

MIDDLE/JUNIOR HIGH SCHOOL

State Goal 11: Understand the processes of scientific inquiry and technological design to investigate questions, conduct experiments, and solve problems.

| LEARNING STANDARD/OUTCOME | SAMPLE ASSESSMENT | CONNECTIONS |
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| <p>Critical to Understand and Master at Middle/Junior High School: M.11.01 Identify questions that can be answered through scientific investigations.</p> | <p>AD: Distinguish between questions that can be answered by science and those that cannot be answered by science (e.g., What causes hair to turn gray? vs. Is it bad to grow old?).</p> <p>AD: Contribute to a list on the chalkboard and discuss questions that are answered using beliefs, superstitions, and opinion (e.g., nonscientific questions) and that are not appropriate to investigate in science classes; those questions might, however, be appropriate to investigate in classes of other disciplines (e.g., social studies, psychology, marketing, religion).</p> | <p>Language Arts: Review interrogative sentences and their responses. Generate questions and sort into 2 categories: those that can be answered through scientific investigation and those that cannot.</p> <p>Art: Create a game with a game board and cards with a series of questions. Relate the game to any subject area.</p> <p>Math: Review and use problem-solving techniques for situations with numbers.</p> |

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| <p>M.11.02 Design a scientific experiment that controls all but one variable and write a prediction for the experiment outcome.</p> | <p>ESS: Investigate how the pH of water is affected by leaching through different types of rocks or soils. PS: Investigate how mass is conserved when chemical reactions take place (e.g., combustion, antacid reaction). LS: Investigate how beak structures affect a bird's ability to eat certain types of food and survive in an environment. AD: Identify variables and a control in an experiment and write what the control is testing or controlling. AD: Think logically about the investigation you are about to begin and write a prediction based on your prior knowledge of objects and events in the environment.</p> | <p>Language Arts: Read biographies about scientists, then write a short essay describing the scientific parts of the scientist's life and their contributions. Math: Using a cake recipe, change one ingredient, then predict how you think your change will affect the cake. Bake the cake, note the differences, and compare them to your prediction. Social Studies: Use current magazines, newspapers, or online reports to explore why scientists (e.g., utilities, medical sciences, etc.) are important to the average person in the modern world. Technology: Visit a local lab to hear a scientist describe their work in today's world.</p> |
| <p>M.11.03 Collect and record data accurately and analyze data using consistent measuring and recording tools and techniques (e.g., experimental control).</p> | <p>AD: Make a data table that is unique and useful for the investigation. AD: Make careful measurements and record all observations. AD: Find patterns in the data that can support a conclusion. PS: Use a graph to compare a set of temperature or precipitation measurements in your school or city with long-term averages for the same general area.</p> | <p>Technology: Do an online search of forensic science and its use in society through history. Math: Review how careful observers collect and record data by conducting a survey in school (e.g., hair color; favorite snack food, music, or sports figure; family car). Use graphs to show survey results.</p> |

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| <p>M.11.04 Use appropriate measurement methods and technologies to analyze data, then write logical inferences.</p> | <p>AD: Use simple formulas, combine data, and make graphs to analyze data. AD: Draw conclusions that can be supported by the data or logically inferred from it. Check any inferences by running additional tests.</p> | <p>History: Study the measurement systems in various cultures and compare them with the U.S. measurement system. Language Arts: Write a persuasive essay about merits of the metric system. Include data from your study of measurement systems.</p> |
| <p>M.11.05 Develop descriptions, explanations, and models of investigations based on observations and evidence; revise and improve models and explanations using critical analysis and mathematical tools (e.g., mean, simple equations, graphs).</p> | <p>AD: Describe that good explanations are based on observations and evidence that can be shown to others for critique and that can be reproduced by others. AD: Be able to distinguish among several explanations to select the one most consistent with data. AD: Analyze a set of data and identify patterns in data that can support an explanation (e.g., temperatures varying with seasonal changes and radiation to Earth). AD: Describe patterns in data using mathematical tools such as simple equations, tables, and graphs.</p> | <p>Language Arts: Watch a CSI episode on television, and write about the logic and methods used to make inferences. History: Research the history of the various branches of science, and how they stem from studies of “philosophy” in the 1800s. Art: Take fingerprints of classmates, and research the basic fingerprint types. Sort the fingerprints from your classmates into types.</p> |
| <p>M.11.06 Recognize, describe, and critically evaluate in a respectful manner alternative explanations or predictions.</p> | <p>AD: Carefully consider alternative explanations without prejudice by asking to see the data that support them. AD: Support a particular explanation by referring to the strength of the evidence backing it.</p> | <p>Language Arts: Watch a detective, crime, or trial movie or television show. Write an alternative explanation or prediction for the crime. Religion: Discuss various prejudices in society and compare these prejudices with past views. Connect your discussion with historical events.</p> |

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| <p>M.11.07 Communicate results and use evidence and logic to defend scientific explanations.</p> | <p>AD: Produce an organized lab report that includes data tables, graphs, and equations that support your conclusions. AD: List and write sentences about variables or factors in an investigation and what you used as a control. AD: Discuss as a class whether some kinds of scientific investigations might not have controls.</p> | <p>Religion: Learn about Darwin's theory of evolution and current ideas about biologic evolution. Compare and contrast these ideas with the Church's view of life on Earth. Language Arts: Have a debate about a school issue (e.g., uniforms, lunch rules, homework). Defend your viewpoint using evidence and logic.</p> |
| <p>M.11.08 Identify a design need in a familiar object or process and establish steps for a solution.</p> | <p>ESS: Identify problems that can occur along a stream channel (e.g., flooding, erosion) and factors that might affect where a levee is placed. PS: Identify reasons why a paper airplane might not glide. LS: Identify ways to design a zoo to house arctic animals in a desert city environment (or vice versa, equatorial animals in more northern climes). AD: List and discuss design challenges and solutions for having equatorial animals in a natural display in a more northern city (e.g., food and habitat for a monkey house in Minneapolis, Minnesota; Montreal, Quebec).</p> | <p>Math: Review problem solving and solutions. Explain different methods that can be used to solve the same problem. History: Read about the inventions from the Industrial Revolution or any other period of time. Choose an invention and write about the steps someone followed to create it. Geography: Choose a physical feature of a location you are studying. Design and draw changes that you would make at that location to make it better for people.</p> |

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| <p>M.11.09 Sketch, propose, and compare solutions to the problem or challenge.</p> | <p>PS: For a transmission radius of 10 kilometers, design a grid with the minimum transmission overlap and number of cell phone towers to serve the city limits of Chicago, Illinois. AD: Make plans, draw sketches, and research solutions to the problems. AD: Discuss your solutions with other teams to determine the pros and cons of different ideas. AD: Show openness to designs and suggestions from colleagues and other teams.</p> | <p>Technology: Use a computer to make a sketch of the solution to a technological problem. Religion: Discuss the 10 Commandments and identify occasions when people might sin and different ways you could respond to them. Social Studies: Bring in current-event articles that describe problems that need to be, or are being solved. Study the problems and suggest other ways to solve them.</p> |
| <p>M.11.10 Select and implement the most appropriate design and build a prototype, simulation, or model of that design.</p> | <p>AD: Make a prototype, set up the experiment, or make a model of your solution.</p> | <p>Art: Create a prototype of a school uniform you would like to see used at your school. Religion: Role-play a conflict between two or more people. Discuss solutions and act out the best solution.</p> |
| <p>M.11.11 Test and evaluate the prototype or model using available materials, instruments, and technology; record all data and observations.</p> | <p>AD: Test the prototype, run the experiment, or test the model by simulating conditions. AD: Record all observations in a science notebook. AD: Use appropriate tools to gather data (e.g., probes, computers, balances, thermometers).</p> | <p>Language Arts: Create a rubric for a project and decide the important elements that need to be evaluated. Art: Go to an art museum to observe objects of art and evaluate what makes them art. Use clay or another medium to create your own masterpiece and ask the class to evaluate it based on criteria you discussed in the museum.</p> |

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| <p>M.11.12</p> <p>Evaluate the test results based on established criteria, note sources of error, and recommend improvements.</p> | <p>ESS: Decide if your design for stream channel management stopped erosion (e.g., the banks of the stream in a stream table remained stable).</p> <p>PS: Determine if changes you made to an airplane improved its flight (e.g., kept it up in the air for the longest amount of time).</p> <p>LS: Determine if the temperature in the model of the zoo did not fluctuate with outside air temperature.</p> <p>AD: Review your design to find sources of error or room for improvement and revision and make recommendations for the next generation of design on this problem.</p> | <p>Language Arts: Read scientific journals and write a short essay explaining the importance of reporting results to and discussing error and improvements with the scientific community.</p> <p>Religion: Put on skits in which the main character keeps a problem to themselves. Contrast that with a character who finds an adult to talk to and help find a solution.</p> <p>Religion: Discuss why people make New Year resolutions.</p> |
| <p>M.11.13</p> <p>Complete a write-up with simple diagrams of the proposed design solution and the test results.</p> | <p>AD: Write a design report that includes diagrams, photographs, or videos of test results and graphs and charts of data and measurements.</p> <p>AD: Display the design and product for others to see.</p> | <p>Technology: Take digital pictures of a design solution and the test. Present results on the computer.</p> <p>Art: Study a set of plans for a new building near your school and then visit the building with the architect. Discuss changes to the design that made the building better suited to its occupants or mistakes that had a negative impact.</p> |

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| <p>M.11.14 Use numbers over orders of magnitude and in different forms (e.g., integers, decimals, fractions, percentages, rounded off) to characterize objects or events in science.</p> | <p>AD: Use mathematics as a language for science. Describe observations by counting, timing, measuring, and inferring from numbers and graphs. ESS: Manipulate large numbers that represent the speed of light, light-years in distance, or time since the formation of the solar system or big bang. PS: Use significant figures correctly when describing the results of a chemical reaction. LS: Describe the percent change in a population related to an environmental threat.</p> | <p>Language Arts: Read articles about mathematicians and write an essay or poem that relates to the person or the field of mathematics. Math: Review the relationships among fractions, decimals, and percentages. Economics and Business: Study how the world banking system works.</p> |
| <p>M.11.15 Apply math skills and techniques in measuring, recording, and organizing scientific data with instruments (e.g., balances, microscopes) and in manipulating data with operations and simple functions.</p> | <p>AD: Describe observations quantitatively whenever possible, using appropriate tools for measurement. AD: Manipulate data in known formulas to reach conclusions (e.g., area of circle). AD: Conduct multiple trials of an experiment and find the average of your results.</p> | <p>Math: Use sports statistics of a player's batting average, a team's wins, or free throw attempts. Art: Take photos of science instruments, label the parts, and describe their use. Create an original book.</p> |

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| <p>M.11.16</p> <p>Use the language and skills of mathematics to express scientific patterns and ideas (e.g., plots, symbolic and numeric representation, simple functions, statistics and probability) and to make predictions.</p> | <p>AD: Develop graphs of the relationship between 2 variables in order to identify patterns and trends (e.g., temperature and evaporation, incline of ramp and speed of ball, resource use and change in animal population).</p> <p>AD: Use multiple-line graphs or bar graphs to compare data or measurements in 2 or more categories (e.g., monthly temperatures for a year in 3 cities).</p> <p>AD: Use the graphs to extrapolate and predict what will happen under circumstances you have not yet tested and then test your prediction (e.g. Do the data fit the trend of the graph?).</p> | <p>Technology: Create computer graphs to illustrate a math topic.</p> <p>Math: Measure a quantity to the greatest degree of accuracy determined by the tool.</p> <p>Math: Make simple scale conversions to reproduce a map.</p> <p>Social Studies: Research the exchange rate of the dollar to the currency of another country and convert dollar amounts to the new currency.</p> |
| <p>M.11.17</p> <p>Use both oral and written communication to convey effectively and logically the findings about scientific investigations.</p> | <p>AD: Write a complete lab report that follows the format suggested by your teacher and includes appropriate data tables, charts, and graphs; complete sentences and grammar; and conclusions backed by evidence.</p> <p>AD: Present findings orally to a group of your peers or a gathering of parents using an introduction, main findings, and a conclusion.</p> | <p>Language Arts: Review skills necessary for a quality oral presentation.</p> <p>Technology: Create a visual presentation for the school's web site.</p> |

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| <p>M.11.18 Communicate ideas and findings in the sciences with accurate representations (2-D, 3-D) such as models, diagrams, dynamic settings, and sketches.</p> | <p>AD: Include in all lab reports at least 1 diagram or sketch to clarify a setup or an observation. AD: Prepare a demonstration for the class using a setup of your own design to illustrate a phenomenon.</p> | <p>Art: Participate in the school Art Fair by creating a painting, making a sculpture, or taking a picture.</p> |
| <p>Significant to Develop at Middle/Junior High School: M.11.19 Explain reasons and examples for why scientists inquire about how physical and living systems function and why new knowledge benefits society. (11A)</p> | <p>ESS: Describe the questions scientists ask about the causes of earthquakes and why knowledge of earthquakes can help people assess their risk in earthquake-prone areas. PS: Describe what scientists have learned about how matter combines and how this knowledge can help lead to new products that benefit society. LS: Describe what scientists know about the causes of disease and the functions of systems within the human body and how this knowledge benefits the health of people in your community.</p> | <p>Language Arts: Arrange a field trip to a museum, nature center, or zoo to observe the living world. Religion: Discuss our obligations as caretakers of God’s Earth. History: Discuss the assassination of John F. Kennedy and the different questions various members of the community would ask (e.g., doctors, news reporters, scientists, policemen).</p> |

State Goal 12: Understand fundamental concepts, principles, and interconnections of the life, physical, and earth and space sciences.

| LEARNING STANDARD/OUTCOME | SAMPLE ASSESSMENT | CONNECTIONS |
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| <p>Critical to Understand and Master at Grade 6: Earth and Space Sciences <i>Properties and structure of Earth</i> 6.12.01 Diagram how the structure of Earth includes a crust, mantle, liquid metal outer core, and solid metal inner core.</p> | <ul style="list-style-type: none"> • Show in a cross-section diagram with clear labels the proper proportions for the inner core, outer core, mantle, and crust of Earth. | <p>Art: Design a front page of a newspaper with Earth’s structure as the front page story. Math: Calculate the volume of the inner and outer core, mantle, and crust, and their percentage of the total volume.</p> |
| <p>6.12.02 Describe how tectonic plates (crust plus upper mantle) move over Earth atop a slowly convecting mantle, affecting processes on Earth’s land, oceans, and atmosphere.</p> | <ul style="list-style-type: none"> • Diagram in cross section with clear labels a spreading ridge and at least 1 plate being subducted beneath an adjacent continent. • Describe the type of tectonic boundary in the center of the Atlantic Ocean. Describe other places on Earth where this type of tectonic boundary occurs. • Describe the tectonic plates that bound the Trans-Himalaya mountain chain and determine what type of tectonic boundary exists there. | <p>Social Studies/Geography: Research why most humans live on coastlines around the world. Language Arts/Economics: Investigate and report on how landforms affect local and national construction projects (e.g., highways, railroads, waterways, waste disposal sites). Math: Given velocities for a tectonic plate (e.g., Juan de Fuca, Pacific, Cocos), calculate how far the plate moves in 100 years (or 1 million years).</p> |

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| <p>6.12.03 Use maps to show that geologic features of Earth’s surface are often related to plate tectonic boundaries (e.g., mountain ranges, ocean basins, continents).</p> | <ul style="list-style-type: none"> • Describe 2 to 3 examples on Earth where colliding tectonic plates have resulted in the formation of mountain chains. • Show on a simple diagram the plates and the types of plate tectonic boundaries around North America. • Of the 3 general plate boundaries, give reasons for which of these best matches the East African Rift Valley. | <p>Social Studies: Landforms such as volcanoes play key roles in the life and culture of indigenous people living near them. Research the importance of volcanoes to the indigenous people of the Americas (e.g., those who live near Crater Lake, Mount Shasta, Popocatepetal). Art history: Investigate depictions of famous volcanoes, such as Mount Fuji in Japan. Physical Education: Read about the first ascent of Mount Everest.</p> |
| <p>6.12.04 Identify key parts of the atmosphere (e.g., layers, composition) and hydrosphere (e.g., oceans, ice caps, waters on land).</p> | <ul style="list-style-type: none"> • Diagram in cross section with clear labels the main layers and thicknesses of the atmosphere. • Sketch and describe in a table the 4 to 5 main parts of the hydrosphere and estimate their relative sizes. • Use a map of Earth to predict the continents where the 4 to 5 largest bodies of freshwater reside. • Compare and contrast ice and ice caps in the Arctic region versus the Antarctic region. | <p>Technology: Visit websites for international research organizations (e.g., National Oceanic and Atmospheric Administration, National Geophysical Data Center, United States Geological Survey) to view images and learn about the atmosphere and hydrosphere. Geography: Make a global map showing locations of current continental ice sheets and alpine glaciers.</p> |

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| <p><i>History of processes on Earth</i> 6.12.05 Give examples of how fossils are evidence of life and environments that have changed on Earth.</p> | <ul style="list-style-type: none"> • Use the wide variety of fossils from the center of North America in the late Mesozoic (Cretaceous) to reconstruct evidence for that environment (e.g., ammonites, mosasaur, plesiosaur, clams, shrimp burrows, fish, giant sharks, large loonlike birds). • Using examples from the fossil record, compare and contrast modern environments dominated by mammals with Mesozoic environments dominated by large reptiles. | <p>Religion/Language Arts: Compare and contrast the biblical account of creation (e.g., Garden of Eden) with ideas about life on Earth and geologic changes on Earth.</p> <p>Economics/Business: Learn about the formation and locations of coal and petroleum, key deposits, and how these “fuel” our economy.</p> |
| <p>6.12.06 Describe examples of how natural and regular Earth events can become natural disasters for humans and describe the causes of those natural events (e.g., earthquakes, floods, tornadoes, hurricanes).</p> | <ul style="list-style-type: none"> • Describe a natural disaster in your community and the cause from Earth systems. • Indicate whether you would predict that natural disasters occurred in past geologic settings, and if so, give examples and evidence. | <p>Health: Discuss how natural hazards such as volcanic eruptions, earthquakes, and tsunamis affect the availability of food or clean water.</p> <p>Geography: Make a map of the lower 48 states showing frequency of tornados.</p> |
| <p><i>Cycles and energy in Earth systems</i> 6.12.07 Describe processes that show interactions in cycles between the geosphere, hydrosphere, atmosphere and biosphere (e.g., rock cycle, water cycle, rock weathering and formation of soil, formation of limestone or coal).</p> | <ul style="list-style-type: none"> • Describe the formation of coal and how the presence of coal records interactions among the atmosphere, biosphere, hydrosphere, and geosphere. | <p>History: Research and discuss the validity of carbon dating for investigating historical facts.</p> <p>Geography: Investigate how the potato famine in Ireland affected immigration and the founding of many new communities in the U.S. in the 1800s.</p> |

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| <p><i>Resources from Earth</i> 6.12.08 Summarize how Earth processes relate to resources and products that are needed and used by society.</p> | <ul style="list-style-type: none"> • Describe the formation of petroleum and locate global regions thought to harbor substantial petroleum resources. • Consider and describe wind or solar power as an alternative form of energy compared with fossil fuels and summarize where these sources of energy can be gathered. | <p>Technology: Visit websites describing alternative energy sources and write about your findings, listing all sources. Language Arts: Write a report on alternative energy.</p> |
| <p><i>Structure of solar systems and stars</i> 6.12.09 Demonstrate that the Sun is a typical star and that Earth is the 3rd planet from the Sun in a solar system that includes the Moon, 8 other planets (some with moons), and smaller objects such as asteroids and comets.</p> | <ul style="list-style-type: none"> • Develop a diagram to show the key features of the solar system (e.g., planets, some moons, comets, asteroid belt). • Show in a diagram which planets the asteroid belt resides between. • Describe recent key results from research and missions to Mars (e.g., NASA rovers, satellites, planned missions). | <p>Religion: Discuss practices, beliefs, and traditions from various cultures associated with the stars, moon, and sun. Language Arts: Discuss as a class and write about recent discoveries in the solar system. Technology: Visit web sites showing recent images of the photosphere of the sun.</p> |
| <p>6.12.10 Explain that objects in the solar system have regular and predictable motions due to the force of gravity between these objects, with motions relating to phenomena such as time of day, season, or phase of the Moon.</p> | <ul style="list-style-type: none"> • List and diagram some key characteristics of a solar system object with a regular or periodic motion (e.g., include period, position, type of object). • Use a diagram with labels to show relative distances of planets and an asteroid belt from the Sun in astronomical units (where 1 AU equals the average distance from Earth to Sun). | <p>Social Studies/Economics: Discuss the social and economic impact of satellite technology and speculate on the dangers associated with the proliferation and/or monopoly of space technology. History: Discuss comets visible from Earth in the last 30 to 40 years (e.g., Hale-Bopp), of what they are made, and how they appear compared with other bodies in the solar system.</p> |

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| <p>Significant to Develop at Grade 6: <i>Cycles and energy in Earth systems</i> 6.12.11 Describe geologic evidence that many Earth processes occurring today (e.g., erosion, sedimentation, volcanism) are similar to those that occurred in the geologic past. (12E)</p> | <ul style="list-style-type: none"> • Describe how interlayered sandstone and siltstone with plant and dinosaur fossils would provide a geologist with information about river environments in the Mesozoic. • Compare how a geologist would use evidence from modern beach and sand dune settings to understand and interpret a sandstone in the geologic record. | <p>Technology: Learn about how geological hazards help to shape codes and policies for buildings and construction. History: Compare accounts of the 79 A.D. eruption of Mount Vesuvius that buried Pompeii with the 1980 eruption of Mt. St. Helens in the Pacific Northwest.</p> |
| <p><i>Evolution of the solar system and universe</i> 6.12.12 Compare and contrast the Sun as a star with other objects in the Milky Way galaxy (e.g., nebulae, globular clusters, dust clouds, stars, black hole) and describe methods to view and study such features. (12F)</p> | <ul style="list-style-type: none"> • Show with a simple diagram or map the position of our solar system on a spiral arm and about halfway out from the center of the Milky Way galaxy. • List in a table the key differences between planets and stars. • Describe the significance of a finding in astronomy in the past year that is in the news (e.g., Huygens probe; sighting from Hubble or Spitzer Space Telescope). • Describe 3 key events in the history of space exploration. • List ways that space exploration has benefited humans. | <p>History: List ways that space exploration has benefited humans. History: Learn about Galileo’s construction and use of a telescope and what he observed. Math: Compare the radius to Pluto (in A.U., astronomical units) with the distance to the nearest star.</p> |

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| <p>Critical to Understand and Master at Grade 7: Physical Sciences <i>Structure and properties of matter</i> 7.12.01 Describe some characteristic physical properties of substances that are independent of the mass of the substance (e.g., density, boiling point, solubility).</p> | <ul style="list-style-type: none"> • Use a graph of measurements for mass versus volume to determine the density of a material. • Describe the change in freezing point that may occur when salt is added to water and why this may occur. | <p>Language Arts: Read an article about the surface temperature of Venus and Earth and discuss the state of lead (Pb) on each planet.</p> <p>Geography: Investigate modifications in cooking practices (e.g., baking, boiling water) for countries or towns at high elevation.</p> |
| <p>7.12.02 Show that properties of objects can be measured and recorded with simple tools (e.g., rulers, timers, balances, thermometers).</p> | <ul style="list-style-type: none"> • Measure mass with a balance and geometric dimensions with a ruler, and then determine volume and density for an object (e.g., cube, rectangle). • Record and plot the change in temperature with time for candle wax and indicate how the graph shows temperature of the liquid-solid transition. | <p>Art: Make a mobile with cardboard cutouts of a group of objects and determine the center of gravity so that it will hang straight.</p> <p>Ecology: Research or visit a water treatment or sewage treatment facility and list all variables of the water or sewage that are measured and their units.</p> <p>Math: Convert the English system of measurement on food labels to the metric system.</p> |
| <p><i>Chemical reactions of matter</i> 7.12.03 Explain that substances react chemically in characteristic ways with other substances to form new substances with different characteristic properties.</p> | <ul style="list-style-type: none"> • Analyze and write down reactants and suggest what might be the products for the chemical reaction between baking soda and vinegar. • List ingredients to make gelatin and compare the properties of these materials at different temperatures with the properties of gelatin when it is made. | <p>Language Arts: Write a poem or short essay describing the kinds of bonds between people in a family.</p> <p>Art: Use toothpicks and gumdrops to construct a model of methane or propane.</p> <p>Social Studies: Research or visit a chemical factory or pharmaceutical company. Learn how chemists' work leads to everyday products.</p> |

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| <p>7.12.04 Give examples of how total mass is conserved in chemical reactions (e.g., combustion, rusting, antacid tablet reaction).</p> | <ul style="list-style-type: none"> • Measure and compare reactants and products when adding 2 antacid tablets to a certain amount of water. | <p>Art: Use various shapes and colors of paper to represent the reactants and the products in different synthesis and decomposition reactions and paste them onto a poster board.</p> <p>Math: Use Avogadro's number and a table of atomic masses to calculate the number of sodium atoms in 50 g of salt (NaCl).</p> <p>Technology: Research the water purification and distribution and waste management programs in your city.</p> |
| <p><i>Interactions of energy and matter</i> 7.12.05 Describe how energy is a property of substances that is associated with heat, light, solar radiation, electricity, mechanical motion, sound, and chemical substances.</p> | <ul style="list-style-type: none"> • Design an experiment to show that producing sound must involve the transfer of energy. • Design an experiment to demonstrate that either giving an object motion or stopping the motion of an object requires energy. | <p>Language Arts: Read and write about the reduction of iron ore in a blast furnace and draw a diagram showing the inside.</p> <p>Language Arts: Research and write about animals that transform chemical energy from food into radiant energy (e.g., bioluminescence) such as glowworms, plankton, or fireflies.</p> <p>Economics: Discuss the pros and cons of investing in an environmentally safe and renewable energy source.</p> |

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| <p><i>Force and motion</i> 7.12.06 Describe ways that forces can affect motion (e.g., action/reaction, equilibrium conditions, free-falling objects, rockets).</p> | <ul style="list-style-type: none"> List and describe 3 everyday examples of ways that friction or air resistance affects the motions of common objects. | <p>Language Arts: Write a poem about your emotions or feelings in relation to a particular movement (e.g., riding a roller coaster or plane).</p> <p>History/Geography: Read about the location, age, architectural features, forces, and current measures to save the Leaning Tower of Pisa.</p> <p>Technology: Research the history and development of the airline industry.</p> |
| <p>7.12.07 Describe and use graphs to show the motion of an object with position, direction, and speed.</p> | <ul style="list-style-type: none"> Measure, tabulate results, and graph findings for position and time of an object with motions such as free falls, periodic motions of a spring or a pendulum, or projectile paths. | <p>Economics: Study a graph of an economic indicator (e.g., inflation, unemployment, housing starts, mean income level as a function of education level) to tell you about a trend.</p> |
| <p><i>Conservation of energy</i> 7.12.08 Describe some of the physical and chemical processes that are used to produce energy and how society uses this natural resource.</p> | <ul style="list-style-type: none"> Beginning with photosynthesis in plants, describe and diagram qualitatively why coal can be a source of energy for society. | <p>History/Language Arts: Research the Manhattan Project of the 1940s and learn how the project related to converting matter to energy.</p> <p>Art: Make a model to help demonstrate how mercury is used in thermometers.</p> <p>Personal Health: Research environmental health and safety issues related to energy production, transportation, distribution, and use.</p> |

| LEARNING STANDARD/OUTCOME | SAMPLE ASSESSMENT | CONNECTIONS |
|--|---|--|
| <p>Significant to Develop at Grade 7: 7.12.09 Describe simple patterns in the periodic table of elements that relate to the physical properties of matter (e.g., solids, gases; metals, nonmetals). (12C)</p> | <ul style="list-style-type: none"> • Circle the general region of the periodic table where gases or metals reside. • Write a pattern that you see for atomic mass in the periodic table of the elements. | <p>Art: Prepare a “History of the Elements” mural, find the year of discovery, and make a drawing depicting the current uses of the element.</p> <p>Language Arts: Write limericks or haiku using words constructed with elements in the periodic table.</p> <p>Religion: Identify the element that corresponds with brimstone in the Bible and discuss its distinctive property.</p> <p>Geography/Economics: Use maps to identify regions of the world where precious metals have been recovered and discuss the social implications of such discoveries.</p> |
| <p>7.12.10 Describe evidence that in most chemical reactions, energy is transferred either into or out of the system (evidence in heat or temperature, light, mechanical motion, electricity). (12C)</p> | <ul style="list-style-type: none"> • Describe and show how the combustion of natural gas (mostly methane, propane) releases energy that humans can use. • Use the photosynthesis reaction to show an understanding of energy transfer in a chemical reaction. • Summarize qualitatively the flow of energy in the reaction that occurs when molten rock (lava) becomes a hardened rock consisting of minerals. | <p>Economics: Research a fractionation tower, identify each fraction of petroleum and its condensation temperature, and list the uses of each.</p> <p>Language Arts: Research and write about how some power plants use a tube in which water changes to steam and back again for power.</p> <p>Technology: Research fuel cells that astronauts use and learn how energy is converted.</p> |

| LEARNING STANDARD/OUTCOME | SAMPLE ASSESSMENT | CONNECTIONS |
|--|---|--|
| <p>7.12.11 Diagram examples of how waves carry energy and transfer energy when they interact with matter (e.g., seismic, light, electromagnetic, sound). (12C)</p> | <ul style="list-style-type: none"> • Use a diagram and describe the interaction of energy and matter when a bright lamp shines on 2 metal cans, one covered with black paper and the other covered with white paper (or conduct and analyze the experiment). | <p>Religion: Consider light coming from distant stars or galaxies and discuss how this compares with your concept of heaven.</p> <p>Social Studies: Read and report on magazine/newspaper articles that describe the benefits and hazards of nuclear energy.</p> <p>Art: Build models of nuclear reactors from cardboard boxes and tubes or dowels and demonstrate key components to the class.</p> <p>Technology: Read about how scientists communicate with the Mars rovers and whether or not this is like a cell phone call.</p> <p>Music: Research the history and development of string and wind instruments and how they produce sound.</p> |
| <p>7.12.12 Show that heat can be transferred between objects in predictable ways (flows from hot to cold). (12C)</p> | <ul style="list-style-type: none"> • Compare the rate of flow of heat along rods made of metal and glass. • Use a diagram with clear labels to describe the flow of energy when boiling water on a stove, starting from an energy source (e.g., electricity or natural gas) in a house to steam above a kettle. | <p>Language Arts: Write a description of a scene in which the state of matter changes (e.g., a glass of lemonade with ice cubes melting in it, a pond freezing in winter, a puddle of water on the hot pavement). Draw color-coded arrows to represent the transfer of heat or cold.</p> <p>Art: Diagram the basic parts of a refrigerator using color-coded arrows to represent the transfer of heat.</p> <p>Social Studies: Compare and contrast insulation methods for houses used by indigenous and modern people in North America.</p> |

| LEARNING STANDARD/OUTCOME | SAMPLE ASSESSMENT | CONNECTIONS |
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| <p>7.12.13</p> <p>Explain the factors that affect the gravitational forces on objects (e.g., changes in mass, distance) and use classic experiments to demonstrate gravitational or electromagnetic forces (e.g., pendulum). (12D)</p> | <ul style="list-style-type: none"> • Measure pendulum period as a function of length, L, and describe in words the relationship you see from a graph. • Measure position as a function of time for an object accelerating due to gravity (e.g., ball on ramp) and describe the change in slope (velocity) on a graph of position as a function of time. | <p>Religion: Describe how buttresses and flying buttresses support cathedrals against collapse.</p> <p>Math: Calculate acceleration for an object in motion (e.g., acceleration equals change in velocity divided by time).</p> |
| <p>Useful to Work on at Grade 7:</p> <p>7.12.14</p> <p>Explain how electrical circuits are converting energy when light, heat, sound, or chemical changes occur. (12C)</p> | <ul style="list-style-type: none"> • Diagram the flow of energy through a house, to a lamp, TV screen, stereo, or kitchen microwave. | <p>Economics: Diagram how the power grid works in your town.</p> <p>Language Arts/Social Studies: Write a paragraph about how your life would be affected if the electricity in your neighborhood were off from noon to midnight.</p> |

State Goal 12: Understand fundamental concepts, principles, and interconnections of the life, physical, and earth and space sciences.

| LEARNING STANDARD/OUTCOME | SAMPLE ASSESSMENT | CONNECTIONS |
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| <p>Critical to Understand and Master at Grade 8: Life Sciences <i>Structure and function of organisms</i> 8.12.01 Describe levels of organization for living systems, starting with cells, then moving to tissues, organs, organ systems, whole organisms, populations, and ecosystems.</p> | <ul style="list-style-type: none"> • Determine which is the more complex of 2 levels of complexity and provide evidence (e.g., blood cells or muscle, heart or respiratory system). • Using a graphic of an ecosystem, distinguish populations of organisms and describe 2 abiotic factors typical of that particular ecosystem. | <p>Art: Make models of cells, organs, and organ systems. Economics/Business: Compare and diagram levels of organization for living systems with levels or organization of dollars in the Chicago economy. Religion: Develop and diagram levels of organization in the Catholic Church from person, to family, parish, and so on.</p> |
| <p>8.12.02 Explain that all living things are composed of cells (i.e., “the building blocks of life”) and that cells carry out the functions needed to sustain life (e.g., photosynthesis in plants).</p> | <ul style="list-style-type: none"> • Describe examples of the different types of cells found in living organisms (plants and animals) and their role in maintaining the organism’s well-being. • Diagram how cells make up tissues in organs. | <p>Art/Religion: Compare cells in an organism to building materials such as bricks or stone in your church or school building. Art: Make models of cells with their organelles and describe their function. Physical Education: Describe how muscle tissues in legs need oxygen to run, jump, or kick in the water.</p> |

| LEARNING STANDARD/OUTCOME | SAMPLE ASSESSMENT | CONNECTIONS |
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| <p>8.12..03 Describe human systems for digestion, respiration, reproduction, blood circulation, excretion, movement and coordination, and protection from disease and ways that these systems interact.</p> | <ul style="list-style-type: none"> • Identify the function of the structures (organs) within the various body systems and the function of each system in the human body. • Describe the role of each system in the human body and the role that each plays in maintaining the good health of the individual. | <p>Technology: Investigate summaries of current research and findings on health issues at the website for the Center for Disease Control and Prevention.</p> <p>Language Arts: Write a story that follows the path a piece of bread takes through the digestive system when it is eaten.</p> <p>Social Studies: Investigate programs for the blind and mentally and physically disabled in your community.</p> |
| <p><i>Behavior of organisms</i> 8.12.04 Describe behavior as an organism’s response to internal or external stimuli and that all organisms must obtain and use resources, grow, reproduce, and maintain internal conditions.</p> | <ul style="list-style-type: none"> • Describe examples of structures and systems that enable organisms to respond to stimuli in their environments. • Develop a diagram to depict key parts of the nervous systems in humans (e.g., eyes, neurons in the skin, the inner ear, receptors in internal organs). • Consider a stomachache and describe pathways for this as an internal response to stimuli from something you ingested. | <p>Geography: Show with maps the migration patterns of different animal species such as birds or whales.</p> <p>Personal Health: Discuss food poisoning and how it is an internal stimuli for organisms.</p> <p>Economics/Business: For the food that you ate today, describe where you think it was produced or grown and how it was transported to your town.</p> |
| <p>8.12.05 Describe that regulation for organisms involves sensing their surroundings (external environment) and then using physiological activities at the cell or organism level to survive.</p> | <ul style="list-style-type: none"> • Describe how an organism, including a human, has systems and mechanisms that sense when something invades the body (e.g., cold virus) which activates chemical and physical responses to neutralize the invader’s effect upon the cells, system, and so on. | <p>Health/Social Studies: Discuss the social impact of an epidemic. Research the development and uses of vaccines and antibiotics.</p> <p>Language Arts: Write a story about cells in a large oak tree and the types of organisms that live in it during different seasons.</p> |

| LEARNING STANDARD/OUTCOME | SAMPLE ASSESSMENT | CONNECTIONS |
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| <p><i>Reproduction and heredity</i> 8.12.06 Explain how reproduction is a characteristic of all living systems, with some organisms reproducing asexually and others reproducing sexually (through egg and sperm).</p> | <ul style="list-style-type: none"> • Distinguish and describe the difference between asexual reproduction and sexual reproduction. • Research and discuss disease prevention and care associated with the human reproductive system. | <p>History: Learn about and discuss the idea of passing on life through a homunculus compared with current knowledge about human reproduction.</p> <p>Language Arts: Compare and contrast in writing pollination in plants versus fertilization in animals.</p> |
| <p>8.12.07 Describe heredity as the passage of genetic information from one generation to the next.</p> | <ul style="list-style-type: none"> • Using examples of family pedigrees for traits such as red-green color blindness or hemophilia, describe examples of genetic characteristics transmitted to offspring. | <p>Personal Health: Discuss the rationale for a National Gene Bank.</p> <p>Physical Education: List with your class examples of parents and offspring with comparable athletic abilities.</p> |
| <p><i>Biologic evolution and change over time</i> 8.12.08 Compare features of organisms for their adaptive, competitive, and survival potential (e.g., appendages, reproductive rates, camouflage, defensive structures).</p> | <ul style="list-style-type: none"> • After comparing such things as skulls, teeth, and the location of the eyes on various predator and prey organisms, recognize and describe how these features contribute to the individual organism's lifestyle and ability to survive. | <p>Social Studies: Research and discuss the adaptive lifestyle of the pilgrims.</p> <p>Economics/Business: Compare and contrast ideas based on a freemarket and capitalism with competition and survival in the natural world.</p> |
| <p>8.12.09 Describe the unity of organisms by studying their similar internal structures, chemical processes, and evidence of common ancestry.</p> | <ul style="list-style-type: none"> • After examining the skeletal structure of related organisms (e.g., wolves, coyotes, and foxes), recognize and describe the close similarities of structures as evidence of a common ancestry. | <p>Social Studies: Investigate the characteristics for racial classification and discuss tolerance for all humans.</p> <p>Language Arts: Write about similarities and differences between birds and bats or between birds and dinosaurs.</p> |

| LEARNING STANDARD/OUTCOME | SAMPLE ASSESSMENT | CONNECTIONS |
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| <p>8.12.10 Describe how natural selection in the environment (e.g., by predators, climate change) leaves individuals more apt to survive and to pass on their genes to offspring.</p> | <ul style="list-style-type: none"> • Describe and predict how individual organisms of a population might react when subject to significant changes in their environment (e.g., a prolonged drought or parasitic infestation). • Give examples of how individual organisms that survive to reproduce transmit their genetic traits, whereas individuals that do not survive to breed have their traits removed from the genetic pool. | <p>Geography: Read about ecosystems in the Midwest or northern Europe during the most recent Glacial Age (20,000 years ago) and find out about the habitats, plants, and animals that lived around Lake Michigan.</p> <p>Religion: Write about how caring for others is similar or different affects natural selection and how it relates to being human.</p> <p>Physical Education: Compare the NCAA basketball tournament to mechanisms in natural selection.</p> |
| <p><i>Populations, interdependence, and ecosystems</i> 8.12.11 Use examples to show that populations of plants or animals consist of all individuals that occur together in a region.</p> | <ul style="list-style-type: none"> • Identify some of the plant and animal populations occurring on your school site or nearby park. • Describe 2 examples of a population that consists of all the plants or animals of the same kind (e.g., all the dandelions in a field are a population of dandelions; all the robins in a park make up a population of robins). | <p>Social Studies: Research and report the characteristics of the human population in Illinois or the nation from the United States Census Bureau.</p> <p>Math: Use a graph to show a doubling of the population of rabbits in an area every 8 months.</p> |

| LEARNING STANDARD/OUTCOME | SAMPLE ASSESSMENT | CONNECTIONS |
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| <p><i>Matter and energy in ecosystems</i> 8.12.12 Develop a diagram showing sunlight (the major source of energy in ecosystems) entering ecosystems through producers by photosynthesis, then passing to consumers and decomposers through food webs.</p> | <ul style="list-style-type: none"> • Diagram the flow of energy through ecosystems, showing the sun as the primary source of the energy. • Give examples from a park near your school of first-order (primary) consumers in making the sun’s energy available to other organisms within the ecosystem through photosynthesis. • Describe the role of decomposers in cycling the basic chemicals back to soils for use in photosynthesis. | <p>Physical Education: Discuss how individuals playing sports on a team is a system. Art: Consider a salad with tuna, mushrooms, and other ingredients and draw and label each part relative to a food web.</p> |
| <p><i>Diversity and adaptation of organisms</i> 8.12.13 Compare examples of ecosystems with vast numbers of species of animals, plants, and microorganisms in many kinds of habitats.</p> | <ul style="list-style-type: none"> • Use diagrams to show various ecosystems with a diversity in populations that have primary producers, first-order consumers, second-order consumers (etc.) and describe how these populations benefit the health of the ecosystem. | <p>Math: Use charts and graphs to show the numbers of humans in different parts of the world. Religion: Consider all microorganisms you know and discuss which would have been present in the Garden of Eden.</p> |
| <p>Significant to Develop at Grade 8: <i>Structure and function of organisms</i> 8.12.14 Describe how disease results from a breakdown in function, such as by invasion from outside the body (i.e., pathogens). (12A)</p> | <ul style="list-style-type: none"> • Describe germ theory and how various diseases are able to disrupt the normal functioning of the body systems of an organism. | <p>Personal Health: Discuss virus outbreaks such as annual outbreaks of influenza, SARS, or Asian bird flu. History: Read about and discuss the causes and spread of the plague (black death) in Europe and Asia in the mid-1300s.</p> |

| LEARNING STANDARD/OUTCOME | SAMPLE ASSESSMENT | CONNECTIONS |
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| <p><i>Reproduction and heredity of organisms</i> 8.12.15 Describe that genetic information is contained in genes and that traits are determined by one or more genes. (12A)</p> | <ul style="list-style-type: none"> • Describe examples of inherited characteristics that are determined by one or more genes from parents. | <p>Math: Discuss the use of DNA in crime investigations and how probability is used to investigate suspects. Art: Draw pictures of different types of trees or bushes that have distinctive traits.</p> |
| <p><i>Populations, interdependence, and ecosystems</i> 8.12.16 Explain how when an environment becomes overpopulated, the ecosystem may become degraded due to increased use of resources, yet such effects may vary from region to region. (12B)</p> | <ul style="list-style-type: none"> • Describe what might happen to an ecosystem that has an overpopulation of first-order consumers (plant eaters) over an extended period of time. • Describe 2 ways that an ecosystem with an overpopulation of herbivores (first-order consumers) might eventually recover (e.g., predators might increase in number and reduce first-order consumers). | <p>Geography: Research the distribution of the growing world population and key resources for human survival (e.g., food, wood, clothes). Math: Graph the growth in population for Chicago, Illinois, and the United States.</p> |
| <p>8.12.17 Identify and classify key biotic and abiotic interactions in an ecosystem and factors that affect population density. (12B)</p> | <ul style="list-style-type: none"> • Identify how changes in abiotic factors such as temperature, loss of soil, and wildfire within an ecosystem may affect the population density of certain organisms within that ecosystem. • Describe how the introduction of exotic or nonnative species of a plant or animal might have a negative effect on populations occupying the niche that is invaded by the introduced species. | <p>Geography: Distinguish among undeveloped, developing, and developed countries and list and discuss factors that lead to hunger and disease in each kind of country. Economics/Business: Discuss where metals are found and mined and how they are a part of society.</p> |

State Goal 13: Understand the relationships among science, technology, and society in historical and contemporary contexts.

| LEARNING STANDARD/OUTCOME | SAMPLE ASSESSMENT | CONNECTIONS |
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| <p>Critical to Understand and Master at Middle/Junior High School: <i>Safety in science</i> M.13.01 Identify and reduce potential hazards in science activities using common sense and technology (e.g., having ventilation, handling chemicals).</p> | <p>LS: Review as a class and list safety protocols for working with bacterial or potentially harmful biologic samples. ESS: Review safety procedures for using dilute acid in calcium carbonate tests, or for using geologic hammers on rock samples. PS: Describe where in your lab to obtain safety equipment such as safety goggles, gloves, aprons, and showers. PS: Review possible flammable or electric hazards that may be a part of your lab activities.</p> | <p>Language Arts/Art: Make classroom posters to illustrate safety guidelines. Health: Research and discuss risks and hazards due to failure to follow safety precautions. Math: Make a scale drawing of the lab, locating lab supplies and safety equipment. Language Arts: Write a story showing that using safety equipment properly can prevent a dangerous situation.</p> |
| <p><i>Science as a human endeavor</i> M.13.02 Describe how science involves different types of abilities, such as logic, reasoning, intellectual honesty, openness, imagination, and creativity.</p> | <p>AD: Compare your ability to follow directions for an experiment provided by a diagram alone, written directions alone, or a combination of the two. Discuss the differences in abilities among the people in your class and among scientists in general to develop an appreciation for the range of abilities necessary to do science in different fields. AD: Use a crime scene scenario to apply the use of logic and inference from evidence.</p> | <p>Language Arts: Research scientific careers and list skills and abilities needed to succeed in each. Religion: “Science is done best with certain attitude.” Discuss attitudes needed to do science and how these attitudes can help us understand better God’s plan for us in the universe. Language Arts: Examine the job listings in a newspaper for science and technology and describe the skills needed in each profession.</p> |

LS: Life Sciences **PS:** Physical Sciences **ESS:** Earth and Space Sciences **AD:** All Disciplines

| LEARNING STANDARD/OUTCOME | SAMPLE ASSESSMENT | CONNECTIONS |
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| <p>M.13.03 Describe that science and technology give information about how the physical and biological worlds work, yet humans must make decisions about how to use science and new technologies.</p> | <p>AD: Give an example of new technology that provides information to understand and evaluate risks and hazards in the physical world. ESS/PS: Consider the Hubble Space Telescope and evaluate decisions for maintaining or terminating its operation, as well as options and costs for how to repair and maintain the telescope (e.g., repairs by astronaut or robot). LS: Discuss and describe costs and benefits of vaccinations for diseases such as influenza, rubella (German measles), or smallpox. ESS: Describe how humans must make decisions about the costs and benefits of living in regions with considerable seismic, volcanic, or other natural hazards (e.g., floodplain land may be less expensive but prone to flooding).</p> | <p>Social Studies: Use newspapers and magazines to find public issues that involve science questions. Discuss how you can become more informed about public issues. Religion: Discuss the Catholic Church’s views on issues involving the use of science and technology. Language Arts (debate): Divide the class into pros and cons to debate both sides of current public issues (e.g., Should all medical means be used to keep people alive? Is it ethical to use DNA to test for possible genetic disorder? Is stem cell research or cloning ethical?).</p> |

| LEARNING STANDARD/OUTCOME | SAMPLE ASSESSMENT | CONNECTIONS |
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| <p><i>Nature of science</i> M.13.04 Describe that science seeks to test and explain nature by using observations, experiments, models, logic, evidence, analysis, and the revision of ideas.</p> | <p>AD: Describe an example from your science class where evidence from experiments clearly supports one possible explanation and precludes another. AD: Use a sketch to show how you analyzed the findings of an experiment and then revised the experiment or your ideas for a more accurate test.</p> | <p>Technology: Use computers to summarize results from an experiment and design data tables and graphs. Math: Design an experiment using inquiry and the scientific method and use numbers to demonstrate results and variability (e.g., percent error, standard deviation, mode, mean, median). Art: Make posters showing the steps of inquiry and the scientific method. Language Arts (writing): Develop a five-panel comic strip with illustrations that shows how science can be used to solve an everyday problem. Meteorology: Make a weather prediction based on observations and previous predictions of weather forecasters. Collect data and analyze the results and your prediction.</p> |

| LEARNING STANDARD/OUTCOME | SAMPLE ASSESSMENT | CONNECTIONS |
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| <p><i>History of science</i> M.13.05 Give examples of individuals from many cultures who have contributed to science and technology and describe that studying the works of these individuals helps to understand the relationship between science and society.</p> | <p>ESS: Write about views of past cultures regarding causes and reasons for earthquakes. ESS/PS: List the names of 5 stars, which are often in Arabic, such as Algol or Aldebaran, and research their meanings. List the names of 5 constellations, which are often in Greek, and research their meanings. PS: Describe and discuss how Marie Curie contributed to our understanding of elements, radioactivity, and the periodic table of elements.</p> | <p>Language Arts: Research the findings of a scientist from your ethnic background. Social Studies: Locate on a world map various discoveries and scientists important to us today. Math: Research and represent on a circle graph the percentage of inventions and discoveries made by various cultures in a certain field (e.g., geometry, astronomy). Language Arts: Make a graphic organizer or poster that shows the benefits in science or technology that we have received from various cultures. Religion: Discuss the contributions that all cultures make to science and the respect that all cultures deserve.</p> |
| <p><i>Science, technology, and society</i> M.13.06 Describe challenges and issues for society that have inspired scientific research or new technologies for developing new processes and products.</p> | <p>LS: Evaluate the current status of Asian bird flu (H5N1) and the measures taken to reduce its spread. AD: Describe recent work seeking to understand the possibility of other life in our solar system (e.g., life on Mars, Titan) and the key technologies involved.</p> | <p>Technology: Research products that make a difference in our lives today (e.g., DVD players, Teflon coatings, automobiles, airplanes) and show with a timeline how the invention is, or is not, related to what was happening in history. Language Arts: Research how and why an invention was discovered or developed. Religion: Consider and discuss whether various inventions have brought the world closer together or farther apart and whether they bring people closer to God or farther from God.</p> |

LS: Life Sciences **PS:** Physical Sciences **ESS:** Earth and Space Sciences **AD:** All Disciplines

| LEARNING STANDARD/OUTCOME | SAMPLE ASSESSMENT | CONNECTIONS |
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| <p>M.13.07 Explain with examples that society and communities must make decisions on whether, or how, to use modern scientific information (e.g., nuclear energy, biotechnology, genetic engineering).</p> | <p>AD: Hold a town hall style discussion regarding possible costs and benefits to society of issues such as genetically engineered agriculture and aquaculture. AD: Describe issues, costs, and benefits related to sources of energy, such as nuclear energy, fossil fuels, and wind or solar energy.</p> | <p>Health: Select and discuss an invention that leads to better personal health and an invention that leads to poorer health. Language Arts (debate): Pick a topic related to modern science and technology and debate the risks and benefits. Math: Collect data that serves as evidence for the advantages and disadvantages of a modern development in science and technology. Social Studies: Make a timeline of one scientific topic or device (e.g., phone, personal computer) and discuss its effects on society. Religion: Discuss the Catholic Church’s position on the topic above.</p> |
| <p>Personal Health M.13.08 Give evidence that regular exercise leads to the physiological benefits of physical fitness (healthy weight, good strength, strong heart-lung system).</p> | <p>AD: Describe and discuss the benefits of regular exercise and list the types of exercise done by students in your class (e.g., walking, sports). LS: Analyze data from a table to discover the relationship between a behavior and health (e.g., increased weight and heart disease, minutes of exercise per week and blood pressure).</p> | <p>Math: Use graphs to show the benefits of physical fitness. Art: Make posters that show the before-and-after benefits of regular exercise. Language Arts (poetry): Write poems or limericks that describe the benefits of exercise and a healthy life style. Language Arts: Cut out magazine ads dealing with diet, food, or exercise and discuss why the product does, or does not, fit into a healthy life style. Religion: Discuss God’s plan for us and how staying healthy fits into His plan.</p> |

| LEARNING STANDARD/OUTCOME | SAMPLE ASSESSMENT | CONNECTIONS |
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| <p>M.13.09 Discuss ways that sexuality is a natural human function that requires physiological, cultural, and ethical understandings.</p> | <p>LS: Compare issues of science related to human sexuality (e.g., sperm fertilizing an egg, heredity from prior generations) with community or ethical views of issues in sexuality.</p> | <p>Math: Contact the State Health Department, obtain a report of communicable diseases, and rank their incidence in certain groups (e.g., HIV/AIDS). Language Arts: Read and write about communicable diseases. Religion: Discuss God’s plan for us, the link between God’s plan and human sexuality, and the Church’s guidelines.</p> |
| <p><i>Natural resources and humans in the environment</i> M.13.10 Explain different ways that humans interact with and rely on the environment.</p> | <p>AD: List 20 materials that are in your classroom and describe how they relate to resources in the environment. AD: Describe the different ways that metals and wood products are part of your class and outline the steps by which these resources arrived in your classroom. PS: Outline the processes by which electricity is produced in your area.</p> | <p>Language Arts (poetry): Write poems and draw pictures about the wonder and beauty of our environment. Math: Design a survey of students to measure attitudes about our use or abuse of earth-limited resources (e.g., use of water or fuel, recycling) and then graph the results of survey. Religion: Discuss examples of stewardship toward Earth and show how to act on one issue (e.g., collect litter in the community, plant flowers or vegetables, clean a stream or field). Social Studies (public policy): Research and discuss a policy about natural resources and the environment from our government, or another government. Language Arts (writing): Write a newspaper editorial in support of establishing a new recycling center in your community. Language Arts (reasoning): Examine truth in advertising by evaluating whether the claims of companies actually help or hurt our environment.</p> |

LS: Life Sciences **PS:** Physical Sciences **ESS:** Earth and Space Sciences **AD:** All Disciplines

| LEARNING STANDARD/OUTCOME | SAMPLE ASSESSMENT | CONNECTIONS |
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| <p><i>Natural hazards and level of risk</i> M.13.11 Describe natural processes that result in hazards that rapidly change the environment, damage property, and harm and kill humans with different levels of risk (e.g., earthquakes, wildfires, tornadoes, volcanic eruptions, droughts, floods).</p> | <p>AD: Describe a recent natural hazard that struck a community somewhere other than North America, the cause of that hazard, and a technological solution or government policy that could have reduced the effect of that hazard on humans.</p> | <p>Geography: Use a map to show where recent natural disasters have occurred and the types of risks posed. Math: Make a scale model or diagram showing how a natural disaster occurred. Math: Use a timeline or graph to chart the date, location, and magnitude of various natural disasters around the world. Language Arts (writing): Write a fictional, diary account of a student your age caught in a natural disaster. Religion: Discuss our role after a natural disaster and how we can help people in need.</p> |
| <p>Significant to Develop at Middle/Junior High School: M.13.12 Identify examples of scientific and technological solutions that have constraints and consequences and that harbor limitations in cost, materials, and practicality (e.g., influenza vaccination) or environmental implications (clear-cutting, overfishing). (13A)</p> | <p>AD: Research and discuss possible solutions and options for disposal of radioactive waste from nuclear energy plants or nuclear weapons manufacturing.</p> | <p>Religion: Study the Catholic social views about solutions and consequences. Social Studies: Discuss the influence of political views on scientific issues, public policy, and laws. Math: Use math to estimate costs of possible scientific and technological solutions to a problem. Language Arts: Make a graphic organizer showing constraints and consequences for solutions to a topic. Technology: Make a flow chart with a computer to show the stages of the possible solutions and consequences.</p> |

| LEARNING STANDARD/OUTCOME | SAMPLE ASSESSMENT | CONNECTIONS |
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| <p>M.13.13</p> <p>Describe an example showing that scientists participate in a public process of peer review of their work, publishing all evidence and results and continuing debate and discussion when results or interpretations do not agree. (13A)</p> | <p>AD: Create a list of 7 to 8 key scientific journals, and their main scientific fields, in which scientists publish new results and findings from their research.</p> <p>AD: Summarize the positions in a current scientific debate and the type of data that would allow the positions to be reconciled or proven.</p> | <p>Language Arts: Write a short play showing what could happen if a scientist made a discovery and did not report or share it.</p> <p>Language Arts: Design a magazine ad to inform readers about a past scientific breakthrough.</p> <p>Technology: Use the computer to design a flow chart to show all the steps needed in peer review for a scientist.</p> <p>Social Studies: Discuss means of communication throughout time and compare them with ways we communicate today.</p> <p>Language Arts (reading): Read an article on current science from a newspaper and report about the topic to the class, indicating the discovery, the evidence found, and the significance of the findings.</p> |