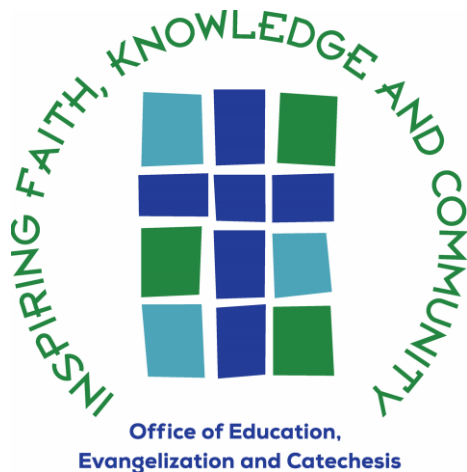


# ADH SCIENCE/HEALTH & WELLNESS CURRICULUM

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## Grades 1-12



*Each community can take from the bounty of the earth whatever it needs for subsistence, but it also has the duty to protect the earth and to ensure its fruitfulness for coming generations. – Pope Francis, Laudato Si.*

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ARCHDIOCESE OF HARTFORD | OFFICE OF EDUCATION, EVANGELIZATION & CATECHESIS



## ACKNOWLEDGEMENTS

This curriculum document is the result of collaborative and collective efforts of many educators throughout the Archdiocese of Hartford. It represents the work of educators who laid the foundation for curriculum design in years past, and the advancements of educators who hold advanced degrees and experience in the area of science education and are dedicated to the mission of education and the formation of our youth in the Archdiocese of Hartford.

This curriculum is designed to scaffold instructional techniques that move student progressively toward concepts of greater depth and complexity from first grade through high school graduation and, ultimately, to become independent thinkers and learners. Teachers from elementary schools, middle schools, each of the four Archdiocesan high schools, and the Curriculum Commission collaborated to form the science committee. Their goal was to elevate the curriculum to ensure all students are scientifically literate and prepared to enter college and/or their career with the skills necessary to lead a successful life and become productive, virtuous citizens who will help fashion a more just and humane world.

*We are not some casual and meaningless product of evolution. Each of us is the result of a thought of God. Each of us is willed, each of us is loved, each of us is necessary. – Pope Benedict, 2005*

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August 16, 2016

In consultation with the Deputy Superintendent and Assistant Superintendent of Catholic Schools, I am pleased to approve the revised *Science/Health and Wellness Curriculum Standards* for Catholic schools in the Archdiocese of Hartford. The curriculum as designed includes a full integration of the disciplines of earth and space sciences, life sciences, and physical sciences. This standards-based curriculum contains clear, relevant, and rigorous standards that holds all students to high expectations, challenging them to think critically, creatively, and collaboratively, fostering students' innate ability to ask questions and to solve problems. The content for grades 1-12 embraces a richly developed program of teaching and learning consistent with the purpose and vision for Catholic schools in the Archdiocese of Hartford: to foster a culture of educational excellence through critical thinking skills, innovative and rigorous curriculum standards, a global perspective, and an emphasis on moral education, community and service.

I am thankful to Mrs. Valerie Mara, Assistant Superintendent of Academics, the Curriculum Commission, and the science committee members for their strategic efforts in writing the *Science/Health and Wellness Curriculum Standards* to ensure the inclusion of Catholic identity and Catholic intellectual tradition consistent with research-based best practices.

*"Science is not only compatible with spirituality; it is a profound source of spirituality. When we recognize our place in an immensity of light-years and in the passage of ages, when we grasp the intricacy, beauty, and subtlety of life, then that soaring feeling, that sense of elation and humility combined, is surely spiritual." Carl Sagan*

Sincerely,

Michael S. Griffin, Ph.D.  
Superintendent of Catholic Schools  
Archdiocese of Hartford

INSPIRING FAITH, KNOWLEDGE AND COMMUNITY



## **INTRODUCTION**

*The actual doing of science or engineering can also pique students' curiosity, capture their interest, and motivate their continued study; the insights thus gained help them recognize that the work of scientists and engineers is a creative endeavor—one that has deeply affected the world they live in.<sup>i</sup>*

The citizen of the twenty-first century must be scientifically literate. He/She must have a basic knowledge of science and its processes to appreciate the wonders of the universe, analyze the problems presented by life, and develop appropriate and morally responsible solutions to those problems.

**The standards and outcomes listed in this curriculum were designed to reflect ten cross-curricular practices that are identified as essential for all students within the network of Catholic schools in the Archdiocese of Hartford to master.**

**The ten practices are as follows:**

- Ask questions and define problems;
- Construct explanations and design solutions;
- Develop and use a variety of models;
- Plan and carry out investigations;
- Analyze and interpret data;
- Use mathematics and computational thinking;
- Engage in argument from evidence;
- Obtain, evaluate, and communicate information;
- Recognize that God has entrusted to all human beings responsibility for the world and all its creatures;
- Understand their responsibility to take care of their own physical and spiritual well being.

## **How to Use This Document**

The ***Science/Health & Wellness Curriculum Standards*** is designed to assist the teacher in the important work of helping young people of the 21<sup>st</sup> century gain a basic knowledge of the science and its processes, recognize the link between the work of scientists and engineers, and to appreciate the wonder of the universe, analyze the problems presented by life, and develop appropriate and morally responsible solutions to those problems. Students will be able to celebrate the miracle of God's universe, to analyze critically the challenges of life, and to develop moral responses to questions, challenges and problems.

The strand of **health & wellness** is an integrated component of the whole science curriculum. As we move forward in the third millennium, the health and wellness curriculum addresses our students' importance and wellness in today's technological society. As Catholic school educators, we recognize that spiritual, physical, emotional, social, and academic growth and performance and good health practices are inextricably intertwined. Today, health education is as important as all other subjects we teach in our Catholic schools.

Science educators of students in grades PK-12 are expected to not only assess students' understanding of core ideas, providing numerous opportunities throughout a term for students to demonstrate that they "know" science concepts; they must also provide numerous opportunities for students to *use* their understanding to "investigate the natural world through practices of science inquiry, or solve meaningful problems through the practices of engineering and design". Students cannot fully understand scientific and engineering ideas without engaging in the **practices of inquiry** and the **discourses** by which such ideas are developed and refined. At the same time, they cannot learn or show competence in practices except in the context of specific content (NRC *Framework*, 2012, p. 218).

The *Science/Health & Wellness Curriculum Standards* are an advancement of a culmination of years of curriculum research and design in the Archdiocese of Hartford. Its foundation is based on research developed by the National Research Council (NRC) of the National Academy of Sciences, National Science Education Standards, and the K-12 framework of the *Next Generation Science Standards*, as well as the *National Health Education Standards: Achieving Excellence*. The secondary level committee relied heavily on the language and concepts of the State of Massachusetts's Science Framework. Within these standards the teacher will find ample expression of the uniqueness of Catholic education. The health curriculum provides students with specific health and wellness related knowledge and skills, health-enhancing behaviors, and known health risks to avoid. The relationship of one's own health and that of family and friends is introduced early in the curriculum and developed through the middle school grades, exploring the impact of health on the broader community and the world.

## **CURRICULUM OVERVIEW**

**Standards** are the overarching instructional targets that outline essential topics and skills that students should know and be able to do with increasing depth and complexity by the end of high school. Daily standards-based lesson planning enables educators to align curriculum and instruction with standards, as they have been adapted by this Archdiocese, thereby keeping the goals of our students in mind. The purpose of standards-based curriculum is to empower all students to meet new, challenging standards of education and to "provide them with lifelong education...that equips them to be lifelong learners" (Fullan, 2006).

**Student curriculum objectives** following the standards are bold-faced; **enabling outcomes** are numbered after the student learning objectives. **Student objectives** are directly aligned with Archdiocesan Standards. They outline the primary tasks students should be able to perform as a result of instruction of all the numbered activities in the sub-skills listed under enabling outcomes. **Enabling outcomes** are skills taught that will result in mastery of the student objective. Teachers are encouraged to pre-assess each unit, then check outcomes as they are taught or assessed as this will drive instruction. In addition, teachers are encouraged to develop outcomes that will best enable students to achieve a measure of mastery of the student objectives. Differentiating instruction plays a paramount role in this determination and in planning *daily learning objectives*.

Each grade level curriculum represents a *minimum instructional plan* for the year. It is essential that each science/health teacher become familiar with the objectives for the preceding as well as the following grade, and has a good overall picture of the sequence of instruction throughout the twelve grades. As schools meet in their **professional learning communities**, conversations should be had regarding the pacing of the curriculum units, the use of the standards, testing data including formative data, summative data, and standardized test data, to effectively and efficiently inform instructional planning to meet the needs of each student.

Classrooms should incorporate a learning environment that values critical thinking, oral, written, and visual communication, and encourages the active participation of the students in the learning process. Instruction should engage students in the learning process rather than allowing them to be the passive recipients of information.

Careful attention should be paid to how students are assessed. Assessment is a key element of any curriculum whether used as an instructional tool (formative) or as a measurement of learning (summative). Assessment for learning is a powerful strategy for improving instruction and student achievement. "Assessment for learning...is about obtaining feedback on the teaching and learning and using that feedback to further shape the instructional process and improve learning." (Fullan, 2006) Good teachers learn which assessment tools best fit the learning outcomes addressed and ensure that a variety of summative assessments are used (performance-based, independent, criterion based) to determine an accurate indication of student achievement. To as great an extent as possible,

**Science and engineering** are integrated throughout this curriculum. Inclusion of science and engineering practices in standards only speak to the types of performances students should be able to demonstrate at the end of instruction of a particular course; the high school standards should not limit what educators and students should or can be engaged in through each curricular course. The application of science concepts in the form of engineering design across many disciplines enables students to retain and apply the concepts in an authentic manner. Each science unit should encompass scientific investigation, which can often lead to a solution of an engineering problem. Science refers to the students' ability to ask and answer questions; engineering refers to the students' ability to define and solve a problem.

### **Writing**

**Writing** cannot be underscored enough to stress its importance in the daily activity in each curricular unit. Every day, in every classroom, students should be writing – individually, in small or whole-class groups, in journals, through emails and other Internet connections, or on electronic devices. They should be writing labs, research reports, opinions, poetry, conclusions, summaries, prayers, and reflections. In addition, teaching students to carefully and accurately cite sources for their work beginning in elementary grades, and then emphasizing various bibliography styles such as MLA or APA in middle school grades, is vital to ensure proper research method and technique in high school. The use of technology to enrich the research experience is strongly encouraged.

### **Critical Thinking and Inquiry**

Central to these standards and to the scientific research and study in this Archdiocese, the goal is creating knowledgeable, young people of faith. They will read with understanding, think critically and make moral decisions. In the content/note section of all grade level standards, teachers are urged to be conscience of and include critical thinking and inquiry strategies vital for our 21<sup>st</sup> century learners as they pertain to specific enabling outcomes. As they plan lessons, teachers are asked to consider the following strategies essential to the study of the sciences:

- Write simple lab reports
- Use scientific method
- Hypothesize
- Prove/disprove hypothesis
- Ask questions about objects, organisms, and events
- Conduct simple investigations
- Conduct simple experiments
- Classify objects according to attributes
- Use simple equipment and tools
- Construct reasonable explanations
- Communicate with graphs, pictures, written statements and numbers
- Make predictions
- Make inferences
- Draw conclusions
- Measure length, volume. and mass using standard/nonstandard units

### **Cross-Curricular Links and Resources**

Throughout this document, cross-curricular connections and enduring understandings are suggested. Through the use of thematic units, students can apply knowledge, principles, and/or values to more than one academic discipline simultaneously, resulting in deeper learning and less fragmentation and isolated skill development. The disciplines may

Science & Health Wellness Curriculum Standards 2017

be related through a central theme, issue, problem, process, topic, or experience (Jacobs, 1989). In addition, it elevates the relevance of the content to students.

The supplemental projects listed are those suggested by various science teachers from within this Archdiocese and dioceses around the country. They are, by no means, a complete list. Here again, teachers are encouraged to annotate this list by adding those thematic projects, ideas, books, websites, and/or apps that are most effective in their individual classroom learning environment.

Textbooks and anthologies are valuable resources that support instruction to help students meet the objectives of a standards-based curriculum. However, they should not be used as the primary resource for instruction or to identify targets of instruction (O'Shea, 2005). Textbooks must be selected from the Archdiocesan Approved Textbook List. If a school wishes to use a textbook resource not listed on the approved list, kindly contact the Assistant Superintendent of Academics for endorsement.

Central to these Standards and to the science/health & wellness programs of this Archdiocese is the goal of creating articulate young people of faith, who can read with understanding, think critically and make moral decisions. Following the standards, is a section entitled **“Suggested Cross Curricular and Catholic Social Teaching Links.”** This section is designed to help teachers link instruction in the sciences to other areas of the curriculum, and, more importantly, with how students live out their faith as expressed in Catholic social teachings. Some suggestions are included, but this part of the document must also be annotated by the teacher. The connection of science and health to life outside of school is real; it is the perfect vehicle for making Jesus' Gospel message of peace and justice live and breathe and have its being in our schools, parishes, communities and towns.

## **ASSESSMENT**

*Assessment is a means of measuring performance. It illustrates how well we are accomplishing our stated mission, goals, and objectives to educate and form the whole person. Through an integrated system of standards and of multiple forms of evaluation, assessment measures:*

- *beliefs, attitudes and behaviors, which are expressions of our Catholic identity;*
  - *content knowledge*
  - *student achievement (individual and group) ; and the*
  - *learning and teaching environment*
- (NCEA'S Statement on Accountability and Assessment in Catholic Education)*

Assessments of students should match the learning outcome or goal. In all classrooms, a variety of assessments, both objective and subjective, should be used to enhance learning and measure progress. Assessments are both instructional tools for students while they are learning and accountability tools to determine if learning has occurred. These assessments should include, but are not limited to:

Summative assessments are *MILEPOSTS* while formative assessments are *CHECKPOINTS*.

*Summative assessments* are designed initially by a teacher for each course and reflects where you want your students to be at end of unit. It is a measure OF learning designed to determine degree of mastery of each student...it judges the success of the process/product at the end.

*Formative assessments* are designed to prepare students for the milepost assessment; they direct instruction and ensure students have the appropriate practice opportunities before the summative assessment. They are stops along the way. Results are used to direct instruction and/or to plan corrective activities.



|                                      | FORMATIVE  | SUMMATIVE  |
|--------------------------------------|--|--|
| <b>PURPOSE</b>                       | To monitor and guide process/product while still in progress                         | To judge the success of process/product at the end (however arbitrarily defined) |
| <b>TIME OF ASSESSMENT</b>            | During the process or development of the product                                     | At the end of the process or when the product is completed                       |
| <b>TYPES OF ASSESSMENT</b>           | Informal observation, quizzes, homework, teacher questions, worksheets               | Formal observation, tests, projects, term papers, exhibitions                    |
| <b>USE OF ASSESSMENT INFORMATION</b> | To improve or change a process/product while it is still going on or being developed | Judge the quality of a process/product; grade, rank, promote                     |

## **TECHNOLOGY INTEGRATION**

*“The Church views emerging technologies as gifts of the Spirit to this age and challenges “God’s faithful people to make creative use of new discoveries and technologies for the benefit of humanity and the fulfillment of God’s plan for the world..” Aetatis Novae, #2, #3; Rose, 1992*

Technology integration is realized when teachers use technology in a lesson or has students create to show mastery of curriculum standards. Blended learning combines face to face classroom learning with global online content, giving student more control over the time, place, path, and pace of their learning.

“Learning through projects while equipped with technology tools allows students to be intellectually challenged while providing them with a realistic snapshot of what the modern office looks like. Through projects, students acquire and refine their analysis and problem-solving skills as they work individually and in teams to find, process, and synthesize information they’ve found online.”

The seamless integration of technology and curriculum will enable students and teachers to acquire the skills they need to thrive in a complex, highly-technological knowledge-based world. Properly used technology, will maximize students’ ability to access information, enhance problem-solving skills, and develop effective communications. The *Standards* provide many such opportunities that can be incorporated into the teaching and learning processes at all levels.

The seamless integration of technology and curriculum will enable students and teachers to maximize their ability to access information, enhance problem-solving skills, and develop effective communications. The following *Technology Standards* provide many such opportunities that can be incorporated into the teaching and learning processes at all levels. Each grade level outlines suggested outcomes for successful integration of technology that augments teaching and learning for the purpose of successful mastery of skills and preparation for 21<sup>st</sup> century fluencies. However, there are many other creative means of achieving this goal. Additional resources can be found <http://ad hoc.org/07.curriculum/resources2.html> under the heading of *Technology*.

### **TECHNOLOGY STANDARDS GRADES 1-12:**

- I. Illustrate and communicate original ideas and stories using digital tools and media-rich resources.

- II. Identify, research, and collect data on an age and grade appropriate issue using digital resources and propose a developmentally appropriate solution.
- III. Engage in electronic learning activities with learners from multiple cultures in order to understand that the world is one human family.
- IV. Use a variety of technologies to communicate and celebrate God's word.
- V. Independently and in a collaborative work group, use a variety of technologies to produce an inquiry-based digital presentation or product in a curriculum area that encourages finding creative solutions to authentic and complex problems.
- VI. Choose and use various technological methods to organize information including lists, systematic counting, sorting, graphic organizers, and tables.
- VII. Demonstrate the safe, ethical, and cooperative use of technology.
- VIII. Independently apply digital tools and resources to address a variety of tasks and problems.
- IX. Communicate about technology using developmentally appropriate and accurate terminology.
- X. Demonstrate the ability to navigate in virtual environments such as electronic books, simulation software, and Web sites.
- XI. Use technology resources to conduct research, demonstrate creative and critical thinking, and communicate and work collaboratively.
- XII. Utilize media to integrate the Church's authentic teaching into the 'new culture' created by modern communications" and "strongly influence what people think about life and, to a great extent, the human experience itself is an experience of media". (*Pontifical Council For Social Communications*)

#### **General Outcomes for Technology Operations and Concepts Grades 1-12:**

1. Demonstrate positive social and ethical behaviors when using technology.
2. Successfully and responsibly operate multiple technology devices.
3. Use a variety of media and technology resources for directed and independent learning activities.
4. Communicate about technology using developmentally appropriate and accurate terminology.
5. Use developmentally appropriate multimedia resources and digital tools for problem solving, communication, illustration of thoughts, ideas, and stories, and to differentiate and personalize learning.
6. Work independently, cooperatively and collaboratively with peers, to gather information and communicate with others using telecommunications, with support from teacher and/or family members.
7. Create developmentally appropriate multimedia products with support from teachers, family members, or student partners.
8. Use email or other online resources to communicate original ideas and/or collaborate on a project.
9. Demonstrate respect for the physical and intellectual property of others.
10. Care for technology equipment and use it safely and in an age-appropriate manner.
11. Name basic technology devices.

#### **Internet Safety & Appropriate Use of Communication Technologies**

The Internet is an amazing resource that offers our children unlimited opportunities for learning, constructive entertainment and personal growth. Any child who is old enough to select a letter on a keyboard can access the world. New technologies offer many ways to communicate, and youth today have fully embraced these technologies. They have become a major part of our children's social environment. The world of computers, cell phones, gaming systems and the Internet are constantly expanding and changing, and it is not uncommon today that children are more knowledgeable

than adults. Parents, educators, and caregivers have a responsibility to help keep children safe online and to educate themselves about the technologies children use to communicate. You need to be aware of your child's online activities and teach him or her about cyber-ethics and how to interact positively in cyberspace.

**<sup>1</sup>Golden rules of behavior to regulate students' behavior in cyberspace.**

- ✓ Rules from real life apply: always use courtesy, kindness, dignity and respect.
- ✓ Don't talk to strangers. Talking to a stranger online is no different from talking to a stranger in the street. Remember that it's not easy to spot a stranger online, as anyone can masquerade as someone else on the Internet.
- ✓ Beware of "roaming the Internet." Just as it's dangerous to roam around unknown streets, wandering online is no different. Spending unlimited time surfing aimlessly is asking for trouble.
- ✓ Know your friends. Only talk online with friends you know and can talk to in person as well. Never agree to meet an online friend without a parent consent. Sit with parents or guardians to discuss who potential online friends are and whether or not they belong on your "friends" list.
- ✓ Don't provoke a fight. Provoking a fight under any circumstances isn't smart. Trying to provoke someone online is called flaming and it is often a violation of the terms of service with your ISP. If you feel someone is flaming you or a friend, tell a parent right away.
- ✓ Don't tell anyone your personal information. You never know who you're talking to online. Even if you think you know, there could be strangers lurking. There is no guarantee that what is said or posted on the Internet is private, and information including photos and videos posted on the Internet can last forever.
- ✓ Don't steal. Downloading music without paying for it or copying a friend's computer game, although common, is wrong. You could be sued or charged with a crime.

The following websites can provide you with more information:

- [www.common sense media.org](http://www.common sense media.org)
- [www.cyberbullying.us](http://www.cyberbullying.us)
- [www.ncpc.org](http://www.ncpc.org)
- [www.net smartz.org](http://www.net smartz.org)

## **UNIT PLANNING**

An overwhelming amount of research suggests that learning is directly correlated to teacher planning and preparation. The degree of teacher effectiveness has a great deal to do with their ability to design and implement instruction that promotes learning. The Archdiocese Science Curriculum supports unit instructional planning through a “backward design” process (e.g., Wiggins and McTighe, 1998). In this model, teachers plan instruction iteratively by asking and answering three questions in this order:

### **1. What is the intended learning (Learning Standard)?**

What should students know, understand, and be able to do? State this as observable behavior using an active verb.

### **2. What serves as evidence of student learning (Assessment)?**

How will students demonstrate that they have acquired and can use the knowledge, skills, and understandings?

### **3. How will I prepare students to show evidence of their learning (Strategies)?**

What teaching and learning activities, resources, field trips, and so on will help me teach the knowledge, skills, and understandings in the outcomes so that students can give evidence of the learning asked for in the assessments that I am using?

## **Enduring Understandings:**

- Students will demonstrate an awareness of the universality of science.
- Students will acquire problem solving skills.
- Students will exhibit behaviors that show respect for life.
- Students will discriminate between moral and immoral use of science in society and the world.
- Students will design and conduct experiments using the scientific method technique.
- Students will evaluate information for accuracy and logical consistency and applicability.
- Students will design and construct physical, theoretical and mathematical models of natural phenomena.
- Students will critically evaluate the applicability and relevance of a particular model to real life situations.
- Students will demonstrate knowledge of fundamental concepts of life sciences and physical science.
- Students will recognize patterns and cycles in the natural world.
- Students will identify the roles of energy in biological, chemical and physical interaction.
- Students will construct and communicate a well-organized synthesis of facts and concepts to form and support a valid conclusion.
- Students will use scientific tools and technology properly and accurately.
- Students will describe the interdependence of organisms with each other and their environment.
- Students will demonstrate self-directed learning through questioning and research.

*All sciences are connected; they lend each other material aid as parts of one great whole, each doing its own work, not for itself alone, but for the other parts; as the eye guides the body and the foot sustains it and leads it from place to place. — Roger Bacon (Opus Tertium)*

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### Science

- S1.1 Increase natural curiosity about and observation of the world
- S1.2 Describe, explain, and predict natural phenomena
- S1.3 Connect concepts and skills learned in science with an understanding of God as the center of creation
- S1.4 Read and write about science and the world using both books and technology
- S1.5 Form hypotheses based on observation and investigation about the natural world
- S1.6 Use senses and simple measuring tools to explore the properties of objects
- S1.7 Recognize and understand that God calls each of us to take personal responsibility to care for the world and as the precious gift He has entrusted to us.
- S1.8 Responsibly take care of their own spiritual and physical well-being
- S1.9 Use technology resources to conduct research, demonstrate creative and critical thinking, and communicate and work collaboratively.
- S1.10 Work independently and collaboratively in an inquiry-based learning environment that encourages finding creative solutions to authentic and complex problems.

### Health / Wellness

- HW1.1 Identify and demonstrate health promotion and disease prevention concepts.
- HW1.2 Access and utilize valid health information and health promoting products and services.
- HW1.3 Practice behaviors that promote health and reduce health risks.
- HW1.4 Analyze the influence of culture, media, technology, and other actors on health.
- HW1.5 Utilize social and communication skills to enhance health.
- HW1.6 Use goal-setting and decision-making skills to enhance health.
- HW1.7 Advocate for personal, family, and community health and wellness.

### **TEACHING AND LEARNING WITH TECHNOLOGY IN GRADES K-2 SCIENCE CLASSROOM**

- ☐ Compare, contrast, and classify various areas of study (e.g. humans, animals, habitats, etc.) using digital resources (e.g. charts, graphs, etc.).
- ☐ Discuss benefits and challenges of digital media.
- ☐ Use a digital camera and video recording material to “capture” the world of forces and motion
- ☐ Work independently and collaboratively to create digital representations of the relationship between states/phases of matter.
- ☐ Google images or other online resources of different rock formations and other physical features of the Earth. Present findings in a digital photo journal.
- ☐ Engage in the research process to conduct an in-depth study of a science topic of interest (e.g. research earthquakes of recent times and chart changes brought to the Earth’s surface).
- ☐ Discuss ways technology can impact health.
- ☐ Use digital charts or graphs to record observations of plant growth; discuss how they can take care of God’s creations.

## **UNIT1: PLANTS, SUN & SKY**

**To describe the different structures plants have for obtaining water and sunlight.**

The students will:

1. List what plants need to live
2. Describe the main parts of plants
3. Observe how seeds grow

**To describe the apparent movement of the sun across the sky and the changes in the length and direction of shadows during the day.**

The students will:

1. Track the movement of celestial bodies over time
2. Pose questions about the effect of the sun on the Earth
3. Draw pictures describing the night and day skies
4. Make and record how shadows change during the day

## **UNIT 1: Health & Wellness**

**To know that growth and development occurs from infancy to early childhood.**

The students will:

1. Describe external body changes from infancy to present age.

**To know names and general functions of the five sense.**

The students will:

1. use drawings, diagrams, examples, name, and demonstrate the 5 senses: hearing, seeing, smelling, touching, tasting

**To know how to get help in an emergency; practice safe behaviors in case of fire.**

The students will:

1. Using a toy telephone, call 911, state name, address clearly
2. Stress proper use of 911
3. State parents'/guardians' real names (not "mommy")
4. HOME ACTIVITY: create a home fire safety plan
5. Practice "stop, drop, roll" if clothing catches on fire
6. Discuss "get out," "get help" rule for fire safety

## **UNIT 2: MATTER & MAGNETS**

**To understand that all things are made up of matter.**

The student will:

1. Describe things as made up of matter
2. Describe the three main states of matter
3. Describe, sort, and classify objects according to physical properties (size, weight, color, space, and temperature)
4. Predict how some common liquids will interact with water
5. Develop questions about how temperature may or may not affect the dissolvability of solids
6. Describe the space and mass of a variety of kinds of matter
7. Describe what happens when two things try to occupy the same space
8. Identify the three main states of matter: solid, liquid, gas
9. Describe how matter can change

**To investigate the properties of magnets**

The student will:

1. Demonstrate how magnets attract things with iron in them
2. Identify a magnet's two poles

- 
3. Show how like poles repel and opposite poles attract
  4. Make and test predictions about how a magnet will move a variety of objects
  5. Identify, observe, record, and discuss the behavior of magnets

## **UNIT 2: Health & Wellness**

### **To know behaviors that help maintain health.**

The students will:

1. List 4 behaviors/habits that promote health (i.e. enough sleep, good nutrition, safe play, wash hands, exercise, quiet times, etc.)
2. Describe good dental hygiene habits
3. Name 4 food groups and examples of each
4. Identify common protective equipment to prevent injury (i.e. helmets, seatbelts, bus safety, etc.)

### **To know symptoms of common childhood illnesses and how to prevent their spread.**

The students will:

1. Identify common illnesses and symptoms (i.e., colds: sore throat, runny nose, cough)
2. Explain common ways to prevent spread of germs (i.e., frequent hand washing, proper disposal of tissues, etc.)
3. Demonstrate how to avoid contact with others' body fluids

### **To identify ways health information can be used.**

The students will:

1. Find examples that effectively present nutrition, learning how to brush/floss teeth, etc. from various positive media sources

## **UNIT 3: ENERGY, MOTION, & MASS**

### **To describe how the motion of objects can be changed by pushing or pulling.**

The student will:

1. Demonstrate how energy is needed to produce a force
2. Observe patterns and predict the motion of objects
3. Create objects and make predictions about their movement

### **To measure and compare the sizes and weights of different objects and organisms using standard and non-standard measuring tools.**

The student will:

1. Sort objects in a variety of ways and relate the properties of the objects to their uses
2. Measure how much an object moves with a ruler
3. Use a simple balance to estimate and measure mass
4. Observe, measure and classify different objects by color, size, shape and weight
5. Use senses and simple measuring tools to collect data (ruler, measuring cup, thermometer)
6. Develop nonstandard tools to measure

### **To investigate forms of energy**

The student will:

1. Identify sound as a kind of energy
2. Demonstrate how sound is made when things vibrate
3. List sources of light energy
4. Identify uses of electricity

### **UNIT 3: Health & Wellness**

#### **To demonstrate responsible Christian behavior in the local school community.**

The students will

1. Role play cooperative behavior
2. Role play following classroom and school rules
3. Create visual display of contributing to a healthy environment by proper disposal of trash, prevention of water pollution, water conservation, etc.

#### **To recognize sources of conflict and skills to resolve conflict.**

The students will:

1. Talk about specific classroom/playground conflicts and how to resolve them
2. Role play scenarios of conflict and resolution

#### **To recognize and identify feelings and appropriate responses to them.**

The students will:

1. List ways to calm oneself when upset and/or angry
2. Appropriately express feelings using select and relevant vocabulary
3. Describe ways a trusted adult can help one feel safe and stay healthy
4. Name things that make one experience specific feelings i.e., happy, sad, angry, hurt, compassionate, etc.

**Write a grade-appropriate research paper on a health issue that affects their age group.**

### **UNIT 4: ANIMAL HABITATS, ANIMAL LIFE CYCLES**

#### **To describe the different ways that animal, including humans, obtain water and food.**

The student will:

1. Match an animal with its appropriate habitat
2. Develop ways in which each person can take care of living things
3. Compare and contrast humans and animals (use charts, graphs, etc.)
4. Illustrate a simple food chain/web
5. Formulate questions about living and nonliving things
6. Make predictions about things that will grow and things that will not
7. Conduct experiments to see what living things need to survive

#### **To describe and document the changes in organisms, such as frogs and butterflies, as they undergo metamorphosis.**

The student will:

1. Describe how animals grow and change in different ways
2. Document changes described

#### **To describe the life cycles of organisms that grow but do not metamorphose.**

The student will:

1. Compare and contrast different animals (use charts, graphs, etc.)
2. Describe the defining characteristics of birds, fish, insects, and mammals

#### **To describe the structures that animals, including humans, use to move around.**

The student will:

1. Compare and contrast the adaptations that animals have made in order to survive (use charts, graphs, etc.)
2. Describe animals' need for air, water and food for survival and diagram the structures that animals have developed in order to survive and meet these needs.



## UNIT 4: Health & Wellness

### To know dangers and safety precautions in the immediate environment.

The students will:

1. Name safe play environments (i.e., own yard, porch, school playground, playground with a trusted adult)
2. Tell meanings of traffic signals
3. Explain reasons for smoke and carbon monoxide detectors
4. Explain ways family members can help one another safety healthy/safe

### To know that information can come in various ways.

The students will:







1. Discuss positive and negative uses of TV, Internet, video games, magazines

### To know safety rules regarding medicines and dangerous substances.

The students will:

1. Identify warning signs on harmful household products
2. Name persons who might appropriately give a child medicine (emphasize that it would be inappropriate to take any substance/medication from an unknown person)

## SUGGESTED CROSS CURRICULAR CONNECTIONS & CATHOLIC SOCIAL TEACHING LINKS

-  In recording observations of plant growth, students discuss how they take care of God's creation. (Science, Math, Religion)
-  While reading non-fiction selections related to nature (i.e., The Giving Tree, The Very Hungry Caterpillar) students understand their role as stewards of God's creation. (Language Arts, Religion, Science)
-  Create murals depicting plants, animals, and their environments. (Art)
-  Take a nature hike or walk on your grounds to observe and gather objects to classify. Write a sentence their observations. (P.E., Language Arts)
-  Work together in small groups, share materials, help each other, discuss results. (Religion)
-  Listen to a story about a famous scientist and find out what he/she noticed that led to a discovery. (Social Studies)

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**Science:**

- S2.1 Connect concepts and skills learned in science with their responsibilities as Catholics towards all of Creation
- S2.2 Make observations, ask questions, and form a hypothesis about objects, organisms, and the environment
- S2.3 Gather information, make predictions base on observed patterns and represent the data in graphs and charts
- S2.4 Read and write about science and the world using books and technology
- S2.5 Use their senses and standard tools to measure and describe physical properties of matter
- S2.6 Articulate their observations of the natural world and formulate conclusions
- S2.7 Explore and describe the interconnectedness of organisms and their environments
- S2.8 Use technology resources to conduct research, demonstrate creative and critical thinking, and communicate and work collaboratively.
- S2.9 Increase natural curiosity about and observation of the world
- S2.10 Work independently and collaboratively in an inquiry-based learning environment that encourages finding creative solutions to authentic and complex problems.
- S2.11 Recognize and understand that God calls each of us to take personal responsibility to care for the world and as the precious gift He has entrusted to us.

**Health & Wellness:**

- S2.12 Identify and demonstrate health promotion and disease prevention concepts.
- S2.13 Access and utilize valid health information and health promoting products and services.
- S2.14 Practice behaviors that promote health and reduce health risks.
- S2.15 Analyze the influence of culture, media, technology, and other actors on health.
- S2.16 Utilize social and communication skills to enhance health.
- S2.17 Use goal-setting and decision-making skills to enhance health.
- S2.18 Advocate for personal, family, and community health and wellness.

**TEACHING AND LEARNING WITH TECHNOLOGY IN GRADES K-2 SCIENCE CLASSROOM**

- ☐ Compare, contrast, and classify various areas of study (e.g. humans, animals, habitats, etc.) using digital resources (e.g. charts, graphs, etc.).
- ☐ Discuss benefits and challenges of digital media.
- ☐ Use a digital camera and video recording material to “capture” the world of forces and motion
- ☐ Work independently and collaboratively to create digital representations of the relationship between states/phases of matter.
- ☐ Google images or other online resources of different rock formations and other physical features of the Earth. Present findings in a digital photo journal.
- ☐ Engage in the research process to conduct an in-depth study of a science topic of interest (e.g. research earthquakes of recent times and chart changes brought to the Earth’s surface).
- ☐ Discuss ways technology can impact health.
- ☐ Use digital charts or graphs to record observations of plant growth; discuss how they can take care of God’s creations.

## **PHYSICAL SCIENCE**

### **UNIT 1: Matter & Magnets**

#### **To describe differences in the physical properties of solids and liquids**

The student will:

1. Describe and classify objects according to their state of matter (solid, liquid, or gas)
2. Design an investigation to determine the factors that affect evaporation
3. Identify condensation, evaporation, melting and freezing of water
4. Describe the transformation of one state of matter to another
5. List the uses of water at home and in school

#### **To investigate and show how natural and artificial magnets have certain kinds of characteristics and attract specific types of metal.**

The student will:

1. Identify, observe, record and discuss the behavior of magnets
2. Predict and test magnetic behavior with iron bearing and non-iron bearing materials
3. Compare natural magnet with artificial ones
4. Conduct an investigation to determine how the different poles of magnets react to the poles of other magnets
5. Identify the applications of magnets in life
6. Create new applications for magnets
7. Use magnetic compasses to determine the directions of north and south poles

## **UNIT 1: Health & Wellness**

#### **To know major body organs (heart, lungs, stomach, brain).**

#### **To know basic information about teeth.**

The students will:

1. Trace body outline and label major organs
2. Draw and describe function of teeth
3. Summarize the difference between primary and secondary teeth

#### **To identify common causes of conflict among children. (*Can be integrated in Family Life*)**

The students will:

1. Brainstorm and list possible causes for conflict
2. Brainstorm and list ways to promote positive relationships (active listening, taking turns, sharing, following rules, etc.)

#### **To practice methods to cope with stress.**

The students will:

1. Distinguish between verbal and nonverbal communication
2. Identify, list, and role play good listening skills
3. Identify, list, and role play healthy and appropriate ways to express needs, wants, and emotions.

## **PHYSICAL SCIENCE**

### **UNIT 2: Energy & Mass**

#### **To measure and compare the sizes and weights of different objects and organisms using standard and non-standard measuring tools.**

The student will:

1. Use metric units to measure the physical characteristics of various objects
2. Distinguish between mass and weight of objects
3. Identify, observe, record, and discuss the behavior of magnets

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**To investigate forms of energy.**

The student will:

1. Explain the characteristics of sound (reflection, absorption, intensity, and pitch)
2. Explain how heat energy affects an object's state of matter
3. Manipulate objects to illustrate how they can reflect, absorb, block, or allow light to pass through

**UNIT 2: Health & Wellness****To know behaviors that help a person stay healthy.**

The students will:

1. Describe how medical checkups (dental and physical) keep a person healthy
2. Describe how a healthy diet can protect against certain diseases/conditions
3. Explain ways germs can be passed from one person to another
4. Describe basic hygiene practices that prevent/control diseases
5. Demonstrate proper hand washing
6. Name the basic food groups and select foods from each group
7. Explain how physical activity promotes good health

**To practice behaviors that protect personal safety.**

The students will:

1. List dangerous substances/situations and how to avoid them i.e., poisonous household products, weapons, unprotected swimming areas, not wearing a seat belt or bicycle helmet, etc.
2. Describe protection from the sun and the cold and various types of weather

**EARTH & SPACE SCIENCE****UNIT 3: Weather, Soil****To discover and describe the varied physical properties which make earth materials useful in different ways.**

The student will:

1. Describe soils by their particle size, color, composition, texture and capacity to retain water
2. Sort different soils by properties, such as particle size, color, and composition
3. Relate the properties of different soils to their capacity to retain water and support the growth of certain plants
4. Read seed packets and select appropriate plants for a given type
5. Identify bodies of water on a map
6. Observe and record the effects of colored water on celery
7. Create and label a water cycle chart

**To investigate and understand basic types, changes and patterns of weather.**

The student will:

1. Observe and record daily weather over time
2. Predict weather based on data collections
3. Use clouds to predict weather
4. Observe and record animal behavior related to weather
4. Create charts and/or graphs of weather-related data
5. Use a thermometer, record temperature changes, and graph seasonal variations

**UNIT 3: Health & Wellness****To know the difference between helpful and not helpful medicines.**

The students will:

1. Recognize that medication is taken for illnesses and given by a trusted adult
2. Distinguish between medicine and "street drugs"
3. Identify people who can provide good health information

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**To practice good personal health habits.**

The students will:

1. Describe/demonstrate washing hands, brushing/flossing teeth, choosing healthy foods, exercise

**Write a grade-appropriate research paper on a health issue that affects their age group.**

**LIFE SCIENCE**

**UNIT 4: Nutrition, Life Cycles**

**To investigate and describe the orderly life cycles of plants and animals**

The student will:

1. Use senses to make observations
2. List what plants need to live
3. Describe, sort and classify plants according to physical properties
4. Explore and describe the effects of light and water on seed germination and plant growth
5. Describe the main parts of plants and what they do
6. Describe how seeds are scattered
7. Describe how light and water affect seed germination
8. Observe and describe the life cycles of flowering plants from germination to seed dispersal
9. Dramatize how humans use plants
10. Describe how all organisms depend on green plants to survive
11. List what organisms need to survive (food, water, air, habitat, and the ability to adapt to environment)
12. Compare and contrast different animals
13. Compare and contrast different habitats of animals
14. Compare and contrast animals and human beings
15. Describe how animals grow and change in different ways
16. Describe the defining characteristics of birds, fish, insects and mammals
17. Create prayers the celebrate the gift of creation
18. List ways in which students take responsibility for living things as stewards of the earth
19. Compare and contrast two organisms that have distinct life cycles (i.e., moth and frog)
20. List animals whose young resemble their parents from birth to maturity

**To describe the nutritional needs of humans including the essential components of balanced nutrition.**

The student will

1. Identify the sources of common foods and classify them by food group
2. Describe how diverse cultures use different food sources to meet their nutritional needs

**UNIT 4: Health & Wellness**

**To understand the effects of media on health.**

The students will:

1. Collect samples of food ads and analyze and discuss how they influence our thinking
2. Discuss how advertising promotes images of health
3. Discuss how certain products improve health (i.e. sunscreen, safety equipment, new advances in medication, etc.)



**To distinguish the differences between safe and risky behaviors.**

The students will:

1. List safe actions; List risky actions
2. Describe how personal decisions about behaviors affect oneself and others
3. Emphasize need to make one's own decisions as opposed to following a group or crowd or popular opinion, etc.

### **Suggested Cross Curricular Connections and Catholic Social Teaching Links**

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-  Students write life stories from the point of view of a frog going through its life cycle. (Science, Language Arts)
-  Students write poems and prayers about the miracle of growth and life. (Science, Religion, Language Arts)

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### **Science**

- S3.1 Connect concepts and skills learned in science with their responsibilities as Catholics towards all of creation
- S3.2 Work independently and collaboratively in an inquiry-based learning environment that encourages finding creative solutions to authentic and complex problems.
- S3.3 Apply the skills of scientific literacy: speaking, listening, presenting, interpreting, reading, and writing about science
- S3.4 Select and utilize appropriate mathematical tools for working with data
- S3.5 Use technology resources to conduct research, demonstrate creative and critical thinking, and communicate and work collaboratively.
- S3.6 Explore how the properties of matter change and how various substances can be separated by using those properties
- S3.7 Explore the power of water in relation to conservation, life, and the water cycle
- S3.8 Investigate and evaluate how people use renewable and non-renewable resources and to discuss different methods of conserving those resources
- S3.9 Recognize that God has entrusted to all human beings responsibility for the world and all its creatures.

### **Health & Wellness**

- S3.10 Identify and demonstrate health promotion and disease prevention concepts.
- S3.11 Access and utilize valid health information and health promoting products and services.
- S3.12 Practice behaviors that promote health and reduce health risks.
- S3.13 Analyze the influence of culture, media, technology, and other actors on health.
- S3.14 Utilize social and communication skills to enhance health.
- S3.15 Use goal-setting and decision-making skills to enhance health.
- S3.16 Advocate for personal, family, and community health and wellness

### **TEACHING AND LEARNING WITH TECHNOLOGY IN GRADES 3-5 SCIENCE CLASSROOM**

- ☐ Compare, contrast, and classify using digital resources and tools
- ☐ Locate digital resources and other media sources that provide reliable, accurate health information
- ☐ Provide a digital camera and video recording material to “capture” the world of forces and motion
- ☐ Work independently and in groups collaboratively to create visual representations of data e.g., charts that show the relationship between states/phases of matter
- ☐ Work independently and in groups collaboratively to create a hypothesis, predict, test, and digitally chart results e.g., chart which objects in a group of objects will stick to a magnet
- ☐ Discuss and describe how the Internet, television, magazines, newspapers, etc., affect health knowledge, choices, and behavior; how does this reflect Catholic social teachings
- ☐ Use digital resources and devices to research a relevant topic of interest as connected to curriculum e.g., research earthquakes of recent times and chart changes brought to the Earth’s surface
- ☐ Discuss ways technology can impact health
- ☐ Critically evaluate, and analyze how print media, broadcast media, and Internet technology influence perceptions of health information.
- ☐ Utilize online simulations as associated with science topics and units of study

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## **PHYSICAL SCIENCE**

### **UNIT 3.1: Energy & Matter**

**To sort and classify materials based on properties such as dissolving in water, sinking and floating, conducting heat, and attracting to magnets.**

The student will:

1. Use appropriate measuring tools to demonstrate and determine mass and volume
2. Use senses to determine physical properties of objects, such as conductivity and attraction to magnets
3. Explain how properties of materials (particle size, magnetism, sinking/floating) can be used to separate mixtures to their components

**To demonstrate the different ways energy changes to other forms.**

The student will:

1. List source of energy (heat, light, sound, electrical, kinetic)
2. Describe how energy can change from one form to another (kinetic to potential, heat to light, etc.)
3. Demonstrate friction between objects
4. Identify the force at work when a child swings back and forth on a swing
5. Demonstrate how a battery works
6. Identify food sources of energy

**To describe the effect of heating on the melting, evaporation, condensation and freezing of water.**

**The student will:**

1. Draw a water molecule and identify the structures
2. Describe the relationship between states and phases of matter
3. Explore the properties of water in solid, liquid, and gas states
4. Describe the effect of heating and cooling on water properties

### **UNIT 3.1: Health & Wellness**

**To know the benefits of nutrition and physical fitness.**

The students will:

1. Describe food combinations that make up a balanced diet based on nutritional content
2. Describe the health benefits of physical activity and physical fitness

**To know ways that ensure personal safety.**

The students will:

1. Compare and contrast safe and harmful behaviors (use charts, graphs, etc.)
2. Distinguish between good/bad touch
3. Weapon safety
4. Explain and demonstrate how to escape from a fire
5. Demonstrate and practice appropriate participation in a fire drill and lock down protocol
6. Describe the effects of bullying and peer pressure
7. Distinguish between positive and negative peer pressure
8. List ways to solve conflicts peacefully
9. Tell what to do in an emergency
10. Set personal goals for good health
11. Develop a class project to make the classroom/playground safe

### **UNIT 3.2: Simple Machines**

**To describe how simple machines assist work.**

1. Identify the concept of “work”
2. Describe and demonstrate how the motion of objects can be changed by pushing or pulling
3. List the six simple machines and demonstrate everyday uses



### **UNIT 3.2: Health & Wellness**

#### **To know six body systems**

The students will:

1. Accurately label a line drawing of the body locating and naming the circulatory, respiratory, nervous, skeletal, muscular systems

#### **To know appropriate ways to gather and access health information.**

The students will:

1. Demonstrate identifying and using health-related publications from home and school
2. Identify appropriate health services and agencies to gain information
3. List people who positively influence health behavior
4. Locate and identify local school and community health helpers
5. Identify positive and negative effects of advertising
6. List electronic and other media sources that provide reliable, accurate health information

#### **Write a grade-appropriate research paper on a health issue that affects their age group.**

### **EARTH & SPACE SCIENCE**

#### **UNIT 3.3: Conservation, Rocks**

#### **To describe how earth materials can be conserved by reducing the quantities used, and by reusing and recycling materials rather than discarding them.**

The student will:

1. Understand the need for protecting resources that cannot be replaced
2. Describe how the disappearance or extinction of one plant or animal species threatens others
3. Identify the natural resources that can and cannot be recycled
4. List some of the effects of environmental changes on plants and animals

#### **To relate the properties of rocks to the possible environmental conditions during their formation.**

The student will:

1. Diagram and explain the rock cycle
2. Demonstrate the processes of weathering and erosion
3. Describe the different ways that some materials can be conserved
4. Explain why people need to protect Earth's resources
5. Compare and contrast the forces in nature (volcanoes, tornadoes, floods, etc.) on different rocks
7. Explore the properties of water and how it moves through different types of earth materials

### **UNIT 3.3: Health & Wellness**

#### **To know, understand, and apply conflict resolution skills**

The students will:

1. Use role playing to demonstrate and implement positive conflict resolution techniques
2. Discuss ways to cope with conflict
3. Discuss Christian interactions with family, peers, and other individuals
4. Apply conflict resolution strategies to scenarios

#### **To explain how customs and traditions may impact community health decisions.**

The students will:

1. List way people are different and alike
2. Describe how common foods are used in different cultures (rice, corn, meat)
3. Celebrate multi-cultural customs and traditions
4. Explain religious and non-religious celebrations and traditions problems/issues

### **LIFE SCIENCE**

### UNIT 3.4: Plants & Animals

**To describe how different plants and animals are adapted to obtain air, water, food and protection in specific land and water habitats.**

The student will:

1. Define and identify the classes of organisms
2. Describe the different types of habitats in which organisms live
3. Compare different plant and animal ecosystems
4. Explain how organisms adapt to their environments, get food, and live together
5. Describe the relationship between a predator and a prey
6. Know the difference between a food chain and a food web
7. Identify the parts of a plant
8. Describe the functions of roots, stems, and leaves
9. Know what flowers and cones do
10. Illustrate how plants grow from seeds
11. Understand the relationship between light and the growth of plants

### UNIT 3.4: Health & Wellness

**To know drugs can be helpful or harmful.**

The students will:

1. State the difference between “good” and “bad” drugs
2. Identify harmful effects of tobacco, alcohol, and other drugs

**To be able to identify the effect of media and technology on health**

The students will:

1. Describe how the TV, the Internet, magazines, newspapers, etc., affect health knowledge, choices, and behavior
2. State ways medical technology has improved over the years (i.e. audio visual, print, etc.)

**To know that environment can be improved.**

The students will:

1. Discuss how people can solve environmental problems that cause illness
2. List health problems that results from unhealthy environments: asthma, lead poisoning
3. Develop a class project that can help community environmental

### GRADE 3 Cross Curricular Connections & Catholic Social Teaching Links

- ✚ Students listing ways their communities can use renewable and non-renewable resources wisely. (Science, Religion, Social Studies)
- ✚ Students write a story based on why God wants us to be stewards (protectors) of our planet Earth, and relate this to how all living things (organisms) have a special role to play in the ecosystems around them. (Science, Language Arts, Religion)
- ✚ Prepare a storyboard (a series of cartoon-like illustrations) on a topic related to a “good neighbor’s or “a whole community’s responsibility to recycle, preserve wildlife habitats, etc.
- ✚ Students write a story about how we are responsible for taking care of planet Earth and develop two different endings – one in which we protect our natural resources and one in which we do not.
- ✚ Students visit a community resource such as a park or natural habitat; find examples that show evidence of caring for the environment and present visual displays of their findings.

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### **Science**

- S4.1 Connect concepts and skills learned in science with their responsibilities as Catholics towards all of Creation
- S4.2 Make observations, ask questions, and form a hypothesis about objects, organisms, and the environment; gather data to prove or disprove hypothesis
- S4.3 Gather information, make predictions base on observed patterns and represent the data in graphs and charts (text or electronic)
- S4.4 Read and write about science and the world using books and technology
- S4.5 Use their senses and standard tools to measure and describe physical properties of matter
- S4.6 Articulate their observations of the natural world
- S4.7 Explore and describe the interconnectedness of organisms and their environments
- S4.8 Use technology resources to conduct research, demonstrate creative and critical thinking, and communicate and work collaboratively.
- S4.9 Increase natural curiosity about and observation of the world
- S4.10 Work independently and collaboratively in an inquiry-based learning environment that encourages finding creative solutions to authentic and complex problems.
- S4.11 Understand that God calls us to care for the world and all His creations
- S4.12 Understand their responsibility to take care of their own physical and spiritual well being

### **Health & Wellness**

- S4.13 Identify and demonstrate health promotion and disease prevention concepts.
- S4.14 Access and utilize valid health information and health promoting products and services.
- S4.15 Practice behaviors that promote health and reduce health risks.
- S4.16 Analyze the influence of culture, media, technology, and other actors on health.
- S4.17 Utilize social and communication skills to enhance health.
- S4.18 Use goal-setting and decision-making skills to enhance health.
- S4.19 Advocate for personal, family, and community health and wellness.

### **TEACHING AND LEARNING WITH TECHNOLOGY IN GRADES 3-5 SCIENCE CLASSROOM**

- ☐ Compare, contrast, and classify using digital resources and tools
- ☐ Locate digital resources and other media sources that provide reliable, accurate health information
- ☐ Provide a digital camera and video recording material to “capture” the world of forces and motion
- ☐ Work independently and in groups collaboratively to create visual representations of data e.g., charts that show the relationship between states/phases of matter
- ☐ Work independently and in groups collaboratively to create a hypothesis, predict, test, and digitally chart results e.g., chart which objects in a group of objects will stick to a magnet
- ☐ Discuss and describe how the Internet, television, magazines, newspapers, etc., affect health knowledge, choices, and behavior; how does this reflect Catholic social teachings
- ☐ Use digital resources and devices to research a relevant topic of interest as connected to curriculum e.g., research earthquakes of recent times and chart changes brought to the Earth’s surface
- ☐ Discuss ways technology can impact health
- ☐ Critically evaluate, and analyze how print media, broadcast media, and Internet technology influence perceptions of health information.
- ☐ Utilize online simulations as associated with science topics and units of study

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## **PHYSICAL SCIENCE**

### **UNIT 4.1: Matter, Motion, Mass**

**To describe objects as being made of matter and having energy and other properties.**

The student will:

1. Observe and record properties of matter to determine what substances are made of
2. Demonstrate changes in matter
3. Identify mixtures and give examples
4. Explore the effects of static electricity

**To describe the effects of the strengths of pushes and pulls on the motion of objects.**

The student will:

1. Identify gravity as the force that pulls objects on Earth towards its center
2. Demonstrate gravity
3. Demonstrate the push and pull of magnets as applied to Newton's Laws
4. Identify the force at work when a child swings back on a swing set
5. Demonstrate that work is accomplished when a force moves an object through a distance in the same direction as the force

**To describe the effect of the mass of an object on its motion.**

The student will:

1. Measure and calculate the mass, volume and density of various objects when force is applied, building on Newton's Laws

### **UNIT 4.1: Health & Wellness**

**To know the basic function of six body functions.**

The students will:

1. Diagram and label body systems: circulatory, respiratory, digestive, nervous, skeletal, muscular  
(*Can carry over into 5<sup>th</sup> grade*)
2. Describe the basic functions of the above mentioned systems

**To know the effect of diet on health**

The students will:

1. Explain the nutrients needed for proper brain function (i.e., breakfast)
2. Explain the effects of malnutrition
3. Identify the six major nutrients in food eaten the previous day: carbohydrates, proteins, fats, water, minerals, vitamins
4. Explain how nutrition needs change with growth and development
5. Describe effects of good nutrition on teeth
6. Bring in menus (from fast food, other restaurants or from Internet) and food labels to class to discuss nutrition information found

## **EARTH & SPACE SCIENCE**

### **UNIT 4.2: Water Cycle**

**To describe how the sun's energy impacts the water cycle**

The student will:

1. Diagram and label the three layers of the Earth
2. Research earthquakes of recent times and chart changes brought to the Earth's surface
3. Create a model of erosion
4. Find and label examples of three basic types of rocks
5. Write a story about life under the sea including terms from the vocabulary list

6. Look up a grocery advertisement and find several products that come from the ocean
7. Create a model of erosion (virtual or physical)
8. Draw pictures of our solar system and all its features and label them
9. Name the seasons and illustrate where the Earth is in relationship to the sun for each of the seasons
10. Take photos of the same beach at different tide levels and discuss the changes observed
11. Draw a diagram of the four layers of our Earth's atmosphere
12. Identify the parts of the water cycle
13. Explain why the relative humidity of air is important to the water cycle
14. Identify the features found on the ocean floor
15. Explain the interaction between ocean currents and waves

#### **UNIT 4.2: Health & Wellness**

##### **To know how specific behaviors affect health.**

The students will:

1. Name 2 specific behaviors and their effect on health (i.e., hand washing, brushing/flossing, too little sleep, insufficient exercise, etc.)
2. Describe and role play personal hygiene
3. Name ways to prevent the spread of germs
4. Identify the difference between communicable diseases and non-communicable diseases
5. Explain the effect of regular physical exercise on personal health

##### **To dialogue about the implications of peer pressure.**

The students will:

1. Explain how peer pressure can affect a person's emotional and physical health

#### **Write a grade-appropriate research paper on a health issue that affects their age group.**

#### **PHYSICAL SCIENCE**

#### **UNIT 4.3: Energy**

##### **To identify the basic forms of energy (light, sound, heat, electrical and magnetic) and recognize that energy is the ability to force motion or cause change.**

The student will:

1. Describe light patterns and changes in mirrors, lenses, prisms and other reflective surfaces
2. Explain how light is energy
3. Demonstrate how sound is a form of energy
4. Demonstrate how the medium through which it travels affects the speed of sound
5. Demonstrate that sound can make things move (Build a simple drum and bounce paper bits or peppercorns on it.)
6. Demonstrate differences in pitch (i.e., using glasses filled to different heights and tap with a spoon)
7. Define and demonstrate pitch or frequency, vibrations and amplitude of vibration
8. Describe what determines the volume of sound
9. Describe the effects of noise pollution and construct a plan to reduce and protect oneself from noise pollution
10. Demonstrate heat transfer from one object to another
11. Explain that electricity is the flow of electrons
12. Describe the two forms of electricity: static and current
13. Demonstrate that an electronic current will produce a magnetic field and a moving magnetic field will produce an electric current
14. Describe electronic currents
15. Describe heat as energy
16. Demonstrate the transference of heat from warmer to cooler objects
17. Identify sources of energy used throughout the world
18. Explain the need to balance procuring energy with the responsibility to protect God's creation

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19. Design protective gear for coal, oil, electrical, and nuclear workers and evaluate for effectiveness
  20. Demonstrate a simple motor
  21. Describe the effects of an oil spill in the environment when energy sources are not handled properly

**To describe and demonstrate how electric and magnetic energy can be transferred and transformed.**

The student will:

1. Describe how batteries and wires can transfer energy to light a light bulb
2. Explain how simple electrical circuits can be used to determine which materials conduct electricity
3. Describe the properties of magnets and how they can be used to identify and separate mixtures of solid materials

#### **UNIT 4.3: Health & Wellness**

**To know how to identify, access, and use good health resources for information.**

The students will:

1. List specific characteristics of useful health information
2. Discuss how TV and other advertising promote smoking and alcohol use
3. Identify and compare and contrast health care agencies, printed material, broadcast media, Internet, other audiovisual materials
4. Identify accurate and inaccurate health information
5. Discuss how media can influence health behaviors
6. Discuss ways technology can positively impact health

**To know that specific behaviors can protect health and safety.**

The students will:

1. Develop a home safety and emergency response plan for fire, medical emergencies; get feedback/sign-off from parents
2. State ways to get help on an emergency at home, in school, in the community
3. Describe bicycle safety rules and ways to prevent injuries
4. Demonstrate basic first aid i.e., your friend falls from his bike, your brother is bitten by a bee, your sister falls from the monkey bars, etc.

#### **LIFE SCIENCE**

##### **UNIT 4.4: Plants & Animals, Organisms & Habitats**

**To describe how animals, directly or indirectly depend on plants to provide the food and energy they need in order to grow and survive**

The student will:

1. Explain how plants are grouped
2. Identify and illustrate the parts of the flower
3. Discuss how flowers make seeds and fruits
4. Outline the life cycle of a flowering plant
5. Explore animal characteristics
6. Analyze the similarities and differences of animals
7. Discuss how organisms obtain energy

**To describe how natural phenomena and some human activities may cause changes into habitats and their inhabitants.**

The student will:

1. Classify animals with backbones
2. Observe how animals respond to stimuli
3. Explore how animals hide
4. Describe the difference between inherited traits and learned behaviors of organisms
5. Outline what structures and behaviors help organisms survive

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6. Discuss how changes in the environment affect survival
  7. Define and describe various ecosystems
  8. Compare food chains and food webs (use charts, graphs, etc.)

#### **UNIT 4.4: Health & Wellness**

**To describe and evaluate the effects of alcohol, inhalants, tobacco, and drug use on self, family, and community.**

The students will:

1. Identify and list the impact on self, family, community
2. Explain the long-term consequences of drug use
3. Discuss effect of tobacco and alcohol on body
4. Relay laws related to illegal alcohol and tobacco use
5. List harmful effects of illegal drugs and the impact on community
6. Describe the use/abuse of prescription and over-the-counter medications
7. Describe the difference between medicine and illegal drugs


#### **To demonstrate diverse communication techniques**

The students will:

1. Demonstrate appropriate communication with a person who has a speech impairment/defect, a person who is hard of hearing or deaf, a person who does not speak English
2. Create a health message to share with others/community
3. Demonstrate nonviolent conflict resolution
4. Identify obstacles and solutions to communication
5. State how to access assistance from a trusted adult when in unsafe or uncomfortable situations

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#### **Cross Curricular Connections & Catholic Social Teaching Links**

-  Students will write essays explaining how and why we need to balance our use of energy with our responsibility to protect God's creation. (Religion, Science, Social Studies, Language Arts)

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### **Science**

- S5.1 Connect concepts and skills learned in science with their responsibilities as Catholics towards all of Creation
- S5.2 Make observations and ask questions about objects, organisms, and the environment
- S5.3 Gather information, make predictions base on observed patterns and represent the data in graphs and charts (text or electronic)
- S5.4 Read and write about science and the world using books and technology
- S5.5 Use their senses and standard tools to measure and describe physical properties of matter
- S5.6 Articulate their observations of the natural world
- S5.7 Explore and describe the interconnectedness of organisms and their environments
- S5.8 Use technology resources to conduct research, demonstrate creative and critical thinking, and communicate and work collaboratively.
- S5.9 Increase natural curiosity about and observation of the world
- S5.10 Work independently and collaboratively in an inquiry-based learning environment that encourages finding creative solutions to authentic and complex problems.
- S5.11 Recognize that God has entrusted to all human beings responsibility for the world and all its creatures
- S5.12 Understand their responsibility to take care of their own physical and spiritual well being

### **Health & Wellness**

- S5.13 Identify and demonstrate health promotion and disease prevention concepts.
- S5.14 Access and utilize valid health information and health promoting products and services.
- S5.15 Practice behaviors that promote health and reduce health risks.
- S5.16 Analyze the influence of culture, media, technology, and other actors on health.
- S5.17 Utilize social and communication skills to enhance health.
- S5.18 Use goal-setting and decision-making skills to enhance health.
- S5.19 Advocate for personal, family, and community health and wellness.

### **TEACHING AND LEARNING WITH TECHNOLOGY IN GRADES 3-5 SCIENCE CLASSROOM**

- ☐ Compare, contrast, and classify using digital resources and tools
- ☐ Locate digital resources and other media sources that provide reliable, accurate health information
- ☐ Provide a digital camera and video recording material to “capture” the world of forces and motion
- ☐ Work independently and in groups collaboratively to create visual representations of data e.g., charts that show the relationship between states/phases of matter
- ☐ Work independently and in groups collaboratively to create a hypothesis, predict, test, and digitally chart results e.g., chart which objects in a group of objects will stick to a magnet
- ☐ Discuss and describe how the Internet, television, magazines, newspapers, etc., affect health knowledge, choices, and behavior; how does this reflect Catholic social teachings
- ☐ Use digital resources and devices to research a relevant topic of interest as connected to curriculum e.g., research earthquakes of recent times and chart changes brought to the Earth’s surface
- ☐ Discuss ways technology can impact health
- ☐ Critically evaluate, and analyze how print media, broadcast media, and Internet technology influence perceptions of health information.
- ☐ Utilize online simulations as associated with science topics and units of study



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## **LIFE SCIENCE**

### **UNIT 5.1 Organisms and Their Survival**

**To describe how organisms are structured to ensure efficiency and survival.**

The students will:

**A. CELLS:**

1. Understand that the basic unit of all life is the cell
2. Identify and explain the differences between animal and plant cells
3. Describe the functions of cells and cell parts
4. Explain why cells require energy
5. Illustrate how cells get energy from food and how some make food

**B. BODY SYSTEMS:**

6. Describe the ways that cells work together
7. Identify animal tissues and describe how they function in an organism
8. Classify and explain the interaction between common tissues found in plants and in animals
9. Describe how tissues function and contribute to the survival of an organism
10. Define and explain the functions of animal and plant organs
11. Know that organs are made up of several different types of tissues that work together to do a specific job
12. Identify and describe the major organ systems in plants and animals: circulatory, skeletal, nervous, and transport

**C. SURVIVAL:**

13. Explain how all living and nonliving things interact with their environment
14. Explain how organisms survive in different environments according to their ability to adapt

**Supplemental:**

15. Describe how light absorption and reflection allow one to see the shapes and colors of objects
16. Describe the structure and function of the human senses and the signals they perceive
17. Compare and contrast the structures of the human eye with those of the camera (use charts, graphs, etc.)
18. Describe the uses of different instruments, such as eye glasses, magnifier, periscopes and telescopes, to enhance our vision

### **UNIT 5.1: Health & Wellness**

**To communicate the value of exercise and activity for a healthy lifestyle.**

The students will:

1. Examine cause and effect of healthy active life and inactivity
2. Differentiate between health-related and skill-related physical activities
3. Discuss strategies for managing stress and importance of exercise and recreational activities
4. Identify the effects of physical activity on cardiovascular system
5. Discuss the importance of developing and maintaining a positive self-image
6. Know how to check heart and respiratory rates before and after exercise

**To discuss and state causes and prevention of certain infectious diseases.**

The students will:

7. Relate hygiene practices and immunizations to the prevention of common infectious diseases
8. Discuss how polio has been controlled in the U.S. and other parts of the world, and where it still occurs today
9. Name respiratory infectious diseases caused by viruses and by bacteria and how they can be prevented and treated

**To define and apply ways to maintain health. *(on-going all year)***

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The students will:

1. Design a daily menu using current USDA recommendations to make healthy food choices
2. Track and graph hours of sleep for a week or two weeks
3. Discuss in small groups ways to manage stress and anger; share with whole group

**To explain how peers, family, and community groups work together to build a healthy community. (on-going all year)**

The students will:

1. List various pollutants and how they enter and affect the environment
2. Identify actions that protect the environment such as recycling, proper waste disposal, neighborhood clean-up days, etc.
3. Track waste at lunch and in the classroom; develop ways to reduce it
4. Describe the relationship between safe school/community and the students' health: role play ways to deal with bullying, develop recess rules to promote safety
5. Discuss sensitivity, respect, and celebration for Christian and non-Christian customs and traditions
6. Examine and promote the value of community health and wellness
7. Develop a community health project
8. Develop a class project whereby students actively volunteer in a service oriented project in the school, parish, and/or community
9. Promote idea of volunteerism and community service

## **PHYSICAL SCIENCE**

### **UNIT 5.2: Energy, Matter**

**To determine what the role of energy is in our world.**

The student will:

1. Recall from grade 4 the factors that affect the pitch and loudness of sound produced by vibrating objects; how sound is transmitted, reflected and/or absorbed by different materials; and how light is absorbed and/or reflected by different surfaces
2. Understand the importance of energy in all of its forms
3. Define and identify energy according to its function
4. Explain how the transfer of energy occurs
5. Describe the work of electricity

**Supplemental:**

6. Explain the use of fossil fuels and efficiency related to electricity
7. Define nuclear energy and research how it can be used today
8. Identify and describe alternative energy resources

**To identify physical and chemical properties of matter through observation and experimentation.**

The student will:

1. Describe and elaborate on the three states of matter (solid, liquid, gas)
2. Identify the physical and chemical properties of matter
3. Record and interpret observations of changes in the various states of matter through experimentation
4. Understand the difference between a physical change and a chemical change
5. Define a chemical reaction
6. Describe a mixture
7. Explain and illustrate/demonstrate the difference between a homogeneous and heterogeneous mixture
8. Describe a colloid
9. Understand that all matter is made up of atoms
10. Define element, and explain how to identify elements
11. Explain the relationship between compounds and molecules

12. Describe the structure of compounds, and explain how the elements of properties change when compounds are formed
13. Explain the classification of elements
14. Introduce basic concepts of the periodic table

## **UNIT 5.2: Health & Wellness**

**To define the effects of the integrated functioning and interrelationships of the body systems.**

The students will:

1. Differentiate and explain the relationship among cells, tissues, organs, systems, and organisms
2. Show interaction/relationship of various systems

**To critically evaluate, and analyze how print media, broadcast media, and Internet technology influence perceptions of health information.**

The students will:

1. Describe the effect of media on health-related behaviors such as dieting, eating disorders, use of acne medication
2. Discuss celebrities influence on hairstyles, clothing, body appearance, lifestyle choices, behavior
3. Discuss and evaluate strategies for validating health information
4. Distinguish between myth and fact related to illness and health

**Write a grade-appropriate research paper on a health issue that affects their age group.**

## **EARTH & SPACE SCIENCE**

### **UNIT 5.3: Energy**

**To describe how the position of Earth in the solar system affects conditions on our planet.**

The student will:

#### **A. ATMOSPHERE:**

1. Know the properties of air
2. Illustrate how changes in the air affect the weather
3. Explain how temperature changes with elevation
4. Define atmosphere, and label the different layers of Earth's atmosphere
5. Identify the atmosphere's chemical components
6. Describe how the sun warms the Earth and explain how the sun affects weather
7. Explain the difference between weather and climate
8. Describe how climate affects the weather
9. Define a weather front and its impact on weather and explain the relationship of humidity and air pressure to weather changes

#### **B. WEATHER:**

10. Describe how the different cloud formations are affected by water vapor and ice
11. Use different instruments (the anemometer, barometer, Beaufort scale) to measure the properties of air
12. List the types of severe weather and their causes
13. Explain where Earth's water is located

#### **C. WATER CYCLE**

14. Explain how water moves into the atmosphere from the Earth's surface and how water moves from the atmosphere to the Earth's surface
15. Identify the parts of the water cycle
16. Explain why the relative humidity of air is important to the water cycle
17. Identify the features found on the ocean floor
18. Explain the interaction between ocean currents and waves

#### **Supplemental:**

19. Explain how earthquakes happen and their results
20. Describe volcanoes and their effects on Earth

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21. Understand what causes change on beaches
  22. Compare and contrast the effects of erosion on mountains and other landforms (use charts, graphs, etc.)
  23. Explain how glaciers change landforms over time and describe the effects of such changes on the oceans of the Earth

### **UNIT 5.3: Health & Wellness**

**To identify changes that occur during puberty (Can be integrated with Family Life program).**

The students will:

1. Understand the importance of identifying physical and emotional changes that occur with puberty
2. List activities and interests of 5<sup>th</sup> grade boys and girls

**To know how to access, evaluate, analyze, and use media-related health information.**

The students will:

1. Analyze food labels and fast food menus for nutritional content
2. Convert grams of sugar listed on a soda can and convert to actual sugar
3. Discuss how food labels and advertising can be misleading
4. Describe where health information can be found
3. Discuss strategies for validating health information

## **EARTH SCIENCE**

### **UNIT 5.4: Moon, Natural Resources**

**To describe the monthly changes in the appearance of the moon based on the moon's orbit around the Earth.**

The student will:

1. Describe the phases of the moon
2. Describe the effects of the moon on Earth's tides
3. Explain how gravity affects the moon's atmosphere
4. Explain the revolution of the Earth and other planets around the sun
5. Explain how the rotation of Earth on its axis causes day and night
6. Know what makes up the solar system
7. Explain how gravity affects the Earth and the its atmosphere

**To describe how humans have the capacity to affect the quality of our life on Earth.**

The student will:

1. Describe how minerals and fossil fuels are formed
2. Understand the importance of conserving natural resources

### **UNIT 5.4: Health & Wellness**

**To analyze the risks of dependence and addiction associated with the use of alcohol, tobacco, inhalants, and other drugs on the systems of the body.**

The students will:

1. Explain short and long term effects of various risk behaviors: effect on academic performance, relationships with family, peers, and other individuals
2. Describe ways smoking harms the lungs
3. Identify and discuss alternatives to drug and substance use
4. Discuss strategies for avoiding drugs, weapons, gangs, violence

**To know diverse communication skills to maintain health and safety.**

The students will:

1. Relate communication skills to the social and emotional health of the individual and family
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2. List names and phone numbers of individuals or organizations that help a person stay healthy (doctor, church, community agencies, poison control, etc.)
  3. Develop and practice ways to say “no” to negative peer pressure
  4. Determine: “easy” or “hard” to say no to certain situations; what would make it easier
  5. Describe healthy and harmful peer influences
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*“What kind of world do we want to leave to those who come after us, to children who are now growing up?” (160). “This question does not have to do with the environment alone and in isolation; the issue cannot be approached piecemeal.”*

Laudato Si, Pope Francis

**CROSS-CURRICULAR CONNECTIONS: ENDURING UNDERSTANDINGS – Grades 4 & 5**

- Understand the processes of scientific inquiry and technological design to investigate questions, conduct experiments, and solve problems.
- Understand fundamental concepts, principles, and interconnections of the life, physical, and earth and space sciences.
- Understand the relationships among science, technology, and society in historical and contemporary contexts.

**Overarching Essential Questions:**

*What is the purpose of our life in this world?*

*What is the goal of our work and all our efforts?*

*What need does the earth have of us?*

**RELIGION**

Report on a recent natural disaster from around the world (e.g., tsunamis, earthquakes, volcanoes, mudslides). Find out how students in your school can help families affected by a natural disaster. Plan a way to help in a small way.

Discuss the importance of transporting some resources by Earth cycles.

Discuss what makes a test fair and the ethics involved in taking tests.

Discuss how evidence, observations, and logic are essential to scientific explanations, but not necessarily part of belief based explanations (e.g., you don't need to see God to believe in Him).

Outline the ethical constraints and considerations with the practice of cloning organisms.

Plan and hold a community service event; report to the class how it went and recommendations you have for future events.

**MATH**

List steps that need to be followed in solving a multi-step word problem.

Measure and graph weekly growth of a plant in and out of the sun.

View a given pattern and then reproduce it using pattern blocks (e.g., tangrams).

Use the guess and test method (i.e., guess and check) to solve word problems.

Use a statistic such as batting average as a criterion to compare individual players in a sport.

Solve word problems using repeated addition and multiplication and compare answers.

Create a graph of the results of the above activity for your entire class using many scenic pictures to determine the most common shape found in nature.

Estimate the height and weight of a zoo animal from observations; check your estimates by asking a zookeeper for information.

Use pattern blocks to see if you can reproduce the natural patterns.

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|-----------------------------------|--|
|                                   | <p>Study number sequences to identify patterns.</p> <p>Business: Hold a Market Day in which students sell handmade items that they have designed and constructed and for which they have developed a budget.</p> <p>Economics: Discuss the costs for a space-age bicycle (e.g., time to produce it, materials).</p> <p>Calculate the year in which the next three comets will appear.</p>  |
| <b>LANGUAGE ARTS</b>              | <p>Dissolve salt in water, put it in a sunny window, and record daily changes in a science journal.</p> <p>Discuss and generate a list of God-given talents. Discuss whether talent in music or art or sports is learned, inherited, or both.</p> <p>Write your own prediction of what might happen in a scientific investigation.</p> <p>Write about a plant growing without sun using information from your science investigations.</p> <p>Read a short story, list ten key events in the story, and arrange them in the proper sequence.</p> <p>Compare a written prediction with what actually happened in an investigation and discuss similarities and differences.</p> <p>Read a mystery novel and describe the evidence and logic that the author uses to solve the mystery</p> <p>Create a rubric that could be used to evaluate your work on a school project.</p> <p>Write a report on a simple scientific investigation that includes sections on the problem, prediction, procedure, data, analysis, revision, and conclusion. Divide the work to prepare the presentation among group members so that all take responsibility</p> <p>Create a survey (e.g., to determine students' favorite candy), ask students to complete the survey, and present the data using tables and graphs.</p> <p>Read and discuss an article in a science journal.</p> <p>Write a short detective story in which the main character uses distinctive evidence and logic to solve a crime.</p> <p>Orally share the detective stories you wrote and participate in a discussion of the strength of the evidence you created in the plot.</p> <p>Use a Venn Diagram to compare a space-age bicycle with a standard bicycle.</p> <p>Write about why a standard bicycle would not be effective in space.</p> |
| <b>SOCIAL STUDIES / GEOGRAPHY</b> | <p>Identify different human habitats and the environments in which they are used.</p> <p>Compare cultures around the world and discuss similarities and differences (e.g., how they live, their beliefs, games they play, work they do, clothes they wear).</p>  |

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|---------------------|--|
|                     | <p>Describe how early humans created fire and how harnessing fire changed their lives. Economics and Business: Find out how homes in your area are heated and where the energy comes from. Science: Explore other results of chemical reactions, such as luminosity (e.g., light sticks).</p> <p>Geography: Measure the depth of the Grand Canyon in kilometers from a photograph or map. Estimate how long it took the Colorado River to carve the canyon if the river erodes at expected rates of about 100 to 500 meters each million years.</p> <p>Use a world map (or consult internet seismology websites) to record volcano locations and recent earthquake sites. Discuss the financial effects on communities of earthquakes and volcanoes. Read a first-hand accounting of living through a volcanic eruption or an earthquake.</p> <p>Choose a famous American who is no longer alive and develop questions you would have liked to have asked the person.</p> <p>Read some writings from history that support ideas that are no longer acceptable (e.g., slavery, limited voting rights for some people, racial discrimination) and write a respectful rebuttal from your point of view.</p> <p>Draw a map of a part of your community including schools, houses, streets, shops, and parks.</p> <p>Read and study design challenges associated with the “Big Dig” project in Boston and/or the Yard Goat Stadium in Hartford.</p> <p>Take a field trip to the zoo, observe animals, and speak to zookeepers to collect information.</p> <p>Visit with a police officer to learn how evidence is collected to solve crimes.</p> <p>Identify times in history when people have tested ideas, revised and corrected errors, and tested again many times (e.g., airplane flight and the Wright brothers).</p> |
| <b>ART/SPECIALS</b> | <p>Art: Draw an extreme environment and an animal whose adaptation makes it possible for it to survive.</p> <p>Art: Make a diorama depicting plants and animals in their natural habitat. Language Arts: Write a poem to describe animal depicted in habitat diorama</p> <p>Music: Teach students the Water Cycle Song by Dr. Jean.<br/>Art: Use rock samples to create an illustration of the rock cycle.</p> <p>Physical Education: Rank sports teams according to their win and loss percentage.</p> <p>Art: Take an artistic or scenic picture and identify the shapes you see in the picture.</p> <p>Art: Make a scale drawing by measuring the object and using a calculator to compute scale measurements.</p> <p>Art: Observe and draw patterns in nature (e.g., patterns on a pineapple, patterns in leaf branching).<br/>Music: Investigate a new type of music and prepare an oral report for the class that includes a visual (e.g., picture, poster) and a sound clip.</p>  |



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|-------------------------------------|--|
|                                     | <p>Physical Education: Build a model of new, proposed playground equipment. Invite children to evaluate your playground model; have them test equipment if you have built life-sized models.</p> <p>Art: Draw a design for a space-age bicycle that might even be able to fly short distances.</p> <p>Physical Education: Run relay races, time each time, and analyze differences in time as a function of race distance; Math: Record times for each team and calculate the average speed and mean speed in kilometers per hour.</p> <p>Art: Make a 3-dimensional model of the solar system.</p>   |
| <b>TECHNOLOGY</b>                   | <p>Find out what kinds of technological tools are used by various professions (e.g., X-ray imaging by radiologists or dentists, GIS by surveyors or field scientists, digital cameras by photographers).</p> <p>Use the Internet to research and learn about recent scientific discoveries. Write a 2-page paper on a recent discovery in the medical sciences of interest to you.</p> <p>Use the Internet to research how NASA tests materials such as ceramics for use in space.</p> <p>Use Power Point or other presentation software and collaborative learning to prepare an oral report by a team.</p> <p>Research about comets and how scientists know when to expect to see them using the Internet</p> <p>Use a digital camera and a computer to create a slide show of patterns in nature.</p> <p>Create a web page to inform people of a recent accomplishment or class event.</p> <p>Use a digital thermometer to measure temperature and compare its use to that of an alcohol thermometer.</p>   |
| <b><u>Multi-curricula Unit:</u></b> | <p><b>Social Studies:</b> Investigate the building of the Leaning Tower of Pisa to identify why it leans and what people are doing about it;</p> <p><b>Language Arts:</b> Prepare a proposal describing what you would do to straighten the Leaning Tower of Pisa;</p> <p><b>Business:</b> Estimate the time it would take and cost of the materials needed to carry out your plan to straighten the Leaning Tower of Pisa;</p> <p><b>Art:</b> Examine layers in the Leaning Tower of Pisa, and use simple materials to build a replica;</p> <p><b>Math:</b> Measure the angular degree of correction that needs to be made to straighten the Leaning Tower of Pisa.</p> <p><b>Art:</b> Using the replica, make structural changes that straighten the Leaning Tower of Pisa.</p> <p><b>Language Arts:</b> Give an oral explanation of your procedure including a sequence of steps you took to straighten the tower.</p> <p><b>Business:</b> Prepare a budget showing actual costs versus estimated costs for straightening the Leaning Tower of Pisa.</p> <p><b>Physical Education:</b> Test to see if a straight line is the shortest distance between two objects by running along a straight path to a location and along a curved path to the same location; count the number of paces and measure the time.</p> |

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**EARTH & SPACE SCIENCE**

- ES6.1 Connect concepts and skills learned in science with their responsibilities as Catholics towards all of Creation
- ES6.2 Make observations and ask questions about objects, organisms, and the environment
- ES6.3 Gather information, make predictions base on observed patterns and represent the data in graphs and charts (text or electronic)
- ES6.4 Use their senses and standard tools to measure and describe physical properties of matter
- ES6.5 Articulate their observations of the natural world
- ES6.6 Explore and describe the interconnectedness of organisms and their environments
- ES6.7 Use technology resources to conduct research, demonstrate creative and critical thinking, and communicate and work collaboratively.
- ES6.8 Increase natural curiosity about and observation of the world
- ES6.9 Work independently and collaboratively in an inquiry-based learning environment that encourages finding creative solutions to authentic and complex problems.
- ES6.10 Recognize that God has entrusted to all human beings responsibility for the world and all its creatures
- ES6.11 Understand their responsibility to take care of their own physical and spiritual well being
- ES6.12 Apply scientific method to a practical problem in the form of a lab report.

**Health & Wellness:**

- ES6.13 Identify and demonstrate health promotion and disease prevention concepts.
- ES6.14 Access and utilize valid health information and health promoting products and services.
- ES6.15 Practice behaviors that promote health and reduce health risks.
- ES6.16 Analyze the influence of culture, media, technology, and other actors on health.
- ES6.17 Utilize social and communication skills to enhance health.
- ES6.18 Use goal-setting and decision-making skills to enhance health.
- ES6.19 Advocate for personal, family, and community health and wellness.

**INTEGRATING TECHNOLOGY IN GRADES 6-8 SCIENCE CLASSROOM**

- ☐ Use digital resources to analyze, compare, contrast and classify various relevant content specific units of study including but not limited to:
    - The Arctic region versus the Antarctic region
    - \_\_\_\_\_ bodies that orbit the sun
    - how weathering and erosion create and shape valleys and floodplains
    - modern environments dominated by mammals with Mesozoic environments dominated by large reptiles
    - positive versus negative peer pressure as related to health and safety
  - ☐ Create digital graphs describing the inequality of the consumption of the world's resources and design service projects that address local and global injustice
  - ☐ Identify environmental resources and determine means to apply Catholic social teaching to practices of conservation.
  - ☐ Research online sources and explain the need to balance procuring energy with the responsibility to protect God's creations.
  - ☐ Research and examine how technology allows astronomers' to study space from the Earth as well as space
  - ☐ Visit websites for international research organizations (e.g., National Oceanic and Atmospheric Administration, etc.) to view images and learn about the atmosphere and hydrosphere
  - ☐ Visit web sites showing recent images of the photosphere of the sun
  - ☐ Identify various media and technologies that influence health
  - ☐ Recognize the persuasive tactics used by various types of media including Internet usage/safety
  - ☐ Use digital resources, online videos or simulations to better understand the environment
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- ☐ Research, analyze, and represent results using digital charts and graphs to show the numbers of humans in different parts of the world
- ☐ Use various digital resources and tools to perform the following examples of curricular units of study:
- ☐ Use a graph of measurements for mass versus volume to determine the density of a material
- ☐ Record and plot the change in temperature with time for candle wax and indicate how the graph shows temperature of the liquid-solid transition
- ☐ 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
- ☐ 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
- ☐ Calculate the average speed of a moving object and illustrate the motion of objects in graphs of distance over time
- ☐ Design a chart showing the photosynthesis and respiration relations
- ☐ Design an energy chart showing energy flow within the ecosystem
- ☐ Utilize online videos or simulations to explore the physical world (motion, forces, etc.)

### **UNIT 6.1: Structure of the Earth, Tectonic Plates, Geological Features**

**To diagram how the structure of Earth includes a crust, mantle, liquid metal outer core, and solid metal inner core.**

The students will:

1. Describe how folded and faulted rock layers provide evidence of the gradual up and down motion of the Earth's crust
2. Explain how the boundaries of tectonic plates can be inferred from the location of earthquakes and volcanoes
3. Explore how heat flow and movement of materials within the Earth cause the rock cycle, earthquakes and volcanic eruptions
4. Model and differentiate a cross-section diagram with clear labels the proper proportions for the inner core, outer core, mantle, and crust of Earth

**To describe how tectonic plates (crust plus upper mantle) move Earth atop a slowly convecting mantle, affecting processes on Earth's land, oceans, and atmosphere.**

The students will:

1. Diagram a cross-section with clear labels a spreading ridge and at least 1 plate being subducted beneath an adjacent continent
2. 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
3. Describe the tectonic plates that bound the Trans-Himalaya mountain chain and determine what type of tectonic boundary exists there

**To 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).**

The students will:

1. describe 2 – 3 examples on Earth where colliding tectonic plates have resulted in the formation of mountain chains
2. design, construct, and label the plates and types of plate tectonic boundaries around North America
3. of the 3 general plate boundaries, justify with evidence which of these best matches the East African Rift Valley

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**To explain geologic evidence that many Earth processes occurring today (e.g., erosion, sedimentation, volcanism) are similar to those that occurred in the geologic past.**

The students will:

1. Describe how inter-layered sandstone and siltstone with plant and dinosaur fossils would provide a geologist with information about river environments in the Mesozoic
2. Research and analyze how a geologist would use evidence from modern beach and sand dune settings to understand and interpret a sandstone in the geologic record

#### **UNIT 6.1: Health & Wellness**

**To know the structure, function, and interrelationship among body systems.**

The students will:

1. Diagram and label body systems and sense organs
2. Analyze the relationships among body organs
3. Describe changes in male and female bodies in puberty
4. Explain relationship between dietary guidelines to eating habits and physical fitness
5. Explain the relationship of drugs, alcohol, tobacco, inhalants to human body functioning

**To describe the connections between mental, emotional, social, and physical development as they relate to adolescence.**

The students will:

1. Discuss the effects of stress
2. Demonstrate actions that reflect respect for individual differences
3. List the positive and negative responses to criticism
4. Discuss in small groups and share with the whole class the effects of peer pressure
5. Describe the importance of personal hygiene
6. Define issues related to body image and weight management, including eating disorders

#### **UNIT 6.2: Atmosphere & Hydrosphere, Fossils, Natural Disasters**

**To identify key parts of the atmosphere (e.g., layers, composition) and hydrosphere (e.g., oceans, ice caps, waters on land).**

The students will:

1. Diagram in cross-section with clear labels the main layers and thicknesses of the atmosphere
2. Sketch and summarize in a table the 4 to 5 main parts of the hydrosphere and estimate their relative sizes
3. Use a map of Earth to predict the continents where the 4 to 5 largest bodies of freshwater reside
4. Compare and contrast ice and ice caps in the Arctic region versus the Antarctic region (use charts, graphs, etc.)

**To provide examples of how fossils are evidence of life and environments that have changed on Earth.**

The students will:

1. Identify fossils and describe how fossil evidence contributes to our knowledge of the earth's evolution and the history of different species
2. 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 loon-like birds).
3. Using examples from the fossil record, compare and contrast modern environments dominated by mammals with Mesozoic environments dominated by large reptiles. (use charts, graphs, etc.)

**Classify and explain 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).**

The students will:

1. Research and present findings on a natural disaster in your community and the cause from Earth systems.
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2. Indicate whether you would predict that natural disasters occurred in past geologic settings, and if so, give examples and evidence.

**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).**

The students will:

1. Discuss and illustrate the formation of coal and how the presence of coal records interactions among the atmosphere, biosphere, hydrosphere, and geosphere

## **UNIT 6.2: Health & Wellness**

**To apply critical thinking skills and personal management strategies to address issues and concerns related to personal health and well-being.**

The students will:

1. Discuss and identify the importance of significant friends and adult-mentors in their life
2. Explain the relationship between self-image and gang-related behaviors
3. List and demonstrate refusal strategies related to alcohol, tobacco, and other drugs
4. Discuss and visually or orally present the serious consequences resulting from misuse of drugs
5. Factually explain prevention and recognition of communicable and non-communicable diseases

**To know the effects of social and cultural effects on health.**

The students will:

1. Identify relationships among body image/self-esteem issues, social expectations and eating habits
2. Discuss social actors causing and resulting from drug use and alcohol abuse
3. Identify ways peer relationships affect personal health

## **UNIT 6.3: Earth, Sun, & Solar System**

**To explore how external and internal sources of energy affect the Earth's systems.**

The student will:

1. Compare and contrast how weathering and erosion create and shape valleys and floodplains (use charts, graphs, etc.)
2. Explore and describe how the cycling of water in and out of the atmosphere ("the water cycle shapes the face of the Earth")
3. Outline the major geologic eras in broad terms, citing their time spans and their major forms of life

**Demonstrate that the Sun is a typical star and that Earth is the 3<sup>rd</sup> 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.**

The students will:

1. Develop a diagram or model to show the key features of the solar system (e.g., planets, some moons, comets, asteroid belt)
2. Show in a diagram which planets the asteroid belt resides between
3. Describe recent key results from research and recent NASA missions (e.g., NASA rovers, satellites, planned missions)

**To describe how the position of Earth in the solar system affects conditions on our planet.**

The student will:

1. Explain the effect of gravity on the orbital movement of planets in the solar system
2. Explain how the regular motion and relative position of the sun, Earth and moon affect the seasons, phases of the moon and eclipses
3. Define gravity as the force that governs the motions of objects in the solar system
4. Explain how the motion of the Earth and moon relative to the sun causes daily, monthly and yearly cycles on Earth

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**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.**

The students will:

1. 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)
2. Research and/or design 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)

**To 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.**

The students will:

1. Illustrate 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
2. Compare and contrast in a table the key differences between planets and stars.
3. 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)
4. Research and present 3 key events in the history of space exploration
5. Discuss and identify ways that space exploration has benefited humans

### **UNIT 6.3: Health & Wellness**

**To know the influence of media and technology on health.**

The students will:

1. Identify various media and technologies that influence health
2. Recognize the persuasive tactics used by various types of media including Internet usage/safety
3. Evaluate and discern tactics that persuade moral decisions

**To know and analyze information to promote healthy living and reduce personal health risks.**

The students will:

1. Demonstrate ways to prevent/respond to deliberate or accidental injuries, conflict resolution, anger management, wearing a seat belt, etc.
2. Write a personal plan for good health (diet, exercise, sleep, etc.)
3. Discuss benefits of modesty and implications of human dignity

### **UNIT 6.4: Oceans, Water, & Cycle**

**To describe the water cycle using appropriate terminology and explain conservation and preservation practices.**

The student will:

1. Identify sources of fresh surface water
2. Explain the importance of glacier to the freshwater supply
3. Name, locate and describe the watershed he/she live in
4. Identify sources of freshwater under the Earth's surface
5. Define permeability and give examples of materials that are permeable or impermeable
6. Demonstrate how water is filtered in nature
7. Recognize and explain differences between artesian wells and other wells
8. Perform water quality tests; record and interpret results
9. Relate water's ability to serve as a solvent to water pollution
10. List and discuss ways to protect freshwater sources

**To identify the Earth's oceans as a precious resource that needs to be protected from pollution.**

The student will:

1. Distinguish between currents, waves, and tides
2. Describe the movements of warm/cold currents
3. Relate the impact of ocean currents on weather patterns

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4. Explain the desalination process

#### **UNIT 6.4: Health & Wellness**

##### **To know and use a variety of communication skills.**



The students will:

1. Practice conflict resolution and mediation skills
2. Demonstrate refusal techniques for alcohol and tobacco use, sexual activity, other risk-taking behaviors
3. Describe positive ways to interact with diverse populations
4. Discuss examples of positive peer pressure

##### **To evaluate the benefits of becoming a positive role model within the family and the community.**

The students will:

1. Demonstrate personal responsibility for exhibiting healthy practices within the school and community setting:
    - a. Virtues (truthfulness, trustworthiness, friendliness, etc.)
    - b. Manners
    - c. Encouragement of others
    - d. Appropriate cooperation and sharing of workload
  2. Create a whole class service project that will benefit the school and/or community
  3. Demonstrate increased leadership role participation in the school
  4. Develop peer mediation techniques
  5. Demonstrate respect for the opinions and beliefs of other individuals
  6. Demonstrate respect for rules and regulations
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| <b>Suggested Cross Curricular and Catholic Social Teaching Links</b>                |   |
|---|---|
| <b>Grade Six</b>  |   |
|  | In reading science related materials, students write essays about the application of Church teaching to scientific advances. (Science, Language Arts, Religion)     |
|  | As they study ancient cultures, sixth graders discuss, debate, and write essays about what motivates scientific discovery. (Science, Language Arts, Social Studies) |

## **6<sup>TH</sup> GRADE SCIENCE READING LITERACY**

The student will:

1. Cite specific textual evidence to support analysis of scientific and technical texts.
2. Summarize the broad ideas and specific conclusions made in a text, basing the summary on textual information rather than on prior knowledge or opinions.
3. Determine the meaning of key terms, symbols and domain specific vocabulary used in a text.
4. Analyze how each major part of a text contributes to an understanding of the topic discussed in the text.
5. Analyze the purpose of an experiment or explanation in a text, including defining the problem or question to be resolved.
6. Integrate information provided by the words in a text with a version of the information expressed graphically (e.g., in a flow chart, diagram, model, graph, or table).
7. Distinguish facts or reasoned judgments based on research findings from opinions.
8. Compare and contrast the information gained from experiments, simulations, video or multimedia sources with that gained from reading a text on the same topic.
9. Read informational text independently, proficiently, and fluently in the grades 6-8 text.

## **SCIENCE WRITING LITERACY**

The student will:

1. Write arguments focused on science content in which they:
  - a) Introduce a claim about a topic or issue, distinguish it from alternate or opposing claims, and organize the reasons, data, and evidence logically to support the claim.
  - b) Support the claim with logical reasoning and detailed, accurate data evidenced from investigations.
  - c) Use words and phrases as well as specific science vocabulary to make clear the relationships among claims, reasons, data, and evidence.
  - d) Sustain an objective style and tone.
  - e) Provide a concluding statement or section that follows logically from the arguments.
2. Present short focused research projects in response to question or problem and generate additional related questions that allow for multiple avenues of exploration.
3. Gather relevant information from multiple print and digital sources using effectively tailored searches; assess the credibility and accuracy of each source; and quote or paraphrase the evidence, avoiding plagiarism and following a standard format for citation.



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**Life Science**

- LS7.1 Understand the process of scientific inquiry and technological design to investigate questions, conduct experiments, and solve problems.
- LS7.2 Read, interpret and examine the credibility of scientific claims in different sources of information
- LS7.3 Design and conduct appropriate types of scientific investigations to answer different questions
- LS7.4 Identify independent and dependent variables, and those variables that are kept constant, when designing an experiment
- LS7.5 Use appropriate tools and techniques to make observations and gather data
- LS7.6 Use mathematical operations to analyze and interpret data
- LS7.7 Identify and present relationships between variables in appropriate graphs
- LS7.8 Draw conclusions and identify sources of error
- LS7.9 Work independently and collaboratively in an inquiry-based learning environment that encourages finding creative solutions to authentic and complex problems.
- LS7.10 Demonstrate their learning through performance-based assessments and express their conclusions through elaborated explanations of their thinking
- LS7.11 Use technology resources to conduct research, demonstrate creative and critical thinking, and communicate and work collaboratively.
- LS7.12 Apply a scientific method to a practical problem in the form of a lab report

**Health & Wellness**

- LS7.13 Identify and demonstrate health promotion and disease prevention concepts.
- LS7.14 Access and utilize valid health information and health promoting products and services.
- LS7.15 Practice behaviors that promote health and reduce health risks.
- LS7.16 Analyze the influence of culture, media, technology, and other actors on health.
- LS7.17 Utilize social and communication skills to enhance health.
- LS7.18 Use goal-setting and decision-making skills to enhance health.
- LS7.19 Advocate for personal, family, and community health and wellness.

**INTEGRATING TECHNOLOGY IN GRADES 6-8 SCIENCE CLASSROOM**

- ☐ Use digital resources to analyze, compare, contrast and classify various relevant content specific units of study including but not limited to:
    - The Arctic region versus the Antarctic region
    - \_\_\_\_\_ bodies that orbit the sun
    - how weathering and erosion create and shape valleys and floodplains
    - modern environments dominated by mammals with Mesozoic environments dominated by large reptiles
    - positive versus negative peer pressure as related to health and safety
  - ☐ Create digital graphs describing the inequality of the consumption of the world's resources and design service projects that address local and global injustice
  - ☐ Identify environmental resources and determine means to apply Catholic social teaching to practices of conservation.
  - ☐ Research online sources and explain the need to balance procuring energy with the responsibility to protect God's creations.
  - ☐ Research and examine how technology allows astronomers' to study space from the Earth as well as space
  - ☐ Visit websites for international research organizations (e.g., National Oceanic and Atmospheric Administration, etc.) to view images and learn about the atmosphere and hydrosphere
  - ☐ Visit web sites showing recent images of the photosphere of the sun
  - ☐ Identify various media and technologies that influence health
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- ☐ Recognize the persuasive tactics used by various types of media including Internet usage/safety
- ☐ Use digital resources, online videos or simulations to better understand the environment
- ☐ Research, analyze, and represent results using digital charts and graphs to show the numbers of humans in different parts of the world
- ☐ Use various digital resources and tools to perform the following examples of curricular units of study:
- ☐ Use a graph of measurements for mass versus volume to determine the density of a material
- ☐ Record and plot the change in temperature with time for candle wax and indicate how the graph shows temperature of the liquid-solid transition
- ☐ 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
- ☐ 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
- ☐ Calculate the average speed of a moving object and illustrate the motion of objects in graphs of distance over time
- ☐ Design a chart showing the photosynthesis and respiration relations
- ☐ Design an energy chart showing energy flow within the ecosystem
- ☐ Utilize online videos or simulations to explore the physical world (motion, forces, etc.)

### UNIT 7.1: Cells

**To describe how all organisms are made up of one or more cells that have common structures to maintain life.**

The student will:

1. Trace the development of cell theory
2. Explore and describe the structures and function of a basic animal cell (e.g. nucleus, cytoplasm, mitochondria, and cell membrane)
3. Explain how all organisms are composed of one or more cell; each cell carries on life-sustaining functions
4. Compare and contrast photosynthesis and cellular respiration

**To 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).**

The students will:

1. 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.
2. Diagram how cells make up tissues in organs

**To describe that regulation for organisms involves sensing their surroundings (external environment) and then using physiological activities at the cell or organism level to survive.**

The students will:

1. Explain 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 and organisms

**To describe the cause and transmission of bacterial and viral diseases and how to prevent, treat, and cure many diseases.**

The student will:

1. Research and present findings regarding the cause and spreading mechanism of viral and bacterial diseases
2. Explore and justify the role of the immune system and how vaccination and antibiotics are used to enhance the fight against infectious diseases

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## **UNIT 7.1: Health & Wellness**

### **To know the body systems and their interrelationships.**

The students will:

1. Review body systems: cardiovascular, respiratory, digestive, neuromuscular, skeletal, urinary

### **To know risk factors and characteristics of various diseases.**

The students will:

1. Identify risk factors for asthma, the effect of asthma on a person, and treatments
2. List significant health risks during adolescence
3. Describe common eating disorders
4. Describe common dental problems and their prevention and treatment
5. Identify causes, symptoms, and treatments of infectious diseases

## **UNIT 7.2: Organ Systems**

### **To describe how many organisms, including humans, have specialized organ systems that interact with each other to maintain dynamic internal balance.**

The student will:

1. Compare and contrast how multi-cellular organisms need specialized structures and systems to perform basic life functions
2. Classify the structures of the human digestive, respiratory, and circulatory systems, and explain how they function to bring oxygen and nutrients to the cells and expel waste materials
3. Explain how the human muscular-skeletal system supports the body and allows movement

### **To describe levels of organization for living systems, starting with cells, then moving to tissues, organs, organ systems, whole organisms, populations, and ecosystems**

The students will:

1. Determine which is more complex of two levels of complexity and provide evidence (e.g., blood cells or muscle, heart or respiratory system).

### **To describe human systems for digestion, respiration, reproduction, blood circulation, excretion, movement and coordination, and protection from disease and ways that these systems interact**

The students will:

1. Identify the function of the structures (organs) within the various body systems and the function of each system in the human body.
2. Describe the role of each system in the human body and the role that each plays in maintaining the good health of the individual

### **To correlate 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.**

The students will:

1. Describe examples of structures and systems that enable organisms to respond to stimuli in their environments
2. 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)
3. Consider a stomachache and describe pathways for this as an internal response to stimuli from something you ingested

## **UNIT 7.2: Health & Wellness**

### **To discern the effects of drugs and alcohol on choices and behavior.**

The students will:

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1. Recognize high risk or harmful behaviors
  2. Identify factors that affect school success
  3. List and discuss choices in early adolescence that can impact the quality of life

**To know that mind and body interrelate.**

The students will:

1. identify the relationship between stress and physical illness
2. describe positive coping skills that counteract stress
3. distinguish between healthy and unhealthy responses to stress

**UNIT 7.3: Reproduction, Heredity, Adaptation, & Survival**

**To explain how reproduction is a characteristic of all living systems, with some organisms reproducing asexually and others reproducing sexually (through egg and sperm).**

The students will:

1. Distinguish and describe the difference between asexual reproduction and sexual reproduction.
2. Compare and contrast mitosis with meiosis
3. Research and discuss disease prevention and care associated with the human reproductive system

**To describe heredity as the passage of genetic information from one generation to the next**

The students will:

1. Collect data and create individual pedigree charts using examples of family pedigrees for traits such as red-green color blindness or hemophilia
2. Describe examples of genetic characteristics transmitted to offspring

**To compare and contrast features of organisms for their adaptive, competitive, and survival potential (e.g., appendages, reproductive rates, camouflage, defensive structures).**

The students will:

1. 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

**To describe the unity of organisms by studying their similar internal structures, chemical processes, and evidence of common ancestry**

The students will:

1. 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

**To 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**

The students will:

1. 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)
2. 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

**To describe that genetic information is contained in genes and that traits are determined by one or more genes**

The students will:

1. Explain the structure of DNA
2. Model/Construct examples of inherited characteristics that are determined by one or more genes from parents
3. Extrapolate how bodies make protein from DNA
4. Research various genetic diseases; communicate/present findings

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### **UNIT 7.3: Health & Wellness**

#### **To know effective communication skills applied to health topics.**

The students will:

1. Compare and contrast positive versus negative peer pressure as related to health and safety (use charts, graphs, essays, etc.)
2. Demonstrate effective communication skills (verbal and nonverbal) to enhance health and safety
3. Demonstrate the ability to make individual and group decisions by evaluating alternatives, predicting consequences of decisions, choosing a plan, informing proper authorities when necessary, evaluating the decision and using information as a basis for future decisions, and listening to conscience, not following blindly

#### **To know own role in family health issues.**

The students will:

1. Describe ways to help own family stay healthy
2. Demonstrate basic knowledge of nutrition, first aid skills, baby-sitting safety and skills
3. Describe the need for and use of protective gear (e.g., bicycle helmet, seat belts, etc.)
4. Create a family plan for natural emergency situations such as hurricanes, fires, winter storms, electrical outage, floods, etc.

### **UNIT 7.4: Ecosystems**

#### **To use examples to show that populations of plants or animals consist of all individuals that occur together in a region**

The students will:

1. Using a graphic of an ecosystem, distinguish populations of organisms and describe 2 abiotic factors typical of that particular ecosystem.
2. Identify some of the plant and animal populations occurring on your school site or nearby park
3. Compare and contrast two 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)
4. Compare and contrast biomes
5. Construct an ecosystem

#### **To 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.**

The students will:

1. Diagram the flow of energy through ecosystems, showing the sun as the primary source of the energy
2. 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
3. Describe the role of decomposers in cycling the basic chemicals back to soils for use in photosynthesis

#### **To compare examples of ecosystems with vast numbers of species of animals, plants, and microorganisms in many kinds of habitats**

The students will:

1. 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

#### **To identify and classify key biotic and abiotic interactions in an ecosystem and factors that affect population density**

The students will:

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1. 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.
  2. 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

#### **Unit 7.4: Health & Wellness**

##### **To know the advantages of sexual abstinence.**

The students will:

1. Discuss the importance of abstinence in relation to Catholic morals and virtues
2. Discuss the consequences of sexual activity; promote modesty

##### **To work cooperatively with others to support and promote a healthy and Christian spirit in school, family, and community.**

The students will:

1. Demonstrate personal responsibility for exhibiting healthy practices within the school and community setting:
    - a. Virtues (truthfulness, trustworthiness, friendliness, etc.)
    - b. Manners
    - c. Encouragement of others
    - d. Appropriate cooperation and sharing of workload
    - e. Volunteering/service
  2. Define, recognize, and apply the benefits of community and personal service
  3. Create individual and class service project; reflect on effects of service in relation to spiritual development and moral development; create a reflective portfolio of the experience
-

The student will:

1. Cite specific textual evidence to support analysis of scientific and technical texts.
2. Summarize the broad ideas and specific conclusions made in a text, basing the summary on textual information rather than on prior knowledge or opinions.
3. Determine the meaning of key terms, symbols and domain specific vocabulary used in a text.
4. Analyze how each major part of a text contributes to an understanding of the topic discussed in the text.
5. Analyze the purpose of an experiment or explanation in a text, including defining the problem or question to be resolved.
6. Integrate information provided by the words in a text with a version of the information expressed graphically (e.g., in a flow chart, diagram, model, graph, or table).
7. Distinguish facts or reasoned judgments based on research findings from opinions.
8. Compare and contrast the information gained from experiments, simulations, video or multimedia sources with that gained from reading a text on the same topic.
9. Read informational text independently, proficiently, and fluently in the grades 6-8 text level.

**SCIENCE WRITING LITERACY**

The student will:

1. Write arguments focused on science content in which they:
  - a) Introduce a claim about a topic or issue, distinguish it from alternate or opposing claims, and organize the reasons, data, and evidence logically to support the claim.
  - b) support the claim with logical reasoning and detailed, accurate data evidenced from investigations.
  - c) use words and phrases as well as specific science vocabulary to make clear the relationships among claims, reasons, data, and evidence.
  - d) sustain an objective style and tone.
  - e) provide a concluding statement or section that follows logically from the arguments.
2. Present short focused research projects in response to question or problem and generate additional related questions that allow for multiple avenues of exploration.
3. Gather relevant information from multiple print and digital sources using effectively tailored searches; assess the credibility and accuracy of each source; and quote or paraphrase the evidence, avoiding plagiarism and following a standard format for citation.

### **Physical Science Standards**

- PS8.1 Understand the process of scientific inquiry and technological design to investigate questions, conduct experiments, and solve problems.
- PS8.2 Read, interpret and examine the credibility of scientific claims in different sources of information.
- PS8.3 Design and conduct appropriate types of scientific investigations to answer different questions.
- PS8.4 Identify independent and dependent variables, and those variables that are kept constant, when designing an experiment.
- PS8.5 Use appropriate tools and techniques to make observations and gather data.
- PS8.6 Use mathematical operations to analyze and interpret data.
- PS8.7 Identify and present relationships between variables in appropriate graphs.
- PS8.8 Draw conclusions and identify sources of error.
- PS8.9 Work independently and collaboratively in an inquiry-based learning environment that encourages finding creative solutions to authentic and complex problems.
- PS8.10 Demonstrate their learning through performance-based assessments and express their conclusions through elaborated explanations of their thinking
- PS8.11 Use technology resources to conduct research, demonstrate creative and critical thinking, and communicate and work collaboratively.
- PS8.12 Apply a scientific method to a practical problem in the form of a lab report.

### **Health & Wellness Standards**

- PS8.13 Identify and demonstrate health promotion and disease prevention concepts.
- PS8.14 Access and utilize valid health information and health promoting products and services.
- PS8.15 Practice behaviors that promote health and reduce health risks.
- PS8.16 Analyze the influence of culture, media, technology, and other actors on health.
- PS8.17 Utilize social and communication skills to enhance health.
- PS8.18 Use goal-setting and decision-making skills to enhance health.
- PS8.19 Advocate for personal, family, and community health and wellness.

### **INTEGRATING TECHNOLOGY IN GRADES 6-8 SCIENCE CLASSROOM**

- ☐ Use digital resources to analyze, compare, contrast and classify various relevant content specific units of study including but not limited to:
    - The Arctic region versus the Antarctic region
    - \_\_\_\_\_ bodies that orbit the sun
    - how weathering and erosion create and shape valleys and floodplains
    - modern environments dominated by mammals with Mesozoic environments dominated by large reptiles
    - positive versus negative peer pressure as related to health and safety
  - ☐ Create digital graphs describing the inequality of the consumption of the world's resources and design service projects that address local and global injustice
  - ☐ Identify environmental resources and determine means to apply Catholic social teaching to practices of conservation.
  - ☐ Research online sources and explain the need to balance procuring energy with the responsibility to protect God's creations.
  - ☐ Research and examine how technology allows astronomers' to study space from the Earth as well as space
  - ☐ Visit websites for international research organizations (e.g., National Oceanic and Atmospheric Administration, etc.) to view images and learn about the atmosphere and hydrosphere
  - ☐ Visit web sites showing recent images of the photosphere of the sun
  - ☐ Identify various media and technologies that influence health
  - ☐ Recognize the persuasive tactics used by various types of media including Internet usage/safety
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- ☐ Use digital resources, online videos or simulations to better understand the environment
- ☐ Research, analyze, and represent results using digital charts and graphs to show the numbers of humans in different parts of the world
- ☐ Use various digital resources and tools to perform the following examples of curricular units of study:
- ☐ Use a graph of measurements for mass versus volume to determine the density of a material
- ☐ Record and plot the change in temperature with time for candle wax and indicate how the graph shows temperature of the liquid-solid transition
- ☐ 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
- ☐ 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
- ☐ Calculate the average speed of a moving object and illustrate the motion of objects in graphs of distance over time
- ☐ Design a chart showing the photosynthesis and respiration relations
- ☐ Design an energy chart showing energy flow within the ecosystem
- ☐ Utilize online videos or simulations to explore the physical world (motion, forces, etc.)

### UNIT 8.1: The Nature of Matter

**To describe some characteristic physical properties of substances that are independent of the mass of the substance (e.g., density, boiling point, solubility)**

The students will:

1. Calculate and use a graph of measurements for mass versus volume to determine the density of a material; document results
2. Describe the change in freezing point that may occur when salt is added to water and why this may occur

**Show that properties of objects can be measured and recorded with simple tools (e.g., rulers, timers, balances, thermometers)**

The students will:

1. Measure and calculate mass with a balance and geometric dimensions with a ruler, and then determine volume and density for an object (e.g., cube, rectangle) to solve problems
2. Record and plot the change in temperature with time for candle wax and indicate how the graph shows temperature of the liquid-solid transition

**To describe the properties of matter.**

The student will:

1. Classify matter as elements, compounds, mixtures, or solutions
2. Describe how the properties of simple compounds are different from the elements from which they are made
3. Classify compounds as acids, bases or salts
4. Explain how mixtures can be separated by using the properties of the substances from which they are made, such as particle size, density, solubility, and boiling point
5. Distinguish between organic and inorganic compounds
6. Explain the Law of Conservation of Energy
7. Explain the processes of synthesis, decomposition and replacement

### UNIT 8.1: Health & Wellness

**To identify and define factors that affect health.**

The students will:

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1. Review interrelationships among the body systems
  2. Describe mind/body relationship in health and disease
  3. Identify mental health issues such as depression, suicide, eating disorders
  4. Identify risk factors for one specific contagious and one non-contagious disease: pathogenic, genetic, age-related, cultural, environmental, behavioral

**To know changes that occur as a person grows older.**

The students will:

1. Identify the characteristics and stages of human growth and development

## **UNIT 8.2: Chemistry**

**To understand and interpret the patterns in the periodic table of elements to obtain information.**

1. Describe the parts of the periodic table (families, periods, etc.)
2. Develop an understanding of the structure of matter by developing an atomic model (identify the parts, atomic number, atomic mass, and electron energy levels)
3. The location of metals, nonmetals, and transition metals. Insert verbs for all 5 skill sets
4. What a family and period is.
5. How many protons, electrons, and neutrons in each element.
6. The names of the different element families, their location on the periodic table and that characteristics the elements share.
7. The number of valence electrons and how this determines the type of bond it will form with other elements.

**To explain that elements react and combine to form new substances with different physical and chemical properties.**

1. Identify the reactants and products in a chemical equation.
2. Balance chemical equations.  
Read, write and understand the components of a chemical formula.  
Balance chemical equations

**Explain that substances react chemically in characteristic ways with other substances to form new substances with different characteristic properties**

The students will:

1. Analyze and write down reactants and suggest what might be the products for the chemical reaction between baking soda and vinegar
2. List ingredients to make gelatin and compare the properties of these materials at different temperatures with the properties of gelatin when it is made

**To be able to provide examples of how total mass is conserved in chemical reactions (e.g., combustion, rusting, antacid tablet reaction)**

The students will:

1. Measure, compare, and document reactants and products when adding 2 antacid tablets to a certain amount of water

**To describe simple patterns in the periodic table of elements that relate to the physical properties of matter (e.g., solids, gases; metals, nonmetals)**

The students will:

1. Understand that patterns formed in periodic table increase with element families.
2. Circle the general region of the periodic table where gases or metals reside
3. Write a pattern that you see for atomic mass in the periodic table of the elements using Bohr Models

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**To 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)**

The students will:

4. Describe and show how the combustion of natural gas (mostly methane, propane) releases energy that humans can use
5. Use the photosynthesis reaction to show an understanding of energy transfer in a chemical reaction
6. Summarize qualitatively the flow of energy in the reaction that occurs when molten rock (lava) becomes a hardened rock consisting of minerals

## **UNIT 8.2: Health & Wellness**

**To know the positive effects of health care and healthy habits and the implications of unhealthy choices.**

The students will:

1. Discuss how immunizations in childhoods and thru life promote health
2. Review appropriate health care and healthy personal habits that prevent illness and premature disability and death
3. Describe the effects of tobacco, alcohol, and other chemical substances on the individual

**To know ways to assure the health and safety of self and others**

The students will:

1. Demonstrate ways to avoid or change situations, including dating or other social relationships, that might threaten personal safety
2. List and describe the value of preventive health measures: immunizations, periodic medical and dental examinations, avoid risk behaviors
3. Research and discuss the recommended frequency of preventive health care
4. Describe strategies that show respect for individual choices and differences, including age in making health decisions
5. Update personal health plan and explain any changes; distinguish between short-term and long-term goals
6. Describe the personal benefit of avoiding sexual activity, tobacco and illegal drug use

## **UNIT 8.3: Force, Motion**

**To describe ways that forces can affect motion (e.g.: action/reaction, equilibrium conditions, free-falling objects, rockets, etc.).**

The students will:

1. List and describe 3 everyday examples of ways that friction or air resistance affects the motions of common objects
2. Construct a model that demonstrates Newton's 3 Laws of motion

**To describe and use graphs to show the motion of an object with position, direction, and speed.**

The students will:

1. 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; summarize and document conclusions

**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)**

The students will:

1. Measure pendulum period as a function of length, and describe the relationship you see from a graph
2. 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

**To describe how energy provides the ability to do work and can exist in many forms.**

The student will:

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1. Explain the relationship among force, distance and work, and use the relationship ( $W = F \times D$ ) to calculate work done in lifting heavy objects
2. Explain how simple machines, such as inclined planes, pulleys and levers, are used to create mechanical advantage
3. Demonstrate an understanding of forces in fluids (Pascal's Principle, Archimedes' Law, Bernoulli's Principle, and hydraulics)
4. Use analyze, and interpret efficiency and power mathematical operations to calculate,
5. Explain how beam, truss, and suspension bridges are designed to withstand the forces that act on them

**To describe how an object's inertia causes it to continue moving the way it is moving unless it is acted upon by a force to change its motion.**

The student will:

1. Describe Newton's Laws of Motion
2. Describe the qualitative relationships among force, mass, and changes in motion
3. Describe the forces acting on an object moving in a circular path
4. Calculate the average speed of a moving object and illustrate the motion of objects in graphs of distance over time
5. Describe the motion of an object by its position, direction of motion, and speed
6. Explain how an unbalanced force acting on an object changes its speed and/or direction
7. Explore and explain how to measure the speed of objects in motion, calculate average speed, and illustrate the motion of objects in graphs of distance over time

### **UNIT 8.3: Health & Wellness**

**To know how to access, evaluate, and use health information.**

The students will:

1. Develop, research, and apply evaluation criteria for examples of health information from TV, periodicals, and Internet
2. Describe the appropriate use of specific health information obtained from TV, periodicals, and/or the Internet
3. List and analyze ways that information, ideas, and opinions about health issues can be communicated

**To investigate and evaluate ways in which peers, families, and other community groups can work together to build a safe and healthy community.**

The students will:

1. Display personal responsibility for exhibiting healthy practices within the school and community setting:
  - a. Virtues (truthfulness, trustworthiness, friendliness, etc.)
  - b. Manner
  - c. Encouragement of others
  - d. Appropriate cooperation and sharing of workload
  - e. Volunteering
2. Create class and individual opportunities for Christian community service
3. Create a reflective portfolio depicting this experience

### **UNIT 8.4: Energy, Electricity, Magnetism**

**To describe how energy is a property of substances that is associated with heat, light, solar radiation, electricity, mechanical motion, sound, and chemical substances INDEPENDENT PROJECT**

The students will:

1. Design an experiment to show that producing sound must involve the transfer of energy; **COMMUNICATE RESULTS**
2. Design an experiment to demonstrate that either giving an object motion or stopping the motion of an object requires energy; **PRESENT FINDINGS**

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**To describe some of the physical and chemical processes that are used to produce energy and how society uses this natural resource INDEPENDENT PROJECT**

The students will:

1. Beginning with photosynthesis in plants, describe and diagram qualitatively why coal can be a source of energy for society; IDENTIFY MOST EFFECTIVE METHOD TO COMMUNICATE FINDINGS

**To diagram examples of how waves carry energy and transfer energy when they interact with matter (e.g., seismic, light, electromagnetic, sound)**

The students will:

1. 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)

**Show that heat can be transferred between objects in predictable ways (flows from hot to cold)**

The students will:

1. Compare the rate of flow of heat along rods made of metal and glass
2. 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

**To describe how energy provides the ability to do work and can exist in many forms**

The student will:

1. Describe how different types of stored (potential) energy can be used to make objects move.
2. Compare and contrast the various forms of energy (heat, light, sound, electrical, magnetic, mechanical, and nuclear)
3. Compare and contrast ways to produce electrical energy
4. Describe how magnetic fields produce an electric current
5. Describe simple, parallel, and series circuits
6. Define magnetism relative to the arrangement of electrons
7. Explain how electromagnets are produced

#### **UNIT 8.4: Health & Wellness**

**To know the effect of health/lack of health beyond one's own self.**

The students will:

1. Identify specific local environmental health threat
  2. Relate issues such as anger management and gun control to personal, family, and community
  3. Discuss significant health issues in developing countries
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*“What kind of world do we want to leave to those who come after us, to children who are now growing up?” (160). “This question does not have to do with the environment alone and in isolation; the issue cannot be approached piecemeal”.*

Laudato Si, Pope Francis

#### CROSS-CURRICULAR CONNECTIONS: ENDURING UNDERSTANDINGS – Middle School

- Understand the processes of scientific inquiry and technological design to investigate questions, conduct experiments, and solve problems.
- Understand fundamental concepts, principles, and interconnections of the life, physical, and earth and space sciences.
- Understand the relationships among science, technology, and society in historical and contemporary contexts.

#### Overarching Essential Questions:

*What is the purpose of our life in this world?*

*What is the goal of our work and all our efforts?*

*What need does the earth have of us?*

#### RELIGION

Discuss various prejudices in society and compare these prejudices with past views. Connect your discussion with historical events.

Discuss the 10 Commandments and identify occasions when people might sin and different ways you could respond to them.

Role-play a conflict between two or more people. Discuss solutions and act out the best solution.

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.

Discuss our obligations as caretakers of God’s Earth.

8 Religion: Consider all microorganisms you know and discuss which would have been present in the Garden of Eden.

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.

Discuss practices, beliefs, and traditions from various cultures associated with the stars, moon, and sun.

7 Religion: Identify the element that corresponds with brimstone in the Bible and discuss its distinctive property.

7 Religion: Consider light coming from distant stars or galaxies and discuss how this compares with your concept of heaven.

8 Religion: Write about how caring for others is similar or different affects natural selection and how it relates to being human.

“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.

Discuss the Catholic Church’s views on issues involving the use of science and technology.

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|             | <p>Discuss the contributions that all cultures make to science and the respect that all cultures deserve.</p> <p>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> <p>Discuss God’s plan for us, the link between God’s plan and human sexuality, and the Church’s guidelines.</p> <p>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).</p>   |
| <b>MATH</b> | <p>Review and use problem-solving techniques for situations with numbers.</p> <p>Review the relationships among fractions, decimals, and percentages.</p> <p>Economics and Business: Study how the world banking system works.</p> <p>Use sports statistics of a player’s batting average, a team’s wins, or free throw attempts.</p> <p>Measure a quantity to the greatest degree of accuracy determined by the tool.</p> <p>Make simple scale conversions to reproduce a map.</p> <p>Calculate the volume of the inner and outer core, mantle, and crust, and their percentage of the total volume.</p> <p>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> <p>Economics/Business: Learn about the formation and locations of coal and petroleum, key deposits, and how these “fuel” our economy.</p> <p>Compare the radius to Pluto (in A.U., astronomical units) with the distance to the nearest star.</p> <p>7 Math: Convert the English system of measurement on food labels to the metric system.</p> <p>7 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>7 Economics: Discuss the pros and cons of investing in an environmentally safe and renewable energy source.</p> <p>7 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>7 Economics: Research a fractionation tower, identify each fraction of petroleum and its condensation temperature, and list the uses of each.</p> <p>7 Math: Calculate acceleration for an object in motion (e.g., acceleration equals change in velocity divided by time).</p> |

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|                      | <p>8 Economics/Business: Compare and contrast ideas based on a free market and capitalism with competition and survival in the natural world.</p> <p>8 Math: Use charts and graphs to show the numbers of humans in different parts of the world.</p> <p>8 Math: Discuss the use of DNA in crime investigations and how probability is used to investigate suspects.</p> <p>8 Math: Graph the growth in population for (local town/city), Connecticut, and the United States.</p> <p>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). Use a box and whisker graph to plot results.</p> <p>Collect data that serves as evidence for the advantages and disadvantages of a modern development in science and technology.</p> <p>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.</p>  |
| <b>LANGUAGE ARTS</b> | <p>Write a persuasive essay about merits of the metric system. Include data from your study of measurement systems.</p> <p>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>Create a rubric for a project and decide the important elements that need to be evaluated.</p> <p>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>Read articles about mathematicians and write an essay or poem that relates to the person or the field of mathematics</p> <p>Review skills necessary for a quality oral presentation.</p> <p>Language Arts/Economics: Investigate and report on how landforms affect local and national construction projects (e.g., highways, railroads, waterways, waste disposal sites).</p> <p>Discuss as a class and write about recent discoveries in the solar system.</p> <p>Write a report on alternative energy.</p> <p>7 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>7 Language Arts: Write a poem or short essay describing the kinds of bonds between people in a family.</p> <p>7 Language Arts: Read and write about the reduction of iron ore in a blast furnace and draw a diagram showing the inside.</p> |



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|   | <p>7 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>7 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>7 Language Arts: Write limericks or haiku using words constructed with elements in the periodic table.</p> <p>7 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>7 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>8 Language Arts: Write a story that follows the path a piece of bread takes through the digestive system when it is eaten.</p> <p>8 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> <p>8 Language Arts: Compare and contrast in writing pollination in plants versus fertilization in animals.</p> <p>Research scientific careers and list skills and abilities needed to succeed in each.</p> <p>Examine the job listings in a newspaper for science and technology and describe the skills needed in each profession.</p> <p>Develop a five-panel comic strip with illustrations that shows how science can be used to solve an everyday problem.</p> <p>Write poems and draw pictures about the wonder and beauty of our environment.</p> <p>Write a newspaper editorial in support of establishing a new recycling center in your community.</p> <p>Examine truth in advertising by evaluating whether the claims of companies actually help or hurt our environment.</p> |
| <b>HISTORY/<br/>SOCIAL STUDIES/<br/>GEOGRAPHY</b> | <p>History: Research the history of the various branches of science, and how they stem from studies of “philosophy” in the 1800s.</p> <p>History: Study the measurement systems in various cultures and compare them with the U.S. measurement system.</p> <p>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>Social Studies/Geography: Research why most humans live on coastlines around the world.</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, Popocatepetl).

Geography: Make a global map showing locations of current continental ice sheets and alpine glaciers.

Geography: Make a map of the lower 48 states showing frequency of tornados.

History: Research and discuss the validity of carbon dating for investigating historical facts.

Geography: Investigate how the potato famine in Ireland affected immigration and the founding of many new communities in the U.S. in the 1800s.

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.

6 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.

6 History: List ways that space exploration has benefited humans.

6 History: Learn about Galileo's construction and use of a telescope and what he observed.

7 Geography: Investigate modifications in cooking practices (e.g., baking, boiling water) for countries or towns at high elevation.

7 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.

7 Social Studies: Research or visit a chemical factory or pharmaceutical company. Learn how chemists' work leads to everyday products.

7 History/Geography: Read about the location, age, architectural features, forces, and current measures to save the Leaning Tower of Pisa.

7 History/Language Arts: Research the Manhattan Project of the 1940s and learn how the project related to converting matter to energy.

8 History: Learn about and discuss the idea of passing on life through a homunculus compared with current knowledge about human reproduction.

7 Geography/Economics: Use maps to identify regions of the world where precious metals have been recovered and discuss the social implications of such discoveries.

7 Social Studies: Read and report on magazine/newspaper articles that describe the benefits and hazards of nuclear energy.

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|                     | <p>7 Social Studies: Compare and contrast insulation methods for houses used by indigenous and modern people in North America.</p> <p>8 Geography: Show with maps the migration patterns of different animal species such as birds or whales.</p> <p>8 Social Studies: Research and discuss the adaptive lifestyle of the pilgrims.</p> <p>8 Social Studies: Investigate the characteristics for racial classification and discuss tolerance and acceptance for all humans.</p> <p>8 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 the CT River (or local body of water).</p> <p>8 Social Studies: Research and report the characteristics of the human population in Connecticut or the nation from the United States Census Bureau.</p> <p>8 History: Read about and discuss the causes and spread of the plague (black death) in Europe and Asia in the mid-1300s. (Read <a href="#">Plague Tales</a>.)</p> <p>8 Geography: Distinguish among undeveloped, developing, and developed countries and list and discuss factors that lead to hunger and disease in each kind of country.</p> <p>8 Economics/Business: Discuss where metals are found and mined and how they are a part of society.</p> <p>Meteorology: Make a weather prediction based on observations and previous predictions of weather forecasters. Collect data and analyze the results and your prediction.</p> <p>Social Studies: Locate on a world map various discoveries and scientists important to us today.</p> <p>Language Arts (debate): Pick a topic related to modern science and technology and debate the risks and benefits.</p> <p>Social Studies: Make a timeline of one scientific topic or device (e.g., phone, personal computer) and discuss its effects on society.</p> <p>Social Studies (public policy): Research and discuss a policy about natural resources and the environment from our government, or another government.</p> |
| <b>ART/SPECIALS</b> | <p>Art: Take fingerprints of classmates, and research the basic fingerprint types. Sort the fingerprints from your classmates into types.</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>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> <p>Art: Create a prototype of a school uniform you would like to see used at your school.</p>   |

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.

Art: Take photos of science instruments, label the parts, and describe their use. Create an original book

Art: Design a front page of a newspaper with Earth's structure as the front page story.

Art history: Investigate depictions of famous volcanoes, such as Mount Fuji in Japan.

Physical Education: Read about the first ascent of Mount Everest.

7 Art: Make a mobile with cardboard cutouts of a group of objects and determine the center of gravity so that it will hang straight.

7 Art: Use toothpicks and gumdrops to construct a model of methane or propane.

7 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.

7 Art: Prepare a "History of the Elements" mural, find the year of discovery, and make a drawing depicting the current uses of the element.

7 Art: Build models of nuclear reactors from cardboard boxes and tubes or dowels and demonstrate key components to the class.

7 Music: Research the history and development of string and wind instruments and how they produce sound.

8 Art: Make models of cells, organs, and organ systems.

8 Art/Religion: Compare cells in an organism to building materials such as bricks or stone in your church or school building.

8 Art: Make models of cells with their organelles and describe their function.

8 Physical Education: Describe how muscle tissues in legs need oxygen to run, jump, or kick in the water.

8 Physical Education: List with your class examples of parents and offspring with comparable athletic abilities.

8 Physical Education: Compare the NCAA basketball tournament (or similar sports organization) to mechanisms in natural selection.

8 Physical Education: Discuss how individuals playing sports on a team is a system.

8 Art: Draw pictures of different types of trees or bushes that have distinctive traits.

Art: Make posters showing the steps of inquiry and the scientific method.

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| <b>TECHNOLOGY</b> | <p>Use a computer to make a sketch of the solution to a technological problem.</p> <p>Take digital pictures of a design solution and the test. Present results on the computer.</p> <p>Create computer graphs to illustrate a math topic</p> <p>Create a visual presentation for the school's web site.</p> <p>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.</p> <p>Visit websites describing alternative energy sources and write about your findings, listing all sources.</p> <p>Visit web sites showing recent images of the photosphere of the sun.</p> <p>Learn about how geological hazards help to shape codes and policies for buildings and construction.</p> <p>Research the water purification and distribution and waste management programs in your city.</p> <p>Research the history and development of the airline industry.</p> <p>Research fuel cells that astronauts use and learn how energy is converted.</p> <p>Read about how scientists communicate with the Mars rovers and whether or not this is like a cell phone call.</p> <p>Investigate summaries of current research and findings on health issues at the website for the Center for Disease Control and Prevention.</p> <p>Use computers to summarize results from an experiment and design data tables and graphs</p> <p>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.</p> |
|-------------------|---|

The student will:

1. cite specific textual evidence to support analysis of scientific and technical texts.
2. summarize the broad ideas and specific conclusions made in a text, basing the summary on textual information rather than on prior knowledge or opinions.
3. determine the meaning of key terms, symbols and domain specific vocabulary used in a text.
4. analyze how each major part of a text contributes to an understanding of the topic discussed in the text.
5. analyze the purpose of an experiment or explanation in a text, including defining the problem or question to be resolved.
6. integrate information provided by the words in a text with a version of the information expressed graphically (e.g., in a flow chart, diagram, model, graph, or table).
7. distinguish facts or reasoned judgments based on research findings from opinions.
8. compare and contrast the information gained from experiments, simulations, video or multimedia sources with that gained from reading a text on the same topic.
9. read informational text independently, proficiently, and fluently in the grades 6-8 text level. X.

### **SCIENCE WRITING LITERACY**

The student will:

1. write arguments focused on science content in which they:
  - a) introduce a claim about a topic or issue, distinguish it from alternate or opposing claims, and organize the reasons, data, and evidence logically to support the claim.
  - b) support the claim with logical reasoning and detailed, accurate data evidenced from investigations.
  - c) use words and phrases as well as specific science vocabulary to make clear the relationships among claims, reasons, data, and evidence.
  - d) sustain an objective style and tone.
  - e) provide a concluding statement or section that follows logically from the arguments.
2. perform short focused research projects in response to question or problem and generate additional related questions that allow for multiple avenues of exploration.
3. gather relevant information from multiple print and digital sources using effectively tailored searches; assess the credibility and accuracy of each source; and quote or paraphrase the evidence, avoiding plagiarism and following a standard format for citation.

# High School Science Standards

## ARCHDIOCESAN HIGH SCHOOL STANDARDS

**As a result of successful completion of the Archdiocesan High School Science Curricula, the students will:**

- HSB1. Work independently and collaboratively in an inquiry-based learning environment to find solutions to authentic and complex problems
- HSB2. Understand and use scientific inquiry as a thoughtful and coordinated attempt to search out, describe, explain and predict natural phenomena
- HSB3. Conduct scientific inquiry through a continuous process of questioning, data collection, analysis and interpretation
- HSB4. Share findings and ideas for critical review by colleagues and other scientists
- HSB5. Read, write, discuss and present coherent ideas about science
- HSB6. Evaluate and use technology resources to conduct research, demonstrate creative and critical thinking, and communicate effectively utilizing a variety of formats and platforms
- HSB7. Use mathematical operations and procedures to calculate analyze and present scientific data and ideas
- HSB8. Demonstrate their learning through performance-based assessments and express their conclusions through elaborated explanations of their thinking

### Introduction to High School Science

This curriculum serves as an overview of high school science courses. It can be integrated into other science disciplines or taught as an introductory course for freshman.

### Energy Transformations

**A.1 To describe the role of energy in our world, demonstrating an understanding that energy cannot be created or destroyed and that it can be converted from one form to another;**

**A.2 To understand that energy enters the Earth system primarily as solar radiation, is captured by materials and photosynthetic processes, and eventually is transformed into heat.**

The student will:

1. Describe the effect of adding energy to matter in terms of the motion of atoms and molecules, and the resulting phase changes
2. Explain how energy is transferred by conduction, convection and radiation
3. Describe energy transformations among heat, light, electricity and motion

**B.1 To describe an electrical force as a universal force that exists between any two charged objects;**

**B.2 To demonstrate an understanding that moving electrical charges produce magnetic forces, and moving magnets can produce electrical force.**

**B.3 To explain how electrical current can be transformed into light through the excitation of electrons.**

The student will:

1. Explain the relationship among voltage, current and resistance in a simple series circuit
2. Explain how electricity is used to produce heat and light in incandescent bulbs and heating elements
3. Describe the relationship between current and magnetism

**C. To describe how various sources of energy are used by humans and all have advantages and disadvantages.**

The student will:

1. Explain how heat is used to generate electricity
2. Describe the availability, current uses and environmental issues related to the use of fossil and nuclear fuels to produce electricity
3. Describe the availability, current uses, and environmental issues related to the use of hydrogen fuel cells, wind and solar energy to produce electricity

### Chemical Structures and Properties

**D. To demonstrate an understanding of how the structure of matter affects the properties and uses of materials.**

The student will:

1. Describe the general structure of the atom and explain how the properties of the first 20 elements in the Periodic Table are related to their atomic structure
2. Describe how atoms combine to form new substances by transferring electrons (ionic bonding) or sharing electrons (covalent bonding)
3. Explain the chemical composition of acids and bases, and explain the change of pH in neutralization reactions

**E. To describe how the structure of matter affects the properties and uses of materials.**

The student will:

1. Explain how the structure of the carbon atom affects the type of bonds it forms in organic and inorganic molecules
2. Describe combustion reactions of hydrocarbons and their resulting by-products
3. Explain the general formation and structure of carbon-based polymers, including synthetic polymers, such as polyethylene, and biopolymers, such as carbohydrate

**F. To describe ways in which science and technology affect the quality of our lives.**

The student will:

1. Explain how simple chemical monomers can be combined to create linear, branched and/or cross-linked polymers
2. Explain how the chemical structure of polymers affects their physical properties
3. Explain the short- and long-term impacts of landfills and incineration of waste materials on the quality of the environment
4. Evaluate the risks and benefits of chemical technology in light of the call of humans to be stewards of creation

### Global Interdependence

**G. To describe how elements on Earth move among reservoirs in the solid earth, oceans, atmosphere and organisms as part of biogeochemical cycles.**

The student will:

1. Explain how chemical and physical processes cause carbon to cycle through the major earth reservoirs
2. Explain how solar energy causes water to cycle through the major earth reservoirs
3. Explain how internal energy of the Earth causes matter to cycle through the magma and the solid earth

**H. To explore how the use of resources by human populations may affect the quality of the environment.**

The student will:

1. Explain how the release of sulfur dioxide (SO<sub>2</sub>) into the atmosphere can form acid rain, and how acid rain affects water sources, organisms and human-made structures
2. Explain how the accumulation of carbon dioxide (CO<sub>2</sub>) in the atmosphere increases Earth's "greenhouse" effect and may cause climate changes
3. Explain how the accumulation of mercury, phosphates and nitrates affect the quality of water and the organism that live in rivers, lakes and oceans

**I. To explore, describe, and evaluate the effect of science and technology on our lives especially in terms of recyclable and non-recyclable materials and the effect they have on the balance of the Earth systems.**

The student will:

1. Explain how new technologies and changes in lifestyle can have positive and/or negative effects on the environment
2. Explain how land development, transportation options and consumption of resources may affect the environment
3. Describe human efforts to reduce the consumption of raw materials and improve air and water quality

### Cell Chemistry and Biotechnology

**J.1 To describe how organisms are structured to ensure efficiency and survival;**

**J.2 To describe how most of the chemical activities of the cell are catalyzed by enzymes that function only in a narrow range of temperature and acidity conditions;**

**J.3 To describe how the cellular processes of photosynthesis and respiration involve transformation of matter and energy.**

The student will:

1. Describe significant similarities and differences in the basic structure of plant and animal cells
2. Describe the general role of DNA and RNA in protein synthesis
3. Describe the general role of enzymes in metabolic cell processes
4. Explain the role of the cell membrane in supporting cell functions



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**K. 1 To describe the essential role microorganisms have in life processes and cycles on Earth;**

**K.2 To demonstrate an understanding of the growth and spread patterns of viruses and bacteria enable the development of methods to prevent and treat infectious diseases.**

The student will:

1. Describe the similarities and differences between bacteria and viruses
2. Describe how bacterial and viral infectious diseases are transmitted, and explain the roles of sanitation, vaccination and antibiotic medications in the prevention and treatment of infectious diseases
3. Explain how bacteria and yeasts are used to produce foods for human consumption

**L. 1 To describe how similarities in the chemical and structural properties of DNA in all living organisms allow the transfer of genes from one organism to another;**

**L.2 To demonstrate an understanding of how the principles of genetics and cellular chemistry can be used to produce new foods and medicines in biotechnological processes.**

The student will:

1. Describe, in general terms, how the genetic information of organisms can be altered to make them produce new materials
2. Explain the risks and benefits of altering the genetic composition and cell products of existing organisms

### **Genetics, Evolution & Biodiversity**

**M. 1 To describe how each offspring in sexually producing organisms contains a mix of characteristics inherited from both parents;**

**M.2 To describe how genetic information is stored in genes that are located on chromosomes inside the cell nucleus and how most organisms have two genes for each trait.**

The student will:

1. Explain how meiosis contributes to the genetic variability of organisms
2. Use the Punnet Square technique to predict the distribution of traits in mono- and bi-hybrid crossings
3. Deduce the probable mode of inheritance of traits (e.g., recessive/dominant, sex-linked) from pedigree diagrams showing phenotypes
4. Describe the difference between genetic disorders and infectious diseases

**N. To describe evolution and biodiversity as the result of genetic changes that occur over time in constantly changing environments.**

The student will:

1. Explain how the processes of genetic mutation and natural selection are related to the evolution of species
2. Explain how the current theory of evolution provides a scientific explanation for fossil records of ancient life forms
3. Describe how structural and behavioral adaptations increase the chances for organisms to survive in their environments

**O. To describe living organisms as having the capacity of producing populations of unlimited size in an environment that can support only a limited number of individuals from each species.**

The student will:

1. Describe the factors that affect the carrying capacity of the environment
  2. Explain how change in population density is affected by emigration, immigration, birth rate and death rate, and relate these factors to the exponential growth of human populations
  3. Explain how technological advances have affected the size and growth rate of human populations throughout history
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**CELLS****A. To understand that the fundamental life processes of plant and animals depend on a variety of chemical reactions that occur in specialized areas of the organism's cells.**

The student will:

1. Construct an explanation based on evidence that organic molecules are primarily composed of six elements, where carbon, hydrogen, and oxygen atoms may combine with nitrogen, sulfur, and phosphorus to form monomers that can further combine to form large carbon-based macromolecules, proteins, carbohydrates, lipids, and nucleic acids.
2. Demonstrate an understanding that cells are enclosed within semi-permeable membranes that regulate their interaction with their surroundings
3. Demonstrate an understanding that enzymes are proteins that catalyze biochemical reactions without altering the reaction, equilibrium and the activities of enzymes depend on the temperature, ionic conditions and the pH of the surroundings
4. Demonstrate an understanding that prokaryotic cells, eukaryotic cells (including those from plants and animals), and viruses differ in complexity and general structure
5. Demonstrate an understanding that the central dogma of molecular biology outlines the flow of information from transcription of ribonucleic acid (RNA) in the nucleus to translation of proteins on ribosomes in the cytoplasm
6. Demonstrate an understanding of the structure and function of endomembrane system.
7. Demonstrate an understanding of transfer of energy in living systems
8. Provide evidence that homeostasis maintains internal body conditions through both body-wide feedback mechanisms and small-scale cellular processes.
9. Understand various forms of cellular transport and communication.
10. Construct an explanation using evidence for why the cell cycle is necessary for the growth, maintenance, and repair of multicellular organisms. Model the major events of the cell cycle, including (a) cell growth and DNA replication, (b) separation of chromosomes (mitosis), and (c) separation of cell contents.

**GENETICS****B. To understand that a multi-cellular organism develops from a single zygote, and its phenotype depends on its genotype, which is established at fertilization.**

The student will demonstrate an understanding that:

1. The probable outcome of phenotypes in a genetic cross can be predicted from the genotypes of the parents and mode of inheritance (autosomal or X-linked, dominant or recessive)
2. Mendel's laws of segregation and independent assortment are the basis of genetics
3. The probable mode of inheritance can be predicted from a pedigree diagram showing phenotypes

**C. To understand that mutation and sexual reproduction lead genetic variation in a population.**

The student will:

1. Develop and use a model to show how DNA in the form of chromosomes is passed from parents to offspring through the processes of meiosis and fertilization in sexual reproduction.
2. Make and defend a claim based on evidence that genetic variations (alleles) may result from (a) new genetic combinations via the processes of crossing over and random segregation of chromosomes during meiosis, (b) mutations that occur during replication, and/or (c) mutations caused by environmental factors. Recognize that mutations that occur in gametes can be passed to offspring.
3. Apply concepts of probability to represent possible genotype and phenotype combinations in offspring caused by different types of Mendelian inheritance patterns.
4. Use scientific information to illustrate that genetic traits of individuals, and the presence of specific alleles in a population, are due to interactions of genetic factors with environmental factors.

#### **D. To understand the utilization and application of biotechnology in the real world.**

The student will:

1. Construct a model of transcription and translation to explain the roles of DNA and RNA that code for proteins that regulate and carry out essential functions of life.
2. Demonstrate an understanding that base pairing rules are used to explain the precise copying of DNA during semi-conservative replication and transcription of information from DNA to mRNA
3. Demonstrate an understanding that genetic engineering (biotechnology) is used to produce novel biomedical and agricultural products
4. Demonstrate an understanding that DNA technology (restriction digestion by endonucleases, gel electrophoresis, ligation and transformation) is used to construct recombinant DNA molecules
5. Demonstrate an understanding that exogenous DNA can be inserted into bacterial cells to alter their genetic makeup and support expression of new protein products

### **ECOLOGY**

#### **E. To understand that stability in an ecosystem is a balance between competing effects.**

The student will:

1. Analyze data sets to support explanations that biotic and abiotic factors affect ecosystem carrying capacity.
2. Use mathematical representations to support explanations that biotic and abiotic factors affect biodiversity, including genetic diversity within a population and species diversity within an ecosystem.
3. Use a mathematical model to describe the transfer of energy from one trophic level to another. Explain how the inefficiency of energy transfer between trophic levels affects the relative number of organisms that can be supported at each trophic level and necessitates a constant input of energy from sunlight or inorganic compounds from the environment.
4. Use a model that illustrates the roles of photosynthesis, cellular respiration, decomposition, and combustion to explain the cycling of carbon in its various forms among the biosphere, atmosphere, hydrosphere, and geosphere.
5. Analyze data to show ecosystems tend to maintain relatively consistent numbers and types of organisms even when small changes in conditions occur but that extreme fluctuations in conditions may result in a new ecosystem. Construct an argument supported by evidence that ecosystems with greater biodiversity tend to have greater resistance to change and resilience.

6. Analyze direct and indirect effects of human activities on biodiversity and ecosystem health, specifically habitat fragmentation, introduction of non-native or invasive species, overharvesting, pollution, and climate change. Evaluate and refine a solution for reducing the impacts of human activities on biodiversity and ecosystem health.

## **BIOLOGICAL EVOLUTION**

### **F. To understand the frequency of an allele in a gene pool of a population depends on many factors and may be stable or unstable over time.**

The student will:

1. Communicate scientific information that the origin of macromolecules in common ancestry and biological evolution are supported by multiple lines of empirical evidence, including molecular, anatomical, and developmental similarities inherited from a common ancestor (homologies), seen through fossils and laboratory and field observations.
2. Construct an explanation based on evidence that Darwin's theory of evolution by natural selection occurs in a population when the following conditions are met: (a) more offspring are produced than can be supported by the environment, (b) there is heritable variation among individuals, and (c) some of these variations lead to differential fitness among individuals as some individuals are better able to compete for limited resources than others.
3. Evaluate models that demonstrate how changes in an environment may result in the evolution of a population of a given species, the emergence of new species over generations, or the extinction of other species due to the processes of genetic drift, gene flow, mutation, and natural selection.

### **G. To understand that evolution is the result of genetic changes that occur in constantly changing environments.**

The student will demonstrate proficient understanding that:

1. Natural selection determines the differential survival of groups of organisms
2. A great diversity of species increases the chance that at least some organisms survive major changes in the environment
3. Genetic drift affects the diversity of organisms in a population
4. Reproductive or geographic isolation affects speciation
5. Fossil evidence contributes to our understanding of biological diversity, episodic speciation and mass extinction
6. Several independent molecular clocks, calibrated against each other and combined with evidence from the fossil record, can help to estimate how long ago various groups of organisms diverged evolutionarily from one another

## **PHYSIOLOGY**

### **H. Diversity of Life: Taxonomic Structures of Organisms:**

The student will:

1. Research and communicate information about key features of viruses and bacteria to explain their ability to adapt and reproduce in a wide variety of environments.
2. Develop and use multiple models to illustrate the key functions and interrelationships of living organisms, which may include (a) food digestion, nutrient uptake, and transport through the body, (b) exchange of oxygen and carbon dioxide, (c) removal of wastes, and (d) regulation of body processes, (e) reproduction, (f) nervous system.

### **I. To understand that as a result of the coordinated structures and functions of organ systems, the internal environment of the human body remains relatively stable (homeostatic) despite changes in the outside environment.**

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The student will demonstrate an understanding that:

1. The complementary activity of major body systems provides cells with oxygen and nutrients and removes toxic waste products such as carbon dioxide
2. The nervous system mediates communication between different parts of the body and the body's interactions with the environment
3. Feedback loops in the nervous and endocrine systems regulate conditions in the body
4. The neurons transmit electrochemical impulses
5. Sensory neurons, inter-neurons and motor neurons all have a role in sensation, thought and response
6. Digestion includes the secretion of stomach acid, digestive enzymes (amylases, proteases, nucleases, lipases) and bile salts into the digestive system
7. The kidneys have a homeostatic role in the removal of nitrogenous wastes from the blood
8. The liver has a homeostatic role in detoxification and keeping the blood glucose balance

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**J. To understand that organisms have a variety of mechanisms to combat disease.**

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The student will demonstrate a proficient understanding that:

1. The skin provides non-specific defenses against infection
  2. Antibodies have a role in the body's response to infection
  3. Vaccination protects an individual from infectious diseases
  4. There are important differences between bacteria and viruses with respect to their requirements for growth and replication, the body's primary defenses against bacterial and viral infections, and effective treatments of these infections
  5. An individual with a comprised immune system (for example, a person with AIDS) may be unable to fight off and survive infections by microorganisms that are usually benign
  6. Phagocytes, B-lymphocytes and T-lymphocytes have a role in the immune system
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# CHEMISTRY

## Scientific Method

### 1. To understand and apply the principles and practice of the scientific method.

The student will :

1. Accurately and precisely use measurements i.e., metric units, scientific notation, and significant figures
2. Develop a well written hypothesis
3. Apply the use of dimensional analysis when converting metric units
4. Develop and demonstrate accuracy and precision in lab technique

## Atomic & Molecular Structure

### 2. To understand that the periodic table displays the elements in increasing atomic number and shows how periodicity of the physical and chemical properties of the elements relates to atomic structure.

The student will demonstrate an understanding that:

1. The nucleus of the atom is much smaller than the atom, yet contains most of its mass
2. The quantum model of an atom is based on experiments and analyses by many scientists, including Dalton, Thomas, Bohr, Rutherford, Millikan and Einstein
3. The position of an element in the periodic table is related to its atomic number
4. The periodic table can be used to identify metals, semimetals, non-metals and halogens
5. The periodic table can be used to identify trends in ionization energy, electro negativity, the relative sizes of ions and atoms, and the number of electrons available for bonding
6. The electronic configuration of elements and their reactivity can be identified based on their position in the periodic table

## Chemical Bonds

### 3. To understand the biological, chemical and physical properties of matter result from the liability of atoms to form bonds from electrostatic forces between electrons and protons and between atoms and molecules.

The student will demonstrate an understanding (that):

1. Atoms combine to form molecules by sharing electrons to form covalent or metallic bonds or by exchanging electrons to form ionic bonds
2. Chemical bonds between atoms in molecules such as  $H_2$ ,  $CH_4$ ,  $NH_3$ ,  $H_2CCH_2$ ,  $N_2$ ,  $Cl_2$ , and many large biological molecules are covalent
3. Salt crystals, such as  $NaCl$ , are repeating patterns of positive and negative ions held together by electrostatic attraction
4. The atoms and molecules in liquids move in a random pattern relative to one another because the intermolecular forces are too weak to hold the atoms or molecules in a solid form
5. Lewis dot structures can provide models of atoms and molecules
6. The shape of simple molecules and their polarity can be predicted from the Lewis Theory
7. Electronegativity and ionization energy are related to bond formation
8. Intramolecular forces and intermolecular forces exist within and between molecules
9. Solids and liquids held together by Van der Waals forces or hydrogen bonds are affected by volatility and boiling/melting point temperatures
10. Of how to construct and write chemical formulas and names of chemical compounds
11. Of how to identify the five basic types of reactions: single replacement, double replacement, decomposition, synthesis, and combustion; as well as acid base precipitation and oxidation reduction reactions
12. Construct an explanation based on the kinetic molecular theory for how the rate of a chemical reaction varies during the dissolving process.

## Conservation of Matter and Stoichiometry

### 4. To understand that the conservation of atoms in chemical reactions lead to the principle of conservation of matter and the ability to calculate the mass of products and reactants.

The student will demonstrate an understanding that:

1. Chemical reactions can be described by writing balanced equations
2. The quantity one mole is set by defining one mole of carbon; 12 atoms to have a mass of exactly 12 grams
3. One mole equals  $6.02 \times 10^{23}$  particles (atoms or molecules)
4. The molar mass of a molecule can be determined from its chemical formula and a table of atomic masses
5. The percent composition and empirical formula can be determined from the molecular formula of the compound
6. The mass of a molecular substance can be converted to moles, number of particles, or volume of gas at standard temperature and pressure
7. Molarity, solution dilution, colligative properties, and percent by mass can be determined for homogeneous mixtures
8. Hess's law is used to calculate enthalpy change in a reaction

## States of Matter

### 5. To understand various forms of matter exist.

The student will understand:

1. The energy associated with phase changes
2. The structure of and intermolecular forces between liquid molecules
3. The kinetic molecular theory as it relates to the movements of the particles in solids, liquids, and gases
4. That the kinetic molecular theory can be used to compare the strengths of the intermolecular forces between molecules in solids, liquids, and gases
5. The simple gas laws, combined gas law, and the ideal gas law can be used to calculate pressure, volume, temperature, and moles
6. The unique properties due to hydrogen bonding in water

## Reaction Rates

### 6. To understand that chemical reaction rates depend on factors that influence the frequency of collision of reactant molecules.

The student will demonstrate an understanding that:

1. The Collision Theory can be used to understand how the rate of the reaction will change over time
2. The rate of reaction is the decrease in concentration of reactants or the increase in concentration of products with time
3. Reaction rates depend on factors such as concentration, temperature and pressure
4. Equilibrium is established when forward and reverse reaction rates are equal
5. Catalysts play a role in increasing the reaction rate by changing the activation energy in a chemical reaction

## Acids and Bases

### 7. To understand that acids and bases are common solutions with unique properties.

The students will:

1. Identify real world acids and bases and relate properties to their pH
2. Develop an understanding of the pH and pOH scale as it relates to the concentration of hydronium and hydroxide concentration
3. Identify Arrhenius Acids, Bronsted-Lowry Acids, Lewis Acids
4. Write an equation for neutralization reactions
5. Determine the molarity of a solution using the technique of titration

## Organic Chemistry & Biochemistry

### 8. To understand the bonding characteristics of carbon allow the formation of many different organic molecules of varied sizes, shapes and chemical properties, and provide the biochemical basis of life.

The student will demonstrate an understanding that:

1. The unique bonding of carbon results in the formation of many large complex structures

2. The bonding of carbon to hydrogen forms hydrocarbons such as alkanes, alkenes, alkynes
3. The identification of functional groups will aid in determining the type of organic molecule present



# PHYSICS

## Motion & Forces

### To understand that Newton's laws predict the motion of most objects.

The student will demonstrate an understanding that:

1. When forces are balanced, no acceleration occurs; thus an object continues to move at a constant speed or stays at rest
2. The law  $F=ma$  is used to solve motion problems that involve constant forces
3. When one object exerts a force on a second object, the second object always exerts a force of equal magnitude and in the opposite direction
4. Applying a force to an object perpendicular to the direction of its motion causes the object to change direction
5. Circular motion requires the application of a constant force directed toward the center of the circle
6. Newton's laws are not exact, but provide very good approximations unless an object is small enough that quantum effects become important

### To understand that the laws of conservation of energy and momentum provide a way to predict and describe the movement of objects.

The students will demonstrate an understanding that:

1. Kinetic energy (KE) can be calculated by using the formula  $KE = \frac{1}{2}mv^2$
2. Changes in gravitational potential energy ( $\Delta PE$ ) near Earth's surface can be calculated by using the formula  $\Delta PE = mg\Delta h$ .
3. The total amount of energy in an isolated system does not change.
4. Momentum (p) is calculated using the formula  $p = mv$ .
5. Momentum is a separately conserved quantity different from energy.
6. An unbalanced force acting on a system produces a change in the momentum of the system.
7. The principles of conservation of energy and momentum can be used to solve problems involving elastic and inelastic collisions.

## Heat & Thermodynamics

### To understand that laws of thermodynamics and heat relate to work and energy in physical systems.

The student will demonstrate an understanding that:

1. Heat flow and work are two forms of energy transfer between systems
2. The work done by a heat engine that is working in a cycle is the difference between the heat flow into the engine at high temperature and the heat flow out at a lower temperature
3. The internal energy of an object includes the energy of random motion of the object's atoms and molecules. The greater the temperature of the object, the greater the energy of motion of the atoms and molecules that make up the object
4. Most processes tend to decrease the order of a system over time, so that energy levels eventually are distributed more uniformly

## Waves

### To understand that waves have characteristic properties that do not depend on the type of wave.

The student will demonstrate an understanding that:

1. Waves carry energy from one place to another
2. Transverse and longitudinal waves exist in mechanical media, such as springs and ropes, and in the Earth as seismic waves.
3. Wavelength, frequency and wave speed are related
4. Sound is a longitudinal wave whose speed depends on the properties of the medium in which it propagates
5. Radio waves, light and X-rays are different wavelength bands in the spectrum of electromagnetic waves, the speed of which in a vacuum is approximately  $3 \times 10^8$  m/s, and less when passing through other media
6. Waves have characteristic behaviors, such as interference, diffraction, refraction and polarization

7. Beats and the Doppler Effect result from the characteristic behavior of waves

## Electric and Magnetic Phenomena

**To understand that electric and magnetic phenomena are related and have many practical applications.**

The student will demonstrate an understanding that:

1. The voltage or current in simple direct current (DC) electric circuits constructed from batteries, wires, resistors and capacitors can be predicted using Ohm's law
2. Any resistive element in a DC circuit dissipates energy, which heats the resistor
3. The power in any resistive circuit element can be calculated by using the formula  $\text{Power} = I^2 R$
4. Charged particles are sources of electric fields and are subject to the forces of the electric fields from other charges
5. Magnetic materials and electric currents (moving electric charges) are sources of magnetic fields and are subject to forces arising from the magnetic fields of other sources
6. Changing magnetic fields produce electric fields, thereby inducing currents in nearby conductors
7. Plasma, the fourth state of matter, contains ions, or free electrons or both and conducts electricity

## EARTH & SPACE SCIENCE

### Earth's Place in the Universe

#### **A. To understand that earth-based and space-based astronomy reveals the structure, scale, and changes in stars, galaxies and the universe over time.**

The student will demonstrate an understanding that:

1. The differences and similarities among the sun, the terrestrial planets and the gas planets may have been established during the formation of the solar system
2. Evidence from Earth and moon rocks indicates that the solar system was formed from a nebular cloud of dust and gas approximately 4.6 billion years ago
3. Evidence from geological studies of Earth and other planets suggests that the early Earth was very different from Earth today
4. The sun is a typical star and is powered by nuclear reactions, primarily the fusion of hydrogen to form helium
5. Asteroids and meteorites had a significant role in shaping the surface of planets and their moons and in mass extinctions of life on Earth
6. The solar system is located in an outer edge of the disc-shaped Milky Way galaxy, which spans 100,000 light years
7. Galaxies are made of billions of stars and comprise most of the visible mass of the universe
8. Evidence indicates that all elements with an atomic number greater than that of lithium have been formed by nuclear fusion in stars
9. Visual, radio, and X-ray telescopes may be used to collect data that reveal those differences in the life cycles of stars
10. The "big bang" model suggests that the universe has been expanding for 10 to 20 billion years

### Dynamic Earth Processes

#### **B. To understand that plate tectonics operating over geologic time have changed the patterns of land, sea and mountains on Earth's surface.**

The student will demonstrate an understanding that:

1. Features of the ocean floor, as well as the shape and rock composition of the major plates, provide evidence of plate tectonics
2. Volcanic eruptions and earthquakes are the result of the movement of matter and energy within the Earth
3. The properties of rocks and minerals can be explained based on the physical and chemical conditions in which they were formed, including plate tectonic processes

### Energy in the Earth System

#### **C. To understand that energy enters the Earth system primarily as solar radiation and eventually escapes as heat.**

The student will demonstrate an understanding that:

1. The sun is a major source of energy for Earth and other planets
2. Some of the solar radiation is reflected back into the atmosphere and some is absorbed by matter and photosynthetic processes.
3. Different atmospheric gases absorb the Earth's thermal radiation
4. The greenhouse effect may cause climatic changes

#### **D. To understand that the heating of Earth's surface and atmosphere by the sun drives convection within the atmosphere and oceans, producing winds and ocean currents.**

The student will demonstrate an understanding that:

1. Differential heating of Earth results in circulation patterns in the atmosphere and oceans that globally distribute the heat
2. The rotation of Earth influences the circular motions of ocean currents and air
3. Properties of ocean water, such as temperature and salinity, can be used to explain the layered structure of the oceans, the generation of horizontal and vertical ocean currents, and the geographic distribution of marine organisms
4. The interaction of wind patterns, ocean currents and the distribution of land masses result in a global pattern of latitudinal bands of rain forests and deserts

#### **E. To understand that climate is the long-term average of a region's weather and depends on many factors.**

The student will demonstrate an understanding that:

1. Weather and climate involve the transfer of energy into and out of the atmosphere
2. Latitude, elevation, topography, proximity to large bodies of water, and cold or warm ocean currents affect the climate

3. Earth's climate has changed over time, corresponding to changes in Earth's geography, atmospheric composition and other factors, such as solar radiation and plate movement

### Biochemical Cycles

**F. To understand that each element on Earth moves among reservoirs which exist in the solid earth, in oceans, in the atmosphere, and within and among organisms as part of biogeochemical cycles.**

The student will demonstrate an understanding that:

1. The movement of matter among reservoirs is driven by Earth's internal and external sources of energy  
Carbon cycles through the reservoirs of the atmosphere, lithosphere, hydrosphere and biosphere

### Structure & Composition of the Atmosphere







**G. To understand that life has changed Earth's atmosphere and changes in the atmosphere affect conditions for life.**

The student will demonstrate an understanding that:

1. The atmosphere has specific thermal structure and chemical composition
2. The composition of Earth's atmosphere has evolved over geologic time
3. The origin of atmospheric oxygen is photosynthetic processes
4. The ozone layer in the upper atmosphere absorbs ultraviolet radiation. This layer varies both naturally and in response to human activities

[Suggested Cross Curricular and Catholic Social Teaching Links](#)

## High School (Grades Nine – Twelve)

-  Student interview transplant patients as part of a case study or essay about the benefits and challenges of technology. (Language Arts, Science)
-  Students read a variety of nonfiction pieces about environmental issues and natural resources to develop an understanding of themselves as guardians of creation. (Science, Religion, Literature)
-  Students read and write essays and speeches that connect excessive economic, social and cultural inequalities to conflicts between nations and among peoples (both in the present and past), articulating the link between peace and justice. (Social Studies, Science, Religion, Literature, Written Language)
-  Students write persuasive essays and speeches supporting one political leader over another because he/she better reflects an understanding of society's moral responsibility to use resources well. (Religion, Social Studies, Science, Written Language)
-  Students write short stories describing the consequences of environmental or personal health choices. (Religion, Written Language, Science)
-  Students write about and calculate the environmental and economic cost of war, natural disasters, unemployment, etc.), expressing an understanding that, as Catholic Christians, we are called to work globally and locally for justice. (Math, Social Studies, Science)

\*Simple Lab Report Sample

Name: \_\_\_\_\_

Grade: \_\_\_\_\_

Date: \_\_\_\_\_

| Criteria  | Points Possible | Self-Assessment: Points Awarded | Actual Points Awarded |
|---|-----------------|---------------------------------|-----------------------|
| Problem Statement- An appropriate question is given.                                | 10              |                                 |                       |
| Hypothesis- Hypothesis is in an “if – then” statement                               | 10              |                                 |                       |
| Variables- IV,DV, CV are accurate   | 15              |                                 |                       |
| Materials list is accurate and detailed   | 10              |                                 |                       |
| Procedure is detailed, accurate, and includes numbered steps.                       | 20              |                                 |                       |
| Data chart is given with observations   | 10              |                                 |                       |
| Conclusion- R.A.C.E. is followed. Evidence from the experiment supports the answer. | 15              |                                 |                       |
| Sources of Error- An accurate, thoughtful account of the lab is given.              | 5               |                                 |                       |
| I, me, my, we, our etc. are not used in the lab.                                    | 5               |                                 |                       |
| Total possible points:  | 100             | /100                            | / 100                 |

Name: \_\_\_\_\_

Grade: \_\_\_\_\_

Date: \_\_\_\_\_

| Title                     |
|---------------------------|
| <b>Problem Statement:</b> |
| <b>Hypothesis:</b>        |
| <b>Variables:</b>         |
| <b>IV:</b>                |
| <b>DV:</b>                |
| <b>CV:</b>                |
| <b>Materials List:</b>    |

**Procedure:**

**Data (Attach Graphs & Charts):**

**Conclusion: Remember R.A.C.E.:**

**Sources of Error:**

***\*Refer to Curriculum Resources Portal for more Lab Report Samples***

## **How to Incorporate the Pope's Encyclical *Laudato Si* into Your Classroom**

*Sunday, September 13, 2015 by Dan Faas*

*"Living our vocation to be protectors of God's handiwork is essential to a life of virtue; it is not an optional or a secondary aspect of our Christian experience"*

A great deal of anticipation always surrounds a new papal encyclical. People wonder: Is Church teaching going to change? Will I, as a Catholic, be called to greater conversion and prayer? Will the pope use awesome words like "sourpuss?" (The answers are pretty consistently "Never," "Always," and "Probably," respectively).

Back in May, you might remember the excitement surrounding Pope Francis' latest encyclical, [Laudato Si: On Care For Our Common Home](#). But for many Catholic school teachers, that was right around the time they were grading finals, packing up the classroom, and getting ready for summer — not exactly the ideal time to read a 42,000-word encyclical.

Laudato Si, in short, is Pope Francis' appeal to the faithful to take a closer look at how we are shaping the future of our planet, the effect of humanity on global issues such as climate change and poverty, and the protection and care for what Francis calls "our common home." I can hardly think of something that functions as more of a "common home" than a school or classroom, so with class back in session and the Holy Father himself visiting our neck of the woods in a few weeks, here are some ideas on how the Catholic educator can incorporate some of the main messages of Laudato Si in their classroom.

*"Education in environmental responsibility can encourage ways of acting which directly and significantly affect the world around us, such as avoiding the use of plastic and paper, reducing water consumption, separating refuse, cooking only what can reasonably be consumed, showing care for other living beings, using public transport or car-pooling, planting trees, turning off unnecessary lights, or any number of other practices." (#211)*

### **1. Discuss with your students ways of being more environmentally responsible.**

The Holy Father gives a number of examples of ways in which we can become more responsible stewards of creation. When planning lessons, teachers can certainly incorporate environmental themes into their content. But often, the most relevant lessons are in the form of actions. As a class, consider how you're caring for your own "common home." How much paper are you using, and how can you and the students work together to create less waste? If you teach older students, consider how you might be able to find out how much your school spends in heating/cooling/energy costs and if there are responsible ways to cut down. Lastly, social justice must extend outside the classroom and school to the wider community. Consider ways in which you and your students can serve the poor in your own communities — even if it's something as simple as [making sandwiches](#).

*"'Tilling' refers to cultivating, ploughing or working, while 'keeping' means caring, protecting, overseeing and preserving. This implies a relationship of mutual responsibility between human beings and nature. Each community can take from the bounty of the earth whatever it needs for subsistence, but it also has the duty to protect the earth and to ensure its fruitfulness for coming generations"*  
(#67)

### **2. Keep a class garden.**

Having some kind of shared space or garden in which students can share responsibility can be a great way not only to cultivate understanding basic elements like botany and scientific observation, but helps the student community grow together and take root in a climate of collaboration (see what I did with all of those puns?). I dare you to watch [this adorable video](#) and not drive to Lowe's for supplies right after. Whether it's for beautification or growing some classroom zucchinis, a garden is a great way to work together and build community.

*"You will find something more in woods than in books. Trees and stones will teach you that which you can never learn from the masters." — St. Bernard of Clairvaux*

### **3. Have class outside.**

While good classroom management is a necessity here, there are plenty of good reasons for students to have engaging experiences with nature during the school day. A science teacher might have students take a look at local plants or an English teacher might have students write nature poems. Regardless of the discipline, though, there's no substitute for some good ol' Vitamin D. Many a teacher has deprived students of sunshine for fear of the class devolving into chaos and unpredictability, yet the NEA suggests it's actually [good for student behavior](#).

*"Living our vocation to be protectors of God's handiwork is essential to a life of virtue; it is not an optional or a secondary aspect of our Christian experience" (#217)*

### **4. Pray!**



Pray with your students, especially when it comes to cultivating an attitude of gratitude and humility in response to all of creation. As Francis has said, protecting creation isn't optional. But it must first come from a deep-seeded faith and awe of God and his handiwork. Turning attention in prayer to the wonder of creation and reflecting on our responsibility for defending it is a necessary step in our continuous "conversion" towards becoming greater stewards and tillers of this planet. At the end of the encyclical, Francis included the following prayer, which is a good place to start:

*A Prayer for Our Earth*

*All-powerful God, you are present in the whole universe  
and in the smallest of your creatures.  
You embrace with your tenderness all that exists.  
Pour out upon us the power of your love,  
that we may protect life and beauty.  
Fill us with peace, that we may live  
as brothers and sisters, harming no one.  
O God of the poor,  
help us to rescue the abandoned and forgotten of this earth,  
so precious in your eyes.  
Bring healing to our lives,  
that we may protect the world and not prey on it,  
that we may sow beauty, not pollution and destruction.  
Touch the hearts  
of those who look only for gain  
at the expense of the poor and the earth.  
Teach us to discover the worth of each thing,  
to be filled with awe and contemplation,  
to recognize that we are profoundly united  
with every creature  
as we journey towards your infinite light.  
We thank you for being with us each day.  
Encourage us, we pray, in our struggle  
for justice, love and peace.*

Whether teachers, school leaders, custodians, secretaries or otherwise, there are myriad ways in which we can take Francis' words to heart. While many Notre Dame fans might bristle at the saying, the Holy Father's words are clear, both now and moving forward: Go Green.

If mastery of a core idea in a science discipline is the ultimate educational destination, then well-designed learning progressions provide a map of the routes that can be taken to reach that destination. Such progressions describe both how students' understanding of the idea matures over time and the instructional supports and experiences that are needed for them to make progress.

Science is also at the heart of the United States' ability to continue to innovate, lead, and create the jobs of the future. All students no matter what their future education and career path must have a solid K–12 science education in order to be prepared for college, careers, and citizenship.

Engaging in the practices of science helps students understand how scientific knowledge develops; such direct involvement gives them an appreciation of the wide range of approaches that are used to investigate, model, and explain the world.

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<sup>i</sup> (2011). A Framework for K-12 Science Education: Practices, crosscutting concepts, and core ideas. (p. 26). Washington, DC: The National Academies Press. Retrieved from [http://www.nap.edu/catalog.php?record\\_id=13165](http://www.nap.edu/catalog.php?record_id=13165) *NRC Framework 2012*, pp. 42-43

**Sharing Catholic Social Teaching  
Selected Resources  
Background for Teachers and Reading Materials for Older Students**

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- Compendium of the Social Doctrine of the Church (Pontifical Council for Justice and Peace; Order through USCCB, 1/800-235-8722). Provides a complete and systematic overview of the Church's social teaching with an extensive index for easy reference on almost any topic.
  - A Place at the Table: A Catholic Recommitment to Overcome Poverty and to Protect the Dignity of All God's Children (USCCB, 1/800-235-8722). The U.S. bishops remind us that central to our identity as disciples of Jesus Christ is our concern for those who are poor or suffering.
  - Faithful Citizenship: A Catholic Call to Political Responsibility (USCCB, 1/800/235-8722) The 2003 bishops' statement includes Church teaching about civic participation, as well as the Church's position on a range of issues.
  - The Challenge of Faithful Citizenship (USCCB, 1/800/235-8722) This two-color brochure summarizes the bishops' statement, Faithful Citizenship: A Catholic Call to Political Responsibility and includes "Question for the Campaign" for voters and candidates.
  - Sharing Catholic Social Teaching: Challenges and Directions (USCCB, 800/235-8722) A statement of the U.S. bishops urging that Catholic social teaching be incorporated into every Catholic educational program. Identifies seven key themes of Catholic social teaching.
  - A Leader's Guide to Sharing Catholic Social Teaching (USCCB, 800/235-8722) Step-by-step process to help catechetical leaders and other adults explore Catholic social teaching. Includes camera-ready handouts.
  - Leaven for the Modern World: Catholic Social Teaching and Catholic Education (National Catholic Education Association, 202/337-6232) A resource designed to help educators at the secondary level deepen their understanding of Catholic social teaching and explore ways to share it with young people.
  - Everyday Christianity: To Hunger and Thirst for Justice (USCCB, 202/835-8722) The most important way lay Catholics work for justice and peace is through their choices and actions every day.
  - Brothers and Sisters to Us/Nuestros Hermanos y Hermanas (USCCB, 800/235-8722) The U.S. bishops promote discussion and action against racism.
  - The Challenge of Peace (USCCB, 800/235-8722) U.S. bishops' landmark pastoral on nuclear weapons and the arms race.
  - Living the Gospel of Life: A Challenge to American Catholics (USCCB, 800/235-8722) Calls U.S. Catholics to recover their identity as followers of Jesus Christ and to be leaders in the renewal of U.S. respect for the sanctity of life.
  - Sharing the Light of Faith: An Official Commentary (USCCB, Department of Education, 800/235-8722) Chapter VII explores Catholic social teaching and guidelines on catechesis for social ministry.
  - Confronting a Culture of Violence: A Catholic Framework for Action (USCCB, 800/235-9722) This statement

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- Economic Justice for All: Pastoral Letter on Catholic Social Teaching and the U.S. Economy by the U.S. bishops (USCCB, 800/235-8722) Resources such as posters and suggestions for using the pastoral letters in the classroom.
  - Renewing the Earth (National Catholic Rural Life Conference, 515/270-2634) Study guides for children, teens and adults on the bishops' environment statement. Materials for Classroom and Small Groups
  - In the Footsteps of Jesus: Resource Manual on Catholic Social Teaching (USCCB, 800/253-8722) Provides background reading, lesson plans for all ages, camera-ready resource, and other tools. Designed to be used with the video, *In the Footsteps of Jesus*.
  - From the Ground Up: Teaching Catholic Social Principles in Elementary Schools (National Catholic Education Association, 202/337-6232) A faculty preparation guide that includes a process for faculty development and sample activities for sharing the seven key themes of Catholic social in grades K through 8.
  - Excerpts from Sharing Catholic Social Teaching (USCCB, 800/253-8722) An easy to distribute card summarizing the seven themes of Catholic social teaching. Also available as a poster.
  - Making a Place at the Table (USCCB, 1/800235-8722) A brief, compelling, four-panel brochure summarizing the bishops' statement on poverty.
  - That's Not Fair! (Tom Turner, Bishop Sullivan Center, 816-231-0984) A complete kit with exercises and handouts to teach middle school students about Catholic social doctrine, culminating in an advocacy/lobbying project on a social justice issue.
  - Lesson Plans on Poverty ([www.povertyusa.org](http://www.povertyusa.org)). Lesson plans for grades K-12 and adults developed by the Catholic Campaign for Human Development.
  - A Catholic Framework for Economic Life (USCCB, 800/235-8722) A card containing ten key principles of Catholic social teaching on economic life.
  - Catholic Call to Justice: An Activity Book for Raising Awareness of Social Justice Issues ([www.usccb.org/CCHD](http://www.usccb.org/CCHD)) A lesson plan designed for ages 14-22 to experience through an obstacle course the major themes of Catholic social teaching.
  - Teaching Resources on Sweatshops & Child Labor (Archdiocese of Newark, 973-497-4000) A complete kit including video, background materials, and classroom exercises and handouts to help educators teach about sweatshops and child labor.
  - Integrating Catholic Social Teaching in the High School Curriculum: English and Religion (University of St. Thomas, 651-962-5712) A curriculum resource developed by Catholic high school educators.

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- Building God’s Kingdom: Implementing Catholic Social Teaching—Resources and Activities for Grades K – 12 (Religious Education Dept., Diocese of Toledo, 419/244-6711) Resources for schools and religious education programs.
  - A Good Friday Appeal to End the Death Penalty (USCCB, 800/235-8722) A brochure containing the U.S. bishops’ 1999 statement urging abolition of the death penalty.
  - Sharing the Tradition, Shaping the Future (Catholic Campaign for Human Development, 800/541-3212). A small group workbook on seven themes of Catholic social teaching.
  - Educating for Peace and Justice: Religious Dimensions, Grades 7-12 and Grades K-6 by James McGinnis (Institutes for Peace and Justice, 314/533-4445)
  - Food Fast (Catholic Relief Services, 800/222-0025) Free materials include a detailed coordinator’s manual with an outline for a 24-hour fast and activities that can be used in a classroom setting to explore issues of hunger and poverty.
  - Math for a Change/Math for a World that Rocks (Mathematical Teachers’ Association, 847/827-1361) Two booklets that use situations of injustice to apply or illustrate mathematics for grades 8-12.
  - Offering of Letters Kit and other resources (Bread for the World, 301/608-2400)
  - Operation Rice Bowl (Catholic Relief Services, 800/222-0025) Lenten program of fasting, education, almsgiving and prayer. The free materials include a video and religious educator’s guide.
  - Videos *In the Footsteps of Jesus* (USCCB, 800/235-8722) Part I (9 minutes): A compelling overview of seven key themes of Catholic social teaching. Part II (19 minutes): A more in-depth illustration of the seven themes highlighting people who have lived them.
  - Faithful Citizenship (USCCB, 800/235-8722) Great for small groups and classes, an appealing video message about the Catholic tradition of political responsibility.
  - Global Solidarity (USCCB, 800/235-8722) The U.S. bishops’ message of solidarity with our brothers and sisters throughout the world.
  - Sisters and Brothers Among Us (Catholic Campaign for Human Development, 202/541-3212) A 16-minute video that tells the story of poverty through the faces and voices of the poor.

#### **Web Sites –**

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- [www.usccb.org/sdwp](http://www.usccb.org/sdwp) -- The USCCB Department of Social Development and World Peace website—background information and action alerts on a variety of domestic and international issues, as well as general information on educating for justice and political responsibility.
  - [www.usccb.org/faithfulcitizenship](http://www.usccb.org/faithfulcitizenship) --Provides statements from the U.S. bishops and a wide range of resources, including lesson plans for all ages on Faithful Citizenship, Solidarity, Human Dignity, and the Option for the Poor.
  - [www.catholicrelief.org/what/advocacy--Up-to-date](http://www.catholicrelief.org/what/advocacy--Up-to-date) information on international public policy issues and how you and your students can act.
  - [www.catholiccharitiesusa.org/programs/advocacy](http://www.catholiccharitiesusa.org/programs/advocacy) ---Up-to date information on domestic public policy issues and how you and your students can act. Includes a special section for children/youth and for teachers and catechists.
  - [www.povertyusa.org](http://www.povertyusa.org) --Extensive information on poverty in the United States, including lesson plans.
  - [www.educationforjustice.org](http://www.educationforjustice.org) --The Center of Concern offers a wide range of educational materials on issues of justice and peace. Membership fee required.
  - [www.osjspm.org](http://www.osjspm.org) --The Office for Social Justice of the Archdiocese of St. Paul/Minneapolis offers a variety of first rate resources for justice education, including an annotated bibliography and information on models and ideas from their Catholic Justice Educator’s Network.
  - [www.stthomas.edu/cathstudies/cst/educ](http://www.stthomas.edu/cathstudies/cst/educ) -- The University of St. Thomas in St. Paul, MN offers a clearinghouse of resources and models for weaving Catholic social teaching into education programs at all levels.