AISJ Science: Scope & Sequence ES Grades 3-5 2015

The **Science Scope and Sequence** document represents an articulation of what students should know and be able to do. The document supports teachers in knowing how to help students achieve the goals of the standards and understanding each standard conceptually. It should be used as a tool to assist in planning and implementing a high quality instructional program.

• The "Sequence of Units" provides a snapshot of the recommended pacing of instruction across a year.

• The unpacking section contains rich information and examples of what the standard means; this section is an essential component to help both teachers and students understand the standards.

• The progressions provides valuable information for pre assessment as well as information on what follows.

Sequence of Units for Grade 3

Unit 1	Unit 2	Unit 3
Animals & Habitats	Weather & Climate	Forces & Motion

Sequence of Units for 4

Unit 1	Unit 2	Unit 3
Life Science	Natural Forces	Energy

Sequence of Units for 5

Unit 1	Unit 2	Unit 3
Earth and Space	Physical Science	Body Science

Science Standards

Standard 1: Life Science
Learners will understand the basic concepts and principles of life science

1. *Structure and Function*
2. *Growth and Development of Organisms*
3. *Organization for Matter and Energy Flow in Organisms*
4. *Information Processing*
5. *Interdependent Relationships in Ecosystems*
6. *Cycles of Matter and Energy Transfer in Ecosystems*
7. *Ecosystem Dynamics, Functioning and Resilience*
8. *Inheritance/Variation of Traits*
9. *Social Interactions and Group Behaviour*
10. *Evidence of Common Ancestry and Diversity*
11. *Natural Selection*
12. *Adaptation*
13. *Biodiversity and Humans*

Standard 2: Physical Science
Learners will develop an understanding of concepts, models, theories, universal principles, and the facts that explain the physical world

1. *Structure of Matter*
2. *Chemical Reactions*
3. *Forces and Motion*
4. *Types of Interactions*
5. *Definitions of Energy*
6. *Conservation of Energy and Energy Transfer*
7. *Relationship between Energy and Forces*
8. *Energy in Chemical Processes and Everyday Life*
9. *Wave Properties*
10. *Electromagnetic Radiation*
11. *Information Technologies and Instrumentation*

Standard 3: Earth & Space Science
Learners will gain an understanding of the origin, evolution and structure of the universe and will gain an understanding of the structure, dynamics, and

geophysical systems of the earth

1. *The Universe and its Stars*
2. *Earth and the Solar System*
3. *The History of Planet Earth*
4. *Earth Materials and Systems*
5. *Plate Tectonics and Large Scale System Interactions*
6. *The Roles of Water in Earth's Surface Processes*
7. *Weather and Climate*
8. *Biogeology*
9. *Natural Resources*
10. *Natural Hazards*
11. *Human Impact on Earth Systems*

Standard 4: **Scientific Inquiry and Critical Thinking**
Learners will demonstrate an understanding of the nature of scientific inquiry

Standard 5: History & Nature of Science
Learners will demonstrate an understanding of the history of science and the evolvement of scientific knowledge (Not taught at this level)

Standard 1: Life Science
Learners will understand the basic concepts and principles of life science

Benchmarks LS	Performance Indicators		
	Grade 3	Grade 4	Grade 5
	Structure and Functions		
1.1 (4 LS1-1) Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction		Organisms have both internal and external macroscopic structures that allow for growth, survival, behavior and reproduction.	
	Growth and Development of Organisms		

1.2 (3 LS1-1) Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction and death	Reproduction is essential to every kind of organism. Organisms have unique and diverse life cycles.		
	Organization for Matter and Energy Flow in Organisms		
2.18 5 PS3-1 Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth)was once energy from the sun			Food provides animals with the material and energy they need for body repair, growth, warmth, and motion. Plants acquire material for growth chiefly from air, water, and process matter and obtain energy from sunlight, which is used to maintain conditions necessary for survival.
1.3 (5 LS1-1) Support an argument that plants get the materials they need for growth chiefly from air and water			
	Information Processing		
1.4 (3 LS2-1) Construct an argument that some animals form groups that help members survive	Different sense receptors are specialized for particular kinds of information; Animals use their perceptions and memories to guide their actions.		
1.5 (4 LS1-2) Use a model to describe that animals' receive different types of information through their senses, process the information in their brain, and respond to the information in different ways		Different sense receptors are specialized for particular kinds of information; Animals use their perceptions and memories to guide their actions.	

	Interdependent Relationships in Ecosystems		
1.6 (5 LS2-1) Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment			The food of almost any animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants, while decomposers restore some materials back to the soil.
	Cycles of Matter and Energy Transfer in Ecosystems		
1.6 (5 LS2-1) Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment			Matter cycles between the air and soil and among organisms as they live and die.
	Ecosystem Dynamics, Functioning, and Resilience		
1.7 (3 LS4-4) Make a claim about the merit of a solution to a problem caused when the changes and the types of plants and animals that live there may change	When the environment changes some organisms survive and reproduce, some move to new locations, some move into the transformed environment and some die.		
	Inheritance of Traits		
	Variation of Traits		
1.8 (3 LS3-1) Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms	Different organisms vary in how they look and function because they have different inherited information; the environment also affects the traits that an organism develops.		

1.9 (3 LS3-2) Use evidence to support the explanation that traits can be influenced by the environment			
	Social Interactions and Group Behavior		
1.10 **DEVELOP benchmark**	Being part of a group helps animals obtain food, defend themselves and cope with changes.		
	Evidence of Common Ancestry and Diversity		
1.11 (3 LS4-1) Analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago	Some living organisms resemble organisms that once lived on Earth. Fossils provide evidence about the types of organisms and environments that existed long ago.		
	Natural Selection		
1.12 (3 LS4-2) Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing	Differences in characteristics between individuals of the same species provide advantages in surviving and reproducing.		
	Adaptation		
1.13 (3 LS4-3) Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well and some cannot survive at all	Particular organisms can only survive in particular environments.		

	Biodiversity of Humans		
1.14 (3 LS-4-4) Make a claim about the merit of a solution to a problem caused when the environment changes and the types if plants and animals that live there may change	Populations of organisms live in a variety of habitats. Change in those habitats affects the organisms living there.		

Standard 2: Physical Science
Learners will develop an understanding of concepts, models, theories, universal principles, and the facts that explain the physical world

1.

Benchmark PS	**Performance Indicators**		
	Grade 3	**Grade 4**	**Grade 5**
	Structure of Matter		
2.1 (3 PS1-1) Develop a model to describe that matter is made of particles too small to be seen			Because matter exists as particles that are too small to see, matter is always conserved even if it seems to disappear. Measurements of a variety of observable properties can be used to identify particular materials.
2.2 (5 PS1-2) Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling or mixing substances, the total weight of matter is			

conserved			
2.3 (5 PS1-1) Develop a model to describe that matter is made of particles too small to be seen			
	Chemical Reactions		
2.2 (5 PS1-2) Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling or mixing substances, the total weight of matter is conserved			Chemical reactions that occur when substances are mixed can be identified by the emergence of substances with different properties; the total mass remains the same.
2.4 (5 PS1-4) Conduct an investigation to determine whether the mixing of two or more substances results in new substances			
	Forces and Motion – AND – Types of Interactions		
2.5 (3 PS2-1) Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object	The effect of unbalanced forces on an object results in change of motion. Patterns of motion can be used to predict future motion. Some forces act through contact, some forces act even when the objects are not in contact. The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center.		
2.6 (3 PS2-2) Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion			
2.7 (3 PS2-3)			

Ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other			
2.8 (3 PS2-4) Define a simple design problem that can be solved by applying scientific ideas abut magnets			
2.9 (5 PS2-1) Support an argument that the gravitational force exerted by Earth on objects is directed down			
	Definitions of Energy		
2.10 (4 PS3-1) Use evidence to construct an explanation relating the speed of an object to the energy of that object		Moving objects contain energy. The faster the object moves, the more energy it has. Energy can be moved from place to place by moving objects, or through sound, light or electrical currents. Energy can be converted from one form to another form.	
2.11 (4 PS3-2) Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents			
2.12 (4 PS3-3) Ask questions and predict outcomes about the changes in energy that occur when objects collide			
2.13 (4 PS3-4) Apply scientific ideas to design, test, and refine a			

device that converts energy from one form to another			
	Conservation of Energy and Energy Transfer		
Not assessed at this level			
	Relationship between Energy and Forces		
2.12 (4 PS3-3) Ask questions and predict outcomes about the changes in energy that occur when objects collide		**When objects collide, contact forces transfer energy so as to change the objects' motions.**	
	Energy in Chemical Processes and Everyday Life		
2.13 (4 PS3-4) Apply scientific ideas to design, test, and refine a device that converts energy from one form to another		Energy can be "produced', "used", or "released" by converting stored energy. Plants capture energy from sunlight which can later be used as fuel or food.	
2.14 (5 PS3-1) Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun	**Not assessed at this level**		
	Wave Properties		
2.15 (4 PS4-1) Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move	**Not assessed at this level**		
	Electromagnetic Radiation		
2.16 (4 PS4-2) Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen	**Not assessed at this level**		

	Information Technologies and Instrumentation
2.17 (4 PS4-3) Generate and compare multiple solutions that use patterns to transfer information	**Not assessed at this level**

Standard 3: Earth & Space Science
Learners will gain an understanding of the origin, evolution and structure of the universe and will gain an understanding of the structure, dynamics, and geophysical systems of the earth

Benchmarks ESS	Performance Indicators		
	Grade 3	Grade 4	Grade 5
	The Universe and its Stars		
3.1 (5 ESS1-1) Support an argument that the apparent brightness of the sun and stars is due to the relative distances from Earth			Stars range greatly in size and distance from Earth and this can explain their relative brightness.
	Earth and the Solar System		
3.2 (ESS1-2) Represent data in graphical Displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky			The Earth's orbit and rotation, and the orbit of the moon around the Earth cause observable patterns.
	The History of Planet Earth		
3.3 (4 ESS1-1) Identify evidence from patterns in rock formations and fossils in rock layers to support an		Certain features on Earth can be used to order events that have occurred in a landscape.	

explanation for changes in a landscape over time			
	Earth Materials and Systems		
3.4 (4 ESS2-1) Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind or vegetation		Four major Earth systems interact. Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, organisms and gravity break rocks, soils, and sediments into smaller pieces and move them around.	
3.5 (5 ESS2-1) Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact		Rainfall helps to shape the land and affects the types of living things found in region. Water, ice, wind, organisms and gravity break rocks, soils, and sediments into smaller pieces and move them around.	Four major Earth systems interact.
	Plate Tectonics and Large-Scale Interactions		
3.6 (4 ESS2-2) Analyze and interpret data from maps to describe patterns of Earth's features		Earth's physical features occur in patterns, as do earthquakes and volcanoes. Maps can be used to locate features and determine patterns in those events.	
	The Roles of Water in Earth's Surface Processes		
3.7 (5 ESS2-2) Describe and graph the amounts and percentages of water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth		Most of Earth's water is in the ocean and much of the Earth's fresh water is in glaciers and underground.	
	Weather and Climate		
3.8 (3 ESS2-1) Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season	Climate describes patterns of typical weather conditions over different scales and variations. Historical weather patterns can be analyzed.		

3.9 (3 ESS2-2) Obtain and combine information to describe climates in different regions of the world			
	Biogeology		
3.4 (4 ESS2-1) Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind or vegetation		Living things can affect the physical characteristics of their environment.	
	Natural Resources		
3.10 (4 ESS3-1) Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment		Energy and fuels humans use are derived from natural sources and their use affects the environment. Some resources are renewable over time, others are not.	
	Natural Hazards		
3.11 (3 ESS3-1) Make a claim abut the merit of a design solution that reduces the impacts of a weather-related hazard	A variety of hazards result from natural processes; humans can not eliminate hazards but can reduce their impacts.		
3.12 (4 ESS3-2) Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans	A variety of hazards result from natural processes; humans can not eliminate hazards but can reduce their impacts.		
	Human Impacts on Earth Systems		
3.13 (ESS3-1) Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment	Societal activities have had major effects on the land, ocean, atmosphere, and even outer space. Societal can also help protect Earth's resources and environments		

Standard 4: **Scientific Inquiry and Critical Thinking** Learners will demonstrate an understanding of the nature of scientific inquiry			
Benchmarks	**Performance Indicators**		
	Grade 3	**Grade 4**	**Grade 5**
	Developing Possible Solutions		
4.1 (3-5 ETS1-2) Generate and compare multiple possible solutions to a problem based o how well each is likely to meet the criteria and constraints of the problem	Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions	Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions	Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions
4.2 (3-5 ETS1-3) Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved	Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that needs to be improved	Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that needs to be improved	Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that needs to be improved
	Optimizing the Design Solution		
4.2 (3-5 ETS1-3) Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved	Optimizing the Design Solution: Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints	Optimizing the Design Solution: Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints	Optimizing the Design Solution: Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints
	Asking Questions and Defining Problems		
4.3 (3 PS2-3; 4 PS1-1) Ask questions that can be investigated based on patterns such as cause and effect relationships	Asking questions and defining problems builds on previous experiences and progresses to specifying qualitative relationships	Asking questions and defining problems builds on previous experiences and progresses to specifying qualitative relationships	

2.8 (3 PS2-4) Define a simple design problem that can be solved by applying scientific ideas abut magnets			
	Developing and Using Models		
4.4 (3 LS1-1; 4 PS4-2; 5 PS1-1; 5 PS3-1; 5 LS2-1) Develop models to describe phenomena	Modeling builds on previous experiences and progresses to building and revising simple models and using models to represent events and design solutions	Modeling builds on previous experiences and progresses to building and revising simple models and using models to represent events and design solutions	Modeling builds on previous experiences and progresses to building and revising simple models and using models to represent events and design solutions
4.5 (4 PS4-1; 5 ESS2-1) Develop a model using an analogy, example, or abstract representation to describe a scientific principle			
	Planning and Carrying Out Investigations		
4.6 (3 PS2-1; 5 PS1-4) Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered	Planning and Carrying out investigations to answer questions or test solutions to problems builds on previous experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions		
4.7 (3 PS2-2; 4 PS3-2; 4 ESS2-1; 5 PS1-3) Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution		Planning and Carrying out investigations to answer questions or test solutions to problems builds on previous experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions	Planning and Carrying out investigations to answer questions or test solutions to problems builds on previous experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions
	Analyzing and Interpreting Data		
4.8 (3 LS3-1; 3 LS4-1; 4 ESS2-2) Analyze and interpret data to make sense of phenomena	Analyzing data builds on previous experiences and progresses to introducing quantitative approaches to	Analyzing data in builds on previous experiences and progresses to introducing quantitative approaches to collecting data and	

using logical reasoning	collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used	conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used	
4.9 (3 ESS2-1; 5 ESS1-2) Represent data in tables and various graphical displays (bar graphs, pictographs and/or pie charts) to reveal patterns that indicate relationships			Analyzing data builds on previous experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used
	Using Mathematics and Computational Thinking		
4.10 (5 PS2-2) Measure and graph quantities such as weight to address scientific and engineering questions and problems			Mathematical and computational thinking builds on previous experiences and progresses to extending quantitative measurements to a variety of physical properties - using competition and mathematics to analyze data and compare alternative design solutions
4.11 (5 ESS2-2) Describe and graph quantities such as area and volume to address scientific questions			
	Constructing Explanations and Designing Solutions		
4.12 (3 PS2-4; 4 PS3-4) Apply scientific ideas to solve problems	Constructing explanations and designing solutions builds on prior experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems	Constructing explanations and designing solutions builds on prior experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems	
4.13 (3 LS3-2; 3 LS4-2; 4 PS3-1; 4 ESS1-1) Use evidence (e.g. observations, patterns) to support an explanation			
4.14 (4 PS4-3; 4 ESS3-2) Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution			

	Engaging in Argument from Evidence		
4.15 (3 LS2-1; 4 LS1-1; 5 PS2-1; 5 LS1-1; 5 ESS1-1) Construct an argument with evidence, data, and/or a model	Engaging in argument from evidence builds on experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed worlds	Engaging in argument from evidence builds on experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed worlds	Engaging in argument from evidence builds on experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed worlds
4.16 (3 LS4-3) Construct and argument with evidence			
4.17 (3 LS4-4; 3 ESS3-1) Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem			
	Obtaining, Evaluating, and Communicating Information		
4.18 (3 ESS2-2; 4 ESS3-1) Obtain and combine information from books and other reliable media to explain phenomena	Obtaining, evaluating, and communicating information builds on previous experiences and progresses to evaluating the merit and accuracy of ideas and methods	Obtaining, evaluating, and communicating information builds on previous experiences and progresses to evaluating the merit and accuracy of ideas and methods	
4.19 (5 ESS3-1) Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem			Obtaining, evaluating, and communicating information builds on previous experiences and progresses to evaluating the merit and accuracy of ideas and methods