catholic Identity

DOC All Grades Catholic Identity

Catholic Social Justice Teachings

Life and Dignity of the Human Person

Rights and Responsibilities

Call to Family, Community, and Participation

Solidarity

Care for God's Creation

The Rights of Children

1. THE RIGHT TO A CATHOLIC COMMUNITY that witnesses to Christ and the Gospel by protecting them from child abuse, including sexual abuse and neglect.

2. THE RIGHT TO A SAFE ENVIRONMENT that promotes care, protection, and security.

3. THE RIGHT TO BE RESPECTED AS INDIVIDUALS with human dignity.

4. THE RIGHT TO WORK ACTIVELY TOWARD THEIR OWN EMPOWERMENT through the development of their gifts and talents.

5. THE RIGHT TO A LEARNING ENVIRONMENT THAT VALUES COOPERATION and challenges its members to critical and reflective thinking in their search for truth.

6. THE RIGHT TO DEVELOP POSITIVE, RESPONSIBLE AND CARING ATTITUDES AND BEHAVIORS TOWARD OTHERS and to recognize the rights of others to be safe and free from harassment and abuse.

7. THE RIGHT TO LEARN THE SKILL OF SELF PROTECTION by identifying safe and unsafe situations.

8. THE RIGHT TO LEARN RESPONSIBILITY for themselves and their actions.

9. THE RIGHT TO MAKE RESPONSIBLE DECISIONS founded on religious conviction.

10. THE RIGHT TO GUIDANCE FROM THE CHURCH in their development as loving people.

Content

1. **There are different types of potential energy.**  
   a. Gravitational potential energy changes in a system as the masses or relative positions of objects are changed.   
   b. Objects can have elastic potential energy due to their compression or chemical potential energy due to the nature and arrangement of the atoms that make up the object.

Skills

1. Identify five different types of potential energy.
2. Differentiate between "energy" and "force."
3. Recognize that gravitational potential energy increases with height and mass.
4. Explain that a change in the height of an object is evidence that the gravitational potential energy has changed.
5. Recognize that elastic potential energy is associated with how much an elastic object has been stretched or compressed and how difficult such a compression or stretch is.
6. Explain that chemical potential energy is associated with the position and arrangement of the atoms within substances.
7. Explain that the energy transferred when a chemical system undergoes a reaction is often thermal energy.
8. Explain that electrical potential energy is associated with the position of electrically charged objects relative to each other and the amount of charge they have.
9. Recognize that magnetic potential energy is associated with the position of magnetic objects relative to each other.
10. Construct an experiment to show how different factors (height and weight) affect gravitational potential energy.
11. Construct catapults with differing compression of stretches to determine elastic potential energy.
12. Prove that a chemical reaction has changed chemical potential energy by conducting experiments where gas byproducts are produced.
13. Realize God, the almighty, is our ultimate source of energy and strength.

**Common Core Literacy Skills**

1. Read closely and comprehend scientific text.
2. Cite evidence from text.
3. Draw conclusions from text.
4. Use correct scientific terms.
5. Analyze the structure of text.
6. Analyze the author's purpose.
7. Integrate quantitative and technical information within a text.

**Common Core Writing Content**

1. Write arguments focused on discipline-specific content.
2. Write informative/explanatory text.
3. Produce clear and coherent writing, appropriate to task, purpose, and audience.
4. Edit and revise writing samples.
5. Use technology to produce and publish writing.
6. Conduct research projects.
7. Gather relevant sources.
8. Draw evidence from text.

Write routinely for a range of discipline-specific tasks, purposes, and audiences.

**Common Core Speaking and Listening**

1. Engage effectively in a range of collaborative discussions.
2. Come to discussions prepared, having read or studied required material.
3. Follow rules for collegial discussions.
4. Pose and respond to specific questions with elaboration and detail.
5. Review the key ideas expressed and demonstrate understanding of multiple perspectives through reflection and paraphrasing.
6. Interpret information presented in diverse media and formats.
7. Delineate a speakers argument and specific claims.
8. Present claims and findings, sequencing ideas logically and using pertinent descriptions, facts, and details.
9. Use appropriate eye contact, adequate volume, and clear pronunciation.
10. Include multimedia components and visual displays.
11. Adapt speech to a variety of contexts and tasks, demonstrating command of formal English.

Essential Questions

1. In what ways do the height and mass of an object change the gravitational potential energy?
2. In what ways does the change in the amount of compression of stretch of an elastic object change its elastic potential energy?
3. How does a chemical reaction show that a change in chemical potential energy has occurred?

Standards Vocabulary

1. mass
2. potential energy
3. energy
4. kinetic energy
5. force
6. gravity
7. gravitational potential energy
8. relative position
9. elastic potential energy
10. compression
11. chemical potential energy
12. elasticity
13. thermal energy
14. atoms
15. substances
16. chemical reactions
17. magnetic potential energy

Stage 2: Assessment Evidence

Pinball Potential

Summative: Lab Assignment

Working in cooperative groups, students will design a way to give a steel marble the most possible potential energy in a pinball machine before it is launched. They will compare the design features to determine what features affect the amount of potential energy given to the ball. With the class, plan a scientific investigation to test and compare the amount of energy of the designs of the different groups in the class. Implement the test on the class designs and formulate a hypothesis about which design features provide the marble with the most potential energy. Have a class discussion on the results of the experiment. What assessment tools/strategies will you use to assess student work? (checklists, rubrics, self-assessment tools, etc.)

CO2 Rockets

Formative: Lab Assignment

Working with a partner, students will experiment with different variables (temperature of water, amounts of Alka-seltzer, and amount amount of water in a film canister) to make the canister go the furthest distance (height or length). They will create a table/chart to record their data and use the data to formulate conclusions about the relationship between temperature, amount of substance, and amount of water. Students will present their findings to the class. What assessment tools/strategies will you use to assess student work? (checklists, rubrics, self-assessment tools, etc.)

Candy Launcher

Formative: Lab Assignment

Create a catapult utilizing rubber bands. Experiment with different thicknesses and number of compressions to make the furthest flying object. Students may also try to hit targets for accuracy. (Design a catapult to hit a target 20 feet away.) What assessment tools/strategies will you use to assess student work? (checklists, rubrics, self-assessment tools, etc.)

Mass and Potential Energy

Summative: Lab Assignment

Working in cooperative groups, students will plan and implement a scientific experiment to determine the relationship between the mass of a metal sphere and the amount of change it can make to sand that is held in a container. Determine how to quantify the changes to the sand. They will represent the data graphically and formulate a conclusion about how the mass of an object is related to its potential energy. They will support their conclusion with data from the experiment and share their results with the class. What assessment tools/strategies will you use to assess student work? (checklists, rubrics, self-assessment tools, etc.)

Masses and Springs Simulator

Summative: Online Learning

Working with a partner, students will use the Masses and Springs simulator to experiment with different thickness of springs and different masses. Compare and contrast how the different forms of potential energy (thermal, elastic and gravitational) change with different masses and thickness. (See Links.) They will write a summary report for the experiment and share their findings with the class. What assessment tools/strategies will you use to assess student work? (checklists, rubrics, self-assessment tools, etc.)

Resources

Stage 3: Learning Plan

Learning Experiences

1. Working in cooperative groups, have students design a way to give a steel marble the most possible potential energy in a pinball machine before it is launched. Have them compare the design features to determine what features affect the amount of potential energy given to the ball. With the class, plan a scientific investigation to test and compare the amount of energy of the designs of the different groups in the class. Implement the test on the class designs and formulate a hypothesis about which design features provide the marble with the most potential energy. Have a class discussion on the results of the experiment.
2. Working with a partner, have students experiment with different variables (temperature of water, amounts of Alka-seltzer, and amount amount of water in a film canister) to make the canister go the furthest distance (height or length). Have them create a table/chart to record their data and use the data to formulate conclusions about the relationship between temperature, amount of substance, and amount of water. Have them present their findings to the class.
3. Working with a partner create a catapult utilizing rubber bands. Experiment with different thicknesses and number of compressions to make the furthest flying object. (See Links.)

Working in cooperative groups, have students plan and implement a scientific experiment to determine the relationship between the mass of a metal sphere and the amount of change it can make to sand that is held in a container. Determine how to quantify the changes to the sand. Have them represent the data graphically and formulate a conclusion about how the mass of an object is related to its potential energy. Have them support their conclusion with data from the experiment. Share their results with the class.

1. Working with a partner, have students use the *Masses and Springs* simulator to experiment with different thickness of springs and different masses. Compare and contrast how the different forms of potential energy (thermal, elastic and gravitational) change with different masses and thickness. (See Links.) Have them write a summary report for the experiment and share their findings with the class.

Resources

* Chemistry in a Ziplock Baggie (<http://www.csupomona.edu/~cemast/supermarket_chemical_reactions-1.pdf>)

Resources

1. iPad Resources
2. Literature Connection  
   Wilson, J. (October 2002) "Frog Legs", *AIMS Magazine*, AIMS Education Foundation  
   *Kinetic and Potential Energy: Understanding Changes Within Physical Systems* by Jennifer Viegas  
   *Kinetic Energy: The Energy of Motion* by Don Nardo

Resources

* Seat Belt Safety and Related Science Experiments (<http://www.hookedonscience.org/files/Buckle_Up_It_s_Science_GUIDE.pdf>)