SCIENCE
CURRICULUM

DIOCESE OF SPOKANE
2011

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INTRODUCTION

The following Science Curriculum (2011) guidelines have been developed to assist teachers and administrators in the Diocese of Spokane. It is the expectation that these guidelines be used to develop a localized Science Curriculum to meet the unique needs of the students at each school. The Diocesan curriculum standards are aligned with the Washington State Learning Standards, which have been referenced with a corresponding number.

- EALR 1: Systems
- EALR 2: Inquiry
- EALR 3: Application
- EALR 4: Domains of Science

ACKNOWLEDGEMENTS

Thank you to the members of the Diocesan School Science Curriculum Committee for all their valuable work in formulating this document.

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PHILOSOPHY

The schools of the Diocese of Spokane believe that the study of science based on a Catholic foundation will foster an awareness and respect for God's creation. Students will learn fundamental scientific principles that will enable them to become responsible and ethical stewards of a changing world.

GOALS

Based on Christian ethical and moral principles, the students will be able to:

- Use scientific principles to organize and classify data to solve problems.
- Apply the scientific method in relevant situations.
- Demonstrate understanding of scientific concepts through the incorporation of communication, technology, and tools.
- Connect scientific concepts to other subject areas and everyday situations.
- Recognize the relationship among the fields of science through the use of systems, inquiry, and applications

Grades
Kindergarten-First

Physical Science: Force and Motion
Push-Pull and Position

Grades K-1 Overview:

- Students gain fluency in using the concept of part-whole relationships.
- Students become better questioners, observers, and thinkers through scientific inquiry.
- Students use simple tools (i.e. pencils, scissors) and materials (i.e. paper, tape, glue) to solve problems in creative ways.
- Students learn how to describe the position and motion of objects and the effects of motions on objects.

Content Standards **Students will know that:**	**Performance Expectation** **Students are expected to:**	**EALR**	**SLE**
1. Living and nonliving things are made of parts. People give names to the parts that are different from the name of the whole object.	• Name at least five different parts, given an illustration of a whole object, plant or animal. • Compare a part of an object with the whole object, correctly using the words "whole" and "part."	E1: SYS A	
2. Some objects can be taken apart and put back together again while other object cannot be taken apart without damaging them (e.g., books, pencils, plants, and animals).	Identify which of several common objects may be taken apart and put back together without damaging them (e.g. puzzle) and which objects cannot be taken apart without damaging them(e.g., books, pencils, plants, and animals) .	E1: SYS B	
3. Science investigations involve asking and trying to answer questions about the natural world by making and recording observations.	• Ask questions about objects, organisms, and events in their environment. • Follow up a question by looking for an answer through students' own activities (e.g., making observations or trying things out) rather than asking an adult for help. • Observe patterns and relationships in the natural world and record observations in a table or picture graph.	E2: INQ A	
4. Scientific investigations involve: • Question/observation • Hypothesis • Investigation • Results • Conclusion	• Utilize the scientific method through observation, questioning, and simple experiments. • Participate in simple investigations following appropriate safety rules.	E2: INQ A	
5. Many children's toys are models that represent real things in some ways, but not in other ways.	• Recognize how a child's toy is a model of an object found in the real world, explain how it is like or unlike the object it represents. • Use materials to construct a model of an object, event, or process.	E2: INQ B	

6. Scientists develop explanations using recorded observations (evidence).	• Describe patterns and data recorded, using tallies, tables, picture graphs, or bar-type graphs. • Participate in a discussion of how the recorded data (evidence) might help to explain the observations.	E2: INQ C	
7. Scientists report on their investigations to other scientists using drawings and words.	• Report on observations of investigations using drawings and sentences. • Listen to and use observations (evidence) made by other students.	E2: INQ D	
8. Observations are more reliable if repeated, especially if repeated by different people.	• State verbally or in writing a need to repeat observations (evidence) to be certain the results are more reliable.	E2: INQ E	
9. All scientific observations must be reported honestly and accurately.	• Record observations (evidence) honestly and accurately.	E2: INQ F	
10. Common tools can be used to solve problems.	• Use simple tools and materials to solve a simple problem.	E3: APP A	
11. Different materials are more suitable for some purposes than for other purposes.	• Choose a material to meet a specific need, and explain why that material was chosen.	E3: APP B	
12. A problem may have more than one acceptable solution.	• Develop two possible solutions to solve a problem.	E3: APP C	
13. Counting, classifying, and measuring can sometimes be helpful in solving a problem.	• Apply the skills of counting, measuring, and classifying to solve a problem.	E3: APP D	
14. The position of an object can be described by locating it relative to other objects or to the object's surroundings.	• Use positional words so that all observers can agree on the location of an object in relation to another object.	E4: PS1 A	
15. Motion is defined as a change in position over time.	• Demonstrate motion by moving an object or a part of a student's body and explain that motion means a change in position.	E4: PS1 B	
16. A force is a push or a pull. Pushing or pulling can move an object. The speed an object moves is related to how strongly it is pushed or pulled.	• Respond to a request to move an object by pushing or pulling it. • When asked to move the object farther, respond by pushing or pulling it more strongly. • Explain that a push or a pull is a force.	E4: PS1 C	
17. Some forces act by touching and other forces can act without touching.	• Distinguish a force that acts by touching it with an object (e.g., by pushing or pulling) from a force that can act without touching (e.g., the attraction between a magnet and a steel paper clip or gravity). • Define magnetism and identify magnetism as a force.	E4: PS1 D	

Math Connections:

- K.1.E Count objects in a set of up to 20 and count out a specific number of up to 20 objects from a larger set.
- K.3.6 Describe the location of one object relative to another using words such as in, out, over, under, above, below, between, next to, behind, and in front of.
- K.4.A Make direct comparisons using measurable attributes such as length, weight, and capacity.
- K.5.A Identify the question(s) asked in a problem.
- K.5.D Select from a variety of problem solving strategies and use one or more strategies to solve a problem.
- K.5.F Describe how a problem was solved.
- 1.1.A Count by ones forward and backward from 1-120, starting at any number and count by 2's, 5's, and 10's to 100.
- 1.3.C Combine known shapes to create shapes and divide know shapes into other shapes.
- 1.4.B use a variety of nonstandard units to measure length.
- 1.5.A Represent data using tallies, tables, picture graphs, and bar-type graphs.
- 1.5.B Ask and answer comparison questions about data.
- 1.6.D Select from a variety of problem solving strategies and use one or more strategies to solve a problem.
- 1.6.G Describe how a problem was solved.

Physical Science: Matter: Properties and Change
Liquids and Solids

Grades K-1 Overview:

- Students gain fluency in using the concept of part-whole relationships.
- Students become better questioners, observers, and thinkers through scientific inquiry.
- Students use simple tools (i.e. pencils, scissors) and materials (i.e. paper, tape, glue) to solve problems in creative ways.
- Students learn about the properties of liquids and solids.

Content Standards **Students will know that:**	**Performance Expectation** **Students are expected to:**	**EALR**	**SLE**
1. Living and nonliving things are made of parts. People give names to the parts that are different from the name of the whole object.	• Name at least five different parts, given an illustration of a whole object, plant or animal. • Compare a part of an object with the whole object, correctly using the words "whole" and "part."	E1: SYS A	
2. Some objects can be taken apart and put back together again while other object cannot be taken apart without damaging them (e.g., books, pencils, plants, and animals).	Identify which of several common objects may be taken apart and put back together without damaging them (e.g. puzzle) and which objects cannot be taken apart without damaging them(e.g., books, pencils, plants, and animals) .	E1: SYS B	
3. Science investigations involve asking and trying to answer questions about the natural world by making and recording observations.	• Ask questions about objects, organisms, and events in their environment. • Follow up a question by looking for an answer through students' own activities (e.g., making observations or trying things out) rather than asking an adult for help. • Observe patterns and relationships in the natural world and record observations in a table or picture graph.	E2: INQ A	
4. Scientific investigations involve: • Question/observation • Hypothesis • Investigation • Results • Conclusion	• Utilize the scientific method through observation, questioning, and simple experiments. • Participate in simple investigations following appropriate safety rules.	E2: INQ A	
5. Many children's toys are models that represent real things in some ways, but not in other ways.	• Recognize how a child's toy is a model of an object found in the real world, and explain how it is like or unlike the object it represents. • Use materials to construct a model of an object, event, or process. •	E2: INQ B	

6. Scientists develop explanations using recorded observations (evidence).	• Describe patterns and data recorded, using tallies, tables, picture graphs, or bar-type graphs. • Participate in a discussion of how the recorded data (evidence) might help to explain the observations.	E2: INQ C	
7. Scientists report on their investigations to other scientists using drawings and words.	• Report observations of investigations using drawings and sentences. • Listen to and use observations (evidence) made by other students.	E2: INQ D	
8. Observations are more reliable if repeated, especially if repeated by different people.	State verbally or in writing a need to repeat observations (evidence) to be certain the results are more reliable.	E2: INQ E	
9. All scientific observations must be reported honestly and accurately.	Record observations (evidence) honestly and accurately.	E2: INQ F	
10. Common tools can be used to solve problems.	Use simple tools and materials to solve a simple problem.	E3: APP A	
11. Different materials are more suitable for some purposes than for other purposes.	Choose a material to meet a specific need, and explain why that material was chosen.	E3: APP B	
12. A problem may have more than one acceptable solution.	Develop two possible solutions to solve a problem.	E3: APP C	
13. Counting, classifying, and measuring can sometimes be helpful in solving a problem.	Apply the abilities of counting, measuring, and classifying to solve a problem.	E3: APP D	
14. Liquids take the shape of the part of the container they occupy.	Predict the shape that water will take in a variety of different containers.	E4: PS2 A	
15. Solids retain their shape regardless of the container they are in.	• Predict that frozen water will retain its shape when moved among containers of different shapes. • Given several substances, sort them into those that are liquid and those that are solid.	E4: PS2 B	

Math Connections:

- K.1.E Count objects in a set of up to 20 and count out a specific number of up to 20 objects from a larger set.
- K.4.A Make direct comparisons using measurable attributes such as length, weight, and capacity.
- K.5.A Identify the question(s) asked in a problem.

- K.5.D Select from a variety of problem solving strategies and use one or more strategies to solve a problem.
- K.5.F Describe how a problem was solved.
- 1.1.A Count by ones forward and backward from 1-120, starting at any number and count by 2's, 5's, and 10's to 100.
- 1.3.C Combine known shapes to create shapes and divide know shapes into other shapes.
- 1.4.B use a variety of nonstandard units to measure length.
- 1.5.A Represent data using tallies, tables, picture graphs, and bar-type graphs.
- 1.5.B Ask and answer comparison questions about data.
- 1.6.D Select from a variety of problem solving strategies and use one or more strategies to solve a problem.
- 1.6.G Describe how a problem was solved.

Earth and Space Science: Earth in Space,
Observing Sun and Moon

Grades K-1 Overview:

- Students gain fluency in using the concept of part-whole relationships.
- Students become better questioners, observers, and thinkers through scientific inquiry.
- Students use simple tools (i.e. pencils, scissors) and materials (i.e. paper, tape, glue) to solve problems in creative ways.
- Students learn that the Sun and Moon have patterns of movement that can be observed and recorded.

Content Standards **Students will know that:**	**Performance Expectation** **Students are expected to:**	**EALR**	**SLE**
1. Living and nonliving things are made of part. People give names to the parts that are different from the name of the whole object.	• Name at least five different parts, given an illustration of a whole object, plant or animal. • Compare a part of an object with the whole object, correctly using the words "whole" and "part."	E1: SYS A	
2. Some objects can be taken apart and put back together again while other object cannot be taken apart without damaging them (e.g., books, pencils, plants, and animals).	Identify which of several common objects may be taken apart and put back together without damaging them (e.g. puzzle) and which objects cannot be taken apart without damaging them(e.g., books, pencils, plants, and animals) .	E1: SYS B	
3. Science investigations involve asking and trying to answer questions about the natural world by making and recording observations.	• Ask questions about objects, organisms, and events in their environment. • Follow up a question by looking for an answer through students' own activities (e.g., making observations or trying things out) rather than asking an adult for help. • Observe patterns and relationships in the natural world and record observations in a table or picture graph.	E2: INQ A	
4. Scientific investigations involve: • Question/observation • Hypothesis • Investigation • Results • Conclusion	• Utilize the scientific method through observation, questioning, and simple experiments. • Participate in simple investigations following appropriate safety rules.	E2: INQ A	
5. Many children's toys are models that represent real things in some ways, but not in other ways.	• Recognize how a child's toy is a model of an object found in the real world, explain how it is like or unlike the object it represents. • Use materials to construct a model of an object, event, or process.	E2: INQ B	

6. Scientists develop explanations using recorded observations (evidence).	• Describe patterns and data recorded, using tallies, tables, picture graphs, or bar-type graphs. • Participate in a discussion of how the recorded data (evidence) might help to explain the observations.	E2: INQ C	
7. Scientists report on their investigations to other scientists using drawings and words.	• Report observations of investigations using drawings and sentences. • Listen to and use observations (evidence) made by other students.	E2: INQ D	
8. Observations are more reliable if repeated, especially if repeated by different people.	State verbally or in writing a need to repeat observations (evidence) to be certain the results are more reliable.	E2: INQ E	
9. All scientific observations must be reported honestly and accurately.	Record observations (evidence) honestly and accurately.	E2: INQF	
10. Common tools can be used to solve problems.	Use simple tools and materials to solve a simple problem.	E3: APP A	
11. Different materials are more suitable for some purposes than for other purposes.	Choose a material to meet a specific need, and explain why that material was chosen.	E3: APP B	
12. A problem may have more than one acceptable solution.	Develop two possible solutions to solve a problem.	E3: APP C	
13. Counting, classifying, and measuring can sometimes be helpful in solving a problem.	Apply the abilities of counting, measuring, and classifying to solve a problem.	E3: APP D	
14. Many things can be seen in the sky. Some change minute by minute, while others move in patterns that can be seen if they are observed day after day.	Observe, describe, and communicate the many things that can be seen in the sky that change minute by minute and those that change their shape or position in observable patterns day after day.	E4: ES1 A	
15. The position of the Sun in the sky appears to change during the day which creates day and night.	• Compare the position of the Sun in the sky in the morning with its position in the sky at midday and in the afternoon. • Describe the differences between day and night.	E4: ES1 B	
16. The Moon can be seen sometimes during the day and sometimes during the night	Observe the moon during different times of the day.	E4: ES1 C	

Math Connections:

- K.1.E Count objects in a set of up to 20 and count out a specific number of up to 20 objects from a larger set.
- K.3.C Describe the location of one object relative to another using words such as: in, out, over, under, above, below, between, next to, behind, and in front of.
- K.4.A Make direct comparisons using measurable attributes such as length, weight, and capacity.
- K.5.A Identify the question(s) asked in a problem.
- K.5.D Select from a variety of problem solving strategies and use one or more strategies to solve a problem.
- K.5.F Describe how a problem was solved.
- 1.1.A Count by ones forward and backward from 1-120, starting at any number and count by 2's, 5's, and 10's to 100.
- 1.3.C Combine known shapes to create shapes and divide know shapes into other shapes.
- 1.4.B use a variety of nonstandard units to measure length.
- 1.5.A Represent data using tallies, tables, picture graphs, and bar-type graphs.
- 1.5.B Ask and answer comparison questions about data.
- 1.6.D Select from a variety of problem solving strategies and use one or more strategies to solve a problem.
- 1.6.G Describe how a problem was solved.

Earth and Space Science: Earth Systems, Structures and Processes, Properties and Change

Grades K-1 Overview:

- Students gain fluency in using the concept of part-whole relationships.
- Students become better questioners, observers, and thinkers through scientific inquiry.
- Students use simple tools (i.e. pencils, scissors) and materials (i.e. paper, tape, glue) to solve problems in creative ways.
- Students will learn that Earth materials have various properties.

Content Standards **Students will know that:**	**Performance Expectation** **Students are expected to:**	**EALR**	**SLE**
1. Living and nonliving things are made of part. People give names to the parts that are different from the name of the whole object.	• Name at least five different parts, given an illustration of a whole object, plant or animal. • Compare a part of an object with the whole object, correctly using the words "whole" and "part."	E1: SYS A	
2. Some objects can be taken apart and put back together again while other object cannot be taken apart without damaging them (e.g., books, pencils, plants, and animals).	Identify which of several common objects may be taken apart and put back together without damaging them (e.g. puzzle) and which objects cannot be taken apart without damaging them(e.g., books, pencils, plants, and animals) .	E1: SYS B	
3. Science investigations involve asking and trying to answer questions about the natural world by making and recording observations.	• Ask questions about objects, organisms, and events in their environment. • Follow up a question by looking for an answer through students' own activities (e.g., making observations or trying things out) rather than asking an adult for help. • Observe patterns and relationships in the natural world and record observations in a table or picture graph.	E2: INQ A	
4. Scientific investigations involve: • Question/observation • Hypothesis • Investigation • Results • Conclusion	• Utilize the scientific method through observation, questioning, and simple experiments. • Participate in simple investigations following appropriate safety rules.	E2: INQ A	
5. Many children's toys are models that represent real things in some ways, but not in other ways.	• Recognize how a child's toy is a model of an object found in the real world, explain how it is like or unlike the object it represents. • Use materials to construct a model of an object, event, or process.	E2: INQ B	
6. Scientists develop explanations using recorded observations (evidence).	• Describe patterns and data recorded, using tallies, tables, picture graphs, or bar-type graphs.	E2: INQ C	

	• Participate in a discussion of how the recorded data (evidence) might help to explain the observations.		
7. Scientists report on their investigations to other scientists using drawings and words.	• Report observations of investigations using drawings and sentences. • Listen to and use observations (evidence) made by other students.	E2: INQ D	
8. Observations are more reliable if repeated, especially if repeated by different people.	State verbally or in writing a need to repeat observations (evidence) to be certain the results are more reliable.	E2: INQ E	
9. All scientific observations must be reported honestly and accurately.	Record observations (evidence) honestly and accurately.	E2: INQ F	
10. Common tools can be used to solve problems.	Use simple tools and materials to solve a simple problem.	E3: APP A	
11. Different materials are more suitable for some purposes than for other purposes.	Choose a material to meet a specific need, and explain why that material was chosen.	E3: APP B	
12. A problem may have more than one acceptable solution.	Develop two possible solutions to solve a problem.	E3: APP C	
13. Counting, classifying, and measuring can sometimes be helpful in solving a problem.	Apply the abilities of counting, measuring, and classifying to solve a problem.	E3: APP D	
14. Some objects occur in nature; others have been designed and processed by people.	Sort objects into two groups: natural and human made.	E4: ES2 A	
15. Earth materials include solid rocks, sand, soil and water. These materials have different observable properties.	• Describe earth objects using appropriate terms such as: hard, soft, dry, wet, heavy and light. • Sort earth objects by one observable property (e.g. rocks by size or color), • Compare earth objects by at least two properties (.e.g. first compare rocks by size and then by color).	E4: ES2 B	
16. Some Earth objects are made of more than one material.	Observe and describe objects made of more than one Earth material (e.g. certain rocks and soil).	E4: ES2 C	

Math Connections:

- K.1.E Count objects in a set of up to 20 and count out a specific number of up to 20 objects from a larger set.
- K.3.B Sort shapes using a sorting rule, and explains the sorting rule.
- K.3.C Describe the location of one object relative to another using words such as: in, out, over, under, above, below, between, next to, behind, and in front of.
- K.4.A Make direct comparisons using measurable attributes such as length, weight, and capacity.

- K.5.A Identify the question(s) asked in a problem.
- K.5.D Select from a variety of problem solving strategies and use one or more strategies to solve a problem.
- K.5.F Describe how a problem was solved.
- 1.1.A Count by ones forward and backward from 1-120, starting at any number and count by 2's, 5's, and 10's to 100.
- 1.3.C Combine known shapes to create shapes and divide know shapes into other shapes.
- 1.4.B Use a variety of nonstandard units to measure length.
- 1.5.A Represent data using tallies, tables, picture graphs, and bar-type graphs.
- 1.5.B Ask and answer comparison questions about data.
- 1.6.D Select from a variety of problem solving strategies and use one or more strategies to solve a problem.
- 1.6.G Describe how a problem was solved.

Earth and Space Science: Earth Systems, Structures and Processes, Weather and Seasons

****not part of Washington State Essential Learning (EALR)**

Grades K-1 Overview:

- Students gain fluency in using the concept of part-whole relationships.
- Students become better questioners, observers and thinkers through scientific inquiry.
- Students use simple tools (i.e. pencils, scissors) and materials (i.e. paper, tape, glue) to solve problems.
- Students will learn that weather changes from day to day, and can be described by measurable quantities such as temperature and rainfall.

Content Standards **Students will know that:**	**Performance Expectation** **Students are expected to:**	**EALR**	**SLE**
1. Living and nonliving things are made of part. People give names to the parts that are different from the name of the whole object.	• Name at least five different parts, given an illustration of a whole object, plant or animal. • Compare a part of an object with the whole object, correctly using the words "whole" and "part."	E1: SYS A	
2. Some objects can be taken apart and put back together again while other object cannot be taken apart without damaging them (e.g., books, pencils, plants, and animals).	Identify which of several common objects may be taken apart and put back together without damaging them (e.g. puzzle) and which objects cannot be taken apart without damaging them(e.g., books, pencils, plants, and animals) .	E1: SYS B	
3. Science investigations involve asking and trying to answer questions about the natural world by making and recording observations.	• Ask questions about objects, organisms, and events in their environment. • Follow up a question by looking for an answer through students' own activities (e.g., making observations or trying things out) rather than asking an adult for help. • Observe patterns and relationships in the natural world and record observations in a table or picture graph.	E2: INQ A	
4. Scientific investigations involve: • Question/observation • Hypothesis • Investigation • Results • Conclusion	• Utilize the scientific method through observation, questioning, and simple experiments. • Participate in simple investigations following appropriate safety rules.	E2: INQ A	
5. Many children's toys are models that represent real things in some ways, but not in other ways.	• Given a child's toy that is a model of an object found in the real world, explain how it is like or unlike the object it represents. • Use materials to construct a model of an object, event, or process.	E2: INQ B	
6. Scientists develop explanations using	• Describe patterns and data recorded,	E2:	

recorded observations (evidence).	using tallies, tables, picture graphs, or bar-type graphs. • Participate in a discussion of how the recorded data (evidence) might help to explain the observations.	INQ C	
7. Scientists report on their investigations to other scientists using drawings and words.	• Report observations of investigations using drawings and sentences. • Listen to and use observations (evidence) made by other students.	E2: INQ D	
8. Observations are more reliable if repeated, especially if repeated by different people.	State verbally or in writing a need to repeat observations (evidence) to be certain the results are more reliable.	E2: INQ E	
9. All scientific observations must be reported honestly and accurately.	Record observations (evidence) honestly and accurately.	E2: INQ F	
10. Common tools can be used to solve problems.	Use simple tools and materials to solve a simple problem.(i.e. thermometer, wind sock, etc.)	E3: APP A	
11. Different materials are more suitable for some purposes than for other purposes.	Choose a material to meet a specific need, and explain why that material was chosen.	E3: APP B	
12. A problem may have more than one acceptable solution.	Develop two possible solutions to solve a problem.	E3: APP C	
13. Counting, classifying, and measuring can sometimes be helpful in solving a problem.	Apply the abilities of counting, measuring, and classifying to solve a problem.	E3: APP D	
14. Weather changes from day to day and over the seasons. Weather can be described by measurable quantities, such as temperature and precipitation.	• Identify and describe the seasons. • Observe, identify, and describe weather patterns. • Collect, chart and record data, and predict basic weather features. • Identify forms of precipitation: fog, dew, rain, frost, snow, sleet, and hail. • Explain how weather affects living things. • Describe air (e.g. wind, warm, cool).		

Life Science: Structures and Functions of Living Organisms
Plant and Animal Parts

Grades K-1 Overview:

- Students gain fluency in using the concept of part-whole relationships.
- Students become better questioners, observers and thinkers through scientific inquiry.
- Students use simple tools (i.e. pencils, scissors) and materials (i.e. paper, tape, glue) to solve problems in creative ways.
- Plants and animals meet their needs in different ways.

Content Standards **Students will know that:**	**Performance Expectation** **Students are expected to:**	**EALR**	**SLE**
1. Living and nonliving things are made of parts. People give names to the parts that are different from the name of the whole object.	• Name at least five different parts, given an illustration of a whole object, plant or animal. • Compare a part of an object with the whole object, correctly using the words "whole" and "part."	E1: SYS A	
2. Some objects can be taken apart and put back together again while other object cannot be taken apart without damaging them (e.g., books, pencils, plants, and animals).	• Identify which of several common objects may be taken apart and put back together without damaging them (e.g. puzzle) and which objects cannot be taken apart without damaging them(e.g., books, pencils, plants, and animals) .	E1: SYS B	
3. Science investigations involve asking and trying to answer questions about the natural world by making and recording observations.	• Ask questions about objects, organisms, and events in their environment. • Follow up a question by looking for an answer through students' own activities (e.g., making observations or trying things out) rather than asking an adult for help. • Observe patterns and relationships in the natural world and record observations in a table or picture graph.	E2: INQ A	
4. Scientific investigations involve: • Question/observation • Hypothesis • Investigation • Results • Conclusion	• Utilize the scientific method through observation, questioning, and simple experiments. • Participate in simple investigations following appropriate safety rules.	E2: INQ A	
5. Many children's toys are models that represent real things in some ways, but not in other ways.	• Recognize how a child's toy is a model of an object found in the real world, explain how it is like or unlike the object it represents. • Use materials to construct a model of an object, event, or process.	E2: INQ B	

6. Scientists develop explanations using recorded observations (evidence).	• Describe patterns and data recorded, using tallies, tables, picture graphs, or bar-type graphs. • Participate in a discussion of how the recorded data (evidence) might help to explain the observations.	E2: INQ C	
7. Scientists report on their investigations to other scientists using drawings and words.	• Report observations of investigations using drawings and sentences. • Listen to and use observations (evidence) made by other students.	E2: INQ D	
8. Observations are more reliable if repeated, especially if repeated by different people.	State verbally or in writing a need to repeat observations (evidence) to be certain the results are more reliable.	E2: INQ E	
9. All scientific observations must be reported honestly and accurately.	Record observations (evidence) honestly and accurately.	E2: INQ F	
10. Common tools can be used to solve problems.	Use simple tools and materials to solve a simple problem.	E3: APP A	
11. Different materials are more suitable for some purposes than for other purposes.	Choose a material to meet a specific need, and explain why that material was chosen.	E3: APP B	
12. A problem may have more than one acceptable solution.	Develop two possible solutions to solve a problem.	E3: APP C	
13. Counting, classifying, and measuring can sometimes be helpful in solving a problem.	Apply the abilities of counting, measuring, and classifying to solve a problem.	E3: APP D	
14. The human body is made up of various external parts.	• Identify the external parts of the human body. • Identify and explain the uses of the five senses. • Identify the body's basic daily needs (e.g. food, water, air). • Identify components of good health (e.g. nutrition, sleep, exercise, hygiene).	E4: LS1 A	
15. All plants and animals have various external parts.	Identify the external parts of different plants and animals. (e.g., legs on an insect, flowers stems and roots, on many plants, feathers on birds, scales on fish).	E4: LS1 B	
16. The parts of a plant or animal appear different under a magnifier compared to the unaided eye.	Observe how parts of a plant or animal look under a magnifier and draw or use words to describe them.	E4: LS1 C	
17. Different animals use their body parts in different ways to see, hear, grasp objects, or move from place to place.	Compare how different animals use different body parts for different purposes (e.g., humans use their tongues to taste, while snakes use their tongues to smell).	E4: LS1 D	

18. Animals have various ways of obtaining food and water. Nearly all animals drink water or eat foods that contain water.	Compare how different animals obtain food and water.	E4: LS1 E	
19. Most plants have roots to get water and leaves to gather sunlight.	Explain that most plants get water from soil through their roots and that they gather light through their leaves.	E4: LS1 F	

Math Connections:

- K.1.E Count objects in a set of up to 20 and count out a specific number of up to 20 objects from a larger set.
- K.4.A Make direct comparisons using measurable attributes such as length, weight, and capacity.
- K.5.A Identify the question(s) asked in a problem.
- K.5.D Select from a variety of problem solving strategies and use one or more strategies to solve a problem.
- K.5.F Describe how a problem was solved.
- 1.1.A Count by ones forward and backward from 1-120, starting at any number and count by 2's, 5's, and 10's to 100.
- 1.3.C Combine known shapes to create shapes and divide know shapes into other shapes.
- 1.4.B Use a variety of nonstandard units to measure length.
- 1.5.A Represent data using tallies, tables, picture graphs, and bar-type graphs.
- 1.5.B Ask and answer comparison questions about data.
- 1.6.D Select from a variety of problem solving strategies and use one or more strategies to solve a problem.
- 1.6.G Describe how a problem was solved.

Life Science: Ecosystems
Habitats

Grades K-1 Overview:

- Students gain fluency in using the concept of part-whole relationships.
- Students become better questioners, observers, and thinkers through scientific inquiry.
- Students use simple tools (i.e. pencils, scissors) and materials (i.e. paper, tape, glue) to solve problems in creative ways.
- Students will understand that habitats are places that meet the daily needs of plants and animals.

Content Standards **Students will know that:**	**Performance Expectation** **Students are expected to:**	**EALR**	**SLE**
1. Living and nonliving things are made of parts. People give names to the parts that are different from the name of the whole object.	• Name at least five different parts, given an illustration of a whole object, plant or animal. • Compare a part of an object with the whole object, correctly using the words "whole" and "part."	E1: SYS A	
2. Some objects can be taken apart and put back together again while other object cannot be taken apart without damaging them (e.g., books, pencils, plants, and animals).	Identify which of several common objects may be taken apart and put back together without damaging them (e.g. puzzle) and which objects cannot be taken apart without damaging them(e.g., books, pencils, plants, and animals) .	E1: SYS B	
3. Science investigations involve asking and trying to answer questions about the natural world by making and recording observations.	• Ask questions about objects, organisms, and events in their environment. • Follow up a question by looking for an answer through students' own activities (e.g., making observations or trying things out) rather than asking an adult for help. • Observe patterns and relationships in the natural world and record observations in a table or picture graph.	E2: INQ A	
4. Scientific investigations involve: • Question/observation • Hypothesis • Investigation • Results • Conclusion	• Utilize the scientific method through observation, questioning, and simple experiments. • Participate in simple investigations following appropriate safety rules.	E2: INQ A	
5. Many children's toys are models that represent real things in some ways, but not in other ways.	• Recognize how a child's toy is a model of an object found in the real world, explain how it is like or unlike the object it represents. • Use materials to construct a model of an object, event, or process.	E2: INQ B	
6. Scientists develop explanations using recorded observations (evidence).	• Describe patterns and data recorded, using tallies, tables, picture graphs, or bar-type graphs.	E2: INQ C	

	• Participate in a discussion of how the recorded data (evidence) might help to explain the observations.		
7. Scientists report on their investigations to other scientists using drawings and words.	• Report observations of investigations using drawings and sentences. • Listen to and use observations (evidence) made by other students.	E2: INQ D	
8. Observations are more reliable if repeated, especially if repeated by different people.	State verbally or in writing a need to repeat observations (evidence) to be certain the results are more reliable.	E2: INQ E	
9. All scientific observations must be reported honestly and accurately.	Record observations (evidence) honestly and accurately.	E2: INQ F	
10. Common tools can be used to solve problems.	Use simple tools and materials to solve a simple problem.	E3: APP A	
11. Different materials are more suitable for some purposes than for other purposes.	Choose a material to meet a specific need, and explain why that material was chosen.	E3: APP B	
12. A problem may have more than one acceptable solution.	Develop two possible solutions to solve a problem.	E3: APP C	
13. Counting, classifying, and measuring can sometimes be helpful in solving a problem.	Apply the abilities of counting, measuring, and classifying to solve a problem.	E3: APP D	
14. There are different kinds of natural areas or habitats where many different plants and animals live together.	Investigate an area near their home or school where many different plants and animals live together and describe the different plants and animals found there.	E4: LS2 A	
15. A habitat supports the growth of many different plants and animals by meeting their basic needs of food, water, and shelter.	Identify the characteristics of a habitat that enable the habitat to support the growth of many different plants and animals (i.e. fresh or salt water).	E4: LS2 B	
16. Humans can change natural habitats in ways that can be helpful or harmful for the plants and animals that live there.	• List two or more things that humans do that might harm plants and animals in a given habitat (e.g. throwing litter in a pond might cause difficulty for water birds and fish to find food or might poison the plants and animals that live there). • Communicate ways that humans protect habitats and/or improve conditions for the growth of plants or animals that live there (e.g. reuse or recycle products to avoid littering).	E4: LS2 C	

Math Connections:

- K.1.E Count objects in a set of up to 20 and count out a specific number of up to 20 objects from a larger set.
- K.4.A Make direct comparisons using measurable attributes such as length, weight, and capacity.
- K.5.A Identify the question(s) asked in a problem.
- K.5.D Select from a variety of problem solving strategies and use one or more strategies to solve a problem.
- K.5.F Describe how a problem was solved.
- 1.1.A Count by ones forward and backward from 1-120, starting at any number and count by 2's, 5's, and 10's to 100.
- 1.3.C Combine known shapes to create shapes and divide know shapes into other shapes.
- 1.4.B Use a variety of nonstandard units to measure length.
- 1.5.A Represent data using tallies, tables, picture graphs, and bar-type graphs.
- 1.5.B Ask and answer comparison questions about data.
- 1.6.D Select from a variety of problem solving strategies and use one or more strategies to solve a problem.
- 1.6.G Describe how a problem was solved.

Life Science: Biological Evolution –
Classifying Plants and Animals

Grades K-1 Overview:

- Students gain fluency in using the concept of part-whole relationships.
- Students become better questioners, observers, and thinkers through scientific inquiry.
- Students use simple tools (i.e. pencils, scissors) and materials (i.e. paper, tape, glue) to solve problems in creative ways.
- Students will understand that both plants and animals have different characteristics that can be used to classify them.

Content Standards **Students will know that:**	**Performance Expectation** **Students are expected to:**	**EALR**	**SLE**
1. Living and nonliving things are made of parts. People give names to the parts that are different from the name of the whole object.	• Name at least five different parts, given an illustration of a whole object, plant or animal. • Compare a part of an object with the whole object, correctly using the words "whole" and "part."	E1: SYS A	
2. Some objects can be taken apart and put back together again while other object cannot be taken apart without damaging them (e.g., books, pencils, plants, and animals).	Identify which of several common objects may be taken apart and put back together without damaging them (e.g. puzzle) and which objects cannot be taken apart without damaging them(e.g., books, pencils, plants, and animals) .	E1: SYS B	
3. Science investigations involve asking and trying to answer questions about the natural world by making and recording observations.	• Ask questions about objects, organisms, and events in their environment. • Follow up a question by looking for an answer through students' own activities (e.g., making observations or trying things out) rather than asking an adult for help. • Observe patterns and relationships in the natural world and record observations in a table or picture graph.	E2: INQ A	
4. Scientific investigations involve: • Question/observation • Hypothesis • Investigation • Results • Conclusion	• Utilize the scientific method through observation, questioning, and simple experiments. • Participate in simple investigations following appropriate safety rules.	E2: INQ A	
5. Many children's toys are models that represent real things in some ways, but not in other ways.	• Recognize how a child's toy is a model of an object found in the real world, explain how it is like or unlike the object it represents. • Use materials to construct a model of an object, event, or process.	E2: INQ B	

6. Scientists develop explanations using recorded observations (evidence).	• Describe patterns and data recorded, using tallies, tables, picture graphs, or bar-type graphs. • Participate in a discussion of how the recorded data (evidence) might help to explain the observations.	E2: INQ C	
7. Scientists report on their investigations to other scientists using drawings and words.	• Report observations of investigations using drawings and sentences. • Listen to and use observations (evidence) made by other students.	E2: INQ D	
8. Observations are more reliable if repeated, especially if repeated by different people.	State verbally or in writing a need to repeat observations (evidence) to be certain the results are more reliable.	E2: INQ E	
9. All scientific observations must be reported honestly and accurately.	Record observations (evidence) honestly and accurately.	E2: INQ F	
10. Common tools can be used to solve problems.	Use simple tools and materials to solve a simple problem.	E3: APP A	
11. Different materials are more suitable for some purposes than for other purposes.	Choose a material to meet a specific need, and explain why that material was chosen.	E3: APP B	
12. A problem may have more than one acceptable solution.	Develop two possible solutions to solve a problem.	E3: APP C	
13. Counting, classifying, and measuring can sometimes be helpful in solving a problem.	Apply the abilities of counting, measuring, and classifying to solve a problem.	E3: APP D	
14. Some things are alive and others are not.	Sort and classify objects into two groups – those that are alive and those that are not.	E4: LS3 A	
15. There are many different types of living things on Earth. Many of them are classified as plants or animals.	• Given a list, illustrations, or actual plants or animals classify them as plants or animals. • Identify uses of plants and animals.	E4: LS3 B	
16. External features of animals and plants are used to classify them into groups.	• Describe several external features and behaviors of animals that could be used to classify them (e.g., size, color, shape, or body parts). • Describe several external features of plants that can be used to classify them (e.g. , size, color, kinds of seeds, shapes, or texture of plant parts). • Give examples to illustrate how pairs of plants or animals are similar to or different from each other (e.g., cats and dogs both have four legs, but many dogs have longer snouts than cats).	E4: LS3 C	

Math Connections:

- K.1.E Count objects in a set of up to 20 and count out a specific number of up to 20 objects from a larger set.
- K.3.B Sort shapes using a sorting rule, and explain the sorting rule.
- K.4.A Make direct comparisons using measurable attributes such as length, weight, and capacity.
- K.5.A Identify the question(s) asked in a problem.
- K.5.D Select from a variety of problem solving strategies and use one or more strategies to solve a problem.
- K.5.F Describe how a problem was solved.
- 1.1.A Count by ones forward and backward from 1-120, starting at any number and count by 2's, 5's, and 10's to 100.
- 1.3.C Combine known shapes to create shapes and divide know shapes into other shapes.
- 1.4.B Use a variety of nonstandard units to measure length.
- 1.5.A Represent data using tallies, tables, picture graphs, and bar-type graphs.
- 1.5.B Ask and answer comparison questions about data.
- 1.6.D Select from a variety of problem solving strategies and use one or more strategies to solve a problem.
- 1.6.G Describe how a problem was solved.

Grades
Second-Third

Physical Science: Force and Motion
Force Makes things Move

Grades 2-3 Overview:

- Students will understand the role of each part in a system.
- Students conduct investigations using instruments, observing, recording, and drawing evidence-based conclusions.
- Students will understand that forces on objects make them move and that changes in forces will cause changes in motion.

Content Standards **Students will know that:**	**Performance Expectation** **Students are expected to:**	**EALR**	**SLE**
1. A system is a group of interacting parts that form a whole.	Give examples of simple living and physical systems (e.g. a whole or animal or plant, a car). For each example, explain how different parts make up the whole.	E1: SYS A	
2. A whole object, plant, or animal may not continue to function the same way if some of its parts are missing.	• Predict what might happen to an object, plant, or animal if one or more if its parts are removed (e.g. a tricycle cannot be ridden if its wheels are removed) • Explain how the parts of a system depend on one another for the system to function.	E1: SYS B	
3. A whole object, plant, or animal can do things that none of its parts can do by themselves.	Contrast the function of a whole object, plant, or animal with the function of one of its parts (e.g., an airplane can fly, but wings and propellers cannot; a plant can grow, but stems and flowers cannot).	E1: SYS C	
4. Some objects need to have their parts connected in a certain way if they are to function as a whole.	Explain why the parts in a system need to be connected in a certain way for the system to function as a whole (e.g., batteries must be connected correctly if a flashlight is to produce light).	E1: SYS D	
5. Similar parts may play different roles in different objects, plants, or animals.	Identify ways that similar parts can play different roles in different systems (e.g., birds may use their beaks to crack seeds, while other birds use their beaks to catch fish).	E1: SYS E	
6. Scientific investigations are designed to gain knowledge about the natural world.	Explain how observations can lead to new knowledge and new questions about the natural world.	E2: INQ A	
7. Scientific investigations involve: • Question/observation • Hypothesis • Investigation • Results • Conclusion	• Make and follow a plan to carry out a scientific investigation. Actions may include accurately observing objects, events, and organisms; measuring and recording data; and predicting outcomes. • Participate in simple investigations following appropriate safety rules	E2: INQ B	
8. Inferences are based on observations.	Distinguish between direct observations and simple inferences.	E2: INQ C	
9. Simple instruments, such as magnifiers, thermometers, and rulers, provide more information than scientists can obtain	Use simple instruments (e.g., metric scales or balances, thermometers and rulers) to observe and make measurements and record and display data in a table, bar graph,	E2: INQ D	

using only their unaided senses.	line plot, or pictograph.		
10. Models are useful for understanding systems that are too big, or too small, or too dangerous to study directly.	Use a simple model to study a system. Explain how a model can be used to understand the system.	E2: INQ E	
11. Scientists develop explanations using observations (evidence) and what they already know about the world. Explanations should be based on evidence from investigations.	• Accurately describe results referring to the graph or other data as evidence. Draw a conclusion about the questions that motivated the study using the results of the investigation as evidence. • Explain why similar investigations may not produce similar results. • Recognize that ideas in science change as new scientific evidence arises.	E2: INQ F	
12. Scientists make the results of their investigations public even when their results contradict their expectations.	Communicate about their investigations describing how observations were made and summarizing results.	E2: INQ G	
13. Scientific ideas and discoveries can be applied to solving problems.	Give an example in which the application of scientific knowledge helped solve a problem (e.g. use electric lights to see at night).	E3: APP B	
14. People in all cultures around the world have always had problems and invented tools and techniques (ways of doing something) to solve problems.	• Describe a problem that people in different cultures around the world have had to solve and the various ways they have solved that problem. • Know that some objects were made by God and occur in nature.	E3: APP C	
15. Tools help scientists see more, measure more accurately, and do things that they could not otherwise accomplish.	Select appropriate tools and materials to meet a goal or solve a specific problem (e.g., build the tallest tower with wooden blocks, or the longest bridge span) and explain the reason for those choices.	E3: APP D	
16. Successful solutions to problems often depend on selection of the best tools and materials and on previous experience.	Evaluate how well a selected tool solved a problem and discuss what might be done differently to solve a similar problem.	E3: APP E	
17. Motion can be described as a change in position over a period of time.	Give an example to illustrate motion as a change in position over a period of time (e.g., if a student stands near the door to his/her seat the student is “in motion” during that time).	E4: PS1 A	
18. There is always a force involved when something starts moving or changes speed or direction of motion.	Identify the force that starts something moving or changes its speed or direction of motion (e.g., when a ball is thrown or when a ball is dropped).	E4: PS1 B	
19. Greater force can make an object move faster and farther.	Give examples to illustrate that a greater force can make an object move faster than a lesser force (e.g., throwing a ball harder, or hitting it harder with a bat will make the ball go faster).	E4: PS1 C	

20. The relative strength of two forces can be compared by observing the difference in how they move a common object.	Measure and compare the distances moved by an object (e.g., a toy car) when given a small push or given a big push.	E4: PS1 D	
21. There are many forces in nature.	• Define and describe magnetism. • Identify magnetic forces. • Experiment with the effects of magnets on various materials. • Define gravity. • Describe and demonstrate the effects of gravity. • Describe different forces that cause objects to move.		
22. Simple machines change the force needed to accomplish a task.	• Identify types of simple machines (levers, inclined planes, and pulleys). • Demonstrate and explain the use of simple machines.		

Math Connections:

- 2.3.C Measure length to the nearest whole unit using both metric and U.S. customary units.
- 2.3.E Use both analog and digital clocks to tell time to the minute.
- 2.5.A Identify the question(s) asked in a problem and any other questions that need to be answered to solve the problem.
- 2.5.D Select from a variety of problems solving strategies, and use one or more strategies to solve a problem.
- 2.5.G Determine whether a solution to a problem is reasonable.
- 3.5.B Measure temperature in degrees Fahrenheit and Celsius using a thermometer.
- 3.5.C Estimate, measure, and compare weight and mass using appropriate size U.S. customary and metric units.
- 3.5.E Construct and analyze pictographs, frequency tables, line plots, and bar graphs.
- 3.6.A Determine the questions (s) to be answered given a problem situation.
- 3.6.E Select and use one or more appropriate strategies to solve a problem.
- 3.6.F Represent a problem situation using words, numbers, pictures, physical objects, or symbols.
- 3.6.I Summarize mathematical information, draw conclusions and explain reasoning.
- 3.6.J Make a test conjectures based on data or information collected from explorations and experiments.
- 3.6.A Determine the question(s) to be answered, given a problem situation.

Physical Science: Matter: Properties and Change

Grades 2-3 Overview:

- Students will understand the role of each part in a system.
- Students conduct investigations using instruments, observing, recording, and drawing evidence-based conclusions.
- Students will understand the properties of an object depend on its shape and on the material it is made from.

Content Standards **Students will know that:**	**Performance Expectation** **Students are expected to:**	**EALR**	**SLE**
1. A system is a group of interacting parts that form a whole.	Give examples of simple living and physical systems (e.g., a whole or animal or plant, a car). For each example, explain how different parts make up the whole.	E1: SYS A	
2. A whole object, plant, or animal may not continue to function the same way if some of its parts are missing.	• Predict what might happen to an object, plant, or animal if one or more if its parts are removed (e.g., a tricycle cannot be ridden if its wheels are removed) • Explain how the parts of a system depend on one another for the system to function.	E1: SYS B	
3. A whole object, plant, or animal can do things that none of its parts can do by themselves.	Contrast the function of a whole object, plant, or animal with the function of one of its parts (e.g., an airplane can fly, but wings and propellers cannot; a plant can grow, but stems and flowers cannot).	E1: SYS C	
4. Some objects need to have their parts connected in a certain way if they are to function as a whole.	Explain why the parts in a system need to be connected in a certain way for the system to function as a whole (e.g., batteries must be connected correctly if a flashlight is to produce light).	E1: SYS D	
5. Similar parts may play different roles in different objects, plants, or animals.	Identify ways that similar parts can play different roles in different systems (e.g., birds may use their beaks to crack seeds, while other birds use their beaks to catch fish).	E1: SYS E	
6. Scientific investigations are designed to gain knowledge about the natural world.	Explain how observations can lead to new knowledge and new questions about the natural world.	E2: INQ A	
7. Scientific investigations involve: • Question/observation • Hypothesis • Investigation • Results • Conclusion	• Make and follow a plan to carry out a scientific investigation. Actions may include accurately observing objects, events, and organisms; measuring and recording data; and predicting outcomes. • Participate in simple investigations following appropriate safety rules	E2: INQ B	
8. Inferences are based on observations.	Distinguish between direct observations and simple inferences.	E2: INQ C	
9. Simple instruments, such as magnifiers, thermometers, and rulers, provide more information than scientists can obtains using only their unaided senses.	Use simple instruments (e.g., metric scales or balances, thermometers and rulers) to observe and make measurements and record and display data in a table, bar graph, line plot, or pictograph.	E2: INQ D	

10. Models are useful for understanding systems that are too big, or too small, or too dangerous to study directly.	Use a simple model to study a system. Explain how a model can be used to understand the system.	E2: INQ E	
11. Scientists develop explanations using observations (evidence) and what they already know about the world. Explanations should be based on evidence form investigations.	Accurately describe results referring to the graph or other data as evidence. Draw a conclusion about the questions that motivated the study using the results of the investigation as evidence.	E2: INQ F	
12. Scientists make the results of their investigations public even when their results contradict their expectations.	Communicate about their investigations describing how observations were made and summarizing results.	E2: INQ G	
13. Simple problems can be solved through a technological design process that includes: defining the problem, gathering information, exploring ideas, making a plan, testing possible solutions to see which is best, and communicating the results.	Design a solution to a simple problem (e.g. design a tool to remove an object from a jar when your hand doesn't fit) using a technological design process that includes: defining the problem, gathering information, exploring ideas, making a plan, testing possible solutions to see which is best, and communicating the results.	E3: APP A	
14. Scientific ideas and discoveries can be applied to solving problems.	Give an example in which the application of scientific knowledge helped solve a problem (e.g. use electric lights to see at night).	E3: APP B	
15. People in all cultures around the world have always had problems and invented tools and techniques (ways of doing something) to solve problems.	• Describe a problem that people in different cultures around the world have had to solve and the various ways they have solved that problem. • Know that some objects are made by God and occur in nature.	E3: APP C	
16. Tools help scientist see more, measure more accurately, and do things that they could not otherwise accomplish.	Select appropriate tools and materials to meet a goal or solve a specific problem (e.g., build the tallest tower with wooden blocks, or the longest bridge span) and explain the reason for those choices.	E3: APP D	
17. Successful solutions to problems often depend on selection of the best tools and materials and on previous experience.	Evaluate how well a selected tool solved a problem and discuss what might be done differently to solve a similar problem.	E3: APP E	
18. Objects have properties including size, weight, hardness, color, shape, texture and magnetism. Unknown substances can sometimes be identified by their properties.	• List several properties of an object. • Select one of several objects that best matches a list of properties. • Sort objects by their functions, shapes and the materials of which they are composed.	E4: PS2 A	
19. An object may be made from different materials. These materials give the object certain properties.	• List properties of common materials. • Compare similar objects made of different materials (e.g., a plastic spoon and a metal spoon) and explain how their properties are similar and different. • Compare two objects made of the same material, but a different shape (e.g., a plastic fork and a plastic spoon) and	E4: PS2 B	

	identify which of their properties are similar and different.		
20. Water changes state (solid, liquid, gas) when the temperature of the water changes.	• Predict what will happen to a sample of liquid water if it is put into a freezer (it will turn to ice) and if it is put into a pan and heated on the stove (it will turn to steam or water vapor). • Test predictions through observation.	E4: PS2 C	
21. The amount of water and other liquids left in an open container will decrease over time, but the amount of liquid in a closed container will not change.	• Predict what will happen to a small quantity of water left in an open container overnight. • Predict what will happen to the same quantity of water left in a closed container overnight. • Explain where the liquid water goes when the amount decreases over time.	E4: PS2 D	

Math Connections:

- 2.3.C Measure length to the nearest whole unit using both metric and U.S. customary units.
- 2.3.E Use both analog and digital clocks to tell time to the minute.
- 2.5.A Identify the question(s) asked in a problem and any other questions that need to be answered to solve the problem.
- 2.5.D Select from a variety of problems solving strategies, and use one or more strategies to solve a problem.
- 2.5.G Determine whether a solution to a problem is reasonable.
- 3.5.B Measure temperature in degrees Fahrenheit and Celsius using a thermometer.
- 3.5.C Estimate, measure, and compare weight and mass using appropriate size U.S. customary and metric units.
- 3.5.E Construct and analyze pictographs, frequency tables, line plots, and bar graphs.
- 3.6.A Determine the questions (s) to be answered given a problem situation.
- 3.6.E Select and use one or more appropriate strategies to solve a problem.
- 3.6.F Represent a problem situation using words, numbers, pictures, physical objects, or symbols.
- 3.6.I Summarize mathematical information, draw conclusions and explain reasoning.
- 3.6.J Make a test conjectures based on data or information collected from explorations and experiments.
- 3.6.A Determine the question(s) to be answered, given a problem situation.

Physical Science: Energy: Transfer, Transformation, and Conservation

Grades 2-3 Overview:

- Students will understand the role of each part in a system.
- Students conduct investigations using instruments, observing, recording, and drawing evidence-based conclusions.
- Students will understand that energy comes in different forms.

Content Standards **Students will know that:**	**Performance Expectation** **Students are expected to:**	**EALR**	**SLE**
1. A system is a group of interacting parts that form a whole	Give examples of simple living and physical systems (e.g., a whole or animal or plant, a car). For each example, explain how different parts make up the whole.	E1: SYS A	
2. A whole object, plant, or animal may not continue to function the same way if some of its parts are missing.	• Predict what might happen to an object, plant, or animal if one or more if its parts are removed (e.g., a tricycle cannot be ridden if its wheels are removed) • Explain how the parts of a system depend on one another for the system to function.	E1: SYS B	
3. A whole object, plant, or animal can do things that none of its parts can do by themselves.	Contrast the function of a whole object, plant, or animal with the function of one of its parts (e.g., an airplane can fly, but wings and propellers cannot; a plant can grow, but stems and flowers cannot).	E1: SYS C	
4. Some objects need to have their parts connected in a certain way if they are to function as a whole.	Explain why the parts in a system need to be connected in a certain way for the system to function as a whole (e.g., batteries must be connected correctly if a flashlight is to produce light).	E1: SYS D	
5. Similar parts may play different roles in different objects, plants, or animals.	Identify ways that similar parts can play different roles in different systems (e.g., birds may use their beaks to crack seeds, while other birds use their beaks to catch fish).	E1: SYS E	
6. Scientific investigations are designed to gain knowledge about the natural world.	Explain how observations can lead to new knowledge and new questions about the natural world.	E2: INQ A	
7. Scientific investigations involve: • Question/observation • Hypothesis • Investigation • Results • Conclusion	• Make and follow a plan to carry out a scientific investigation. Actions may include accurately observing objects, events, and organisms; measuring and recording data; and predicting outcomes. • Participate in simple investigations following appropriate safety rules	E2: INQ B	
8. Inferences are based on observations.	Distinguish between direct observations and simple inferences.	E2: INQ C	
9. Simple instruments, such as magnifiers, thermometers, and rulers, provide more information than scientists can obtains	Use simple instruments (e.g., metric scales or balances, thermometers and rulers) to observe and make measurements and	E2: INQ D	

using only their unaided senses.	record and display data in a table, bar graph, line plot, or pictograph.		
10. Models are useful for understanding systems that are too big, or too small, or too dangerous to study directly.	Use a simple model to study a system. Explain how a model can be used to understand the system.	E2: INQ E	
11. Scientists develop explanations using observations (evidence) and what they already know about the world. Explanations should be based on evidence form investigations.	Accurately describe results referring to the graph or other data as evidence. Draw a conclusion about the questions that motivated the study using the results of the investigation as evidence.	E2: INQ F	
12. Scientists make the results of their investigations public even when their results contradict their expectations.	Communicate about their investigations describing how observations were made and summarizing results.	E2: INQ G	
13. Simple problems can be solved through a technological design process that includes: defining the problem, gathering information, exploring ideas, making a plan, testing possible solutions to see which is best, and communicating the results.	Design a solution to a simple problem (e.g. design a tool to remove an object from a jar when your hand doesn't fit) using a technological design process that includes: defining the problem, gathering information, exploring ideas, making a plan, testing possible solutions to see which is best, and communicating the results.	E3: APP A	
14. Scientific ideas and discoveries can be applied to solving problems.	Give an example in which the application of scientific knowledge helped solve a problem (e.g. use electric lights to see at night).	E3: APP B	
15. People in all cultures around the world have always had problems and invented tools and techniques (ways of doing something) to solve problems.	Describe a problem that people in different cultures around the world have had to solve and the various ways they have solved that problem.	E3: APP C	
16. Tools help scientist see more, measure more accurately, and do things that they could not otherwise accomplish.	Select appropriate tools and materials to meet a goal or solve a specific problem (e.g., build the tallest tower with wooden blocks, or the longest bridge span) and explain the reason for those choices.	E3: APP D	
17. Successful solutions to problems often depend on selection of the best tools and materials and on previous experience.	Evaluate how well a selected tool solved a problem and discuss what might be done differently to solve a similar problem.	E3: APP E	
18. Heat, light, motion, electricity, and sound are all forms of energy.	• Use the word energy to explain everyday activities (e.g. food gives people energy to play games). • Give examples of different forms of energy as observed in everyday life: light, sound, and motion. • Explain how light, sound, and motion are all energy. • Identify sources of heat and energy. • List ways to conserve energy as good stewards of God's creation.	E4: PS3A	

Math Connections:

- 2.3.C Measure length to the nearest whole unit using both metric and U.S. customary units.
- 2.3.E Use both analog and digital clocks to tell time to the minute.
- 2.5.A Identify the question(s) asked in a problem and any other questions that need to be answered to solve the problem.
- 2.5.D Select from a variety of problems solving strategies, and use one or more strategies to solve a problem.
- 2.5.G Determine whether a solution to a problem is reasonable.
- 3.5.B Measure temperature in degrees Fahrenheit and Celsius using a thermometer.
- 3.5.C Estimate, measure, and compare weight and mass using appropriate size U.S. customary and metric units.
- 3.5.E Construct and analyze pictographs, frequency tables, line plots, and bar graphs.
- 3.6.A Determine the questions (s) to be answered given a problem situation.
- 3.6.E Select and use one or more appropriate strategies to solve a problem.
- 3.6.F Represent a problem situation using words, numbers, pictures, physical objects, or symbols.
- 3.6.I Summarize mathematical information, draw conclusions and explain reasoning.
- 3.6.J Make a test conjectures based on data or information collected from explorations and experiments.
- 3.6.A Determine the question(s) to be answered, given a problem situation.

Earth and Space Science: Earth in Space
Motions in the Solar System

Grades 2-3 Overview:

- Students will understand the role of each part in a system.
- Students conduct investigations using instruments, observing, recording, and drawing evidence-based conclusions.
- Students will understand that the Sun and Moon have patterns of movement that can be inferred by observing and recording shadows cast by the Sun.

Content Standards **Students will know that:**	**Performance Expectation** **Students are expected to:**	**EALR**	**SLE**
1. A system is a group of interacting parts that form a whole	Give examples of simple living and physical systems (e.g., a whole or animal or plant, a car). For each example, explain how different parts make up the whole.	E1: SYS A	
2. A whole object, plant, or animal may not continue to function the same way if some of its parts are missing.	• Predict what might happen to an object, plant, or animal if one or more if its parts are removed (e.g., a tricycle cannot be ridden if its wheels are removed). • Explain how the parts of a system depend on one another for the system to function.	E1: SYS B	
3. A whole object, plant, or animal can do things that none of its parts can do by themselves.	Contrast the function of a whole object, plant, or animal with the function of one of its parts (e.g., an airplane can fly, but wings and propellers cannot; a plant can grow, but stems and flowers cannot).	E1: SYS C	
4. Some objects need to have their parts connected in a certain way if they are to function as a whole.	Explain why the parts in a system need to be connected in a certain way for the system to function as a whole (e.g., batteries must be connected correctly if a flashlight is to produce light).	E1: SYS D	
5. Similar parts may play different roles in different objects, plants, or animals.	Identify ways that similar parts can play different roles in different systems (e.g., birds may use their beaks to crack seeds, while other birds use their beaks to catch fish).	E1: SYS E	
6. Scientific investigations are designed to gain knowledge about the natural world.	Explain how observations can lead to new knowledge and new questions about the natural world.	E2: INQ A	
7. Scientific investigations involve: • Question/observation • Hypothesis • Investigation • Results • Conclusion	• Make and follow a plan to carry out a scientific investigation. Actions may include accurately observing objects, events, and organisms; measuring and recording data; and predicting outcomes. • Participate in simple investigations following appropriate safety rules	E2: INQ B	
8. Inferences are based on observations.	• Distinguish between direct observations and simple inferences.	E2: INQ C	

9. Simple instruments, such as magnifiers, thermometers, and rulers, provide more information than scientists can obtains using only their unaided senses.	Use simple instruments (e.g., metric scales or balances, thermometers and rulers) to observe and make measurements and record and display data in a table, bar graph, line plot, or pictograph.	E2: INQ D	
10. Models are useful for understanding systems that are too big, or too small, or too dangerous to study directly.	Use a simple model to study a system. Explain how a model can be used to understand the system.	E2: INQ E	
11. Scientists develop explanations using observations (evidence) and what they already know about the world. Explanations should be based on evidence form investigations.	Accurately describe results referring to the graph or other data as evidence. Draw a conclusion about the questions that motivated the study using the results of the investigation as evidence.	E2: INQ F	
12. Scientists make the results of their investigations public even when their results contradict their expectations.	Communicate about their investigations describing how observations were made and summarizing results.	E2: INQ G	
13. Simple problems can be solved through a technological design process that includes: defining the problem, gathering information, exploring ideas, making a plan, testing possible solutions to see which is best, and communicating the results.	Design a solution to a simple problem (e.g. design a tool to remove an object from a jar when your hand doesn't fit) using a technological design process that includes: defining the problem, gathering information, exploring ideas, making a plan, testing possible solutions to see which is best, and communicating the results.	E3: APP A	
14. Scientific ideas and discoveries can be applied to solving problems.	Give an example in which the application of scientific knowledge helped solve a problem (e.g. use electric lights to see at night).	E3: APP B	
15. People in all cultures around the world have always had problems and invented tools and techniques (ways of doing something) to solve problems.	• Describe a problem that people in different cultures around the world have had to solve and the various ways they have solved that problem. • Know that some objects are made by God and occur in nature.	E3: APP C	
16. Tools help scientist see more, measure more accurately, and do things that they could not otherwise accomplish.	Select appropriate tools and materials to meet a goal or solve a specific problem (e.g., build the tallest tower with wooden blocks, or the longest bridge span) and explain the reason for those choices.	E3: APP D	
17. Successful solutions to problems often depend on selection of the best tools and materials and on previous experience.	Evaluate how well a selected tool solved a problem and discuss what might be done differently to solve a similar problem.	E3: APP E	
18. The Earth and planets orbit (revolve) around the Sun.	• Describe and explain day and night. • Describe hours, days, months and years as increments of movements of the Earth around the Sun.		

	• Describe the relationship between the Earth and Sun and the change of seasons.		
19. Outdoor shadows are longest during the morning and evening and shortest during the middle of the day. These changes in the length and direction of an object's shadow indicate the changing position of the Sun during the day.	• Mark the position of shadows cast by a stick over the course of a few hours, and infer how the Sun has moved during that time. • Observe that the length of shadows is shortest at about noon, and infer that this is because the Sun is highest in the sky (but not directly overhead) at about that time. • Explain how shadows could be used to tell the time of day.	E4: ES1 A	
20. The moon has phases.	• Observe and draw the phases of the moon. • Explain (with a model) the phases of the moon. • Describe the interactions of Sun, Earth, and Moon.		

Math Connections:

- 2.3.C Measure length to the nearest whole unit using both metric and U.S. customary units.
- 2.3.E Use both analog and digital clocks to tell time to the minute.
- 2.5.A Identify the question(s) asked in a problem and any other questions that need to be answered to solve the problem.
- 2.5.D Select from a variety of problems solving strategies, and use one or more strategies to solve a problem.
- 2.5.G Determine whether a solution to a problem is reasonable.
- 3.5.B Measure temperature in degrees Fahrenheit and Celsius using a thermometer.
- 3.5.C Estimate, measure, and compare weight and mass using appropriate size U.S. customary and metric units.
- 3.5.E Construct and analyze pictographs, frequency tables, line plots, and bar graphs.
- 3.6.A Determine the questions (s) to be answered given a problem situation.
- 3.6.E Select and use one or more appropriate strategies to solve a problem.
- 3.6.F Represent a problem situation using words, numbers, pictures, physical objects, or symbols.
- 3.6.I Summarize mathematical information, draw conclusions and explain reasoning.
- 3.6.J Make a test conjectures based on data or information collected from explorations and experiments.
- 3.6.A Determine the question(s) to be answered, given a problem situation.

Earth and Space Science: Earth Systems, Structures, and Processes
Water and Weather

Grades 2-3 Overview:

- Students will understand the role of each part in a system.
- Students conduct investigations using instruments, observing, recording, and drawing evidence-based conclusions.
- Students will understand that water is essential in Earth systems. This is seen by observing and recording changes in weather patterns and Earth formations.

Content Standards **Students will know that:**	**Performance Expectation** **Students are expected to:**	**EALR**	**SLE**
1. A system is a group of interacting parts that form a whole.	Give examples of simple living and physical systems (e.g., a whole or animal or plant, a car). For each example, explain how different parts make up the whole.	E1: SYS A	
2. A whole object, plant, or animal may not continue to function the same way if some of its parts are missing.	• Predict what might happen to an object, plant, or animal if one or more if its parts are removed (e.g., a tricycle cannot be ridden if its wheels are removed) • Explain how the parts of a system depend on one another for the system to function.	E1: SYS B	
3. A whole object, plant, or animal can do things that none of its parts can do by themselves.	Contrast the function of a whole object, plant, or animal with the function of one of its parts (e.g., an airplane can fly, but wings and propellers cannot; a plant can grow, but stems and flowers cannot).	E1: SYS C	
4. Some objects need to have their parts connected in a certain way if they are to function as a whole.	Explain why the parts in a system need to be connected in a certain way for the system to function as a whole (e.g., batteries must be connected correctly if a flashlight is to produce light).	E1: SYS D	
5. Similar parts may play different roles in different objects, plants, or animals.	Identify ways that similar parts can play different roles in different systems (e.g., birds may use their beaks to crack seeds, while other birds use their beaks to catch fish).	E1: SYS E	
6. Scientific investigations are designed to gain knowledge about the natural world.	Explain how observations can lead to new knowledge and new questions about the natural world.	E2: INQ A	
7. Scientific investigations involve: • Question/observation • Hypothesis • Investigation • Results • Conclusion	• Make and follow a plan to carry out a scientific investigation. Actions may include accurately observing objects, events, and organisms; measuring and recording data; and predicting outcomes. • Participate in simple investigations following appropriate safety rules.	E2: INQ B	
8. Inferences are based on observations.	Distinguish between direct observations and simple inferences.	E2: INQ C	

9. Simple instruments, such as magnifiers, thermometers, and rulers, provide more information than scientists can obtain using only their unaided senses.	Use simple instruments (e.g., metric scales or balances, thermometers and rulers) to observe and make measurements and record and display data in a table, bar graph, line plot, or pictograph.	E2: INQ D	
10. Models are useful for understanding systems that are too big, or too small, or too dangerous to study directly.	Use a simple model to study a system. Explain how a model can be used to understand the system.	E2: INQ E	
11. Scientists develop explanations using observations (evidence) and what they already know about the world. Explanations should be based on evidence form investigations.	Accurately describe results referring to the graph or other data as evidence. Draw a conclusion about the questions that motivated the study using the results of the investigation as evidence.	E2: INQ F	
12. Scientists make the results of their investigations public even when their results contradict their expectations.	Communicate honestly about their investigations describing how observations were made and summarizing results.	E2: INQ G	
13. Simple problems can be solved through a technological design process that includes: defining the problem, gathering information, exploring ideas, making a plan, testing possible solutions to see which is best, and communicating the results.	Design a solution to a simple problem (e.g. design a tool to remove an object from a jar when your hand doesn't fit) using a technological design process that includes: defining the problem, gathering information, exploring ideas, making a plan, testing possible solutions to see which is best, and communicating the results.	E3: APP A	
14. Scientific ideas and discoveries can be applied to solving problems.	Give an example in which the application of scientific knowledge helped solve a problem (e.g. use electric lights to see at night).	E3: APP B	
15. People in all cultures around the world have always had problems and invented tools and techniques (ways of doing something) to solve problems.	• Describe a problem that people in different cultures around the world have had to solve and the various ways they have solved that problem. • Know that some objects were made by God and occur in nature.	E3: APP C	
16. Tools help scientist see more, measure more accurately, and do things that they could not otherwise accomplish.	Select appropriate tools and materials to meet a goal or solve a specific problem (e.g., build the tallest tower with wooden blocks, or the longest bridge span) and explain the reason for those choices.	E3: APP D	
17. Successful solutions to problems often depend on selection of the best tools and materials and on previous experience.	Evaluate how well a selected tool solved a problem and discuss what might be done differently to solve a similar problem.	E3: APP E	
18. Water plays an essential role in Earth systems, including shaping landforms.	• Identify where natural bodies of water occur in local environment. • Show how water has shaped a local landform (e.g., river valley, canyon, Puget Sound). • Identify water as a resource and describe	E4: ES2 A	

	the need and ways to conserve water (stewardship).		
19. Water can have various properties. Water can be a liquid or a solid and can go back and forth from one form to another. If water is turned into ice and then the ice is allowed to melt, the amount of water will be the same as it was before freezing. Water occurs in the air as rain, snow, hail, fog and clouds.	• Draw and explain the water cycle. • Describe the various states of water on Earth as liquids, solids, and gases (e.g., as liquid in morning dew; in lakes streams, and oceans; as solid ice at the North and South Poles, and on the tops of mountains; and in the air as clouds, fog, rain, hail and snow). • Predict that the weight of a sample of water will be nearly the same before and after it is frozen or melted. Explain why the weight will be almost the same. • Differentiate between the properties of fresh water and salt water. • Define and describe buoyancy, cohesion, and surface tension. • Identify, describe, and draw (paint) different types of clouds (Cumulus, Cirrus, and Stratus).	E4: ES2 B	
20. Weather changes from day to day and over the seasons. Weather can be described by measurable quantities such as temperature and precipitation.	• Measure and record changes in weather (e.g., inches of rain using a rain gauge, depth of snow, using a ruler, and temperature using a thermometer). • Describe how geological features effect weather. • Describe factors that influence weather (i.e. temperature, wind, humidity, air pressure and precipitation). • Interpret graphs of weather conditions to describe with measurements how weather changes from season to season.	E4: ES2 C	

Math Connections:

- 2.3.C Measure length to the nearest whole unit using both metric and U.S. customary units.
- 2.3.E Use both analog and digital clocks to tell time to the minute.
- 2.4. B Collect, organize, represent, and interpret data in bar graphs and picture graphs.
- 2.5.A Identify the question(s) asked in a problem and any other questions that need to be answered to solve the problem.
- 2.5.D Select from a variety of problems solving strategies, and use one or more strategies to solve a problem.
- 2.5.G Determine whether a solution to a problem is reasonable.
- 3.5.B Measure temperature in degrees Fahrenheit and Celsius using a thermometer.
- 3.5.C Estimate, measure, and compare weight and mass using appropriate size U.S. customary and metric units.
- 3.5.E Construct and analyze pictographs, frequency tables, line plots, and bar graphs.
- 3.6.A Determine the questions (s) to be answered given a problem situation.
- 3.6.E Select and use one or more appropriate strategies to solve a problem.

- 3.6.F Represent a problem situation using words, numbers, pictures, physical objects, or symbols.
- 3.6.I Summarize mathematical information, draw conclusions and explain reasoning.
- 3.6.J Make a test conjectures based on data or information collected from explorations and experiments.
- 3.6.A Determine the question(s) to be answered, given a problem situation.

Earth and Space Science: Earth History Geology
****not part of Washington State Essential Learning (EALR)**

Grades 2-3 Overview:

- Students will understand the role of each part in a system.
- Students conduct investigations using instruments, observing, recording, and drawing evidence-based conclusions.
- Students will understand the geologic forces that have shaped the earth over time.

Content Standards **Students will know that:**	**Performance Expectation** **Students are expected to:**	**EALR**	**SLE**
1. A system is a group of interacting parts that form a whole	Give examples of simple living and physical systems (e.g., a whole or animal or plant, a car). For each example, explain how different parts make up the whole.	E1: SYS A	
2. A whole object, plant, or animal may not continue to function the same way if some of its parts are missing.	• Predict what might happen to an object, plant, or animal if one or more if its parts are removed (e.g., a tricycle cannot be ridden if its wheels are removed) • Explain how the parts of a system depend on one another for the system to function.	E1: SYS B	
3. A whole object, plant, or animal can do things that none of its parts can do by themselves.	Contrast the function of a whole object, plant, or animal with the function of one of its parts (e.g., an airplane can fly, but wings and propellers cannot; a plant can grow, but stems and flowers cannot).	E1: SYS C	
4. Some objects need to have their parts connected in a certain way if they are to function as a whole.	Explain why the parts in a system need to be connected in a certain way for the system to function as a whole (e.g., batteries must be connected correctly if a flashlight is to produce light).	E1: SYS D	
5. Similar parts may play different roles in different objects, plants, or animals.	Identify ways that similar parts can play different roles in different systems (e.g., birds may use their beaks to crack seeds, while other birds use their beaks to catch fish).	E1: SYS E	
6. Scientific investigations are designed to gain knowledge about the natural world.	Explain how observations can lead to new knowledge and new questions about the natural world.	E2: INQ A	
7. Scientific investigations involve: • Question/observation • Hypothesis • Investigation • Results • Conclusion	• Make and follow a plan to carry out a scientific investigation. Actions may include accurately observing objects, events, and organisms; measuring and recording data; and predicting outcomes. • Participate in simple investigations following appropriate safety rules.	E2: INQ B	
8. Inferences are based on observations.	Distinguish between direct observations and simple inferences.	E2: INQ C	

9. Simple instruments, such as magnifiers, thermometers, and rulers, provide more information than scientists can obtains using only their unaided senses.	Use simple instruments (e.g., metric scales or balances, thermometers and rulers) to observe and make measurements and record and display data in a table, bar graph, line plot, or pictograph.	E2: INQ D	
10. Models are useful for understanding systems that are too big, or too small, or too dangerous to study directly.	Use a simple model to study a system. Explain how a model can be used to understand the system.	E2: INQ E	
11. Scientists develop explanations using observations (evidence) and what they already know about the world. Explanations should be based on evidence form investigations.	Accurately describe results referring to the graph or other data as evidence. Draw a conclusion about the questions that motivated the study using the results of the investigation as evidence.	E2: INQ F	
12. Scientists make the results of their investigations public even when their results contradict their expectations.	Communicate about their investigations describing how observations were made and summarizing results.	E2: INQ G	
13. Simple problems can be solved through a technological design process that includes: defining the problem, gathering information, exploring ideas, making a plan, testing possible solutions to see which is best, and communicating the results.	Design a solution to a simple problem (e.g. design a tool to remove an object from a jar when your hand doesn't fit) using a technological design process that includes: defining the problem, gathering information, exploring ideas, making a plan, testing possible solutions to see which is best, and communicating the results.	E3: APP A	
14. Scientific ideas and discoveries can be applied to solving problems.	Give an example in which the application of scientific knowledge helped solve a problem (e.g. use electric lights to see at night).	E3: APP B	
15. People in all cultures around the world have always had problems and invented tools and techniques (ways of doing something) to solve problems.	• Describe a problem that people in different cultures around the world have had to solve and the various ways they have solved that problem. • Know that some objects are made by God and occur in nature.	E3: APP C	
16. Tools help scientist see more, measure more accurately, and do things that they could not otherwise accomplish.	Select appropriate tools and materials to meet a goal or solve a specific problem (e.g., build the tallest tower with wooden blocks, or the longest bridge span) and explain the reason for those choices.	E3: APP D	
17. Successful solutions to problems often depend on selection of the best tools and materials and on previous experience.	Evaluate how well a selected tool solved a problem and discuss what might be done differently to solve a similar problem.	E3: APP E	
18. The earth changes over time.	• Describe the rock cycle. • Describe destructive and constructive forces in natures (i.e. landslides, volcanoes, earthquakes, erosion). • Describe the continual change of surface features due to geological processes (i.e. mountain formation and erosion, change of river's course).		

	• Describe the formation of fossils. • Explain the importance of fossils in documenting life and environmental changes over time. • Describe change over time as evidence of God's creative process.		
19. The earth is made of various materials.	• Describe the physical properties of the earth materials (rocks, soil, water, and air). • Describe and classify soils based on physical properties (i.e. color, particle size, ability to retain or drain water, texture, smell, support plant growth, and source of minerals). • Observe and classify rocks and minerals based on physical properties (i.e. color, shape, size, and texture). • Classify rocks by how they are formed (igneous, sedimentary, and metamorphic). • Identify and describe the core, mantle, and crust of the earth. • Identify and describe landmasses, bodies of water, and landforms on a globe or map.		

Life Science: Structures and Functions of Living Organisms
Life Cycles

Grades 2-3 Overview:

- Students will understand the role of each part in a system.
- Students conduct investigations using instruments, observing, recording, and drawing evidence-based conclusions.
- Students will understand that plants and animals have life cycles.

Content Standards **Students will know that:**	**Performance Expectation** **Students are expected to:**	**EALR**	**SLE**
1. A system is a group of interacting parts that form a whole.	Give examples of simple living and physical systems (e.g., a whole or animal or plant, a car). For each example, explain how different parts make up the whole.	E1: SYS A	
2. A whole object, plant, or animal may not continue to function the same way if some of its parts are missing.	• Predict what might happen to an object, plant, or animal if one or more if its parts are removed (e.g., a tricycle cannot be ridden if its wheels are removed) • Explain how the parts of a system depend on one another for the system to function.	E1: SYS B	
3. A whole object, plant, or animal can do things that none of its parts can do by themselves.	Contrast the function of a whole object, plant, or animal with the function of one of its parts (e.g., an airplane can fly, but wings and propellers cannot; a plant can grow, but stems and flowers cannot).	E1: SYS C	
4. Some objects need to have their parts connected in a certain way if they are to function as a whole.	Explain why the parts in a system need to be connected in a certain way for the system to function as a whole (e.g., batteries must be connected correctly if a flashlight is to produce light).	E1: SYS D	
5. Similar parts may play different roles in different objects, plants, or animals.	Identify ways that similar parts can play different roles in different systems (e.g., birds may use their beaks to crack seeds, while other birds use their beaks to catch fish).	E1: SYS E	
6. Scientific investigations are designed to gain knowledge about the natural world.	Explain how observations can lead to new knowledge and new questions about the natural world.	E2: INQ A	
7. Scientific investigations involve: • Question/observation • Hypothesis • Investigation • Results • Conclusion	• Make and follow a plan to carry out a scientific investigation. Actions may include accurately observing objects, events, and organisms; measuring and recording data; and predicting outcomes. • Participate in simple investigations following appropriate safety rules.	E2: INQ B	
8. Inferences are based on observations.	Distinguish between direct observations and simple inferences.	E2: INQ C	
9. Simple instruments, such as magnifiers, thermometers, and rulers, provide more information than scientists can obtains	Use simple instruments (e.g., metric scales or balances, thermometers and rulers) to observe and make measurements and	E2: INQ D	

using only their unaided senses.	record and display data in a table, bar graph, line plot, or pictograph.		
10. Models are useful for understanding systems that are too big, or too small, or too dangerous to study directly.	Use a simple model to study a system. Explain how a model can be used to understand the system.	E2: INQ E	
11. Scientists develop explanations using observations (evidence) and what they already know about the world. Explanations should be based on evidence form investigations.	Accurately describe results referring to the graph or other data as evidence. Draw a conclusion about the questions that motivated the study using the results of the investigation as evidence.	E2: INQ F	
12. Scientists make the results of their investigations public even when their results contradict their expectations.	Communicate about their investigations describing how observations were made and summarizing results.	E2: INQ G	
13. Simple problems can be solved through a technological design process that includes: defining the problem, gathering information, exploring ideas, making a plan, testing possible solutions to see which is best, and communicating the results.	Design a solution to a simple problem (e.g. design a tool to remove an object from a jar when your hand doesn't fit) using a technological design process that includes: defining the problem, gathering information, exploring ideas, making a plan, testing possible solutions to see which is best, and communicating the results.	E3: APP A	
14. Scientific ideas and discoveries can be applied to solving problems.	Give an example in which the application of scientific knowledge helped solve a problem (e.g. use electric lights to see at night).	E3: APP B	
15. People in all cultures around the world have always had problems and invented tools and techniques (ways of doing something) to solve problems.	• Describe a problem that people in different cultures around the world have had to solve and the various ways they have solved that problem. • Know that some objects are made by God and occur in nature.	E3: APP C	
16. Tools help scientist see more, measure more accurately, and do things that they could not otherwise accomplish.	• Select appropriate tools and materials to meet a goal or solve a specific problem (e.g., build the tallest tower with wooden blocks, or the longest bridge span) and explain the reason for those choices.	E3: APP D	
17. Successful solutions to problems often depend on selection of the best tools and materials and on previous experience.	• Evaluate how well a selected tool solved a problem and discuss what might be done differently to solve a similar problem.	E3: APP E	
18. Plants have life cycles that include sprouting, growing to full size, forming fruits and flowers, shedding seeds (which begins a new cycle), and eventually dying. The details of the life cycle are different for different plants.	• Identify and explain the functions of plant parts (i.e. roots, stems, leaves, flower, and fruit). • Describe the life cycle of a common type of plant (e.g., the growth of a fast growing plant from seed to sprout, to adult, to fruits, flowers, and seeds). • Describe and illustrate the process of photosynthesis.	E4: LS1 A	

19. Animals have life cycles that include being born; developing into juveniles, adolescents, then adults; reproducing (which begins a new cycle); and eventually dying. Details of the life cycle are different for different animals (Christian Living Curriculum).	• Classify and identify the characteristics of animals (vertebrate/ invertebrate, mammal, birds, fish, reptiles and amphibians) • Describe the life cycle of a common type of animal (e.g., the development of a butterfly or moth form egg to larva to pupa to adult, or the development of a frog from egg to tadpole to adult frog).	E4: LS1 B	
20. God's creation provides for the needs of living organisms.	Describe God's love and care for creation and our responsibility as good stewards.		

Math Connections:

- 2.3.C Measure length to the nearest whole unit using both metric and U.S. customary units.
- 2.3.E Use both analog and digital clocks to tell time to the minute.
- 2.5.A Identify the question(s) asked in a problem and any other questions that need to be answered to solve the problem.
- 2.5.D Select from a variety of problems solving strategies, and use one or more strategies to solve a problem.
- 2.5.G Determine whether a solution to a problem is reasonable.
- 3.5.B Measure temperature in degrees Fahrenheit and Celsius using a thermometer.
- 3.5.C Estimate, measure, and compare weight and mass using appropriate size U.S. customary and metric units.
- 3.5.E Construct and analyze pictographs, frequency tables, line plots, and bar graphs.
- 3.6.A Determine the questions (s) to be answered given a problem situation.
- 3.6.E Select and use one or more appropriate strategies to solve a problem.
- 3.6.F Represent a problem situation using words, numbers, pictures, physical objects, or symbols.
- 3.6.I Summarize mathematical information, draw conclusions and explain reasoning.
- 3.6.J Make a test conjectures based on data or information collected from explorations and experiments.
- 3.6.A Determine the question(s) to be answered, given a problem situation.

Life Science: Changes in Ecosystems

Grades 2-3 Overview:

- Students will understand the role of each part in a system.
- Students conduct investigations using instruments, observing, recording, and drawing evidence-based conclusions.
- Students will understand that changes in ecosystems affect living populations and the nonliving elements of a defined area.

Content Standards **Students will know that:**	**Performance Expectation** **Students are expected to:**	**EALR**	**SLE**
1. A system is a group of interacting parts that form a whole.	Give examples of simple living and physical systems (e.g., a whole or animal or plant, a car). For each example, explain how different parts make up the whole.	E1: SYS A	
2. A whole object, plant, or animal may not continue to function the same way if some of its parts are missing.	• Predict what might happen to an object, plant, or animal if one or more if its parts are removed (e.g., a tricycle cannot be ridden if its wheels are removed) • Explain how the parts of a system depend on one another for the system to function.	E1: SYS B	
3. A whole object, plant, or animal can do things that none of its parts can do by themselves.	Contrast the function of a whole object, plant, or animal with the function of one of its parts (e.g., an airplane can fly, but wings and propellers cannot; a plant can grow, but stems and flowers cannot).	E1: SYS C	
4. Some objects need to have their parts connected in a certain way if they are to function as a whole.	Explain why the parts in a system need to be connected in a certain way for the system to function as a whole (e.g. batteries must be connected correctly if a flashlight is to produce light).	E1: SYS D	
5. Similar parts may play different roles in different objects, plants, or animals.	Identify ways that similar parts can play different roles in different systems (e.g., birds may use their beaks to crack seeds, while other birds use their beaks to catch fish).	E1: SYS E	
6. Scientific investigations are designed to gain knowledge about the natural world.	Explain how observations can lead to new knowledge and new questions about the natural world.	E2: INQ A	
7. Scientific investigations involve: • Question/observation • Hypothesis • Investigation • Results • Conclusion	• Make and follow a plan to carry out a scientific investigation. Actions may include accurately observing objects, events, and organisms; measuring and recording data; and predicting outcomes. • Participate in simple investigations following appropriate safety rules.	E2: INQ B	
8. Inferences are based on observations.	Distinguish between direct observations and simple inferences.	E2: INQ C	

9. Simple instruments, such as magnifiers, thermometers, and rulers, provide more information than scientists can obtains using only their unaided senses.	Use simple instruments (e.g., metric scales or balances, thermometers and rulers) to observe and make measurements and record and display data in a table, bar graph, line plot, or pictograph.	E2: INQ D	
10. Models are useful for understanding systems that are too big, or too small, or too dangerous to study directly.	Use a simple model to study a system. Explain how a model can be used to understand the system.	E2: INQ E	
11. Scientists develop explanations using observations (evidence) and what they already know about the world. Explanations should be based on evidence form investigations.	Accurately describe results referring to the graph or other data as evidence. Draw a conclusion about the questions that motivated the study using the results of the investigation as evidence.	E2: INQ F	
12. Scientists make the results of their investigations public even when their results contradict their expectations.	Communicate honestly about their investigations describing how observations were made and summarizing results.	E2: INQ G	
13. Simple problems can be solved through a technological design process that includes: defining the problem, gathering information, exploring ideas, making a plan, testing possible solutions to see which is best, and communicating the results.	Design a solution to a simple problem (e.g. design a tool to remove an object from a jar when your hand doesn't fit) using a technological design process that includes: defining the problem, gathering information, exploring ideas, making a plan, testing possible solutions to see which is best, and communicating the results.	E3: APP A	
14. Scientific ideas and discoveries can be applied to solving problems.	Give an example in which the application of scientific knowledge helped solve a problem (e.g. use electric lights to see at night).	E3: APP B	
15. People in all cultures around the world have always had problems and invented tools and techniques (ways of doing something) to solve problems.	• Describe a problem that people in different cultures around the world have had to solve and the various ways they have solved that problem. • Know that some objects are made by God and occur in nature.	E3: APP C	
16. Tools help scientist see more, measure more accurately, and do things that they could not otherwise accomplish.	Select appropriate tools and materials to meet a goal or solve a specific problem (e.g., build the tallest tower with wooden blocks, or the longest bridge span) and explain the reason for those choices.	E3: APP D	
17. Successful solutions to problems often depend on selection of the best tools and materials and on previous experience.	Evaluate how well a selected tool solved a problem and discuss what might be done differently to solve a similar problem.	E3: APP E	
18. Ecosystems support all life on the planet, including human life, by providing food, fresh water, breathable	• Identify at least four ways that ecosystems support life (e.g., by providing fresh water, generating	E4: LS2 A	

air and habitats.	oxygen, removing toxic pollutants, and providing sources of useful materials). • Identify the needs of living organisms (i.e. nutrients, water, air, temperature and light). • Identify various habitats. • Describe and illustrate various food chains (predator/prey, producer/consumer). • God's creation provides for the needs of living organisms.		
19. Characteristics of living organism vary from ecosystem to ecosystem.	• Identify and explain the functions of plant parts and how they vary between eco systems (i.e. roots, stems, leaves, flower, and fruit). • Describe and illustrate the process of photosynthesis. • Observe and describe body parts and distinctive characteristics of living organisms (i.e. spiders have eight legs, birds, have feathers). • Classify plants and animals using various characteristics. • Explain plant and animal adaptations: protective coloration, mimicry, structural characteristics.		
20. All ecosystems change over time as a result of natural causes, (e.g., storms, floods, volcanic eruptions, fire). Some of these changes are beneficial for the plants and animals, some are harmful, and some have not effect.	• Describe three or more of the changes that occur in an ecosystem over time, as well as how these changes may affect the plants and animals living there. • Name some endangered, threatened, and extinct species. • Identify needs and interventions of endangered and threatened species (stewardship).	E4: LS2 B	
21. Some changes in ecosystems occur slowly and others occur rapidly. Changes can affect life forms, including humans.	• Explain the consequences of rapid ecosystem change (e.g. flooding, windstorms, snowfall, and volcanic eruptions). • Explain the consequences of gradual ecosystem change (e.g. gradual increase or decrease in daily temperatures, reduction, or increase in yearly rainfall.	E4: LS2 C	
22. Humans affect ecosystems in both positive and negative ways. Humans can help improve the health of ecosystems so that they provide habitats for plants and animals and resources for humans over the long term (e.g. if people use fewer resources and recycle waste, there will be fewer	• Describe a change that humans are making in a particular ecosystem and predict how that change could harm or improve conditions for a given type of plant or animal. • Propose a plan to protect or improve an ecosystem. •	E4: LS2 D	

negative impacts on natural systems).	• Name and demonstrate ways to reduce, reuse, and recycle (stewardship). • Identify responsibilities of humans toward animals (stewardship).		

Math Connections:

- 2.3.C Measure length to the nearest whole unit using both metric and U.S. customary units.
- 2.3.E Use both analog and digital clocks to tell time to the minute.
- 2.4. B Collect, organize, represent, and interpret data in bar graphs and picture graphs.
- 2.5.A Identify the question(s) asked in a problem and any other questions that need to be answered to solve the problem.
- 2.5.D Select from a variety of problems solving strategies, and use one or more strategies to solve a problem.
- 2.5.G Determine whether a solution to a problem is reasonable.
- 3.5.B Measure temperature in degrees Fahrenheit and Celsius using a thermometer.
- 3.5.C Estimate, measure, and compare weight and mass using appropriate size U.S. customary and metric units.
- 3.5.E Construct and analyze pictographs, frequency tables, line plots, and bar graphs.
- 3.6.A Determine the questions (s) to be answered given a problem situation.
- 3.6.E Select and use one or more appropriate strategies to solve a problem.
- 3.6.F Represent a problem situation using words, numbers, pictures, physical objects, or symbols.
- 3.6.I Summarize mathematical information, draw conclusions and explain reasoning.
- 3.6.J Make a test conjectures based on data or information collected from explorations and experiments.
- 3.6.A Determine the question(s) to be answered, given a problem situation.

Life Science: Biological Evolution
Variation of Inherited Characteristics

Grades 2-3 Overview:

- Students will understand the role of each part in a system.
- Students conduct investigations using instruments, observing, recording, and drawing evidence-based conclusions.
- Students will understand that plants and animals vary from one another and their parents. These differences serve as the basis for natural selection.

Content Standards **Students will know that:**	**Performance Expectation** **Students are expected to:**	**EALR**	**SLE**
1. A system is a group of interacting parts that form a whole.	Give examples of simple living and physical systems (e.g. a whole or animal or plant, a car). For each example, explain how different parts make up the whole.	E1: SYS A	
2. A whole object, plant, or animal may not continue to function the same way if some of its parts are missing.	• Predict what might happen to an object, plant, or animal if one or more if its parts are removed (e.g. a tricycle cannot be ridden if its wheels are removed) • Explain how the parts of a system depend on one another for the system to function.	E1: SYS B	
3. A whole object, plant, or animal can do things that none of its parts can do by themselves.	Contrast the function of a whole object, plant, or animal with the function of one of its parts (e.g., an airplane can fly, but wings and propellers cannot; a plant can grow, but stems and flowers cannot).	E1: SYS C	
4. Some objects need to have their parts connected in a certain way if they are to function as a whole.	Explain why the parts in a system need to be connected in a certain way for the system to function as a whole (e.g., batteries must be connected correctly if a flashlight is to produce light).	E1: SYS D	
5. Similar parts may play different roles in different objects, plants, or animals.	Identify ways that similar parts can play different roles in different systems (e.g., birds may use their beaks to crack seeds, while other birds use their beaks to catch fish).	E1: SYS E	
6. Scientific investigations are designed to gain knowledge about the natural world.	Explain how observations can lead to new knowledge and new questions about the natural world.	E2: INQ A	
7. Scientific investigations involve: • Question/observation • Hypothesis • Investigation • Results • Conclusion	• Make and follow a plan to carry out a scientific investigation. Actions may include accurately observing objects, events, and organisms; measuring and recording data; and predicting outcomes. • Participate in simple investigations following appropriate safety rules.	E2: INQ B	
8. Inferences are based on observations.	Distinguish between direct observations and simple inferences.	E2: INQ C	

9. Simple instruments, such as magnifiers, thermometers, and rulers, provide more information than scientists can obtains using only their unaided senses.	Use simple instruments (e.g., metric scales or balances, thermometers and rulers) to observe and make measurements and record and display data in a table, bar graph, line plot, or pictograph.	E2: INQ D	
10. Models are useful for understanding systems that are too big, or too small, or too dangerous to study directly.	Use a simple model to study a system. Explain how a model can be used to understand the system.	E2: INQ E	
11. Scientists develop explanations using observations (evidence) and what they already know about the world. Explanations should be based on evidence form investigations.	Accurately describe results referring to the graph or other data as evidence. Draw a conclusion about the questions that motivated the study using the results of the investigation as evidence.	E2: INQ F	
12. Scientists make the results of their investigations public even when their results contradict their expectations.	Communicate about their investigations describing how observations were made and summarizing results.	E2: INQ G	
13. Simple problems can be solved through a technological design process that includes: defining the problem, gathering information, exploring ideas, making a plan, testing possible solutions to see which is best, and communicating the results.	Design a solution to a simple problem (e.g. design a tool to remove an object from a jar when your hand doesn't fit) using a technological design process that includes: defining the problem, gathering information, exploring ideas, making a plan, testing possible solutions to see which is best, and communicating the results.	E3: APP A	
14. Scientific ideas and discoveries can be applied to solving problems.	Give an example in which the application of scientific knowledge helped solve a problem (e.g. use electric lights to see at night).	E3: APP B	
15. People in all cultures around the world have always had problems and invented tools and techniques (ways of doing something) to solve problems.	Describe a problem that people in different cultures around the world have had to solve and the various ways they have solved that problem. Know that some objects are made by God and occur in nature.	E3: APP C	
16. Tools help scientist see more, measure more accurately, and do things that they could not otherwise accomplish.	Select appropriate tools and materials to meet a goal or solve a specific problem (e.g. build the tallest tower with wooden blocks, or the longest bridge span) and explain the reason for those choices.	E3: APP D	
17. Successful solutions to problems often depend on selection of the best tools and materials and on previous experience.	Evaluate how well a selected tool solved a problem and discuss what might be done differently to solve a similar problem.	E3: APP E	
18. There are variations among the same kinds of plants and animals.	• Give examples of variations among individuals of the same kinds of plants and animals within a population (e.g. tall and short pine trees, black cats and white cats, people with blue eyes or brown eyes, people with freckles or without). • Classify plants and animals using various characteristics.	E4: LS3 A	

19. The offspring of a plant or animal closely resembles its parents, but close inspections reveals differences.	Compare the offspring of a plant or animal with its parents, listing features that are similar and that are different.	E4: LS3 B	
20. Sometimes differences in characteristics give individual plants or animals an advantage in surviving and reproducing.	• Predict how differences in characteristics might help one individual survive better than another (e.g. animals that are stronger or faster, plants or animals that blend into the background, plants that grow taller, or that need less water to survive). • Explain plant and animal adaptations: protective coloration, mimicry, structural characteristics.	E4: LS3 C	
21. Fossils are often similar to parts of plants or animals that live today.	Observe fossils and compare them to similar plants or animals that live today (e.g. compare a fossil fern with a similar fern that grows today, a dinosaur leg bone with the leg bone of a reptile that lives today, a mastodon and an elephant).	E4: LS3 D	
22. Some fossils are very different from plants and animals that live today.	• Conclude from fossil evidence that once there were species on earth that are no longer alive (e.g. T-Rex, Trilobites). • Identify and describe prehistoric animals. • Given pictures of animals that are extinct (e.g., dinosaurs, mammoths), describe how these animals are different from animals that live today. • Describe the formation of fossils. • Explain the importance of fossils in documenting life and environmental changes over time.	E4: LS3 E	

Math Connections:

- 2.3.C Measure length to the nearest whole unit using both metric and U.S. customary units.
- 2.3.E Use both analog and digital clocks to tell time to the minute.
- 2.4. B Collect, organize, represent, and interpret data in bar graphs and picture graphs.
- 2.5.A Identify the question(s) asked in a problem and any other questions that need to be answered to solve the problem.
- 2.5.D Select from a variety of problems solving strategies, and use one or more strategies to solve a problem.
- 2.5.G Determine whether a solution to a problem is reasonable.
- 3.5.B Measure temperature in degrees Fahrenheit and Celsius using a thermometer.
- 3.5.C Estimate, measure, and compare weight and mass using appropriate size U.S. customary and metric units.
- 3.5.E Construct and analyze pictographs, frequency tables, line plots, and bar graphs.
- 3.6.A Determine the questions (s) to be answered given a problem situation.
- 3.6.E Select and use one or more appropriate strategies to solve a problem.
- 3.6.F Represent a problem situation using words, numbers, pictures, physical objects, or symbols.

- 3.6.I Summarize mathematical information, draw conclusions and explain reasoning.
- 3.6.J Make a test conjectures based on data or information collected from explorations and experiments.
- 3.6.A Determine the question(s) to be answered, given a problem situation.

Grades
Fourth–Fifth

Physical Science: Forces and Motion

Grades 4-5 Overview:

- Students will understand that forces and motions can be measured.
- Students will analyze a system in terms of subsystem functions as well as inputs and outputs.
- Students will plan and use different kinds of investigations, including field studies, systematic observations, models, and controlled experiments.
- Scientific application is about interactions between science and technology and how both can help solve real-world problems.

Content Standard: Students will know:	**Performance Expectation Students are expected to:**	**EALR**	**SLE**
1. Systems have inputs and outputs. Changes in inputs may change the output of a system.	Describe what goes into a system (input) and what comes out of a system (output).	E1:SYS C	
2. Scientific investigations involve: • Question/observation • Hypothesis • Investigation • Results • Conclusion	• Given a research question, plan an investigation, including systematic observation, field studies, models, open-ended exploration, or controlled experiments. • Gather, record, organize data, tables, and graphs, to draw a conclusion supported by evidence from the investigation.	E2: IN Q A-G	
3. One defective part can cause a subsystem to malfunction, which in turn will affect the system as a whole.	Predict what might happen to a system if one part in one or more of its subsystems is missing, broken, worn out, mismatched, or misconnected.	E1: SYS D	
4. Results are communicated verbally and in writing even when those results show their predictions were wrong or unexplainable.	Communicate the purpose, procedure, results, and conclusions of an investigation.	E2: INQ H, I	
5. Moral issues regarding science and technology are facing society today. These issues require a response in a manner consistent with the teaching of the Catholic Church.	Investigate and discuss issues facing society today (e.g. chemical pollution, warfare).		
6. Problems can be solved using a variety of technology.	Define a problem, listing several criteria for a successful solution, using tools, techniques, and materials to make a drawing, model, or prototype.	E3: APP C,E	
7. People in different cultures all around the world use different materials or technologies to solve the same problems.	Give examples of how people use different materials or technologies to solve the same problem.	E3: APP C	
8. The weight of an object is a measure of how strongly it is pulled down toward the ground by gravity.	Explain and record the weight of objects, using a spring scale, demonstrating force of gravity of an object.		
9. The relative speed of two objects can be determined in more than one way.	Measure and compare the distance that two different object travel in a given interval of time to determine which is fastest.	E4: PS1 B	

10. The relationship between force, mass, and acceleration applies to Newton's 2nd Law of Motion.	• Show how friction and mass effect motion. • Distinguish between potential and kinetic energy.		
11. Balanced and unbalanced forces determine the effects of push and pull on the motion of objects.	Demonstrate the effects of push and pull on the motion of objects.		
12. Simple and complex machines have different functions and components.	Demonstrate the use of simple and complex machines.		

Math Connections:

- 3.5 C Estimate, measure, and compare with and mass, using appropriate –size U.S. customary and metric units.
- 2.3 Measure length to the nearest whole unit in both metric and U.S customary units.
- 4.4 Estimate and determine elapsed time, using a calendar, a digital clock, and an analog clock.

Physical Science: States of Matter

Grades 4-5 Overview:

- Students will understand that a single kind of matter can exist as a solid liquid, or gas.
- Students will understand that matter is conserved.
- Students will analyze a system in terms of subsystem functions as well as inputs and outputs.
- Students will plan and use different kinds of investigations, including field studies, systematic observations, models, and controlled experiments.

Content Standard **Students will know:**	**Performance Expectation** **Students are expected to:**	**EALR**	**SLE**
1. Systems have inputs and outputs. Changes in inputs may change the output of a system.	Describe what goes into a system (input) and what comes out of a system (output).	E1:SYS C	
2. Scientific investigations involve: • Question/observation • Hypothesis • Investigation • Results • Conclusion	• Given a research question, plan an investigation, including systematic observation, field studies, models, open-ended exploration, or controlled experiments. • Gather, record, organize data, tables, and graphs, to draw a conclusion supported by evidence from the investigation.	E2: INQ A-G	
3. Results are communicated verbally and in writing even when those results show their predictions were wrong or unexplainable.	Communicate the purpose, procedure, results, and conclusions of an investigation.	E2: INQ H, I	
4. Moral issues regarding science and technology are facing society today. These issues require a response in a manner consistent with the teaching of the Catholic Church.	Investigate and discuss issues facing society today (e.g. chemical pollution, warfare).		
5. Problems can be solved using a variety of technology.	Define a problem, listing several criteria for a successful solution, using tools, techniques, and materials to make a drawing, model, or prototype.	E3: APP C,E	
6. Substances can exist in different physical states-solid, liquid, and gas. Many substances can be changed from one state to another by heating or cooling.	Provide examples of all three states of matter and how they change through freezing, melting, evaporation, condensation, and boiling.	E4:PS2 A	
7. The total amount of matter is conserved (stays the same) when it undergoes a physical change (when object is broken into smaller pieces or dissolved).	• Demonstrate how dissolved substances have not disappeared and cite evidence to determine that the substance is still there. • If an object is weighed, then broken into small pieces, predict that the small pieces will weigh the same as the large piece. Explain why the weight will be the same.	E4: PS 2 C	

8. Substances undergo a chemical reaction to produce new substances.	Give an example or demonstrate chemical change (e.g. vinegar and baking soda, lighting a match, rust, gak).		
9. The basic structure of the periodic table consists of various elements.	Demonstrate understanding of the periodic table by identifying various elements.		
10. The structure of an atom consists of subatomic particles.	Demonstrate understanding of the subatomic particles of an atom. (e.g. proton, neutron, electron)		
11. Elements, mixtures, compounds, and solutions are different from one another.	Distinguish the difference between elements, mixtures, compounds, and solutions.		

Math Connections:

- 4.5J, & 5.6 J Make and test conjectures based on data collected from explorations and experiments.

Physical Science: Energy
Heat, Light, Sound, and Electricity

Grades 4-5 Overview:

- Students will understand that heat, sound, light, and electrical energy can be transferred.
- Students will analyze a system in terms of subsystem functions as well as inputs and outputs.
- Students will plan and use different kinds of investigations, including field studies, systematic observations, models, and controlled experiments.

Content Standard **Students will know:**	**Performance Expectation** **Students are expected to:**	**EALR**	**SLE**
1. Systems have inputs and outputs. Changes in inputs may change the output of a system.	Describe what goes into a system (input) and what comes out of a system (output).	E1:SYS C	
2. One defective part can cause a subsystem to malfunction, which in turn will affect the system as a whole.	Predict what might happen to a system if one part in one or more of its subsystems is missing, broken, worn out, mismatched, or misconnected.	E1: SYS D	
3. Scientific investigations involve: • Question/observation • Hypothesis • Investigation • Results • Conclusion	• Given a research question, plan an investigation, including systematic observation, field studies, models, open-ended exploration, or controlled experiments. • Gather, record, organize data, tables, and graphs, to draw a conclusion supported by evidence from the investigation.	E2: INQ A-G	
4. Results can be communicated verbally and in writing even when those results show their predictions were wrong or unexplainable.	Communicate the purpose, procedure, results, and conclusions of an investigation	E2: INQ H, I	
12. Moral issues regarding science and technology are facing society today. These issues require a response in a manner consistent with the teaching of the Catholic Church.	Investigate and discuss issues facing society today (e.g. chemical pollution, warfare).		
5. Problems can be solved using a variety of technology.	Define a problem, listing several criteria for a successful solution, using tools, techniques, and materials to make a drawing, model, or prototype.	E3: APP C,E	
6. People in different cultures all around the world use different materials or technologies to solve the same problems.	Give examples of how people use different materials or technologies to solve the same problem.	E3: APP C	
7. Energy has many forms (heat, light, sound, motion, and electricity).	Demonstrate understanding of different forms of energy.	E4: PS 3 A	
8. Energy can be transferred from one place to another.	Show several ways that energy can be transferred from one place to another.	E4: PS 3 B	
9. Heat can be generated a number of ways and can move from one place to	• Identify several ways to generate heat.	E4:PS3 C	

another. (Heat energy is transferred from warmer things to colder things.)	• Explain how heat is transferred (conduction, convection, radiation). • Distinguish between and give examples of renewable and non-renewable energy sources. • Define the terms insulator and conductor; and provide examples.		
10. Sound energy can be generated with vibrations.	• Demonstrate how sound can be generated by vibrations, and explain how sound energy is transferred through the air from a source to an observer (sound waves). • Compare and contrast pitch and volume (e.g. different water levels in a glass affect pitch).	E4: PS3 D	
11. Light energy interacts with matter.	Understand the behavior of light in terms of bouncing off, passing through and changing of direction (e.g. refraction, reflection).		
12. Electrical energy in circuits can be changed to other forms of energy, including light, heat, sound, and motion. Electric circuits require a complete loop through conducting materials in which an electric current can pass.	• Demonstrate the transference of electrical energy to other forms of energy(e.g. light, heat, sound, motion). • Connect wires to produce and complete circuit (open and closed circuit).	E4: PS 3 E	
13. There is a relationship between electricity and magnetism.	Demonstrate the relationship between electricity and magnetism by creating an electromagnet.		

Earth and Space Science: Earth and Space

Grades 4-5 Overview:

- Students will understand that Earth systems include the big picture of Earth as an interacting and dynamic system.
- Students will analyze a system in terms of subsystem functions as well as inputs and outputs.
- Students will plan and use different kinds of investigations, including field studies, systematic observations, models, and controlled experiments.

Content Standard **Students will know:**	**Performance Expectation** **Students are expected to:**	**EALR**	**SLE**
1. Systems contain subsystems.	Identify the various subsystems in space.	E1: SYS A	
2. A system can do things that none of its subsystems can do by themselves.	Specify how a system can do things that none of its subsystems can do by themselves.	E1: SYS B	
3. Systems have inputs and outputs. Changes in inputs may change the output of a system.	Describe what goes into a system (input) and what comes out of a system (output).	E1:SYS C	
4. Scientific investigations involve: • Question/observation • Hypothesis • Investigation • Results • Conclusion	• Given a research question, plan an investigation, including systematic observation, field studies, models, open-ended exploration, or controlled experiments. • Gather, record, organize data, tables, and graphs, to draw a conclusion supported by evidence from the investigation.	E2: INQ A-G	
5. A scientific model is a simplified representation of an object, event, system, or process created to understand some aspect of the natural world.	Create a simple model to represent an event, system, or process.	E2: INQ F	
6. Communicate the results verbally and in writing even when those results show their predictions were wrong or unexplainable.	Communicate the purpose, procedure, results, and conclusions of an investigation.	E2: INQ H, I	
7. Moral issues regarding science and technology are facing society today. These issues require a response in a manner consistent with the teaching of the Catholic Church.	Investigate and discuss Catholic teachings in regards to conservation, pollution and God's guiding hand in His creation.		
8. Problems can be solved using a variety of technology.	Define a problem, listing several criteria for a successful solution, using tools, techniques, and materials to make a drawing, model, or prototype.	E3: APP C,E	
9. People in different cultures all around the world use different materials or technologies to solve the same problems.	Give examples of how people use different materials or technologies to solve the same problem (e.g. space exploration, oceanography).	E3: APP C	

10. The differences between rotation and revolution can be distinguished; day and night; seasons and years.	Use a physical model or diagram to show that Earth's rotation causes night and day.	E4: ES1 B	
11. Earth's annual orbit around the Sun causes us to see and identify different constellations and planet revolutions at different times of the year.	Use a physical model or diagram to show how different constellations are visible in different seasons.	E4: ES1 C	

Earth and Space Science: Formation of Earth Materials

Grades 4-5 Overview:

- Students will understand that Earth materials are formed by various natural processes and can be used in different ways.
- Students will analyze a system in terms of subsystem functions as well as inputs and outputs.
- Students will plan and use different kinds of investigations, including field studies, systematic observations, models, and controlled experiments.

Content Standard: Students will know:	**Performance Expectation Students are expected to:**	**EALR**	**SLE**
1. Systems contain subsystems.	Identify the various subsystems.	E1: SYS A	
2. A system can do things that none of its subsystems can do by themselves.	Specify how a system can do things that none of its subsystems can do by themselves.	E1: SYS B	
3. Systems have inputs and outputs. Changes in inputs may change the output of a system.	Describe what goes into a system (input) and what comes out of a system (output).	E1:SYS C	
4. Scientific investigations involve: • Question/observation • Hypothesis • Investigation • Results • Conclusion	• Given a research question, plan an investigation, including systematic observation, field studies, models, open-ended exploration, or controlled experiments. • Gather, record, organize data, tables, and graphs, to draw a conclusion supported by evidence from the investigation.	E2: INQ A-G	
5. Moral issues regarding science and technology are facing society today. These issues require a response in a manner consistent with the teaching of the Catholic Church.	Investigate and discuss Catholic teachings in regards to conservation, pollution and God's guiding hand in His creation.		
6. Earth materials include rocks, soil, water, and gases of the atmosphere. Materials have different physical and chemical properties.	• List physical and chemical properties of materials. • Distinguish between synthetic materials and those found in nature.	E4: ES2 A	
7. Weathering is the breaking down of rock into pebbles and sand caused by physical processes such as heating, cooling, and pressure, and chemical processes such as acid rain.	• Describe and give examples of the physical and chemical processes of weathering rock. • Create a simple model to represent an event, system, or process.	E4: ES2 B	
8. Soils are formed by weathering and erosion, decay of plant matter, settling of volcanic ash, transport by rain through streams and rivers, and deposition of sediments in valleys,	Identify the different ways soil is formed.	E4: ES2 D	

riverbeds, and lakes.			
Soils are found in layers and have different chemical composition and physical properties.	Compare the composition of different layers in soil with respect to physical properties.	E4: ES2 E	

Earth and Space Science: Focus on Fossils and Rocks

Grades 4-5 Overview:

- Students will understand that fossils provide evidence that environments of the past were quite different from what we observe today.
- Students will analyze a system in terms of subsystem functions as well as inputs and outputs.
- Students will plan and use different kinds of investigations, including field studies, systematic observations, models, and controlled experiments.

Content Standard: **Students will know:**:	**Performance Expectation** **Students are expected to:**	**EALR**	**SLE**
1. Systems have inputs and outputs. Changes in inputs may change the output of a system.	Describe what goes into a system (input) and what comes out of a system (output).	E1:SYS C	
2. Scientific investigations involve: • Question/observation • Hypothesis • Investigation • Results • Conclusion	• Given a research question, plan an investigation, including systematic observation, field studies, models, open-ended exploration, or controlled experiments. • Gather, record, organize data, tables, and graphs, to draw a conclusion supported by evidence from the investigation.	E2:INQ A-G	
3. Moral issues regarding science and technology are facing society today. These issues require a response in a manner consistent with the teaching of the Catholic Church.	Investigate and discuss Catholic teachings in regards to conservation, pollution and God's guiding hand in His creation.		
4. Problems can be solved using the technological design process.	Define a problem and list several criteria for a successful solution. Research the problem to better understand the need and to see how others have solved similar problems.	E3:APP C	
5. Communicate the results verbally and in writing even when those results show their predictions were wrong or unexplainable.	Communicate the purpose, procedure, results, and conclusions of an investigation.	E2: INQ H, I	
6. By studying the kinds of plant and animal fossils in a layer of rock, it is possible to infer what the environment was like at the time and where the layer formed.	Infer from a picture of several fossils in a layer of rock the environmental conditions that existed when the fossils were formed (e.g., fish fossils would indicate that a body of water existed at the time the fossils formed).	E4: ES3 B	
7. Classify three different types of rocks and minerals based on physical properties.	• Differentiate between rocks and minerals. • Identify a particular rock using luster, hardness, density, streak, cleavage and fracture, color, and special properties. • Demonstrate understanding of the rock cycle		

Math Connections:

- 4.5J & 5.6J Make and test conjectures based on data collected from explorations and experiments.

Life Science: Structures and Behaviors

Grades 4-5 Overview:

- Students will understand that plants and animals have different structures that meet their needs and respond to the environment.
- Students will analyze a system in terms of subsystem functions as well as inputs and outputs.
- Students will plan and use different kinds of investigations, including field studies, systematic observations, models, and controlled experiments.

Content Standard: Students will know:	**Performance Expectation Students are expected to:**	**EALR**	**SLE**
1. Systems contain subsystems.	Identify the various subsystems.	E1: SYS A	
2. A system can do things that none of its subsystems can do by themselves.	Specify how a system can do things that none of its subsystems can do by themselves.	E1: SYS B	
3. One defective part can cause a subsystem to malfunction, which in turn will affect the system as a whole.	Predict what might happen to a system if a part in one or more of its subsystems malfunctions.	E1: SYS D	
4. Scientific investigations involve: • Question/observation • Hypothesis • Investigation • Results • Conclusion	• Given a research question, plan an investigation, including systematic observation, field studies, models, open-ended exploration, or controlled experiments. • Gather, record, organize data, tables, and graphs, to draw a conclusion supported by evidence from the investigation.	E2: INQ A-G	
5. People in different cultures all around the world use different materials or technologies to solve the same problems.	Research and share how people around the world use different materials or technologies to solve the same problem (e.g. people in different countries use different materials to build their houses).	E3: APP B,F	
6. Moral issues regarding science and technology are facing society today. These issues require a response in a manner consistent with the teaching of the Catholic Church.	Investigate and discuss Catholic teachings in regards to conservation, pollution and God's guiding hand in His creation.		
7. Communicate the results verbally and in writing even when those results show their predictions were wrong or unexplainable.	Communicate the purpose, procedure, results, and conclusions of an investigation.	E2: INQ H, I	
8. Science and technology have greatly improved food quality and quantity, transportation, health, sanitation, and communication.	Describe specific ways that science and technology have improved the quality of the students' lives.	E3: APP G	
9. Organisms are made up of cells, which can be single cell or multi-cellular.	Give examples of single cell and multi-cellular organism.		

10. Plants and animals have cells that function differently.	• Identify and explain plant and animal cell parts. • Create a model of each cell.		
11. Plants are classified by structure and function.	Distinguish between angiosperm and gymnosperm.		
12. Plants make their own food using energy from the sun (photosynthesis).	Describe or demonstrate that plants make their own food.	E4: LS2 B	
13. Plants reproduce differently based upon if they have seeds or are seedless.	Provide examples and explain the reproduction of seed and seedless plants.		
14. Environmental factors effect plant growth.	• Describe and give examples of how plants respond to their environment. • Conduct an experiment to demonstrate environmental effects on plants.	E4: LS1 C	
15. Classify animals into groups.	• Distinguish between vertebrates and invertebrates, and warm blooded and cold-blooded animals. • Identify the subsystems of an animal (e.g., kingdom, phylum)	E1: SYS A	
16. Animals adapt and interact with their ecosystem.	Describe how an animal adapts and interacts with their environment.	E4: LS1 C	
17. Nutrition is essential to health. Various kinds of foods are necessary to build and maintain body structures.	• Describe how various types of foods contribute to the maintenance of healthy body structures. • Based on the above list, develop a balanced plan for eating that will allow you to build and maintain your body. • Describe the effect on a system if its input is changed (e.g. glucose levels).	E4: LS1 E E1: SYS C	
18. Understand and describe the components of life functions and interconnecting organ systems. • circulatory • respiratory • excretory • reproductive • muscular – skeletal • digestive • nervous	Identify and differentiate between each organ system and how it functions with the subsystems.	E1: SYS D	

Math Connections: 4.5J Test conjectures based on data collected from explorations and experiments.

Life Science: Food Webs

Grades 4-5 Overview:

- Students will understand that changes in the ecosystems affect the populations that can be supported in a food web.
- Students will analyze a system in terms of subsystem functions as well as inputs and outputs.
- Students will plan and use different kinds of investigations, including field studies, systematic observations, models, and controlled experiments.

Content Standard: Students will know:	**Performance Expectation Students are expected to:**	**EALR**	**SLE**
1. Systems contain subsystems.	Identify the various subsystems.	E1: SYS A	
2. A system can do things can that none of its subsystems can do by themselves.	Specify how a system can do things that none of its subsystems can do by themselves.	E1: SYS B	
3. One defective part can cause a subsystem to malfunction, which in turn will affect the system as a whole.	Predict what might happen to a system if a part in one or more of its subsystems malfunctions	E1: SYS D	
4. An ecosystem includes all of the plant and animal populations and nonliving resources in a given area which are dependent on one another.	• Create a model of an ecosystem • Describe how plant and animals in an ecosystem depend on each other and nonliving resources.	E4: LS2 A	
5. Plants and animals are related in food webs with producers, consumers, and decomposers.	• Draw a simple food web given a list of three common organisms, including arrows to accurately depict the cycle. • Compare the roles of producer, consumers, and decomposers in an ecosystem.	E4: LS2 C	
6. Ecosystems can change slowly or rapidly. Big changes over a short period of time can have a major impact on the ecosystem and the populations of plants and animals living there.	Apply relationships of organisms to its ecosystem and predict how slow or rapid change will affect the population of an organism.	E4: LS2 D	
7. All plants and animals change the ecosystem where they live. If this change reduces another organism's access to resources, that organism may move to another location or die.	Describe how one population may affect other plants and/or animals in the ecosystem (e.g. increase in Scotch Broom replaces native plants normally eaten by butterfly caterpillars, reducing the butterfly population).	E4: LS2 E	
8. People affect ecosystems both positively and negatively.	• Describe ways that humans can improve the health of ecosystems (e.g. recycling wastes, establishing rain gardens, planting native species to prevent flooding and erosion). • Describe ways that humans can harm the health of ecosystems (e.g. overuse of fertilizers, littering, not recycling, being good stewards of God's creation).	E4: LS2 F	
9. Major land and water biomes can be identified and differentiated between.	Show the difference between land and water biomes (e.g., diorama, Venn diagram)		

Math Connections:
4.5J & 5.6J Make and test conjectures based on data collected from explorations and experiments.

Life Science: Heredity and Adaption

Grades 4-5 Overview:

- Students will understand that ecosystem change and organisms that can adapt to these changes will survive and reproduce in higher numbers.
- Students will analyze a system in terms of subsystem functions as well as inputs and outputs.
- Students will plan and use different kinds of investigations, including field studies, systematic observations, models, and controlled experiments.

Content Standard: Students will know:	**Performance Expectation Students are expected to:**	**EALR**	**SLE**
1. Systems contain subsystems.	Identify the various subsystems.	E1: SYS A	
2. A system can do things that none of its subsystems can do by themselves.	Specify how a system can do things that none of its subsystems can do by themselves.	E1: SYS B	
3. One defective part can cause a subsystem to malfunction, which in turn will affect the system as a whole.	Predict what might happen to a system if a part in one or more of its subsystems malfunctions.	E1: SYS D	
4. Plants and animals inherit many characteristics from their parents. Some inherited characteristics allow organisms to better survive and reproduce in a given ecosystem.	Give examples to illustrate an inherited characteristic that would enable an organism to better survive and reproduce in a given ecosystem.	E4: LS3 B	
5. Fossils provide evidence that many plant and animal species are extinct and that species have changed over time.	• Examine reasons why some populations may not survive as well as others. • Explain how fossils provide evidence of species changing over time.	E4: LS3 A E4: LS3 D	

Math Connection:

4.4.F Describe and compare the likelihood of events.

Earth Science

Grades
Sixth-Eighth

Earth Science: Mandatory Essentials
(Threads throughout entire science curriculum)

Grades 6-8 Overview:
The primary goal of instruction throughout Earth Science is to integrate the themes of systems, inquiry, and application into content standards.

- Students will explore complex situations and see how they can be analyzed.
- Students will investigate a question through valid experimental techniques with conclusions based on evidence and are repeatable.
- Students will apply the full process of technological design and relevant science concepts to solve a problem.

Content Standard: Students will know that:	**Performance Expectation: Students are expected to:**	**EALR**	**SLE**
1. Scientific inquiry involves asking and answering questions and comparing the answer with what scientists already know about the world.	Generate a question that can be answered through scientific investigation. • Question/observation • Hypothesis • Investigation • Results • Conclusion	E2: INQ A	
2. Different kinds of questions suggest different kinds of scientific investigations.	• Plan and conduct a scientific investigation (e.g. field study, systematic observation, controlled experiment, model, or simulation) that is appropriate for the question being asked. • Propose a hypothesis, give a reason for the hypothesis, and explain how the planned investigation will test the hypothesis. • Work collaboratively with other students to carry out the investigations.	E2: INQ B	
3. Collecting, analyzing, and displaying data are essential aspects of all investigations.	• Communicate results using pictures, tables, charts, diagrams, graphic displays, and text that are clear, accurate, and informative. • Recognize and interpret patterns – as well as variations from previously learned or observed patterns – in data, diagrams, symbols, and words. • Use statistical procedures (e.g. median, mean, or mode) to analyze data and make inferences about relationships.	E2: INQ C	
4. For an experiment to be valid, all (controlled) variables must be kept the same whenever possible. The manipulated (independent) variable will be tested and the responding (dependent) variable will be measured and recorded. If a variable cannot be controlled, it must be reported and accounted for.	• Plan and conduct a controlled experiment to test a hypothesis about a relationship between two variables. • Determine which variables should be kept the same (controlled), which (independent) variable should be systematically manipulated, and which responding (dependent) variable is to be measured and recorded. • Report any variables not controlled and explain how they might affect results.	E2: INQ D	

5. Models are used to represent objects, events, systems, and processes. Models can be used to test hypotheses and better understand phenomena, but they have limitations.	• Create a model or simulation to represent the behavior of objects, events, systems, or processes. • Use the model to explore the relationship between two variables and point out how the model or simulation is similar to or different from the actual phenomenon.	E2: INQ E	
6. It is important to distinguish between the results of a particular investigation and general conclusions drawn from these results.	• Generate a scientific conclusion from an investigation using inferential logic, and clearly distinguish between results (e.g., evidence) and conclusions (e.g., explanation). • Describe the differences between an objective summary of the findings and an inference made from the findings.	E2: INQ F	
7. Scientific reports should enable another investigator to repeat the study to check the results.	Prepare a written report of an investigation by clearly describing the question being investigated, what was done, and an objective summary of results. (The scientific report should provide evidence to accept or reject the hypothesis, explain the relationship between two or more variables, and identify limitations of the investigation.)	E2: INQ G	
8. Science advances through openness to new ideas, honesty, and legitimate skepticism. Asking thoughtful questions, querying other scientists' explanations, and evaluating one's own thinking in response to the ideas of others are abilities of scientific inquiry.	• Recognize flaws in scientific claims, such as uncontrolled variables, overgeneralizations from limited data, and experimenter bias. • Listen actively and respectfully to research reports by other students. Critique their presentations respectfully, using logical argument and evidence. • Engage in reflection and self-evaluation.	E2: INQ H	
9. There are ethical codes governing experiments, research in natural ecosystems. Moral issues regarding science and technology are facing society today. These issues require a response in a manner consistent with the teaching of the Catholic Church.	Examine ethical and moral concerns and identify precautions in response to scenarios of scientific investigations and research in natural ecosystems.	E2: INQ I	
10. People have always used technology to solve problems. Advances in human civilization are linked to advances in technology.	• Describe how a technology and society have interacted over time. • Understand the benefits of science and technology are not available to all the people in the world.	E3: APP A	
11. Science and technology are interdependent. Science drives technology by demanding better instruments and suggesting ideas for new designs. Technology drives science by providing instruments and research methods.	• Give examples to illustrate how scientists have helped solve technological problems and how engineers have aided science (e.g., designing telescopes to discover distant planets). • Collaborate with other students to generate solutions to a problem.	E3: APP C	

Collaboration is needed to find solutions.			
12. Solutions must be tested to determine whether or not they will solve the problem. Results are used to modify the design, and the best solution must be communicated persuasively.	• Test the best solution by building a model or other representation and using it with the intended audience. • Redesign as necessary. • Present the results using models or drawings verbally or in written form.	E3: APP F	
13. People in all cultures have made and continue to make contributions to society through science and technology.	Describe scientific or technological contributions to society by people in various cultures.	E3: APP H	
14. Any system may be thought of as containing subsystems and as being a subsystem of a larger system.	Given a system identify subsystems and a larger encompassing system (e.g. planets as part of the Milky Way).	E1: SYS B	
15. The output of one system can become the input of another system.	Give an example of how output of matter or energy from a system can become input for another system. (e.g., household waste goes to a landfill).	E1: SYS B S	
16. In an open system, matter flows into and out of the system. In a closed system energy may flow into or out of the system, but matter stays within the system.	Given a description of a system, analyze and defend whether it is open or closed.	E1: SYS B S	
17. If the input of matter or energy is the same as the output, then the amount of matter or energy in the system won't change. If the input is more or less than the output, then the amount of matter or energy in the system will change.	Measure the flow of matter into and out of an open system and predict how the system of likely to change (e.g., amount of wind determine how much energy a wind turbine produces).	E1: SYS B S	

Mathematics Connections:

- Represent a problem situation, describe the process used to solve the problem, and verify the reasonableness of the solution.
- Communicate the answer(s) to the question(s) in a problem, using appropriate representations, including symbols and informal and formal mathematical language.
- Make and test conjectures based on data (or information) collected from explorations and experiments
- Construct and interpret histograms, stem-and-leaf plots, and circle graphs.
- Evaluate different displays of the same data for effectiveness and bias, and explain reasoning.

- Analyze a problem situation and represent it mathematically.
- Select and justify functions and equations to model and solve problems.
- Select and apply strategies to solve problems.
- Generalize a solution strategy for a single problem to a class of related problems, and apply a strategy for a class of related problems to solve a specific problem.
- Select and justify functions and equations to model and solve problems.
- Summarize mathematical ideas with precision and efficiency for a given audience and purpose.
- Describe the correlation of data in scatter plots in terms of strong or weak and positive or negative.
- Make valid inferences and draw conclusions based on data.
- Find the equation of a linear function that best fits bivariate data that are linearly related, interpret the slope and the y-intercept of the line, and use the equation to make predictions.

Earth and Space Science: Solar System

Grades 6-8 Overview:

- Students will understand that Earth and Space is the longest and most comprehensive story that can be told, beginning with God's creation of the universe that set the stage for the wide diversity of life.
- Students will explore complex situations and see how they can be analyzed.
- Students will investigate a question through valid experimental techniques with conclusions based on evidence and are repeatable.

Content Standard: **Students will know:**	**Performance Expectation** **Students are expected to:**	**EALR**	**SLE**
1. The Moon's monthly cycle of phases can be explained by its changing relative position as it orbits Earth. An eclipse of the Moon occurs when the Moon enters Earth's shadow. An eclipse of the Sun occurs when the Moon is between the Earth and Sun, and the Moon's shadow falls on the Earth.	• Create a model to explain how the moon's changing position in its orbit results in the changing phases of the Moon as observed from Earth. • Explain how the cause of the eclipse of the Moon is different from the cause of the Moon's phases. • Compare a solar and lunar eclipse.	E4: ES1 A	
2. The solar system is made up of the Sun, eight planets, their moons, and smaller objects such as asteroid, plutoids, and comets.	• Compare the relative sizes and distances of the Sun, Moon, Earth, and other major planets, moons, asteroids, plutoids and comets. • Create a model of the solar system, describing and explaining the components of the solar system.	E4: ES1 B	
3. Gravity is the force that keeps planets in orbit around the Sun and governs the rest of the motion in the Solar System.	Explain what would happen to an object if gravity was increased, decreased, or taken away.	E4: ES1 D	
4. Our Sun is one of billions of stars within the galaxy, each its own life cycle. Many of these stars have planets orbiting around them. The Milky Way galaxy is one of billions of galaxies in the universe.	• Describe how star color indicates temperature. • Describe the life cycle of a star. • Understand the comparative size of our solar system and the Milky Way with the universe.	E4: ES1 E	
5. The Sun is the major source of energy for phenomena on Earth's surface, such as winds, ocean currents, and the water cycle.	Connect the uneven heating of Earth's surface by the Sun to global wind and ocean current.	E4: ES2 B	

Math Connections: 7.2.D Make scale drawings and solve problems related to scale.

Earth and Space Science: Cycles in Earth Systems

Grades 6-8 Overview:

- Students will understand Earth is an interacting system of solid, liquids, gases.
- Students will understand the Earth processes, water cycle, and the rock cycle.
- Students will understand Earth has nonrenewable resources and as Gods stewards, they must be used responsibly.
- Students will investigate a question through valid experimental techniques with conclusions based on evidence and are repeatable.

Content Standard: **Students will know**:	**Performance Expectation** **Student are expected to:**	**EALR**	**SLE**
1. The atmosphere is a mixture of nitrogen, oxygen, and trace gases that include water vapor. The atmosphere has different properties at different elevations. The atmosphere is made up of distinct layers.	• Describe the composition and properties of the atmosphere. • Identify and explain the properties of the atmospheric layers.	E4: ES2 A	
2. Weather is caused by interactions of temperature, wind, humidity, air pressure, and precipitation.	• Explain the effects on weather of air masses and fronts. • Compare and contrast the different types of clouds. • Demonstrate the relationship between weather and climate. • Explain the stabilization effect of water on weather and climate of a region.		
3. Water is a solvent. As it passes through the water cycle, it dissolves minerals and gases and carries them to the oceans.	• Demonstrate and explain the process and rationale of desalination. • Explain the causes and impact of acid rain. • Describe how water moves through underground layers of rock and soil (e.g. water cycle).		
4. Climate is determined by energy transfer from the sun to the Earth's surface and is impacted by landforms and bodies of water. Human activities affect climate, (e.g. burning of fossil fuels, also affect the global climate).	• Explain how climate is affected by seasonal weather patterns and proximity to mountain ranges and to the oceans. • Identify global climate zones. • Identify the impact of humans on the atmosphere. (e.g. greenhouse gases to the atmosphere).	9-11 ES2 B	
5. The earth does not have infinite resources; increasing human consumption places severe stress on the natural processes.	• Identify renewable and nonrenewable resources. • Compare and contrast the methods of harvesting solar, wind, and hydro energy. • Identify the process of the formation of natural resources. • Explain how human use of natural resources stress natural processes and link that use to a possible long-term	9-11 ES2 D	

	consequence.		
6. The Earth is composed of a relatively thin crust, a dense metallic core and a layer called the mantle between the crust and core that is very hot and partially melted.	Demonstrate the major layers of Earth, showing the approximate relative thicknesses and consistency of the crust, core, and mantle.	ES2 F	
7. The crust is composed of huge crustal plates which move incrementally, pushed by convection in the upper mantle, causing earthquakes, volcanoes, and mountains.	Describe what may happen when plate boundaries meet (e.g. earthquakes, tsunami, faults, continental shelf a slope, mountain building).	ES2 F	
8. Landforms are created by processes that build up structures and that break down structures, carrying away material through erosion and weathering.	Explain how a given landform has been shaped by processes that build up structures and by processes that break down and carry away material.	ES2 G	
9. The rock cycle describes the formation of igneous rock from magma or lava, sedimentary rock from compaction of eroded particles, and metamorphic rock by heating pressure.	Identify sample of igneous, sedimentary, and metamorphic rock from their properties and describe how properties provide evidence of how they were formed.	ES2 H	

Math Connections: 7.2 D Make scale drawings and solve problem related to scale.

Earth and Space Science: Evidence of Change

Grades 6-8 Overview:

- Students will understand Earth history has been deduced by observing processes that take place today, and projecting those processes back in time. These remnants, especially fossils, provide essential clues to understanding the evolution of our planet.
- Students will understand all creation comes from and depends upon God for its existence.
- Students will investigate a question through valid experimental techniques with conclusions based on evidence and are repeatable.

Content Standard: Students will know:	**Performance Expectation** Student are expected to:	**EALR**	**SLE**
1. The understanding of Earth's history is based on the evidence that processes seen today are similar to those to that occurred in the past.	Describe how the Earth processes that can be observed and measured, providing clues to Earth's past (e.g. rate of sedimentation, plate tectonics, Pangaea and changes in composition of the atmosphere).	ES3 A	
2. Sedimentary rock provides evidence that determines the age of Earth's changing surface and can be used to estimate the age of fossils found in the rocks.	Explain how the age of landforms can be estimated by studying the number and thickness of rock layers, as well as fossils found within rock layer.	ES3 B	
3. Sedimentary rocks are often in horizontal formations with the oldest layers on the bottom. However, in some locations, rock layers are folded, tipped, or inverted, which provide evidence of geologic events in the past.	• Explain why younger layers of sedimentary rocks are usually on top of older layers. • Hypothesize what geologic events could have caused blocks of horizontal sedimentary layers to be tipped or older rock layers to be on top of younger rock layers.	ES3 C	
4. Earth has been shaped by many natural events, including earthquakes, volcanic eruptions, glaciers, floods, storms, tsunamis, and the impact of asteroids.	Identify landforms as evidenced of past geologic events (e.g. Mount St. Helens, Crater Lake, Channeled Scablands)	ES3 D	
5. Living organisms have played roles in shaping landforms seen today.	Explain several ways that living organisms have shaped landforms (e.g. coral island, limestone deposit, oil and coal deposits).		

Math Connections: 6.3 B Write ratios to represent a variety of rate.

Life Science

Grades
Sixth-Eighth

Life Science: Mandatory Essentials
(Threads throughout entire science curriculum)

Grades 6-8 Overview:
The primary goal of instruction throughout Life Science is to integrate the themes of systems, inquiry, and application into content standards.

- Students will understand the interconnectedness between content and the scientific process.
- Students will communicate throughout the scientific discovery and processes that God is our creator and all life come from him.
- Students will investigate a question through valid experimental techniques with conclusions based on evidence and are repeatable.

Content Standard: Students will know that:	**Performance Expectation: Students are expected to:**	**EALR**	**SLE**
1. Scientific inquiry involves asking and answering questions and comparing the answer with what scientists already know about the world.	Generate a question that can be answered through scientific investigation. • Question/observation • Hypothesis • Investigation • Results • Conclusion	E2: INQ A	
2. Different kinds of questions suggest different kinds of scientific investigations.	• Plan and conduct a scientific investigation (e.g., field study, systematic observation, controlled experiment, model, or simulation) that is appropriate for the question being asked. • Propose a hypothesis, give a reason for the hypothesis, and explain how the planned investigation will test the hypothesis. • Work collaboratively with other students to carry out the investigations.	E2: INQ B	
3. Collecting, analyzing, and displaying data are essential aspects of all investigations.	• Communicate results using pictures, tables, charts, diagrams, graphic displays, and text that are clear, accurate, and informative. • Recognize and interpret patterns as well as variations from previously learned or observed patterns in data, diagrams, symbols, and words. • Use statistical procedures (e.g. median, mean, or mode) to analyze data and make inferences about relationships.	E2: INQ C	
4. For an experiment to be valid, all (controlled) variables must be kept the same whenever possible. The manipulated (independent) variable will be tested and the responding (dependent) variable will be measured and recorded. If a variable cannot be controlled, it must be reported and accounted	• Plan and conduct a controlled experiment to test a hypothesis about a relationship between two variables. • Determine which variables should be kept the same (controlled), which (independent) variable should be systematically manipulated, and which responding (dependent) variable is to be measured and recorded. • Report any variables not controlled and explain how they might affect results.	E2: INQ D	

for.			
5. Models are used to represent objects, events, systems, and processes. Models can be used to test hypotheses and better understand phenomena, but they have limitations.	• Create a model or simulation to represent the behavior of objects, events, systems, or processes. • Use the model to explore the relationship between two variables and point out how the model or simulation is similar to or different from the actual phenomenon.	E2: INQ E	
6. It is important to distinguish between the results of a particular investigation and general conclusions drawn from these results.	• Generate a scientific conclusion from an investigation using inferential logic, and clearly distinguish between results (e.g. evidence) and conclusions (e.g. explanation). • Describe the differences between an objective summary of the findings and an inference made from the findings.	E2: INQ F	
7. Scientific reports should enable another investigator to repeat the study to check the results.	Prepare a written report of an investigation by clearly describing the question being investigated, what was done, and an objective summary of results. (The scientific report should provide evidence to accept or reject the hypothesis, explain the relationship between two or more variables, and identify limitations of the investigation.)	E2: INQ G	
8. Science advances through openness to new ideas, honesty, and legitimate skepticism. Asking thoughtful questions, querying other scientists' explanations, and evaluating one's own thinking in response to the ideas of others are abilities of scientific inquiry.	• Recognize flaws in scientific claims, such as uncontrolled variables, overgeneralizations from limited data, and experimenter bias. • Listen actively and respectfully to research reports by other students. Critique presentations respectfully, using logical argument and evidence. • Engage in reflection and self-evaluation.	E2:INQ H	
9. There are ethical codes governing experiments, research in natural ecosystems. Moral issues regarding science and technology are facing society today. These issues require a response in a manner consistent with the teaching of the Catholic Church.	Examine ethical and moral concerns and identify precautions in response to scenarios of scientific investigations and research in natural ecosystems.	E2: INQ I	
10. People have always used technology to solve problems. Advances in human civilization are linked to advances in technology.	• Describe how a technology and society have interacted over time. • Understand the benefits of science and technology are not available to all the people in the world.	E3: APP A	

11. Science and technology are interdependent. Science drives technology by demanding better instruments and suggesting ideas for new designs. Technology drives science by providing instruments and research methods. Collaboration is needed to find solutions.	• Give examples to illustrate how scientists have helped solve technological problems and how engineers have aided science (e.g. designing telescopes to discover distant planets). • Collaborate with other students to generate solutions to a problem.	E3: APP C	
12. Solutions must be tested to determine whether or not they will solve the problem. Results are used to modify the design, and the best solution must be communicated persuasively.	• Test the best solution by building a model or other representation and using it with the intended audience. • Redesign as necessary. • Present the results using models or drawings verbally or in written form.	E3: APP F	
13. People in all cultures have made and continue to make contributions to society through science and technology.	Describe scientific or technological contributions to society by people in various cultures.	E3: APP H	
14. Any system may be thought of as containing subsystems and as being a subsystem of a larger system.	Given a system identify subsystems and a larger encompassing system.	E1: SYS B	
15. The output of one system can become the input of another system.	Give an example of how output of matter or energy from a system can become input for another system. (e.g. household waste goes to a landfill).	E1: SYS B S	
16. In an open system, matter flows into and out of the system. In a closed system energy may flow into or out of the system, but matter stays within the system.	Given a description of a system, analyze and defend whether it is open or closed.	E1: SYS B S	
17. If the input of matter or energy is the same as the output, then the amount of matter or energy in the system won't change. If the input is more or less than the output, then the amount of matter or energy in the system will change.	Measure the flow of matter into and out of an open system and predict how the system of likely to change (e.g. amount of wind determine how much energy a wind turbine produces).	E1:SYS B S	

Mathematics Connection

- Use inductive reasoning about algebra and the properties of numbers to make conjectures, and use deductive reasoning to prove or disprove conjectures.

- Evaluate a solution for reasonableness, verify its accuracy, and interpret it in the context of the original problem.
- Represent a function with a symbolic expression, as a graph, in a table, and using words, and make connections among these representations.
- Synthesize information to draw conclusions and evaluate the arguments and conclusions of others.

Life Science: Structure and Function of Organisms

Grades 6-8 Overview:

The primary goal of instruction throughout Life Science is to integrate the themes of systems, inquiry, and application into content standards.

- Students will understand that all living systems are composed of cells, which make up tissues, organs, and organ systems.
- Students will understand that at each level of organization, the structures enable specific functions required by the organism.
- Students will understand that cells have complex molecules and structures that enable them to carry out life functions such as photosynthesis and respiration and pass on their characteristics to future generations.
- Students will investigate a question through valid experimental techniques with conclusions based on evidence and are repeatable.

Content Standard: Students will know that:	**Performance Expectation: Students are expected to:**	**EALR**	**SLE**
1. All organisms are composed of cells, which carry on the many functions needed to sustain life.	• Identify the criteria that indicate the organism is living (e.g. moves, has DNA, responds to change, reproduces….). • Draw and describe observations made with a microscope showing that plants and animals are made of cells, and explain that cells are the fundamental unit of life. • Describe the functions performed by cells to sustain a living organism (e.g. division to produce more cells, taking in nutrients, releasing waste, using energy to do work, and producing materials the organism needs).	LS1 A	
2. The cell is surrounded by a membrane that separates the interior of the cell from the outside world and determines which substances may enter and which may leave the cell.	Describe the structure of the cell membrane and how the membrane regulates the flow of materials into and out of the cell.	9-11 LS1 D	
3. Cells contain specialized parts for determining essential functions such as regulation of cellular activities, energy capture and release, formation of proteins, waste disposal, the transfer of information, and movement.	Draw, label, and describe the functions of components of essential structures within cells (e.g. cellular membrane, nucleus, chromosome, chloroplast, mitochondrion, ribosome).	9-11 LS1 C	
4. All of the functions of the cell are based on chemical reactions. Food molecules are broken down to provide the energy and the chemical constituents needed to synthesize other molecules.	• Explain how cells break down food molecules and use the constituents to synthesize proteins, sugars, fats, DNA and many other molecules that cells require. • Describe the role that enzymes play in the breakdown of food molecules and synthesis of the many different molecules	9-11 LS1 F	

	Breakdown and synthesis are made possible by proteins called enzymes. Some of these enzymes enable the cell to store energy in special chemicals, such as ATP, that are needed to drive the many other chemical reactions in a cell.	needed for cell structure and function. • Explain how cells extract and store energy from food molecules.		
5.	Both plant and animal cells must carry on life functions with common parts (e.g. nuclei, cytoplasm, cell membranes, and mitochondria). Plants have specialized cell parts such as chloroplasts for photosynthesis and cell wall which provide plants their overall structure.	• Illustrate similarities and differences between plant and animal cell structures and describe their functions (e.g. both have nuclei, cytoplasm, cell membranes, and mitochondria, while only plants have chloroplasts and cell walls). • Distinguish between a plant and animal cell	LS1 D	
6.	Carbon-containing compounds are the building blocks of life. Photosynthesis is the process that plant cells use to combine the energy of sunlight with molecules of carbon dioxide and water to produce energy-rich compounds that contain carbon (food) and release oxygen.	• Explain how plant cells use photosynthesis to produce their own food. • Explain the importance of photosynthesis for both plants and animals, including humans. • **(recommended for 8th grade**) Use the following equation to illustrate how plants rearrange atoms during photosynthesis: 6CO2+6H2O+light energy —> C6H12O6+6O2	9-11 LS1 A	
7.	Egg and sperm cells are formed by a process called meiosis in which each resulting cell contains only one representative chromosome from each pair found in the original cell. Recombination of genetic information during meiosis scrambles the genetic information, allowing for new genetic combinations and characteristics in the offspring	• Describe the process of meiosis in which egg and sperm cells are formed with only one set of chromosomes from each parent. • Predict the outcome of specific genetic crosses involving two characteristics	9-11 LS1 I	
8.	The genetic information responsible for inherited characteristics is encoded in the DNA molecules in chromosomes.	Describe how DNA molecules are long chains linking four subunits (smaller molecules) whose sequence encodes genetic information.	9-11 LS1 E	

9. Genes are carried on chromosomes. Animal cells contain two copies of each chromosome with genetic information that regulate body structure and functions. Most cells divide by a process called mitosis, in which the genetic information is copied so that each new cell contains exact copies of the original chromosomes.	Describe the process of mitosis, in which one cell divides, producing two cells, each with copies of both chromosomes from each pair in the original cell.	9-11 LS1 H	

Mathematics Connections:

- Represent a function with a symbolic expression, as a graph, in a table, and using words, and make connections among these representations.
- Make valid inferences and draw conclusions based on data.

Life Science: Evidence of Change (Evolution)

Grades 6-8 Overview:

The primary goal of instruction throughout Life Science is to integrate the themes of systems, inquiry, and application into content standards.

- Students will understand underlying mechanisms of evolution
- Students will understand traits of organisms are passed on through the transfer of genetic information during reproduction and inherited variations can become adaptations to a changing environment.
- Students will investigate a question through valid experimental techniques with conclusions based on evidence and are repeatable.

Content Standard: Students will know that:	**Performance Expectation: Students are expected to:**	**EALR**	**SLE**
1. Biological evolution (natural selection) is due to: (a) genetic variability of offspring due to mutations and genetic recombination, (b) the potential for a species to increase its numbers, (c) a finite supply of resources, and natural selection by the environment for those offspring better able to survive and produce offspring.	• Explain biological evolution as the consequences of the interactions of four factors: population growth, inherited variability of offspring, a finite supply of resources, and natural selection by the environment of offspring better able to survive and reproduce. • Predict the effect on a species if one these factors should change.		
2. Random changes in the genetic makeup of cells and organisms (mutations) can cause changes in their physical characteristics or behaviors. While many of these changes will be harmful, a small minority may allow the offspring to better survive and reproduce.	Explain how a genetic mutation may or may not allow a species to survive and reproduce in a given environment.	9-11 LS3 B	
3. The diversity of organisms is the result of more than 3.5 billion years of evolution that has filled available ecosystem niches on Earth with life forms as part of God's creative process. The fossil record and observed similarities of species provide evidence of change over time.	Explain how the millions of different species alive today are related by descent from a common ancestor.	9-11 LS3 C	

Mathematics Connections

- Determine probabilities for mutually exclusive, dependent, and independent events for small sample size

Life Science: Classifications of Living Things

Grades 6-8 Overview:

The primary goal of instruction throughout Life Science is to integrate the themes of systems, inquiry, and application into content standards.

- Students will understand both plants and animals have different characteristics that can be used to classify them.
- Students will understand that living things are organized from the components of a single cell to complex multicellular organism such as humans. Cell type and organization provide living systems with structure and function. Plants and animals have different structures that enable them to meet their needs and response to the environment.
- Lifestyle choices and environmental conditions can affect parts of the human body, which may affect the health of the body as a whole. Understanding how organisms operate as systems helps students understand the commonalities among life forms, introduces further study of biology, and offers scientific insights into the ways that personal choices may affect health.
- Students will investigate a question through valid experimental techniques with conclusions based on evidence and are repeatable.

Content Standard: Students will know that:	**Performance Expectation Students are expected to:**	**EALR**	**SLE**
1. Single-celled organisms contain parts to carry out all life functions.	Draw and describe observations made with a microscope showing that a single-celled organism (e.g. paramecium) contains parts used for all life functions.	LS1 B	
2. Multicellular organisms have specialized cells that perform different functions. These cells join together to form tissues that give organs their structure and enable the organs to perform specialized functions within organ systems. 3. Lifestyle choices and living environments can damage structures at any level of organization of the human body and can significantly harm the whole organism.	• Relate the structure of a specialized cell (e.g. nerve and muscle cells) to the function that the cell performs. • Explain the relationship between tissues that make up individual organs and the functions the organ performs (e.g. valves in the heart control blood flow, air sacs in the lungs maximize surface area for transfer of gases). • Describe the components and functions of the digestive, nervous, reproductive, circulatory, and respiratory systems in humans and how these systems interact. • Evaluate how lifestyle choices and environments affect parts of the human body and the organism as a whole in specific organ systems (e.g. tobacco, drug, and alcohol use, amount of exercise, quality of air, and kinds of food).	LS1 C LS1 F	
4. In classifying organisms, scientists consider both internal and external structures and behaviors.	• Use a classification key to identify organisms, noting use of both internal and external structures as well as behaviors. • Know the five kingdoms and their characteristics. • Distinguish between vertebrates and invertebrates.	LS1 E	

	• Identify distinctive characteristics of animals. • Observe and describe life cycle of various animals. • Explain animal behavior: innate and learned. • Explain animals' adaptations: protective coloration, structural, and protective resemblance.		
5. In classifying plants, scientists consider both internal and external structures and functions.	• Distinguish between perennials and annuals. • Differentiate monocot and dicot plants. • Define and identify different types of tropism. • Differentiate between root types. • Distinguish between angiosperms and gymnosperms and classify according to these characteristics. • Explain photosynthesis. • Differentiate between male and female plant cells.		
6. Bacteria and viruses have different characteristics and behaviors.	• Describe and differentiate the characteristics of a virus and bacteria according to physical traits, methods of obtaining energy, and means of reproduction. • Describe how vaccinations and antibodies work. • Distinguish between helpful and harmful bacteria. • Describe the transmission of disease (e.g. Direct contact, contagious contact, in=direct contact, contaminated water or food, and bites or infected animals.)		

Mathematics Connections:

- Represent a function with a symbolic expression, as a graph, in a table, and using words, and make connections among these representations.
- Make valid inferences and draw conclusions based on data.

Life Science: Ecosystems

Grades 6-8 Overview:

The primary goal of instruction throughout Life Science is to integrate the themes of systems, inquiry, and application into content standards.

- Students will apply key concepts about ecosystems to understand the interactions among organisms and the nonliving environment.
- Students will understand the process of photosynthesis and possible causes of environmental change.
- Students will investigate environmental issues and to use science to evaluate different solutions to problems. Knowledge of how energy flows through ecosystems is a critical aspect of students' understanding of how energy sustains life on the planet, including human life.
- Students will understand the factors that affect populations and the importance for many societal and global issues.
- Students will investigate a question through valid experimental techniques with conclusions based on evidence and are repeatable.

Content Standard: Students will know that:	**Performance Expectation: Students are expected to:**	**EALR**	**SLE**
1. An ecosystem consists of all the populations living within a specific area and interactions with nonliving factors. One geographical area may contain many ecosystems.	• Explain that an ecosystem is a defined area that contains populations of organisms and nonliving factors. • Give examples and describe ecosystems (e.g.,Olympic National Forest, Puget Sound, one square foot of lawn).	LS2 A	
2. Energy flows through an ecosystem from producers (plants) to consumers to decomposers. These relationships can be shown for specific populations in a food web.	• Analyze the flow of energy in a ecosystem. • Draw a labeled food web showing the relationships among all of the ecosystem's plant and animal populations.	LS2 B	
3. The major source of energy for ecosystems on Earth's surface is sunlight. Producers transform the energy of sunlight into the chemical energy of food through photosynthesis. This food energy is used by plants and all other organisms to carry on life processes. Nearly all organisms on the surface of Earth depend on this energy source.	• Explain how energy from the Sun is transformed through photosynthesis to produce chemical energy in food. • Explain that producers are the only organisms that make their own food. Animals cannot survive without producers because animals get food by eating producers or other animals that eat producers	LS2 C	
4. Ecosystems are continuously changing. Causes of these changes include nonliving factors such as the amount of light, range of temperatures, and availability of water, as well as living factors such as the disappearance of	Predict what may happen to an ecosystem if nonliving factors change (e.g. the amount of light, range of temperatures, or availability of water or habitat) or if one or more populations are removed from or added to the ecosystem.	LS2 D	

	different species through disease, predation, habitat destruction, and overuse of resources or the introduction of new species.			
5.	Investigations of environmental issues should uncover factors causing the problem and relevant scientific concepts and findings that may inform an analysis of different ways to address the issue.	• Investigate a local environmental issue by defining the problem, researching possible causative factors, understanding the underlying science, and evaluating the benefits and risks of alternative solutions. • Identify resource uses that reduce the capacity of ecosystems to support various populations (e.g. use of pesticides, construction, extinct/endangered or threatened species).	LS2 E	
6.	Living organisms have the capacity to produce very large populations. Population density is the number of individuals of a particular population living in a given amount of space.	Evaluate the conditions necessary for rapid population growth (e.g. given adequate living and nonliving resources and no disease or predators, populations of an organism increase at rapid rates).	9-11 LS2 B	
7.	Population growth is limited by the availability of matter and energy found in resources, the size of the environment, and the presence of competing and/or predatory organisms.	Explain factors in the environment that limit the growth of plant and animal populations in natural ecosystems	9-11 LS2 C	
8.	The concept of sustainable development and Christian stewardship support adoption of policies that enable people to obtain the resources they need today without limiting the ability of future generations to meet their own needs. Sustainable processes include substituting renewable for nonrenewable resources, recycling, and using fewer resources.	• Explain how scientific concepts and findings relate to a resource issue currently under discussion in the state of Washington (e.g. removal of dams to facilitate salmon spawning in rivers; construction of wind farms). • Explain how the concept of sustainable development may be applied to a current resource issue in the state of Washington	9-11 LS2 F	

Mathematics Connections:

- Analyze a problem situation and represent it mathematically.
- Represent proportional relationships using graphs, tables, and equations, and make connections among the representations.
- Represent a function with a symbolic expression, as a graph, in a table, and using words, and make connections among these representations.
- Recognize the multiple uses of variables, determine all possible values of variables that satisfy prescribed conditions, and evaluate algebraic expressions that involve variables.
- Make valid inferences and draw conclusions based on data.

- Solve an equation involving several variables by expressing one variable in terms of the others.

Physical Science

Grades
Sixth-Eighth

Physical Science: Mandatory Essentials
(Threads throughout entire science curriculum)

Grades 6-8 Overview:
The primary goal of instruction throughout Physical Science is to integrate the themes of systems, inquiry, and application into content standards.

- Students will view issues through both a scientific and Catholic perspective.
- Students will plan and conduct a variety of investigations, including field studies, systematic observations, models, and controlled experiments.
- Students will communicate results of investigations in a variety of forms.

Content Standard: Students will know that:	**Performance Expectation: Students are expected to:**	**EALR**	**SLE**
1. Scientific inquiry involves asking and answering questions and comparing the answer with what scientists already know about the world.	Generate a question that can be answered through scientific investigation. • Question/observation • Hypothesis • Investigation • Results • Conclusion	E2: INQ A	
2. Different kinds of questions suggest different kinds of scientific investigations.	• Plan and conduct a scientific investigation (e.g. field study, systematic observation, controlled experiment, model, or simulation) that is appropriate for the question being asked. • Propose a hypothesis, give a reason for the hypothesis, and explain how the planned investigation will test the hypothesis. • Work collaboratively with other students to carry out the investigations.	E2: INQ B	
3. Collecting, analyzing, and displaying data are essential aspects of all investigations.	• Communicate results using pictures, tables, charts, diagrams, graphic displays, and text that are clear, accurate, and informative. • Recognize and interpret patterns as well as variations from previously learned or observed patterns in data, diagrams, symbols, and words. • Use statistical procedures (e.g. median, mean, or mode) to analyze data and make inferences about relationships.	E2: INQ C	
4. For an experiment to be valid, all (controlled) variables must be kept the same whenever possible. The manipulated (independent) variable will be tested and the responding (dependent) variable will be measured and recorded. If a variable cannot be controlled, it must be reported and	• Plan and conduct a controlled experiment to test a hypothesis about a relationship between two variables. • Determine which variables should be kept the same (controlled), which (independent) variable should be systematically manipulated, and which responding (dependent) variable is to be measured and recorded.	E2: INQ D	

accounted for.	• Report any variables not controlled and explain how they might affect results.		
5. Models are used to represent objects, events, systems, and processes. Models can be used to test hypotheses and better understand phenomena, but they have limitations.	• Create a model or simulation to represent the behavior of objects, events, systems, or processes. • Use the model to explore the relationship between two variables and point out how the model or simulation is similar to or different from the actual phenomenon.	E2: INQ E	
6. It is important to distinguish between the results of a particular investigation and general conclusions drawn from these results.	• Generate a scientific conclusion from an investigation using inferential logic, and clearly distinguish between results (e.g. evidence) and conclusions (e.g. explanation). • Describe the differences between an objective summary of the findings and an inference made from the findings.	E2: INQ F	
7. Scientific reports should enable another investigator to repeat the study to check the results.	Prepare a written report of an investigation by clearly describing the question being investigated, what was done, and an objective summary of results. (The scientific report should provide evidence to accept or reject the hypothesis, explain the relationship between two or more variables, and identify limitations of the investigation.)	E2: INQ G	
8. Science advances through openness to new ideas, honesty, and legitimate skepticism. Asking thoughtful questions, querying other scientists' explanations, and evaluating one's own thinking in response to the ideas of others are abilities of scientific inquiry.	• Recognize flaws in scientific claims, such as uncontrolled variables, overgeneralizations from limited data, and experimenter bias. • Listen actively and respectfully to research reports by other students. Critique presentations respectfully, using logical argument and evidence. • Engage in reflection and self-evaluation.	E2: INQ H	
9. There are ethical codes governing experiments, research in natural ecosystems. Moral issues regarding science and technology are facing society today. These issues require a response in a manner consistent with the teaching of the Catholic Church.	Examine ethical and moral concerns and identify precautions in response to scenarios of scientific investigations and research in natural ecosystems.	E2: INQ I	
10. People have always used technology to solve problems. Advances in human civilization are linked to advances in technology.	• Describe how a technology and society have interacted over time. • Understand the benefits of science and technology are not available to all the people in the world.	E3: APP A	

11. Science and technology are interdependent. Science drives technology by demanding better instruments and suggesting ideas for new designs. Technology drives science by providing instruments and research methods. Collaboration is needed to find solutions.	• Give examples to illustrate how scientists have helped solve technological problems and how engineers have aided science (e.g. designing telescopes to discover distant planets). • Collaborate with other students to generate solutions to a problem.	E3: APP C	
12. Solutions must be tested to determine whether or not they will solve the problem. Results are used to modify the design, and the best solution must be communicated persuasively.	• Test the best solution by building a model or other representation and using it with the intended audience. • Redesign as necessary. • Present the results using models or drawings verbally or in written form.	E3: APP F	
13. People in all cultures have made and continue to make contributions to society through science and technology.	Describe scientific or technological contributions to society by people in various cultures.	E3: APP H	
14. Any system may be thought of as containing subsystems and as being a subsystem of a larger system.	Given a system, identify subsystems and a larger encompassing system.	E1: SYS B	
15. The output of one system can become the input of another system.	Give an example of how output of matter or energy from a system can become input for another system. (e.g. household waste goes to a landfill).	E1: SYS B S	
16. In an open system, matter flows into and out of the system. In a closed system energy may flow into or out of the system, but matter stays within the system.	Given a description of a system, analyze and defend whether it is open or closed.	E1: SYS B S	
17. If the input of matter or energy is the same as the output, then the amount of matter or energy in the system won't change. If the input is more or less than the output, then the amount of matter or energy in the system will change.	Measure the flow of matter into and out of an open system and predict how the system of likely to change (e.g., amount of wind determine how much energy a wind turbine produces).	E1: SYS B S	

Mathematics Connections:

- Represent a problem situation, describe the process used to solve the problem, and verify the reasonableness of the solution.
- Communicate the answer(s) to the question(s) in a problem, using appropriate representations, including symbols and informal and formal mathematical language.
- Make and test conjectures based on data (or information) collected from explorations and experiments
- Construct and interpret histograms, stem-and-leaf plots, and circle graphs.
- Evaluate different displays of the same data for effectiveness and bias, and explain reasoning.
- Analyze a problem situation and represent it mathematically.
- Select and justify functions and equations to model and solve problems.
- Select and apply strategies to solve problems.
- Generalize a solution strategy for a single problem to a class of related problems, and apply a strategy for a class of related problems to solve a specific problem.
- Select and justify functions and equations to model and solve problems.
- Summarize mathematical ideas with precision and efficiency for a given audience and purpose.
- Describe the correlation of data in scatter plots in terms of strong or weak and positive or negative.
- Make valid inferences and draw conclusions based on data.
- Find the equation of a linear function that best fits bivariate data that are linearly related, interpret the slope and the y-intercept of the line, and use the equation to make predictions.
- Use inductive reasoning about algebra and the properties of numbers to make conjectures, and use deductive reasoning to prove or disprove conjectures.
- Evaluate a solution for reasonableness, verify its accuracy, and interpret it in the context of the original problem.
- Represent a function with a symbolic expression, as a graph, in a table, and using words, and make connections among these representations.
- Synthesize information to draw conclusions and evaluate the arguments and conclusions of others.

Physical Science: Atoms and Molecules

Grades 6-8 Overview:

The primary goal of instruction throughout Physical Science is to integrate the themes of systems, inquiry, and application into content standards.

- Students will learn the basic concepts behind the atomic nature of matter.
- Students will have understanding of the Periodic Table, atomic structure, formation of molecules and ions, compounds and solutions, and the details of a few common chemical reactions.
- Students will investigate a question through valid experimental techniques with conclusions based on evidence and are repeatable.

Content Standard: Students will know that:	**Performance Expectation: Students are expected to:**	**EALR**	**SLE**
Matter and Measurement of Matter 1. Substances have specific properties such as density, solubility, boiling point, and melting point, all of which are independent of the amount of the sample. 2. Heat (thermal energy) flows from warmer to cooler objects until both reach the same temperature. Conduction, radiation, and convection, or mechanical mixing, are the means of heat transfer.	• Use characteristic intrinsic properties such as density, boiling point, and melting point to identify an unknown substance. • Explain how solutes affect freezing and boiling points of a solvent. • Describe factors that influence solubility of a substance. • Understand relationship between mass, volume, and density. • Utilize measurable properties of matter: length, mass, area, volume, density, temperature, time, hardness, and color. • Use everyday examples of conduction, radiation, and convection, or mechanical mixing, to illustrate the transfer of heat energy from warmer objects to cooer ones until the objects reach the same temperature.	E4: PS2 A PS3 B	
3. All matter is made of atoms. Matter made of only one type of atom is called an element.	• Explain that all matter is made of atoms, and give examples of common elements, substances composed of just one kind of atom. • Describe properties of specific elements (e.g. metals are malleable)	E4: PS2 C	
States of Matter: 4. Solids, liquids, and gases differ in the motion of individual particles. In solids, particles are packed in a nearly rigid structure; in liquids, particles move around one another; and in gases, particles move almost independently. (Including crystalline, amorphous, surface tension, and viscosity). 5. Heat (thermal energy) consists of	• Describe how solids, liquids and gases behave when put into a container (e.g. gas fills the entire volume of the container). • Relate these properties to the relative movement of the particles in the three states of matter. • Explain how various types of insulation slow transfer of heat energy based on the atomic-molecular model of heat (thermal energy). • Define freezing, melting, evaporation, condensation, boiling, and sublimation.	E4: PS2 E E1: SYS D E1: SYS E PS3 C	

random motion and the vibrations of atoms and molecules. The higher the temperature, the greater the atomic or molecular motion. Thermal insulators are materials that resist the flow of heat. 6. In an open system, matter flows into and out of the system. In a closed system, energy may flow into or out of the system, but matter stays within the system. 7. If the input of matter or energy is the same as the output, then the amount of matter or energy in the system won't change; but if the input is more or less than the output, then the amount of matter or energy in the system will change.	• Analyze and defend whether a system is open or closed. • Determine the flow of matter into and out of an open system and predict how the system is likely to change.		
Atoms 8. Atoms are composed of protons, neutrons, and electrons. The nucleus of an atom takes up very little of the atom's volume but makes up almost all of the mass. The nucleus contains protons, and neutrons, which are much more massive than the electrons surrounding the nucleus. Protons have a positive charge, electrons are negative in charge, and neutrons have no yet charge. 9. Atoms of the same element have the same number of protons. The number and arrangement of electrons determines how the atom interacts with other atoms to form molecules. 10. Atoms or ions of an element with different numbers of neutrons in their atomic nucleus are called isotopes.	• Describe the relative charges, masses, and locations of the protons, neutrons, and electrons in an atom of an element. • Given the number and arrangement of electrons in the outermost shell of an atom, predict the chemical properties of the element. • Given the atomic number and atomic mass number of an isotope, students draw and label a model of the isotope's atomic structure (number of protons, neutrons, and electrons).	E4: PS2 A (9-12) E4: PS2 B (9-12)	
Periodic Table and Trends: 11. When elements are listed in order according to the number of protons, repeating patterns of physical and chemical properties identify families of elements with similar properties. The Periodic Table is a consequence of the repeating pattern of outermost electrons.	• Given the number of protons, identify the element using the Periodic Table. • Explain the arrangement of the elements on the Periodic Table, including the significant relationships among elements in a given column or row and the development and organization of the table.	E4: PS2 C (9-12)	

Molecular and Ionic Bonds: 12. Ions are produced when atoms or molecules lose or gain electrons, thereby gaining a positive or negative electrical charge. Ions of opposite charge are attracted to each other, forming ionic bonds. 13. Molecular compounds are composed of two or more elements bonded together in a fixed proportion by sharing electrons between atoms, forming covalent bonds. Such compounds consist of well-defined molecules. Formulas of covalent compounds represent the types and numbers of atoms of each element in each molecule.	• Explain how ions and ionic bonds are formed. • Explain the meaning of a chemical formula. • Show the formation of bonds by using the electron dot diagrams. • Illustrate that molecules are groups of two or more atoms bonded together (e.g. a molecule of water is formed when one oxygen atom shares electrons with two hydrogen atoms). • Explain the meaning of a chemical formula for a molecule (e.g., CH4 or H2O).	E4: PS2 D (9-12) E4: PS2 E (9-12)	
Compounds & Mixtures: 14. Mixtures are combinations of substances whose chemical properties are preserved. Compounds are substances that are chemically formed and have different physical and chemical properties from the reacting substances. 15. Compounds are composed of two or more kinds of atoms, which are bound together in well-defined molecules or arrays.	• Separate a mixture using differences in properties of the substances used to make the mixture (e.g. solubility, size, magnetic attraction). • Define mixture, solubility and solution. • Demonstrate that the properties of a compound are different from the properties of the reactants from which it was formed. • Demonstrate with a labeled diagram and explain the relationship among atoms, molecules, elements, and compounds.	E4: PS2 B E4: PS2 D	
Chemical Reactions: 16. Chemical reactions change the arrangement of atoms in the molecules of substances. 17. When substances within a closed system interact, the total mass of the system remains the same. The concept, called conservation of mass, applies to all physical and chemical changes.	• Differentiate and give examples of chemical vs. physical changes • Describe several chemical reactions and illustrate flow of energy. • Use a chemical equation to illustrate how the atoms in molecules are arranged before and after reaction. • Apply the concept of conservation of mass to predict changes in mass before and after chemical reactions, including reactions that occur in closed containers, and reactions that occur in open containers where a gas is given off.	E4: PS2 G (9-12) E4: PS2 F E1: SYS C	
18. The output of one system can become the input of another system.	• Give an example of how output of matter or energy from a system can become input for another system (e.g. Hydrogen plus oxygen yields H2O).	E1: SYS B S	

Acid – Base Chemistry 19. Solutions are mixtures in which particles of one substance are evenly distributed through another substance. Liquids are limited in the amount of dissolved solid or gas that they can contain. Aqueous solutions can be described by relative quantities of the dissolved substances and acidity or alkalinity (pH).	• Give examples of common solutions and explain the differences among the processes of dissolving, melting, and reacting. • Predict the result of adding increased amounts of a substance to an aqueous solution, in concentration and pH. • Define salts, acids, and bases and use the pH scale to determine acid-base strength.	E4: PS2 H (9-12)	

Mathematics Connections:

- Solve word problems, using mathematical expressions and equations, and verify solutions.
- Solve two-step linear equations.
- Describe prisms, pyramids, tetrahedra, and regular polyhedra in terms of their faces, edges, vertices, and properties.
- Represent proportional relationships, using graphs, tables, and equations, and make connections among the representations.
- Select and justify functions and equations to model and solve problems.
- Sketch the graph for an exponential function of the form y = abn where n is an integer, describe the effects that changes in the parameters a and b have on the graph, and answer questions that arise in situations modeled by exponential functions.

Physical Science: Force and Motion

Grades 6-8 Overview:

The primary goal of instruction throughout Physical Science is to integrate the themes of systems, inquiry, and application into content standards.

- Students will measure, record, and calculate the average speed of objects and to tabulate and graph the results.
- Students will apply Newton's Laws of Motion and Gravity both conceptually and quantitatively, calculate average speed, velocity, acceleration, and develop an understanding of forces due to gravitational and electrical attraction.
- Students will investigate a question through valid experimental techniques with conclusions based on evidence and are repeatable.

Content Standard: Students will know that:	**Performance Expectation: Students are expected to:**	**EALR**	**SLE**
1. Average speed is defined as the distance traveled in a given period of time.	• Measure the distance an object travels in a given interval of time and calculate the object's average speed, using S = d/t (e.g. a battery-powered toy car travels 20 meters in 5 seconds, so its average speed is 4 meters per second). • Illustrate or infer, using a graph, the motion of an object.	PS1 A	
2. Friction is a force that can help objects start moving, stop moving, slow down or can change the direction of the object's motion.	Demonstrate and explain the frictional force acting on an object with the use of a physical model.	PS1 B	
3. Unbalanced forces will cause changes in the speed or direction of an object's motion. The motion of an object will stay the same when forces are balanced.	• Determine whether forces on an object are balanced or unbalanced and justify with observational evidence. • Given a description of forces on an object, predict the object's motion.	PS1 C	
4. The same unbalanced force will change the motion of an object with more mass more slowly than an object with less mass.	Given two different masses that receive the same unbalanced force, predict which will move more quickly.	PS1 D	
5. Average velocity is defined as a change in position with respect to time. Velocity includes both speed and direction.	• Explain how two objects moving at the same speed can have different velocities. • Calculate the average velocity of a moving object, given the object's change in position and time (v = x2-x1/ t2-t1).	9-11 PS1 A	
6. Average acceleration is defined as a change in velocity with respect to time. Acceleration indicates a change in speed and/or a change in direction.	• Explain how an object moving at constant speed can be accelerating. • Calculate the average acceleration of an object, given the object's change in velocity with respect to time (a = v2-v1/ t2-t1).	9-11 PS1 B	

7. An object at rest will remain at rest unless acted on by an unbalanced force. An object in motion at constant velocity will continue at the same velocity unless acted on by an unbalanced force. (Newton's First Law of Motion, the Law of Inertia)	Given specific scenarios, compare the motion of an object acted on by balanced forces with the motion of an object acted on by unbalanced forces.	9-11 PS1 C	
8. A net force will cause an object to accelerate or change direction. A less massive object will speed up more quickly than a more massive object subjected to the same force. (Newton's Second Law of Motion, F=ma)	• Predict how objects of different masses will accelerate when subjected to the same force. • Calculate the acceleration of an object, given the object's mass and the net force on the object, using Newton's Second Law of Motion (F=ma).	9-11 PS1 D	
9. Whenever one object exerts a force on another object, a force of equal magnitude is exerted on the first object in the opposite direction. (Newton's Third Law of Motion)	Illustrate with everyday examples that for every action there is an equal and opposite reaction (e.g. a person exerts the same force on the Earth as the Earth exerts on the person).	9-11 PS1 E	
10. Gravitation is a universal attractive force by which objects with mass attract one another. The gravitational force between two objects is proportional to their masses and inversely proportional to the square of the distance between the objects (Newton's Law of Universal Gravitation).	• Predict how the gravitational force between two bodies would differ for bodies of different masses or different distances apart. • Explain how the weight of an object can change while its mass remains constant.	9-11 PS1 F	
11. Electrical force is a force of nature independent of gravity that exists between charged objects. Opposite charges attract while like charges repel.	• Predict whether two charged objects would attract or repel each other and explain why. • Illustrate or explain an example of an electrical force.	9-11 PS1 G	
12. Electricity and magnetism are two aspects of a single electromagnetic force. Moving electric charges produce magnetic forces, and moving magnets produce electric forces.	• Demonstrate and explain that an electric current flowing in a wire will create a magnetic field around the wire (electromagnetic). • Demonstrate and explain that moving a magnet near a wire will cause an electric current to flow in the wire (the generator effect). • Illustrate the transformations of energy in	9-11 PS1 H	

13. Energy from a variety of sources can be transformed into electrical energy, and then to almost any other form of energy. Electricity can also be distributed quickly to distant locations.	an electric circuit when heat, light, and sound are produced. • Describe the transformation of energy in a battery within an electric circuit.	PS3 E	

Mathematics Connections:

- Fluidly and accurately multiply and divide non-negative decimals.
- Solve one-step equations and verify the solutions.
- Solve word problems using mathematical expressions and equations, and verify the solutions.
- Write ratios to represent a variety of rates.
- Solve single- and multi-step word problems involving ratios, rates, and percentages, and verify the solutions.
- Construct and interpret line graphs.
- Graph ordered pairs of rational numbers and determine the coordinates of a point in the coordinate plane.
- Represent proportional relationships using graphs, tables, and equations, and make connections among the representations.
- Determine the slope of a line corresponding to the graph of a proportional relationship, and relate slope to similar triangles.
- Represent a function with a symbolic expression, as a graph, in a table, and using words, and make connections among these representations.
- Identify and interpret the slopes and intercepts of a linear function, including equations for parallel and perpendicular lines.
- Recognize the multiple uses of variables, determine all possible values of variables that satisfy prescribed conditions, and evaluate algebraic expressions that involve variables.
- Analyze a problem situation and represent it mathematically.
- Make valid inferences and draw conclusions based on data.
- Solve an equation involving several variables by expressing one variable in terms of the others.
- Determine whether or not a relationship is proportional and explain your reasoning.

Physical Science:
Wave, Sound, and Light Characteristics and Interactions

Grades 6-8 Overview:

The primary goal of instruction throughout Physical Science is to integrate the themes of systems, inquiry, and application into content standards.

- Students will understand fundamental concepts of energy, including the Law of Conservation of Energy—that the total amount of energy in a closed system is constant.
- Students will explain energy concepts such as gravitational, potential and kinetic energy, how waves transfer energy, the nature of sound, and the electromagnetic spectrum.
- Students will demonstrate how heat, light, and sound are generated and can be transferred from place to place.
- Students will investigate a question through valid experimental techniques with conclusions based on evidence and are repeatable.

Content Standard: Students will know that…	**Performance Expectation: Students are expected to…**	**EALR**	**SLE**
1. Energy can be transferred from one place to another through waves. Waves include vibrations in materials. Sound and earthquake waves are examples. These and other waves move at different speeds in different materials. 2. Waves can be distinguished through their properties.	• Define wave in terms of energy transfer. • Describe the three main types of waves: transverse, longitudinal, and surface waves. • Identify the four basic wave properties: amplitude, wavelength, frequency, and speed. • Explain that sound is caused by a vibrating object. • Describe the relationship between frequency, pitch, amplitude, and volume. • Describe the three basic interactions sound has when it strikes an object (absorption, reflection, and transmission). • Contrast a sound wave with a light wave by identifying that both have characteristic wavelengths, but light waves can travel through a vacuum while sound waves cannot.	PS3 F	
3. Visible light from the Sun is made up of a mixture of all colors of light. To see an object, light emitted or reflected by that object must enter the eye.	• Describe the wave model of light. • Define light in terms of its wavelength and frequency on the electromagnetic spectrum. • Describe the basic interactions light has when it strikes an object: reflection, transmission, absorption, and refraction. • Describe how to demonstrate that visible light from the sun is made up	PS3 D	

	of different colors. • Draw and label a diagram showing that for an object to be seen, light must come directly from the object or from an external source reflected from the object, and enter the eye.		

Physical Science:
Energy Transfer, Transformation, and Conservation

(Energy standards are also placed in other science areas throughout the document)

Grades 6-8 Overview:

The primary goal of instruction throughout Physical Science is to integrate the themes of systems, inquiry, and application into content standards.

- Students will understand how energy and matter interact in various settings.
- Students will investigate a question through valid experimental techniques with conclusions based on evidence and are repeatable.

Content Standard: Students know that…	**Performance Expectations Students are expected to…**	**EARL**	**SLE**
1. Energy exists in many forms which include: heat, light, chemical, electrical, motion of objects, and sound. 2. Energy can be transformed from one form to another and transferred from one place to another.	• List and differentiate between the different forms of energy (e.g. thermal, light, chemical, electrical, kinetic, potential, and sound energy). • Describe and demonstrate ways in which energy is transformed from one form to another and transferred from one place to another (e.g. chemical to electrical energy in a battery, electrical to light energy in a bulb). • Explain the law of conservation of energy and the conversion of energy from one form to another.	PS3 A	
3. Heat (thermal energy) flows from warmer to cooler objects until both reach the same temperature. 4. Conduction, radiation, and convection, or mechanical mixing, are means of energy transfer.	Use everyday examples of conduction, radiation, and convection, or mechanical mixing, to illustrate the transfer of energy from warmer objects to cooler ones until the objects reach the same temperature.	PS3 B	
5. Heat (thermal energy) consists of random motion and the vibrations of atoms and molecules. The higher the temperature, the greater the atomic or molecular motion. Thermal insulators are materials that resist the flow of heat.	Explain how various types of insulation slow transfer of heat energy based on the atomic-molecular model of heat (thermal energy).	PS3 C	
6. Energy from a variety of sources can be transformed into electrical energy, and then to almost any other form of energy.	• Illustrate the transformations of energy in an electric circuit when heat, light, and sound are produced. • Describe the transformation of energy in	PS3 E	

Content Standard: Students know that…	Performance Expectations Students are expected to…	EARL	SLE
Electricity can also be distributed quickly to distant locations.	a battery within an electric circuit.		

Mathematics Connections:

- Solve problems involving measurement conversions within and between systems, including those involving derived units, and analyze solutions in terms of reasonableness of solutions and appropriate units.
- Recognize the multiple uses of variables, determine all possible values of variables that satisfy prescribed conditions, and evaluate algebraic expressions that involve variables.
- Solve an equation involving several variables by expressing one variable in terms of the others.

Crosscutting Concepts and Abilities

Science is an active process that involves thinking in systems, asking and answering questions through investigations, and applying science and technology to solve real-world problems. As illustrated in the chart below, these crosscutting concepts and abilities increase in complexity, depth, and range as students mature from one grade band to the next.

Cross-cutting	EALR 1 Systems	EALR 2 Inquiry	EALR 3 Application
The Big Ideas of Science	…is a way of thinking that makes it possible to analyze and understand complex phenomena.	… is a process of asking and answering questions about the natural world that forms the bedrock of science.	…is about the interaction between science and technology, and how both can help solve real-world problems.
Grades 9-12	**Predictability and Feedback**	**Conducting Analyses and Thinking Logically**	**Science, Technology, and Society**
	Create realistic models with feedback loops, and recognize that all models are limited in their predictive power.	Expand and refine skills and abilities of inquiry to gain a deeper understanding of natural phenomena.	Transfer and apply abilities in science and technological design to develop solutions to societal issues.
Grades 6-8	**Inputs, Outputs, Boundaries & Flows**	**Questioning and Investigating**	**Science, Technology, and Problem Solving**
	Look at a complex situation and see how it can be analyzed as a system with boundaries, inputs, outputs, and flows.	Investigate an answerable question through valid experimental techniques. Conclusions are based on evidence and are repeatable.	Work with other members of a team to apply the full process of technological design and relevant science concepts to solving a problem.
Grades 4-5	**Complex Systems**	**Planning Investigations**	**Different Technologies**
	Analyze a system in terms of subsystems functions as well as inputs and outputs.	Plan different kinds of investigations, including field studies, systematic observations, models, and controlled experiments.	Define technologies and the technological design process to understand the use of technology in different cultures and career fields.
Grades 2-3	**Role of Each Part in a System**	**Conducting Investigations**	**Solving Problems**
	See how parts of objects, plants, and animals are connected and work together.	Carry out investigations by using instruments, observing, recording, and drawing evidence-based conclusions.	Develop a solution to a problem by using a simplified technological design process. Investigate the use of tools.

Grades K-1	Part-Whole Relationships	Making Observations	Tools and Materials
	Identify parts of living and non-living systems.	Answer questions by explaining observations of the natural world.	Use simple tools and materials to solve problems in creative ways.

Big Ideas in EALR 4: The Domains of Science

The following tables summarize the nine big ideas in the science domains. Under each big idea are notes about how the learning in each of the grade level spans contributes to the development of the big idea as children advance through the grade levels. While these brief notes do not capture all of the concepts and abilities that students are expected to acquire, they do show how what students learn in any given year related to what they learned before and to what they will be expected to learn at the next grade band.[i]

Science Domain	EALR 4 Physical Science		
The Big Ideas of Science	**Force and Motion** concerns the forces and motions that occur in our physical universe. At the highest level, students apply Newton's Laws of Motion and Gravity to explain phenomena such as the fall of a leaf and the motions of planet Earth in space.	**Matter: Properties and Change** concerns the fundamental nature of matter, including the atomic-molecular theory that explains macroscopic properties of materials and makes it possible to predict the outcomes of chemical and nuclear reactions.	**Energy: Transfer, Transformation, and Conservation** concerns energy as it changes forms and moves from one place to another. Energy is never created or destroyed. These concepts are useful in explaining phenomena in all domains.
Grades 9-11	**Newton's Laws**	**Chemical Reactions**	**Transformation and Conservation of Energy**
	Multiple forces affect an objects motion in predictable ways. These affects are explained by Newton's Laws.	Atomic structure accounts for atoms ability to combine to produce compounds. These changes maybe physical, chemical or nuclear.	Energy can take many forms and be transferred and transformed. Within a closed system the total energy is conserved.
Grades 6-8	**Balanced and Unbalanced Forces**	**Atoms and Molecules**	**Interactions of Energy and Matter**
	Objects in motion are affected by balanced and unbalanced forces. Speed and direction of motion change due to these forces.	Substances have unique properties based on their atomic structure. As atoms combine in a closed system their mass is conserved.	Energy and matter interact resulting in energy transfers and transformations. There are multiple forms of energy.

Grades 4-5	**Measurement of Force and Motion**	**States of Matter**	**Heat, Light, Sound, and Electricity**
	Forces and motions can be measured.	A single kind of matter can exist as a solid, liquid, or gas. Matter is conserved.	Heat, light, sound, and electrical energy can be transferred.
Grades 2-3	**Force Makes Things Move**	**Properties of Materials**	**Forms of Energy**
	Forces on objects make them move. Changes in forces will cause changes in the motion.	The properties of an object depend on its shape and on the material it is made from.	Energy comes in different forms.
Grades K-1	**Push-Pull and Position**	**Liquids and Solids**	
	Forces are pushes and pulls. Motion is a change in position.	Different kinds of materials display different properties.	

Science Domains	**EALR 4 Earth and Space Science**		
The Big Ideas of Science	**Earth and Space** is the longest and most comprehensive story that can be told, beginning with the birth of the universe and our home solar system, to the dynamic Earth-Sun-Moon system that set the stage for the wide diversity of life.	**Earth Systems, Structures, and Processes** includes the big picture of Earth as an interacting and dynamic system, including weather, and climate, the oceans, and the long-term movement of crustal plates that build up mountains and cause earthquakes, tsunami, and volcanoes.	**Earth History** has been uncovered by observing processes that take place today, and projecting those processes back in time. These remnants, especially fossils, provide essential clues to understanding the evolution of our planet.
Grades 9-11	**Evolution of the Universe**	**Energy in Earth Systems**	**Evolution of the Earth**
	Physical principles apply to the origins and development of the Earth and the Universe.	Energy from the Sun drives our weather system and climate, while energy from Earth's interior drives the rock cycle and crustal plates.	Evidence provided by natural radioactive material has made it possible to determine the age of different structures and of Earth as a planet.
Grades 6-8	**The Solar System**	**Cycles in Earth Systems**	**Evidence of Change**
	Our Solar System is held together by gravity. Moon phases and eclipses are explained.	Earth is an interacting system of solids, liquids, and gases. Important Earth processes include the water	Layers of rocks and different types of fossils provide clues to how conditions on Earth have

		cycle and the rock cycle.	changed over time.
Grades 4-5	**Earth in Space**	**Formation of Earth Materials**	**Focus on Fossils**
	Earth is spherical in shape. It spins on its axis and orbits the Sun.	Earth materials are formed by various natural processes and can be used in different ways.	Fossils provide evidence that environments of the past were quite different from what we observe today.
Grades 2-3	**The Sun's Daily Motion**	**Water and Weather**	
	The Sun and Moon appear to have patterns of movement that can be inferred by observing and recording shadows cast by the Sun.	Water is essential in Earth systems. This is seen by observing and recording changes in weather patterns and Earth formations.	
Grades K-1	**Observing the Sun and Moon**	**Properties and Change**	
	The Sun and the Moon appear to have patterns of movement that can be observed and recorded.	Earth materials have various properties.	

Science Domains	**EALR 4 Life Science**		
The Big Ideas of Science	**Structure & Function of Living Systems** includes the way living things are organized and carry on life processes, from the components of a single cell to complex multicellular organisms such as humans.	**Ecosystems** are defined as all of the plant and animal populations and nonliving resources in a given area. The relationships between organisms within an ecosystem make it possible to predict the consequences of change and provide insights into the sustainable use of natural resources.	**Biological Evolution** is the essential framework for understanding how organisms change over time, from the first single-celled bacteria on the young Earth to the amazing diversity of species that populate our planet today. Evidence and reasoning are essential to recognize the patterns and scale of past changes.
Grades 9-11	**Processes Within Cells**	**Maintenance and Stability of Populations**	**Mechanisms of Evolution**

	Cells contain the mechanisms for life functions, reproduction, and inheritance.	A variety of factors can affect the ability of an ecosystem to maintain current population levels.	The underlying mechanisms of evolution include genetic variability, population growth, resource supply, and environment.
Grades 6-8	**From Cells to Organisms**	**Flow of Energy Through Ecosystems**	**Inheritance, Variation and Adaptation**
	Cell type and organization provide living systems structure and function.	Energy flows through ecosystems from a primary source through all living organisms.	Multiple lines of evidence support biological evolution. These include genetics, reproduction, adaptation and speciation.
Grades 4-5	**Structures and Behaviors**	**Food Webs**	**Heredity and Adaptation**
	Plants and animals have different structures that meet their needs and respond to the environment.	Changes in ecosystems affect the populations that can be supported in a food web.	Ecosystems change. Organisms that can adapt to these changes will survive and reproduce in higher numbers.
Grades 2-3	**Life Cycles**	**Changes in Ecosystems**	**Variation of Inherited Characteristics**
	Plants and animals have life cycles.	Changes in ecosystems affect living populations and the non-living elements of a defined area.	Plants and animals vary from one another and their parents. These differences serve as the basis for natural selection.
Grades K-1	**Plant and Animal Parts**	**Habitats**	**Classifying Plants and Animals**
	Plants and animals meet their needs in different ways.	Habitats are places that meet the daily needs of plants and animals.	Both plants and animals have different characteristics that can be used to classify them.

Glossary

Accelerate: Change in velocity over time. The rate at which something speeds up or slows down.

Adaptation: Any change in the structure or functioning of an organism that is favored by natural selection and makes the organism better suited to its environment.

Air: The mixture of gases in the Earth's atmosphere is commonly known as air. Earth's atmosphere is a layer of gases surrounding our planet that is retained by Earth's gravity. Dry air contains roughly 78% nitrogen, 21% oxygen, and 1% trace gases, primarily water vapor.

Allele: One member of a pair or series of different forms of a gene.

Analyze: To separate into separate parts or basic principles to determine the nature of the whole.

Anatomical feature: A structure found in a living thing (e.g., heart, lung, liver, backbone).

Apply: The skill of selecting and using information in new situations or problems.

Aqueous solution: A solution in which the solvent is water.

Asexual reproduction: Involves the growth of a new organism by fission of cell nuclei. Asexual reproduction usually involves one parent and leads to offspring that are genetically identical to the parent and to one another.

Asteroid: A small rocky body orbiting the Sun, sometimes called minor planet or planetoid.

Atmosphere: A layer of gases that may surround the Earth and other material bodies of sufficient mass.

Atom: A basic unit of matter consisting of a dense central nucleus surrounded by a cloud of negatively charged electrons.

Atomic mass number: The total number of protons and neutrons in the nucleus of a single atom.

Atomic number: The number of protons in the nucleus of an atom.

Average acceleration: Change in velocity and/or direction with respect to time. Acceleration is a vector quantity, so both velocity and direction are required to define it.

Average speed: The measure of distance that an object travels in a given time interval.

Average velocity: Change in position and/or direction with respect to time. Velocity is a vector quantity, so both speed and direction are required to define it.

Biodiversity: The different kinds of organisms in a specific ecosystem or on the planet as a whole.

Biogeochemical cycle: A circuit or pathway by which a chemical element moves through both living and non-living components of an ecosystem, including the Earth as a whole.
Biological classification: A method by which biologists group and categorize species of organisms. Biological classification is a form of scientific taxonomy.

Boiling point: The temperature at which a liquid changes state and becomes a gas. The boiling point changes as pressure changes.

Carbon cycle: The biogeochemical cycle that describes the transformations of carbon and carbon-containing compounds in nature.

Cellular membrane: The biological membrane separating the interior of a cell from the outside environment. It is a semipermeable lip bilayer found in all cells.

Cellular respiration: The process by which molecules are converted into useable energy in cells.

Challenges: Problems that can be solved using science concepts and principles, inquiry, and the technological design process.

Characteristic: A distinguishable trait, quality, or property.

Chemical change: A chemical change occurs whenever compounds are formed or decomposed. During this type of reaction, there is a rearrangement of atoms that makes or breaks chemical bonds.

Chemical properties: Any of a material's properties, such as color, pH, or ability to react with other chemicals, that becomes evident during a chemical reaction.

Chemical reaction: A process that results in the conversion of chemical substances (reactants) to other substances (products). Products generally have different chemical properties from the reactants.

Chloroplast: An organelle found only in plants and photosynthetic protists; contains chlorophyll, which absorbs the light energy used to drive photosynthesis.

Chromosome: An organized structure of DNA and supporting regulatory proteins found in cells. Chromosomes contain many genes.

Claim: A proposition based on evidence and logical argument.

Classify: To arrange in some sort of order by categories or groupings.

Climate: Encompasses the temperatures, humidity, atmospheric pressure, winds, rainfall, atmospheric particle count, and numerous other meteorological elements in a given region over long periods of time.

Closed system: A system in which matter may circulate, but may not enter or leave.

Comet: A small Solar System body that orbits the Sun and, when close enough to the Sun, exhibits a visible coma (atmosphere) and/or a tail made of gas and/or dust.

Common ancestors: A group of organisms is said to have common descent if they have a common ancestor. In modern biology, it is generally accepted that all living organisms on Earth are descended from a common ancestor or ancestral gene pool.

Common: Refers to materials and processes that most students have experienced.
Communicate: Participate in the discourse of science. Communication includes but is not limited to discussions, journaling, and sharing the results of investigations effectively and clearly in both written and oral forms.

Compare: To examine two or more objects or events to establish similarities and differences.

Comparison: An examination of two or more objects or events to establish similarities and differences.

Compound: A substance consisting of two or more different elements chemically bonded together in a fixed proportion by mass that can be split up into simpler substances through a chemical reaction.

Concept: An abstract, universal idea of phenomena or relationships among phenomena.

Conclusion: A statement of the findings of an investigative process that is supported by investigative evidence (data) and links to the current body of scientific knowledge.

Condensation: The change of the physical state of matter from a gas to a liquid.

Conduction: The transfer of heat energy through matter by kinetic energy from particle to particle with no net displacement of the particles.

Confidence: Assurance that the conclusions of an investigation are reliable and valid.

Conservation of Energy: A physical law stating that the total amount of energy in an isolated system remains constant. Also stated as: energy cannot be created or destroyed—only changed from one form to another.

Conservation of Mass: A physical law stating that the total amount of mass in a closed system remains constant. Also stated as: mass can be neither created nor destroyed during a chemical reaction—only rearranged.

Conservation: To preserve. In physics, the Conservation Laws specify quantities that are preserved during transformations.

Consider: Sustained purposeful concentration and attention to details in an attempt to reach the truth or arrive at a decision about the validity of evidence or a claim.

Constellation: A group of stars that appear to form a visible figure or picture as viewed by people in a particular culture.

Constraint: The limitations imposed on possible solutions to problems or challenges. Constraints are often expressed in terms of available money, materials, or time.

Consumer: An organism that gets its chemical energy for growth and development from other organisms. Animals in a food web are consumers that obtain food energy by eating other animals or plants.

Contrast: To examine two or more objects or events to establish differences.
Control: A standard condition that other conditions can be compared to in a scientific experiment.

Controlled experiment: A laboratory investigation in which the values of all variables are kept the same except for one that is changed from trial to trial (manipulated or independent variable) and one that is measured (responding or dependent variable).

Controlled variable: The conditions that are kept the same from trial to trial in a laboratory investigation.

Convection: The physical movement of molecules within fluids (e.g., liquids, and gases). Convection is one of the major modes of heat transfer and mass transfer.

Core of the Earth: Earth's core is most likely a solid sphere about 1,220 km in radius. It is believed to consist of an iron-nickel alloy, and is likely surrounded by a liquid outer core, extending to about 3,400 km from the center of our planet.

Core: Used literally, core refers to whatever is in the center of an object, as the core of an apple, or Earth's core. Used metaphorically, core refers to what is most important, as in "core content."

Correlation: A known relationship between two variables in which it is not possible to infer whether or not a change in one variable caused a change in the other variable.

Covalent bond: A form of chemical bond characterized by sharing of pairs of electrons between atoms, or between atoms and other covalent bonds.

Criteria: A standard on which to judge success (plural form: criteria).

Critique: A critical review of a specific topic, process, or investigation.

Crust: Earth's outermost shell that is composed of a variety of igneous, metamorphic, and sedimentary rocks. Earth's crust includes the oceanic crust, about 7-10 km thick, and the continental crust, about 35-40 km thick.

Crustal plate: The outermost part of the Earth's interior mantle contains the lithosphere which is divided into eight major tectonic or crustal plates that float on the asthenosphere and move in relation to one another.

Culture: Refers to patterns of human activity and the symbolic structures that give such activities significance and importance within a society.

Decompose: To break down tissue of a formerly living organism into simpler forms of matter.

Decomposers: Organisms that consume the remains of dead organisms and, in doing so, break down the tissues into simpler forms of matter that can be used as nutrients for other living organisms.

Dehydration synthesis: A chemical reaction in which two molecules or functional groups combine to form one single molecule, with the accompanying loss of a small molecule. When this small molecule is water, it is known as a dehydration synthesis.

Density: Mass per unit volume.

Dependent variable: The factor of a system being investigated that changes in response to the manipulated (independent) variable and is measured.

Deposition of sediments: Refers to the geologic process following erosion, in which particles of sand or soil are no longer transported from their source by wind or water and are added to a new landform.

Describe: The skill of developing a detailed picture, image, or characterization using diagrams and/or words, written or oral.

Design: (Noun): Either the final plan (proposal, drawing, or model) or the result of implementing that plan in the form of the final product of a design process.

Design: (Verb): The process of originating and developing a plan for a product, structure, system, or component to meet a human need or want.

Designed world: Systems or subsystems of the natural world built entirely or in part by people. Also called the constructed world.

Discriminate: The skill of distinguishing accurately between and among pieces of evidence.

Diversity: Wide variety. Species diversity refers to the abundance of different species within an ecosystem.

DNA: Large molecules inside the nucleus of living cells that carry genetic information. The scientific
name for DNA is deoxyribonucleic acid.

Dwarf planet: A body gravitationally bound to the Sun with sufficient mass to be approximately spherical in shape, but not enough mass to have pulled in debris from the neighborhood of their orbit. Plutoids are dwarf planets that orbit further from the Sun than Neptune.

e.g.: Abbreviation meaning “for example” or “for instance.” Refers to examples given in Performance Expectations.

Eclipse: An astronomical event that occurs when one celestial object moves into the shadow of another. The term eclipse is most often used to describe either a solar eclipse, when the Moon's shadow crosses Earth's surface, or a lunar eclipse, when the Moon moves into the shadow of Earth.

Ecosystem: A natural unit consisting of all plants, animals, and microorganisms (biotic factors) in an area functioning together with all of the nonliving physical (abiotic) factors of the environment.

Effect: The result or consequence of an action, influence, or causal agent.

Electric circuit: An interconnection of electrical elements such as resistors, inductors, capacitors, transmission lines, voltage sources, current sources, and switches that has a closed loop, giving a return path for the current.

Electromagnetic force: One of the four known fundamental forces in the universe; includes the forces between charged particles and between molecules and ions.

Electromagnetic spectrum: The array of electromagnetic waves, from the shortest and most energetic gamma rays to the longest radio waves. The visible light spectrum is a small part of the middle range of the electromagnetic spectrum.

Electromagnetic waves: A self-propagating wave that includes visible light, radio waves, microwaves, infrared radiation, ultraviolet radiation, X-rays, and gamma rays. EM radiation is composed of an oscillating electric and magnetic field that moves through empty space or transparent matter.

Electron: An elementary subatomic particle that carries a negative electrical charge.

Element: A pure chemical substance composed of all atoms that have the same number of protons.

Empirical: Based on actual measurements, observations, or experience rather than on theory.

Energy transfer: The movement of energy from one location to another.

Energy transformation: Change of energy from one form to another.

Energy: The amount of work that can be done by a force.

Environment: Natural surroundings, including living and nonliving components. May also refer to a region or to all natural systems on planet Earth.

Enzyme: Biological molecules that catalyze (increase the rates of) chemical reactions. Almost all enzymes are proteins.

Equilibrium: The condition of a system in which competing influences are balanced.

Erosion: The carrying away or displacement of solids (sediment, soil, rock, and other particles), usually by wind, water, or ice by down-slope movement in response to gravity or by living organisms.

Error: Mistakes of perception, measurement, or process during an investigation; an incorrect result or discrepancy.

Established: A proven or demonstrated inference or theory.

Evaluate: To make judgments or appraisals based on collected data.

Evaporation: The change in state of a substance from liquid to gas.

Evidence: Observations, measurements, or data collected through established and recognized scientific processes.

Evolution: A series of gradual or rapid changes, some regular, some random, that account for the present form and function of phenomena both living and nonliving.

Examine: To use a scientific method of observation to explore, test, or inquire about a theory, hypothesis, inference, or conclusion.

Experiment: An investigation under which the conditions for a phenomenon to occur are arranged beforehand by the investigator.

Explain how: The skill of making a process plain and comprehensible, possibly including supporting details with an example.

Explain that: The skill of making plain and comprehensible a theory, hypothesis, inference, or conclusion, possibly including supporting details with an example.

Explain: To apply scientific ideas to describe the cause of a phenomenon or relationship, and/or to render a complex idea plan.

Extinction: The death of all members of a species of plant or animal. The moment of extinction is generally considered to be the death of the last individual of that species, although the capacity to breed and recover may have been lost before this point.

Factor: Agent or condition that could cause a change.

Fault: In geology, a fault or fault line is a rock fracture that shows evidence of relative Earth movement. Some faults may extend hundreds or even thousands of kilometers.

Feedback: The process by which the output of a system is used to make changes in the operation of the system. Feedback can be negative, which reduces the disturbance to a system, or positive, which tends to increase the disturbance to a system.

Fertilization: The union of an egg nucleus and a sperm nucleus.

Field studies: The scientific study of free-living plants or animals in which the subjects are observed in their natural habitat without changing, harming, or materially altering the setting or subjects of the investigation.

Fission: Nuclear fission is the process by which the nucleus of a large atom is split into two smaller atomic nuclei.

Food web: The complex eating relationships among species within an ecosystem. In a diagram of a food web organisms are connected to the organisms they consume by arrows representing the direction of energy transfer.

Force: A push or pull. In physics, it is whatever can cause an object with mass to accelerate. Force has both magnitude and direction, making it a vector quantity.

Form: The shape, appearance, or configuration of an object or organism.

Fossil Fuel: A substance that can be burned for heat energy, such as coal, oil, or natural gas, formed from the decayed remains of prehistoric animals and plants.

Fossil: The preserved remains or traces of animals, plants, and other organisms from the remote past.

Frictional force: The force resisting the relative motion of two surfaces in contact **or** a surface in contact with a fluid (e.g., air on an aircraft or water in a pipe). Also referred to as “friction.”
Function: The normal and specific contribution of a bodily or cellular part to the economy of a living organism.

Fusion: Combining two or more distinct things. Nuclear fusion refers to the process by which multiple nuclei join together to form a heavier nucleus.

Gas: A state of matter consisting of a collection of particles (molecules, atoms, ions, electrons, etc.) without a definite shape or volume that are in more or less random motion.

Gene: A segment of inheritance information that, taken as a whole, specifies a trait. In common language the term “gene” sometimes refers to the scientific concept of an allele.

Generate: To produce.

Generation: A generation is defined as “the average interval of time between the birth of parents and the birth of their offspring.”

Genetic information: A set of instructions coded in DNA molecules that specifies the traits of an organism.

Genetic recombination: The regrouping of genes in an offspring caused by the crossing over of chromosomes during meiosis.

Genetic variation: A measure of the tendency of individual genotypes in a population to vary from one to another.

Genetic: Inherited or affected by genes.

Global climate: The average temperature, humidity, rainfall, and other meteorological measures of Earth as a whole over a long period of time (usually taken to be about 30 years).

Gravitational potential energy: Energy associated with gravitational force. Factors that affect an object's gravitational potential energy are its height relative to some reference point, its mass, and the strength of the gravitational field.

Gravity: The force by which any two masses are attracted to one another. The term is sometimes used to refer to Earth's gravity.

Habitat: An ecological or environmental area that is inhabited by a particular species. It is the natural environment in which an organism lives or the physical environment that surrounds (influences and is used by) a species population.

Heat: A form of kinetic energy produced by the motion of atoms and molecules. Also known as thermal energy, heat may be transferred from one body or system to another due to a difference in temperature.

Heredity: The passing of traits to offspring. This is the process by which an offspring cell or organism acquires the characteristics of its parent cell or organism.

Human-made or man-made: The designed or modified environment (also called the built environment) created by people to meet their needs. The term also describes the interdisciplinary field concerned with the design, management, and use of the human-made environment.
Human problems: Difficulties for individuals or populations that call for a solution.

Hypothesis: A testable explanation for a specific problem or question based on what has already been learned. A hypothesis may be stated in an "if-then" format that predicts a causal relationship or correlation between two variables.

Idea: A general perception, thought, or concept.

Igneous rock: Rocks formed when molten magma cools. Igneous rocks are divided into two main categories: Plutonic rocks result when magma cools and crystallizes slowly within the Earth's crust (e.g., granite), while volcanic rocks result from magma reaching the surface either as lava or fragments that are ejected into the air (e.g., pumice and basalt).
In biology: the central structure in a living cell enclosed in a membrane that includes most of the genetic information in the cell.

Independent (manipulated) variable: The factor of a system being investigated that is changed to determine that factor's relationship to the dependent (responding) variable.

Index fossil: Fossil that is used to determine relative age of layer of sedimentary rock.

Infer: To arrive at a decision or logical conclusion by reasoning from evidence.

Inference: A logical conclusion based on evidence.

Information explosion: The rapid expansion of knowledge of the natural world, in part brought about by new knowledge and new technologies into the scientific, technological, and communication enterprises.

Information technology: The branch of technology devoted to the acquisition, processing, storage, retrieval, and application of data. The term also applies to the hardware (e.g., computers and cell phones) and software developed to utilize data.

Input: The addition of matter, energy, or information to a system.

Inquiry: The diverse ways in which people study the natural world and propose explanations based on evidence derived from their work.

Insulator: A material that is a poor conductor of energy such as electricity or heat.

Integrity: A state of honesty; freedom from corrupting influence, motive, or bias in the collection and interpretation of data and observations.

Interactions: The mutual influences among variables in a system or between subsystems, which may be correlational or causal.

Interpret: To present an explanation of an event or process.

Interpretation: Inferences drawn from data collected during a scientific investigation.

Intrinsic: A property of something or action which is essential and specific to that thing or action, and which is wholly independent of any other object, action, or consequence.

Investigate: To plan and conduct an organized scientific study to answer a question.

Investigation: A multifaceted, organized scientific study of the natural world. Investigations may include such activities as making systematic observations; asking questions; gathering information through planned study in the field, laboratory, or research setting; analyzing data to find patterns; summarizing results, drawing conclusions, and communicating findings both orally and in writing.

Ion: An atom or molecule that has lost or gained one or more electrons, giving it a positive or negative electrical charge.

Ionic bond: A type of chemical bond that often forms between metal and nonmetal ions through

electrostatic attraction.

Ionic crystal: A formation of atoms held together by ionic bonds. Crystals of sodium chloride (salt), for example, does not form molecules. Rather, ions of sodium (Na) and chorine (Cl) are held together by ionic bonds in a three-dimensional ionic crystal.

Isotope: Isotopes are differing forms of the same element that have nuclei with the same number of protons (the same atomic number) but different numbers of neutrons. Therefore, isotopes have different mass numbers.

Kinetic energy: Energy of motion.

Law: An observed regularity of the natural world that scientists have observed repeatedly. Natural Laws can be used to accurately predict what will happen in many situations.

Life cycle: A description of the stages of development of an organism or planetary object such as a star.

Liquid: A fluid that takes the shape of the part of the container that it occupies, and that forms a distinct surface.

Logical argument: A set of one or more premises supported by evidence that leads to a clear conclusion.

Logical plan: A series of steps thoughtfully designed to meet a clear goal.

Magnifier: A convex lens which is used to produce an enlarged image of an object.

Manipulated (independent) variable: The factor of a system being investigated that is changed to determine that factor's relationship to the dependent (responding) variable.

Mantle: Earth's mantle is a viscous layer between the crust and the outer core. Earth's mantle is about 2,900 km thick and makes up about 70% of Earth's volume.

Mass: A measure of how much matter there is in an object.

Matter: Anything that has mass and that takes up space.

Mechanical mixing: Physical rearrangement of fluids or small particles by continuous movement.
Meiosis: A process of cell division that produces reproductive cells known as gametes. Each gamete contains only one set of the unpaired chromosomes and half as much genetic information as the original cell.

Melting point: The temperature at which a solid melts and becomes a liquid.

Mendelian Genetics: Fundamental concept of heredity that each organism has characteristics that are encoded in its genes and passed on from one generation to the next.

Metamorphic rock: Rocks modified by temperatures and pressures that are high enough to change the original minerals into other mineral types or into other forms of the same minerals.

Mitochondria: The organelle in eukaryotic cells that carry on cellular respiration, release energy from food molecules and storing it in ATP.

Mitosis: The production of two identical nuclei in one cell usually followed by cell division and the production of two cells with the same genetic makeup as the original cell.

Mixture: A substance made by combining two or more different materials without a chemical reaction occurring (the objects do not bond together).

Model: A simplified representation of a system. Models are useful for studying systems that are too big, too small, or too dangerous to study directly.

Molecule: A stable unit of two or more atoms held together by chemical bonds.

Moons: A natural satellite or moon is a celestial body that orbits a planet or smaller planetary body.

Motion: A constant change in the location of a body.

Mutation: Change to the nucleotide sequence of the genetic material of an organism.

Natural selection: The process by which heritable traits that are favored by environmental conditions become more common in successive generations, and heritable traits that are less favored by environmental conditions become less common. Over time, this process may result in the emergence of new species.

Natural world: Living and non-living aspects of the physical universe.

Neutron: A subatomic particle with no net electric charge and a mass slightly larger than that of a proton.

Niche: The position of a species or population in its ecosystem. A shorthand definition of niche is how and where an organism makes a living.

Nitrogen cycle: The biogeochemical cycle that describes the transformations of nitrogen and nitrogen-containing compounds in nature.

Nucleus: In physics: the central structure in an atom that contains neutrons and protons.

Nutrients: A food or chemicals that an organism needs to live and grow, or a substance used in an organism's metabolism that must be taken in from its environment.
Observation: The skill of recognizing and noting some fact or occurrence in the natural world. Observation includes the act of measuring.

Open system: A system in which matter may flow in and out, as opposed to a closed system in which matter may not flow in or out.

Open-ended explorations: Initial investigations of interesting phenomena without prior hypotheses about what may be discovered, or even what variables may be most important to observe and measure.

Orbit: The gravitationally curved path of one object around a point or another body, such as the orbit of a planet around a star.

Organism: A living thing such as an animal, plant, fungus, or microorganism. In at least some form, all organisms are capable of reacting to stimuli, reproduction, growth and maintenance as a stable whole.

Output: Matter, energy, or information that flows out of a system.

Patterns: Recurring events or objects that repeat in a predictable manner.

Phases of the Moon: Refers to the appearance of the illuminated portion of the Moon as seen by an observer, usually on Earth.

Phenomena: Events or objects occurring in the natural world.

Photosynthesis: A metabolic pathway that converts light energy into chemical energy. Its initial substrates are carbon dioxide and water; the energy source is sunlight (electromagnetic radiation); and the end products are oxygen and (energy-containing) carbohydrates, such as sucrose, glucose, or starch.

Physical change: Any change not involving modification of a substance's chemical identity, such as a change of state from solid to liquid, or liquid to gas.

Plutoid: A dwarf planet outside the orbit of Neptune. Plutoids have sufficient mass to be approximately spherical in shape, but not enough mass to have pulled in debris from the neighborhood of their orbit. (Pluto is both a dwarf planet and a plutoid.)

Population density: The number of individuals of a particular population living in a given amount of space.

Population growth: The rate at which the number of individuals in a population increases. Usually applies to a given ecosystem, but could refer to a region or the entire Earth.

Population: The collection organisms of a particular species that can breed and reproduce.

Precipitation: Any product of the condensation of atmospheric water vapor deposited on Earth's surface, such as rain, snow, or hail.

Predict/Prediction: Extrapolation to a future event or process based on theory, investigative evidence, or experience.

Principle: Rule or law concerning the functioning of systems of the natural world.

Producer: An organism that produces complex organic compounds from simple inorganic molecules using energy from light or inorganic chemical reactions.

Properties: Essential attributes shared by all members of a group.

Proton: A small particle with an electric charge of +1 elementary charge. It is often found as a subatomic particle in the nucleus of an atom, but is also stable in an ionic form in which it is also known as the hydrogen ion, H+.

Question: A grammatical form of sentence that invites an answer.

Radiation: Energy in the form of rapidly propagating waves or particles emitted by a body as it changes from a higher energy state to a lower energy state.

Rain gauge: An instrument used to measure the amount of liquid precipitation over a set period of time.

Recombine: To disassemble, mix up, and put back together in a new arrangement.

Redesign: To create a new and improved solution to a problem after an earlier solution was tested and found to be lacking in some respects.

Relationship: Connections observed among systems, subsystems, or variables. Different types of relationships exist, including causal relationships and correlations.

Reliability: An attribute of any investigation that promotes consistency of results during repeated trials.

Responding (dependent) variable: The factor of a system being investigated that changes in response to the manipulated (independent) variable and is measured.

Ribosome: A cell organelle constructed in the nucleus. It consists of two subunits and functions as the site of protein synthesis in the cytoplasm.

Science: Knowledge of the natural world derived from systematic investigations; also, the activity of adding to the body of scientific knowledge.

Sediment: Any particulate matter that can be transported by fluid flow and which eventually is deposited as a layer of solid particles on the bed or bottom of a body of water or other liquid.

Sedimentary rock: Rocks formed by deposition of solid particles at the bottom of a body of water, followed by compaction and cementation. Common sedimentary rocks include shale, sandstone, and limestone.

Sexual reproduction: The production of new generations involving the combination of chromosomes from both a male and female parent. Because each parent contributes genetic information, the offspring of sexual reproduction are usually not identical to either parent.

Simulation: The imitation of some real thing, state of affairs, or process. The act of simulating something generally entails representing certain key characteristics or behaviors of a selected physical or abstract system.

Skepticism: The attitude in scientific thinking that emphasizes that no fact or principle can be known with complete certainty; the tenet that all knowledge is uncertain.

Solar System: The Sun and those celestial objects bound to it by gravity, including eight planets, moons, dwarf planets, plutoids, asteroids, meteoroids, and other small bodies.

Solid: The state of matter characterized by resistance to deformation and changes of volume.

Solubility: The ability of a given substance to dissolve in a liquid.

Solution: 1. A device or process created through technological design to meet a human need or want. 2. A mixture in which particles of one substance are evenly distributed through another substance.

Species: A group of organisms capable of interbreeding and producing fertile offspring.

Speed: The rate or measure of the rate of motion. The distance travel divided by the time of travel.

Spherical: Shaped like a ball.

State of matter: Matter can exist in various states (or forms), which may depend on temperature and pressure. Traditionally, three states of matter are recognized: solid, which maintains a fixed volume and shape; liquid, which maintains a fixed volume but adopts the shape of its container; and gas, which occupies the entire volume available. Plasma, or ionized gas, is a fourth state that occurs at very high temperatures.

Steam: The scientific term “steam” is equivalent to water vapor, an invisible gas. In common language the term refers to visible mist made up of droplets of water that have condensed when steam meets cooler air. The distinction is not necessary at the elementary level.

Subsystem: The subset of interrelated parts within the larger system.

Sustainable development: Policies that enable people to obtain the resources they need today without limiting the ability of future generations to meet their own needs.

System: An assemblage of interrelated parts or conditions through which matter, energy, and information flow.

Technological design process: A sequence of steps used to define and solve a problem. The steps may include: defining the problem in terms of criteria and constraints, gathering information about the problem through research, generating ideas for possible solutions, synthesizing or selecting of one or more promising ideas or solutions, constructing a plan or model to test the proposed idea or solution, redesigning if needed and communicating the results.

Technology: Ways that people change the natural world to solve practical problems or improve the quality of life. Technology is the result of technological design.

Temperature: A physical property that determines the direction of heat flow between two objects placed in thermal contact. If no heat flow occurs, the two objects have the same temperature; otherwise, heat flows from the hotter object to the colder object.
Theory: An integrated, comprehensive explanation of many facts capable of generating hypotheses and testable predictions about the natural world.

Thermometer: An instrument for measuring temperature.

Tools: A device used to accomplish a task that a person alone cannot accomplish. The most basic tools are simple machines.

Transfer: Move from one place to another.

Transform: Change from one form to another.

Trials: Repetitions of data collection protocols in an investigation.

Tsunami: Unusually large waves created when a body of water, such as an ocean, is rapidly displaced by an earthquake, volcanic eruption, landslide, or other disruption (plural: tsunami).

Validity: An attribute of an investigation that describes the degree of confidence that data collected and logical inferences are accurate representations of the phenomena being investigated.

Variable: Any changed or changing factor used to test a hypothesis or prediction in an investigation that could affect the results.

Variation: A measure of the tendency of individuals in a population to differ from one another.

Velocity: A vector quantity whose magnitude is a body's speed and whose direction is the body's direction of motion.

Water vapor: The gas phase of water.

Wave amplitude: A measure of the maximum disturbance in the medium during one wave cycle (the maximum distance from the highest point of the crest to the equilibrium).

Wave frequency: The number of occurrences of a wave per unit time.

Wave: A disturbance that propagates through space and time, usually with transference of energy. Examples of wavelike phenomena are light, water waves, and sound waves.

Wavelength: The distance between two sequential crests (or troughs) of a wave.

Weathering: The decomposition of earth rocks, soils and their minerals through direct contact with the planet's atmosphere or biological agents.

Weight: The strength of the gravitational pull on an object.

Wind: The flow of air or other gases that compose an atmosphere