CAISL
Carlucci American International School of Lisbon

GRADE 4 SCIENCE FRAMEWORK

Contents

THEMES AND CONTENT 1
SCIENCE AND ENGINEERING PRACTICES (DEVELOPED IN CONJUNCTION WITH THE PERFORMANCE INDICATORS) 1
SCIENCE NOTEBOOK EXPECTATIONS 4
SCIENTIFIC WRITING EXPECTATIONS 4
SCIENCE LABORATORY SAFETY EXPECTATIONS 4
INFORMATION TECHNOLOGY EXPECTATIONS 4
PERFORMANCE INDICATORS (ASSESSED ON REPORT CARDS) 4
PHYSICAL SCIENCE 4
LIFE SCIENCE 5
EARTH AND SPACE SCIENCE 5
ENGINEERING, TECHNOLOGY, AND APPLICATIONS OF SCIENCE 5

THEMES AND CONTENT

- Energy
- Waves: Waves and Information
- Structure, Function, and Information Processing
- Earth's Systems: Processes that Shape the Earth

SCIENCE AND ENGINEERING PRACTICES (DEVELOPED IN CONJUNCTION WITH THE PERFORMANCE INDICATORS)

Asking Questions and Defining Problems

Asking questions and defining problems in 3–5 builds on K–2 experiences and progresses to specifying qualitative relationships.

- Ask questions about what would happen if a variable is changed.
- Identify scientific (testable) and non-scientific (non-testable) questions.
- Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships.
- Use prior knowledge to describe problems that can be solved.

- Define a simple design problem that can be solved through the development of an object, tool, process, or system and includes several criteria for success and constraints on materials, time, or cost.

Developing and Using Models
Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions.
- Identify limitations of models.
- Collaboratively develop and/or revise a model based on evidence that shows the relationships among variables for frequent and regular occurring events.
- Develop a model using an analogy, example, or abstract representation to describe a scientific principle or design solution.
- Develop and/or use models to describe and/or predict phenomena.
- Develop a diagram or simple physical prototype to convey a proposed object, tool, or process.
- Use a model to test cause and effect relationships or interactions concerning the functioning of a natural or designed system.

Planning and Carrying Out Investigations
Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.
- 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.
- Evaluate appropriate methods and/or tools for collecting data.
- 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.
- Make predictions about what would happen if a variable changes.
- Test two different models of the same proposed object, tool, or process to determine which better meets criteria for success.

Analyzing and Interpreting Data
Analyzing data in 3–5 builds on K–2 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.
- Represent data in tables and/or various graphical displays (bar graphs, pictographs and/or pie charts) to reveal patterns that indicate relationships.
- Analyze and interpret data to make sense of phenomena, using logical reasoning, mathematics, and/or computation.
- Compare and contrast data collected by different groups in order to discuss similarities and differences in their findings.
- Analyze data to refine a problem statement or the design of a proposed object, tool, or process.
- Use data to evaluate and refine design solutions.

Using Mathematics and Computational Thinking
Mathematical and computational thinking in 3–5 builds on K–2 experiences and progresses to extending quantitative measurements to a variety of physical properties and using computation and mathematics to analyze data and compare alternative design solutions.

- Decide if qualitative or quantitative data are best to determine whether a proposed object or tool meets criteria for success.
- Organize simple data sets to reveal patterns that suggest relationships.
- Describe, measure, estimate, and/or graph quantities (e.g., area, volume, weight, time) to address scientific and engineering questions and problems.
- Create and/or use graphs and/or charts generated from simple algorithms to compare alternative solutions to an engineering problem.

Constructing Explanations and Designing Solutions
Constructing explanations and designing solutions in 3–5 builds on K–2 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.

- Construct an explanation of observed relationships (e.g., the distribution of plants in the back yard).
- Use evidence (e.g., measurements, observations, patterns) to construct or support an explanation or design a solution to a problem.
- Identify the evidence that supports particular points in an explanation.
- Apply scientific ideas to solve design problems.
- 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
Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s).

- Compare and refine arguments based on an evaluation of the evidence presented.
- Distinguish among facts, reasoned judgment based on research findings, and speculation in an explanation.
- Respectfully provide and receive critiques from peers about a proposed procedure, explanation, or model by citing relevant evidence and posing specific questions.
- Construct and/or support an argument with evidence, data, and/or a model.
- Use data to evaluate claims about cause and effect.
- 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
Obtaining, evaluating, and communicating information in 3–5 builds on K–2 experiences and progresses to evaluating the merit and accuracy of ideas and methods.

- Read and comprehend grade-appropriate complex texts and/or other reliable media to summarize and obtain scientific and technical ideas and describe how they are supported by evidence.
- Compare and/or combine across complex texts and/or other reliable media to support the engagement in other scientific and/or engineering practices.
- Combine information in written text with that contained in corresponding tables, diagrams, and/or charts to support the engagement in other scientific and/or engineering practices.
- Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem.
- Communicate scientific and/or technical information orally and/or in written formats, including various forms of media as well as tables, diagrams, and charts.

SCIENCE NOTEBOOK EXPECTATIONS

- Inquiry is the focus of science notebooks.
- Students use and create their own science notebook as an interactive resource for lessons and investigations in order to feel ownership of their science exploration.
- Science notebooks can include student notes added to structured pages such as cloze reading, graphic organizers, unlabeled diagrams, and questions to guide reflections for investigations.

SCIENTIFIC WRITING EXPECTATIONS

- Students start an investigation by talking about the purpose, and have a focus question at the beginning of the lesson which they will be able to answer at the end.
- Students form a preliminary hypothesis based on prior knowledge.
- Students research information about their focus question (either as a class or in small groups) in order to come up with a revised hypothesis.
- Students discuss and write about their conclusion as a class.

SCIENCE LABORATORY SAFETY EXPECTATIONS

Students will be expected to learn and to follow the expectations for safe and appropriate practices during laboratory activity, as shown on the "Science Laboratory Safety" document.
See link below:
https://www.caislisbon.org/uploaded/Curriculum_links/Science/Science_lab_safety_EC3to5th.pdf

INFORMATION TECHNOLOGY EXPECTATIONS

Students will be expected to use a variety of digital tools according to grade level expectations stated in CAISL's Research and Information Technology Integration Scope and Sequence.
See link below:
https://www.caislisbon.org/uploaded/Curriculum_links/2019-2020/IT_Skills_Scope_and_Sequence_by_Grade.pdf

PERFORMANCE INDICATORS (ASSESSED ON REPORT CARDS)

PHYSICAL SCIENCE
Energy: Use evidence to construct an explanation relating to speed of an object to the energy of that object. DOK 2
Energy: Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents. DOK 2
Energy: Ask questions and predict outcomes about the changes in energy that occur when objects collide. DOK 2

Energy: Apply scientific ideas to design, test, and refine a device that converts energy from one form to another. DOK 2
Waves and their Applications: Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move. DOK 3
Waves and their Applications: Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen. DOK 3
Waves and their Applications: Generate and compare multiple solutions that use patterns to transform energy. DOK 3

LIFE SCIENCE
From Molecules to Organisms Structures and Processes: Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. DOK 4
From Molecules to Organisms Structures and Processes: 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. DOK 2

EARTH AND SPACE SCIENCE
Earth's Systems: Processes that Shape the Earth: Identify evidence from patterns, in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time. DOK 2
Earth's Systems: Processes that Shape the Earth: Make observations and / or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation. DOK 2
Earth's Systems: Processes that Shape the Earth: Analyze and interpret data from maps to describe patterns of Earth's features. DOK 3
Earth's Systems: Processes that Shape the Earth: Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment. DOK 3
Earth's Systems: Processes that Shape the Earth: Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans. DOK 3

ENGINEERING, TECHNOLOGY, AND APPLICATIONS OF SCIENCE
Engineering Design: Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost. DOK 3
Engineering Design: Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem. DOK 3
Engineering Design: 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. DOK 3