Republic of the Philippines
Department of Education
DepEd Complex, Meralco Avenue, Pasig City

MATATAG K TO 10 CURRICULUM OF THE K TO 12 PROGRAM

SCIENCE

GRADES 3-10

SCIENCE SHAPING PAPER

I. Introduction

The Science Shaping Paper is developed to provide the narrative for the development of the recalibrated Science Curriculum. It outlines the goals, theoretical and philosophical foundations, and rationale that shape the Science Curriculum. It presents the big ideas and cross-cutting concepts in Science to emphasize the development of durable understanding among learners as well as skills applicable in various contexts.

The Science Shaping Paper and the Science curriculum are based on the General Shaping Paper, taking into consideration the findings of the curriculum review conducted in 2019-2020. Furthermore, the Science curriculum draws on the goals of the 2016 Science K to 12 curriculum. Its new features include: (a) expanding technological literacy to technology and engineering literacy to enable learners to develop their ability to connect science content to real-world technological and engineering applications; (b) introduction of key stage and grade level standards to articulate expectations of what learners should be capable of doing at each key stage and grade level; and (c) developmental sequence of content in consideration of the prior learning of students and the cognitive and language demands of learning new science ideas. Specifically, in sequencing the science content, three *modes of thinking* have been considered, starting from the simplest level when a person reacts to the physical environment; is able to internalize actions through words and images, and at the most complex level; and is already able to think using a symbol system such as written language and number systems.

The recalibration of the Science curriculum draws from and supports the DepEd MATATAG agenda, which sets the new direction in resolving basic education challenges through the four critical components:

- **MA**king the curriculum relevant to produce competent and job-ready, active, and responsible citizens;
- **TA**king steps to accelerate delivery of basic education facilities and services;
- **TA**king good care of learners by promoting learner well-being, inclusive education, and a positive learning environment; and
- **G**iving support to teachers to teach better.

It comes at a time when rapid changes and disruptions are happening. According to Marope, Griffin, and Gallagher (2017), in the face of such persistent and rapid changes, education, through its curricula, should serve as lifelong learning systems, demonstrating constant self-renewal and innovation.

The succeeding sections are organized as follows:

- The Shape of the Grades 3 to 10 Science Curriculum
- Development of the Curriculum
  - Curriculum Goals, Theoretical and Philosophical Bases, Curriculum Framework, Key Stage Standards, Grade Level Standards
- Elements Contributing to the Curriculum
  - Big Ideas, Cross-cutting Concepts, Developmental Sequence of Concepts, Development of 21st Century Skills, Social Issues and Government Priorities, STEM, Pedagogies, Assessment, and Resources, Curriculum Organization.

The Shape of the Grades 3 to 10 Science Curriculum

The Science curriculum has been developed with the view that science is essential for Filipino learners in an increasingly scientific, technological, and challenging world.

Science offers systematic processes and practices to investigate the natural and man-made world and to innovate and to collaborate with other people to explore frontiers and challenges, and to look for solutions to real-world problems. It offers a well-established and reliable body of knowledge that is increasingly accessible to all and at a range of conceptual levels. Science offers unique ways of thinking and acting in everyday social settings, as well as in more technical and professional settings. It offers ways to exhibit values and attitudes to contribute to an improved world.

The Science curriculum supports Filipino learners to engage with science-related issues, and with the ideas of science, as a reflective citizen. It supports them to explain phenomena scientifically, evaluate and design scientific inquiry, and interpret data and evidence. It encourages and supports them to apply scientific, environmental, technological, and engineering knowledge, practices, and principles in the context of real-life situations.

II. Development of the Curriculum

A. Curriculum Goals

The overall goal of the Grades 3 to 10 Science curriculum is the achievement of scientific, environmental, and technology and engineering literacy of all learners.

On achieving the outcomes of the curriculum, learners will be ready to actively participate in local, national, and global contexts and make meaningful contributions to a dynamic, culturally diverse, and expanding world. By successfully completing the Science curriculum, Filipino learners will demonstrate capabilities as put forth in the Basic Education Development Plan (BEDP) 2030.

B. Theoretical and Philosophical Bases

The Science curriculum presents a modern outlook incorporating learning approaches drawn from an increasingly expanding body of worldwide education research and education experience that recommend that science curricula and the teaching and learning of science for the elementary and secondary years focus on engaging learners in scientific inquiry and the nature and practice of science.

The Enhanced Basic Education Act of 2013 (RA 10533), Section 5.e requires that the curriculum support and reflect universally recognized theories of learning, particularly *Constructivism*. Other theories contributing to the development of the Science curriculum include *Social cognition theory, Brain-based theories of learning,* and *Vygotsky's Zone of Proximal Development (ZPD).*

The ***Constructivist theory of learning*** suggests that learners learn by expanding their knowledge based on their prior knowledge. One of the primary goals of using constructivist teaching is for learners to learn how to learn when they are trained to take the initiative for their own learning experiences. Therefore, learners learn best when they can construct a personal understanding based on experiencing things and reflecting on those experiences. Constructivism emphasizes the active role of learners in building their own understanding. Rather than passively receiving information, learners reflect on their experiences, create mental representations, and incorporate new knowledge into their schemas, thus promoting deeper learning and understanding.

The **Social Constructivist Theory** advocated by Vygotsky posits three important ideas on the processes of learning and development of an individual. First, these processes involve co-construction with others. Social interaction plays a key role in shaping what learners know (cognition). Second, language mediates the learning process as they communicate with others, which includes not only verbal but also non-verbal communication. Knowledge and concepts are conveyed in the language and modes of communication we use. And third, learning and development take place within cultural and historical contexts. This means that learners' participation in the classroom and in school is also influenced by other institutions in which they participate, such as

their home and community. There is a need to accommodate learners' diverse backgrounds, acknowledging their development as whole persons and tapping into their everyday practices, emotions, and identities.

Vygotsky's Zone of Proximal Development (ZPD) refers to the difference between what a learner can do without help and what he or she can achieve with guidance and encouragement from a skilled partner. The term 'proximal' suggests that area where the learner is 'close' to grasping the knowledge or skills to be learned. It recommends that learning occurs best in the ZPD – the zone where instruction is the most beneficial – where the task is only just beyond the individual's capabilities. An important process: therefore, is for the teacher to identify what the learner already knows and can do so the teacher can provide the 'close to' environment. Successful scaffolding thus requires appropriate selections, thoughtful organization, and sensitive presentation of suitable tasks.

The Science curriculum acknowledges the learners' direct interaction to their environment through assimilation and reinforcement as a crucial factor in learning and knowledge acquisition. ***The Social cognition learning model*** suggests that "most human behavior is learned observationally through modeling," thus, learners can learn from observing others either as a live model, a symbolic model, or a verbal instructional model. This pedagogical theory explains as well how attention, retention of ideas, reproduction of skills, and motivation, are influenced by how learners observe others and their experiences as they interact in their social and media environment.

The ***Brain-based learning theory*** is a relatively new educational theory that puts premium on the recent research about cognitive and neurosciences on how the brain learns and how learners learn differently as they age, grow, and mature cognitively, emotionally, and socially. It strongly suggests that learning can be improved and accelerated if teachers structure educational experiences in the classroom to reflect conditions that facilitate learning and improve brain functions and health and deliver lessons based on the science of learning.

The **Cognitive load theory** is a theory of how human brains process, learn and store information. The theory suggests that working memory has a limited capacity and that overloading it reduces the effectiveness of teaching. Furthermore, Dylan William has described cognitive load theory as "the single most important thing for teachers to know" (William 2017). A large body of research evidence indicates that instruction is most effective when designed according to the limitations of working memory.

C. Curriculum Framework

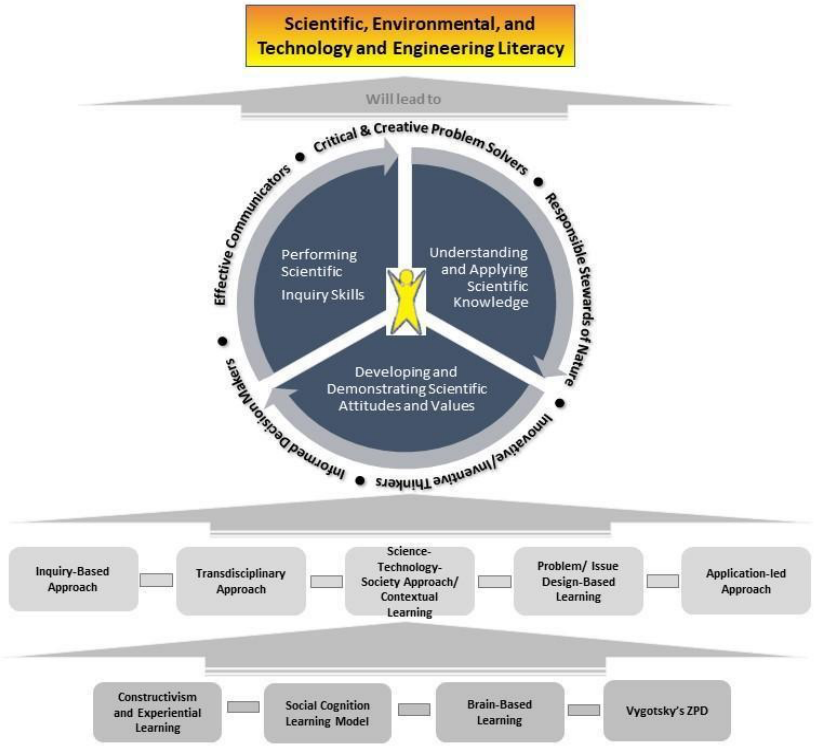

Figure 1. Science Curriculum Framework

A central feature of the Science curriculum is the balanced integration of three interrelated content strands:

- ***Performing scientific inquiry skills;***
- ***Understanding and applying scientific knowledge; and***
- ***Developing and demonstrating scientific attitudes and values***.

This content is structured into a developmental sequence of science content, which progressively increases in conceptual demand. The design supports learners to engage with and learn in science appropriate to the expected prior experiences and learning.

To support the achievement of the developmental sequence, the Science curriculum has cross-disciplinary opportunities for learning built into learning competencies to reinforce the knowledge and understanding, skills and processes, and values and attitudes content included in the domains for a grade level or stage.

The learning of this content is principally facilitated using ***the inquiry approach***, supported through approaches that challenge learners according to their prior learning and needs.

> *Participation in scientific inquiry enables students to develop ideas about science and how ideas are developed through scientific activity. The key characteristic of such activity is an attempt to answer a question to which students do not know the answer or to explain something they do not understand. The answer to some questions can be found by first-hand investigation, but for others information is needed from secondary sources. Therefore, capabilities involved in conducting scientific inquiry have a key role in the development of big ideas.*
>
> From *Harlen*, W. (Ed.) *Working with big ideas of science education*; (2015)

Other approaches that enhance inquiry learning and have also contributed to the curriculum design include:

- ***applications-led learning,***
- ***the science-technology-society approach,***
- ***problem-based learning, and***
- ***multi-disciplinary learning***.

The Science curriculum adopts in a developmental way the ***Big Ideas*** (Harlen, et al. 2015) and ***Crosscutting Concepts* of Science** (A Framework for the K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas, 2012), as well as integrates government priorities identified as appropriate to the science learning area.

The Science curriculum recognizes the place of science and technology in everyday human affairs. It integrates science and technology in the social, economic, personal, and ethical aspects of life. The science curriculum promotes strong links between science and technology, including indigenous know-how in the use of natural materials, thus contributing to the preservation of the country's cultural heritage.

The three areas of **knowledge and understanding**, **skills and processes**, and **values and attitude** are intertwined within the learning competencies in the Science curriculum as these are best learned in context. This reduces the load on the teacher to find matching skills, processes, and values and attitudes for the concepts to produce authentic activities.

Organizing the curriculum around situations and problems that challenge and activate learners' curiosity motivates them to engage and appreciate science as relevant and useful.

The intention of the curriculum is not to rely solely on textbooks, but to engage learners in science, as well as technological and engineering-related practices and processes and to incorporate varied hands-on and minds-on activities to develop learners' interest and encourage them to be active learners. Where learning competencies suggest engagement with and demonstrations of knowledge and understanding, this curriculum sets the expectation that learners will actively engage in locating and interpreting the relevant scientific facts, concepts, laws, and theories, and reinterpret or represent them as a deliberate learning strategy. This approach is strongly supported in brain-based learning, which suggests that teachers can promote higher learning through guidance with questions rather than by requiring learners to rote learn.

The Science curriculum is designed to be learner-centered and inquiry-based, emphasizing the use of evidence in constructing explanations and providing opportunities for collaboration, innovation, creative scientific exploration, and engineering design. The curriculum explicitly presents many learning competencies that require active learner participation and leadership. Thus, teachers should also deliberately look for opportunities to apply inquiry learning when addressing any learning competency, as this models the nature and practice of science in authentic scientific research and enterprise.

Assessment is an integral part of teaching and learning. The curriculum is designed to progressively introduce science concepts and skills and build towards learning of more conceptually complex content. For that reason, it is crucial that the prior experiences, knowledge, and understanding of learners are considered and assessed in formative ways to ensure that an accessible but challenging level of teaching and learning is offered to learners, maximizing the effectiveness of instruction (Vygotsky, 1978). Further information about assessment is described in the last part of this paper.

The Science curriculum provides learners with a repertoire of competencies for lifelong learning, for the world of work, and playing part in a well-informed society. It envisions learners with scientific, environmental, and technology and engineering literacy. Learners will be productive members of society because they are critical and creative problem solvers, responsible stewards of nature, innovative/inventive thinkers, informed decision makers, and collaborative and effective communicators.

The curriculum provides *Content standards* for each Domain and Grade to support teachers to identify the level of science knowledge, skills, and values to be taught and learned. It also clearly articulates *Performance standards* to support the teacher to assess the levels of knowledge, skills, and values that learners demonstrate in relation to the *Content* and *Learning Competencies* addressed during and at the end of each quarter of teaching and learning.

The Science curriculum is structured using the following organizers:

- ***Content*** – signaling the key areas of focus for a Quarter;
- ***Content Standards*** – indicating the conceptual level expected for the Quarter;
- ***Learning Competencies*** – identifying the specific aspects of content for learners to achieve;
- ***Performance Standards*** – providing a level for teachers to use to judge learner achievement at the end of each quarter; and
- ***Performance Tasks*** – samples of tasks where the learner applies their knowledge, understanding, skills and processes, values and attitudes, through which teachers can judge the levels of achievement of the performance standard for each quarter in the domain.

IV. Elements Contributing to the Science Curriculum

A. Big Ideas

The concepts and skills of Science are not taught in isolation, but rather in the context of big ideas in Science with increasing levels of complexity from one grade level to another in developmental progression, thus paving the way to a deeper understanding of core concepts. The integration across science domains leads to a meaningful understanding of interrelated concepts and their applications in real-life situations.

One of the reported findings from the curriculum review is that the curriculum is congested – that there is an unequal distribution of learning competencies across different cognitive demands and grade levels. Specifically, there are many learning competencies on the cognitive demands communicating understanding of science concepts and analyzing information and advance scientific arguments. To address this issue, the learning standards are redesigned with a focus on the Big Ideas, and the content standards are progressively appropriate for each grade level. Additionally, the learning competencies ensure a comparable distribution of cognitive demands across different cognitive domains and grade levels, for the learners to learn to perform basic procedures before undertaking the more cognitively demanding competencies.

A *Big Idea* is a statement of an idea that is central to learning – one that links numerous understandings into a coherent whole. It also represents a progression towards understanding key concepts in different learning areas (Charles, 2005). Grounding the learner's content knowledge on a relatively few Big Ideas establishes a robust understanding of the learning area. The connection of Big Ideas to many other ideas allows the learner to see it as a set of interrelated concepts, skills, and facts thus, promoting memory and enhancing transfer.

B. Crosscutting Science Concepts

Crosscutting concepts are described as "dimensions that unify the study of science and engineering through their common application across fields." (*A Framework for K-12 Science Education Practices, Crosscutting Concepts, and Core Ideas,* National Academy of Sciences, 2012)

Research suggests that learners, over multiple years of school, actively engage in science and engineering practices and apply crosscutting concepts to deepen their understanding of each field's disciplinary core ideas.

The Science curriculum recognizes the importance of utilizing internationally accepted crosscutting ideas that recur across the different science domains and across grade levels. These crosscutting concepts include the following:

- *Structure and function,*
- *Stability and change,*
- *Systems and system models,*
- *Energy and matter: flows, cycles, and conservation,*
- *Scale, proportion and measurement,*
- *Patterns,*
- *Cause and effect,* and
- *The nature and practices of Science.*

Crosscutting concepts connect the small ideas in the different science domains as the learning areas are introduced in every quarter.

C. The Developmental Sequence of Concepts

The Science curriculum has been structured to progressively develop conceptual understanding of science ideas and practices by carefully paying attention to the introduction of new ideas. It is cognizant of the following important factors that influence students' readiness to learn science ideas and practices:

1. The experiences and expected prior learning of students;
2. The stages of development of students as described in educational research (that learners progress through *modes of thinking* from birth to adulthood: from *sensorimotor* to iconic to *concrete symbolic*, to *formal* and finally to *post-formal*.);
3. The cognitive demand of new science ideas for learners;
4. The language demands associated with new ideas in science; and
5. The need to reinforce new ideas within and across science domains in a consistent manner.

- The Science curriculum for Grades 3 to 10 particularly responds to the first three *modes of thinking* to inform the sequencing of science content. The ***Sensorimotor*** mode identifies the developmental stage when a person reacts to the physical environment. For a very young child, it is the mode in which motor skills are acquired. In adult life, this mode is utilized as skills associated with sports and other physical activities that develop and evolve. The ***Iconic*** mode identifies when a person can internalize actions in the form of images. It is in this mode that the young child develops words and images that represent objects and events. For the adult, this mode of functioning assists in the appreciation of art and music and leads to a form of knowledge referred to as intuitive. The ***Concrete symbolic*** mode identifies when a person thinks using a symbol system such as written language and number systems. Thinking in this mode is reliant on a 'real-world' referent. This is the most common mode addressed in learning in the upper primary and secondary school (Biggs & Collis, 1982).

The design of the Science curriculum promotes interactive, concrete, and hands-on instructional approaches in the early grades, especially in the introduction of more difficult concepts. The delivery of a lesson will call for activating prior knowledge in which new learning is built over prior learning. The presentation of content follows a progression from Grade 3 to Grade 10 towards the scientific, environmental, and technology and engineering literacy of all learners.

a. Vertical Articulation

The various concepts, processes, and skills in the four domains of the Science curriculum are arranged in an increasing level of complexity from Grade 3 to Grade 10. It reinforces new ideas through the use of the development of key ideas towards the

big ideas as described by Harlen, et al., (2015), and this learning is reinforced by integrating the crosscutting concepts of science developmentally through the various domains.

The progression of concepts across grade levels provides an opportunity for the development of understanding of key science concepts. This is fundamental to the process whereby learners construct their understanding and skills. Since science is taught as a separate learning area from Grade 3, the learning standards leading to the acquisition of good health habits and the development of curiosity about self and the environment using basic process skills in Grades 1 and 2 are articulated in other learning areas.

b. Horizontal Articulation

The learning of science is interconnected with other learning areas especially languages and mathematics. The foundational skills, especially literacy and numeracy, introduced in the other learning areas are paramount to the understanding and acquisition of concepts and skills in science. These basic skills, together with the other essential skills, such as communication, collaboration, and critical thinking, ensure not only the learning of science content but also address and establish connections and applications in other learning areas. Linking science with literacy and numeracy is vital to fill in the gaps where the learners' knowledge and skills may be inadequate.

The curriculum also makes use of the interconnection between science and the other learning areas such as Edukasyong Pantahanan at Pangkabuhayan/Technology Livelihood Education (EPP/TLE), Araling Panlipunan (AP), the language subjects, and Mathematics, among others. Analysis of factors affecting the Program for International Student Assessment (PISA) performance of Filipino learners has shown that the development of problem solving, critical thinking, and information literacy in subject areas such as Araling Panlipunan, English, and Filipino is related to the development of the same set of 21st century skills in Science.

D. Development of the 21st Century Skills

One of the daunting challenges of 21st century education is to respond to the needs and demands of this fast-paced dynamic world. Accelerated digitalization and artificial intelligence, shifting job market demands, information explosion, pressures of global competitiveness, and transforming scientific innovations and technological advancements redefine the knowledge, skill and competency sets that the next generation of learners must be equipped with to be adequately prepared.

The Department of Education (DepEd) recognizes and responds to these needs and demands through appropriate changes in the educational system. DepEd also continues to respond to the challenges through the refinement of the K to 12 curricula to

produce holistically developed Filipino learners with essential 21st century knowledge and skills needed to participate in and provide significant contributions to society and to nation-building.

21st Century Skills are the knowledge, skills, attitudes, and competencies that learners need to develop so that they can prepare for and succeed in work and life in the 21st century (DepEd Order No. 21, s. 2019). It also refers to the knowledge, skills and attitudes necessary to be competitive in the 21st century workforce, participate appropriately in an increasingly diverse society, use new technologies and cope with rapidly changing workplaces (Binkley *et al.* 2012; Scoular and Care, 2018). These skills are transversal in nature and work in conjunction with foundational literacy and numeracy skills and discipline-specific competencies (e.g., scientific literacy).

Every K to 12 graduate is expected to be equipped with 21st Century Skills which include the following:

(a) Information, Media, and Technology skills – the ability to gather, manage, evaluate, use, and synthesize information through media and technology. These skills allow learners to navigate a fluid and dynamic environment of knowledge creation and acquisition. Among the skills and competencies that the science curriculum emphasizes include *Visual, Information, Technology,* and *Digital literacies*.

(b) Learning and Innovation skills – the ability to think critically, analyze and solve problems, create and implement innovations, and generate functional knowledge. The science curriculum highlights *Creativity, Openness, Critical thinking, Problem-solving,* and *Reflective thinking.*

(c) Life and Career skills – prepares learners to make informed life and career decisions to enable them to become citizens that engage in a dynamic global community and to successfully adapt to meet the challenges and opportunities to lead in the global workforce. The science curriculum helps develop *Informed decision-making, Self-discipline, Future orientation,* and *Resilience and adversity management*.

(d) Communication skills – the ability to express oneself clearly and collaborate with others. The science curriculum puts premium on communication skills including all forms and context including but not limited to verbal and non-verbal, active listening, as well as the abilities to express feelings and provide feedback. The science curriculum focuses on the development of the sub-skills: *Teamwork, Collaboration, Intrapersonal skills, Interactive communication,* and *Communicating in a diverse environment.*

E. Social Issues and Government Priorities

The Science curriculum contributes to the achievement of government priorities to address current social issues by integrating developing learners' awareness in relation to those aspects of the content that are most applicable and provide authentic significance for learners. The common goal is achieved by bringing relevant issues and applications to curriculum learning contexts in science to support learners to develop their understanding, skills, and values and attitudes towards becoming responsible and productive citizens.

Science, as a discipline, puts premium on the investigation of natural phenomena and as such addresses and contributes to the goals of the many government priorities, which include the following:

- Reduction and management of risks and disaster;
- Fighting against climate change;
- Environmental protection and conservation;
- Sustainable development of resources and energy, including the Green economy, Renewable energy, Sustainable mining; and
- Comprehensive Sexuality Education (CSE).

F. STEM

Science, Technology, Engineering and Mathematics (STEM) is a government priority and is significant in the development of problem solvers, innovative thinkers, and entrepreneurs who can contribute to inclusive economic development. As depicted in the STEM Framework, this development is achieved through three learning areas in the K to 12 curriculum – Science, Mathematics, and Technology and Livelihood Education (TLE), which may collectively employ the Engineering Design Process (EDP) to attain curriculum goals. Though distinct and taught separately, these three learning areas are interrelated, and each contributes knowledge and skills for the solution to real-world problems. Figure 2 shows a diagrammatic representation of the STEM Framework.

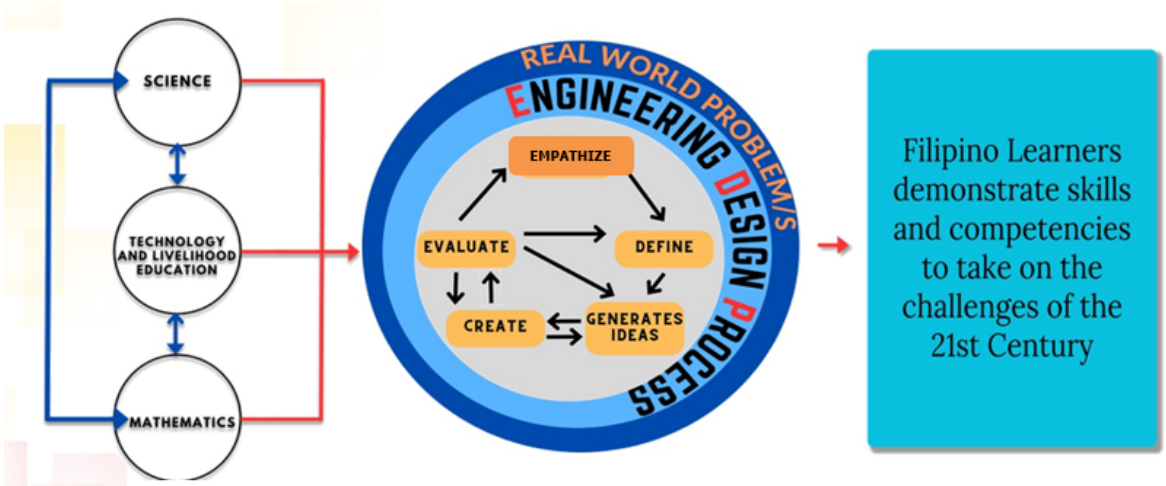

Figure 2. STEM Framework

Utilizing the EDP in the instruction allows learners to design solutions based on understanding the needs and contexts, build and test solutions, repeat steps as many times as needed to make improvements, learn from unsuccessful attempts, and discover different or novel design possibilities to arrive at optimal solutions. In the curriculum, EDP is exhibited through problem solving and investigative approaches where learners apply their mathematical, scientific, and technological understanding to formulate, conjecture, reason, create, and evaluate.

G. Pedagogies, Assessment, and Resources

The Science Curriculum Framework identifies the pedagogies that the curriculum embraces to improve learning in science for Filipino learners. These pedagogical approaches can be included appropriately by teachers in the delivery of science lessons to adapt to the learners' context and learning environment. These approaches are described below to guide teachers in using each pedagogical approach.

Inquiry-based learning approach puts a premium on questioning, investigating, proving, probing, explaining, predicting, and establishing connections of evidence (Calburn, 2020). Instead of a transmissive mode of teaching, this approach involves inquiry and sustained active engagement of learners. The approach is characterized in the classroom by questions and discussions. Inquiry allows learners to formulate questions and find solutions through learning real-life-based investigations and research

projects. Concepts and specific scientific terms need to be explained in simple language. Applications and situations need to be explained in relevant contexts and are best explored through science activities. In this approach learners also engage in developing process skills, analyzing, and evaluating evidence, experiencing and discussing, and talking to their peers about their own understanding (Suchman, 1964). Learners collaborate with others to make discoveries, solve problems, and plan investigations.

An ***applications-led approach*** suggests that it is useful to consider the application of the concept rather than of an approach based on the traditional logic of the discipline. Applications-led approach means that the science to be taught is determined by applications from life and NOT by the logic of the discipline of science. Although this curriculum does not suggest an applications-led approach for the entire curriculum, the inclusion in each quarter in each of the domains of learning of suggested Performance Tasks is intended to reflect the importance given to the expectation that the learners demonstrate how their learning can be applied to their everyday lives.

The Science Technology Society approach (STS) focuses on the societal role of science and technology in the contemporary and modern world. It provides a dynamic and interdisciplinary relationship of history, philosophy and sociology including cultural perspectives to answer and respond to current science concerns, issues and problems (Pritchard & Woollard, 2010). By using this approach, the learners expand their understanding of science across disciplines and holistically view problems by examining the consequences of science and technology.

Problem-based Learning approach (PBL) is the acquisition of knowledge and skills using critical thinking and creativity to solve real-life problems. In this approach, real-world problems motivate learners to seek out deeper understanding of concepts, design reasoned decisions and defend them, and collaborate among themselves (Duch et al., 2001). Through this approach, development of critical thinking, problem-solving abilities, and collaboration and communication skills, are essentially given a focus. An effective and versatile approach for PBL is design thinking or engineering design process, which can be used to generate solutions based on the needs of intended users.

A ***multidisciplinary (cross-disciplinary)*** design is built into the Science curriculum. A multidisciplinary approach is defined by UNESCO as "*curriculum integration which focuses primarily on the different disciplines and the diverse perspectives they bring to illustrate a topic, theme or issue. A multidisciplinary curriculum is one in which the same topic is studied from the viewpoint of more than one discipline*." The Science curriculum lends itself to greater integration of disciplines as may be adopted in some schools. Similarly, UNESCO defines a ***transdisciplinary approach*** as "*an approach to curriculum integration which dissolves the boundaries between the conventional disciplines and organizes teaching and learning around the construction of meaning in the context of real-world problems or themes*." An ***interdisciplinary approach*** is defined as "*An approach to curriculum integration that generates an understanding of themes and ideas that cut across disciplines and of the connections between different disciplines and*

their relationship to the real world. It normally emphasizes process and meaning rather than product and content by combining contents, theories, methodologies, and perspectives from two or more disciplines."

Assessment for the Science Curriculum

1. **Classroom Assessment** is an ongoing process of identifying, gathering, organizing, and interpreting quantitative and qualitative information about what learners know and can do (DepEd Order 31, s. 2020).

The alignment of assessment to curriculum and pedagogy ensures that assessments are fair, valid and reliable in judging, providing feedback, and adjusting for the cognitive progress of the learners. *Appropriate assessment shall be employed to holistically measure the learners' current and developing abilities while developing personal accountability in the process* (DepEd Order 8, s. 2015).

Assessment for the Science curriculum should be organized to:

- identify prior learning and to set goals for learning;
- support learners explicitly to take an active role in assessing and evaluating their learning; and
- judge the level of achievement of the learners against the content, performance and grade standards of the intended learning.

As instruction for the Science curriculum is expected to be inquiry-based, it is critical that before addressing the learning competencies for that quarter the teacher identifies what the learners already know and can do. This may or may not be through formal assessment tasks but should provide the information needed to properly plan learning activities for individual learners and the class overall. These types of assessment may be used any time during inquiry-based science instruction to check on understanding of scientific concepts, verify the development of scientific inquiry, and reiterate the Science process skills. Assessment to check on learners' learning also provides a process to provide feedback and adapt to the needs of the learner, thus allowing the teacher to adjust instruction to meet learners' ever-changing needs.

2. Performance Tasks and Standards

The Science curriculum requires learners to complete at least one substantial performance task for each quarter. These may be through independent or collaborative work. The curriculum provides Performance Standards along with sample tasks to guide teachers on the performance level expected. The levels of learner performance are judged using criteria suitable for the task.

The Performance standards, which are closely aligned with the Content Standards, provide a mechanism for teachers to make judgements on how well learners are applying science knowledge and understanding, skills and processes, and values and attitudes described in the curriculum content.

Performance Tasks and Standards assist the teachers and learners to answer the questions:
1. “What do learners do with what they know?”
2. “How well do learners demonstrate their learning?”
3. “How well do learners apply their learning in different situations, including in real-life contexts?”
4. “What tools and measures and values do learners use or draw on to demonstrate what they know?”

Resources and Technologies

The implementation of the Science curriculum can be delivered across available learning delivery resources. The teaching and learning process is not limited to face-to-face. The curriculum allows the adoption of a distance or blended learning approach. Teachers may need to change their usual practice of instruction – they would have to be familiar with the pedagogical and technological demands of these new learning approaches.

There are several innovative teaching methods and technological tools that should be introduced appropriately in basic science education. These emerging methodologies, strategies and tools should be appropriately chosen, and integrated into the science lessons to fit learners’ cognitive abilities and classroom contexts. Among these innovative teaching methods and tools which can be applied to science are design thinking and engineering design processes, robotics technology, mobile learning applications, learning analytics, games and gamification, and virtual and remote laboratories. Teaching methods and strategies should cater to the needs, skills, and contexts of diverse learners. The Department of Education will continually assess and evaluate the applicability of these emerging approaches.

H. Curriculum Organization

The Science curriculum is organized into discipline-oriented domains**.**

The domains for Grades 3-6 are:

- *Materials*
- *Force, Motion, and Energy*
- *Living things; and*
- *Earth and space.*

The domains for Grades 7-10 are:

- *Science of Materials*
- *Force, Motion, and Energy*
- *Life Science; and*
- *Earth and Space Science.*

The learning competencies in the Science curriculum are written as statements of what learners know and can do. They signal learning activities that require active learner participation using an inquiry approach to deliver deep learning.

Teachers are encouraged to develop learning activities and opportunities that progressively build conceptual understanding, skills, values, and attitudes within domain quarters by considering the learning competencies holistically, rather than as a list of things/content to cover.

Over a grade, teachers are encouraged to develop learning activities and opportunities that connect with and draw on content from other domain quarters.

The science curriculum provides cross-domain alignment of significant science knowledge, skills, processes and attitude-related contexts and competencies to allow learners to apply and reinforce learning in varying contexts throughout each year and key stage.

LEARNING AREA STANDARDS

Science Curriculum Overview

The Science curriculum provides learners with a repertoire of competencies important for lifelong learning and in the world of work in a skill-based society. It envisions the development of ***scientifically***, ***environmentally***, and ***technology literate learners*** who are productive members of society and who are *critical problem solvers*, *responsible stewards of nature*, *innovative and creative citizens*, *informed decision makers*, and *collaborative and effective communicators*.

A central feature of the Science curriculum is the balanced integration of three interrelated content strands:

- *Performing scientific inquiry skills,*
- *Understanding and applying scientific knowledge, and*
- *Developing and demonstrating scientific attitudes and values.*

It is designed and organized through the integration of the three interrelated content strands. The acquisition of these content strands is facilitated by drawing from the key pedagogical approaches: ***inquiry-based learning, applications-led approach, the science-technology-society approach, problem-based learning, and multi-disciplinary learning.*** The approaches are based on sound and valued educational research and concepts including *Constructivism*, the *Social Cognition Learning Model*, *Brain-based Learning* and *Vygotsky's Zone of proximal development*.

The Science curriculum explicitly adapts in a developmental way *Big Ideas* (Harlen, et al., 2015) and Cross Cutting Concepts of Science (A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas, 2012), and integrates governmental thrusts of the Philippines identified as appropriate to the science learning area. The science curriculum recognizes the place of science and technology in everyday human affairs. It integrates science and technology in the social, economic, personal, and ethical aspects of life. The science curriculum promotes a strong link between science and technology, including indigenous technology, thus preserving our country's cultural heritage.

Science concepts and science processes are intertwined through the learning competencies in the Science G3 to G10 curriculum. A learner-centered and inquiry-based approach facilitates the acquisition of science concepts. Organizing the curriculum around situations and problems that challenge and stir up learners' curiosity motivates them to learn and appreciate science as relevant and useful. Rather than relying solely on textbooks, a variety of hands-on, minds-on, and hearts-on activities are advocated to develop learners' interest and lead them to becoming active learners to acquire deep knowledge for applying 21st Century Skills.

The Science curriculum emphasizes the use of evidence in constructing explanations and providing opportunities for collaboration, innovation, creative scientific exploration, and engineering design.

Concepts and skills in the learning domains are not taught in isolation, but rather in the context of important ideas in Science with increasing levels of complexity from one grade level to another in developmental progression, thus paving the way to a deeper understanding of core concepts. The integration across science topics and other disciplines will lead to a meaningful understanding of interrelated concepts and their applications in real-life situations.

Assessment is an integral part of teaching and learning. The curriculum is designed to progressively introduce science concepts and skills and build towards learning more conceptually complex content. For that reason, it is crucial that the prior experiences, knowledge and understanding of learners are considered and assessed in formative ways. Doing so ensures that an accessible and engaging level of teaching and learning is offered to learners, hence maximizing the effectiveness of instruction (Vygotsky, 1978). Regular monitoring will ensure the effectiveness of the implementation of the Science curriculum and its responsiveness to the needs of the learner and the demands of the highly globalized community.

I. Key Stage Standards

Key Stage 1 Standard

At the end of Grade 3, the learners acquire healthy habits and curiosity about self and their environment using basic process skills of observing, communicating, comparing, classifying, measuring, inferring, and predicting. This curiosity will help learners value science as an important tool in helping them continue to explore their natural and physical environment. This also includes developing scientific knowledge or concepts.

The specific objectives of Key Stage 1 are to ensure that the learners:

a. understand the properties of objects around them;
b. describe the basic needs of living things;
c. demonstrate and practice basic science process skills to investigate scientifically; and
d. exhibit curiosity and appreciation of the natural world.

Key Stage 2 Standard

At the end of Grade 6, the learners have the essential skills of scientific inquiry – designing simple investigations, using appropriate procedures and tools to gather evidence, observing patterns, determining relationships, drawing conclusions based on evidence, and communicating ideas in varied ways to make meaning of the observations and/or changes that occur in the environment. The content and skills learned will be applied to maintain good health, ensure the protection and improvement of the environment, and practice safety measures in daily activities.

The specific objectives of Key Stage 2 are to ensure that the learners:

a. acquire knowledge and skills necessary to explain natural phenomena;
b. understand and recall science concepts and connect them with new information;
c. conduct investigations safely using appropriate equipment; and
d. communicate scientific observations and ideas accurately.

Key Stage 3 Standard

At the end of Grade 10, the learners demonstrate scientific, environmental, and technological and engineering literacies that would lead to rational choices on issues confronting them. Having been exposed to scientific investigations related to real life, they recognize that the central feature of an investigation is that if one variable is changed, the effect of the change on another variable can be measured. The contexts of investigations can be problems at the local or national levels and can encourage learners to

communicate their findings to other people. The learners demonstrate understanding of science concepts and apply science inquiry skills in addressing real-world problems through scientific investigations.

The specific objectives of Key Stage 3 are to ensure that the learners:

a. apply science concepts in designing scientific investigations and/or possible solutions to real-world problems;
b. evaluate scientific evidence in drawing interpretations and conclusions;
c. exhibit critical and analytical thinking in making decisions in scientific contexts; and
d. demonstrate desirable attitudes and skills in conducting scientific investigations.

II. Grade Level Standards

Kindergarten – Grade 2

The grade-level standards for Kindergarten, Grade 1, and Grade 2 form part of other curricula, including the English curriculum and the Mathematics curriculum. The content, including learning competencies for these grades, is not included in the Science curriculum; however, the content of other curricula has been used to develop the Science curriculum. The use of the Science curriculum should be built on and incorporate the content of other curricula, especially in use with Grade 3 learners, where understanding of expected prior learning is essential.

Grade 3

At the end of Grade 3, learners demonstrate simple science process skills of observing, predicting, and measuring to explore common local materials, their physical properties, and how they have been used over hundreds of years. They locate and describe non-living things that produce useful materials. They observe, describe, and measure living and non-living things in their local environment. They describe the basic needs of living things and explain how their body parts allow them to carry out their daily activities. They recognize the need to protect the environment to ensure that the basic needs of living things can be met.

Learners use everyday language to explore, describe, and make suggestions about the simple movements of objects. They learn through guided activities to make safe and careful observations of natural objects in the sky and demonstrate scientific ways of recording observations to reveal patterns in nature. Learners identify and explore sources of light and sound in their local environment and suggest how to use them safely in their lives. They apply their curiosity in the world around them and their creativity to propose solutions to simple challenges. Learners demonstrate safe handling procedures in using equipment and materials.

Grade 4

At the end of Grade 4, learners describe the chemical properties of materials and that changes to them are sometimes harmful. They identify that plants and animals have systems whose function is to keep them alive. They observe, describe, and create representations to show how living things interact with their habitat, survive, and reproduce. They use diagrams to show the feeding relationship among different organisms.

Learners use simple equipment to identify types of soil that hold water and support plant growth. Learners use simple equipment and processes to measure and record data about movement and describe and predict how things around them move. They describe the concepts of speed and force. They recognize that science processes are used to gain deeper understanding about the properties of magnets, light, sound, and heat. Learners apply their developing observation skills and objectivity to identify where energy is evident in their local communities and how it is used by people. They use instruments and secondary sources to measure and describe the characteristics of weather and use the information to make predictions. Learners demonstrate appreciation for the dangers of extreme weather events and use safe practice to protect themselves. Learners use personal observations and reliable secondary information sources to describe the sun and explain its importance to life on Earth. They exhibit objectivity and open-mindedness in gathering information related to environmental issues and concerns in the community.

Grade 5

At the end of Grade 5, learners identify matter as having mass and taking up space and existing in three states based on the properties of shape and volume. They identify that heat is involved in changes of state. They plan and carry out a simple scientific investigation following appropriate steps and identifying appropriate equipment. Learners describe and create models of the body systems that represent how humans grow, develop, and reproduce. They use tables to group living things as plants, animals, or microorganisms. They use skills of observing, predicting, measuring, and recording to plan and carry out a simple activity to compare the life cycles of plants and animals. They plan and carry out valid and reliable scientific investigations to explore frictional forces by identifying and controlling variables. They observe and describe basic features of static electricity and electric current and explain and recognize applications of forces and electrical energy in the home and community.

Learners explain the role of the water cycle in changing landforms and earth materials. They explain the causes and impacts of extreme weather and identify appropriate and safe ways to respond to such events. They recognize the scale of space and describe the features of the solar system. They use models to communicate significant relationships and movements. They demonstrate curiosity and creativity in communicating information about earth processes to other people. Learners use objectivity and

measurement to carry out scientific investigations using fair tests and multiple trials to explore how forces influence the movement of familiar objects and predict how gravity affects objects on Earth.

Grade 6

At the end of Grade 6, learners describe the benefits of various separation techniques and demonstrate skills through the use of equipment. They use diagrams and flowcharts to describe changes of state. They use the words reversible and irreversible to describe changes to materials. They identify mixtures such as solutions and give examples such as mixture. They recognize and apply their understanding of the features of a fair test. Learners describe the different ways that plants reproduce and plan a simple scientific investigation to determine which method works best in a given habitat. They describe that vertebrates are animals with a backbone and that invertebrates do not have a backbone. They design and produce an example of a food web that identifies the role of consumers, producers, scavengers, and decomposers. They identify the technical terms biotic and abiotic as referring to living and non-living things.

Learners carry out investigations to observe patterns and systems scientifically. They support their observations and conclusions to explain occurrences and concepts using technical scientific language. They use critical thinking skills and creativity to make models and other devices to communicate their understanding to other people.

Learners describe that volcanoes can have unexpected and severe impacts on communities and that the uncertainty and impacts of unpredicted eruptions can be offset by understanding and following alerts from authorities. Learners explain that the weather patterns that produce seasons are largely predictable, and use models to explain natural processes and timing, such as the changes of season. Learners identify that scientific models are valuable in explaining other observations of patterns in nature, such as the apparent movement of celestial objects across the sky. They exhibit respect for cultures and interpretations of natural phenomena by indigenous people over generations and respect explanations of phenomena using scientific inquiry and objectivity.

Grade 7

At the end of Grade 7, learners use models to describe the Particle theory of matter. They use diagrams and illustrations to explain the motion and arrangement of particles during changes of state. They explain the role of solute and solvent in solutions and the factors that affect solubility. They demonstrate skills to plan and conduct a scientific investigation making accurate measurements and using standard units. Learners describe the parts and functions of a compound microscope and use this to identify cell structure. They describe the cell as the basic unit of life and that some organisms are unicellular and some multicellular. They explain that there are two types of cell division, and that reproduction can occur through sexual or asexual

processes. They use diagrams to make connections between organisms and their environment at various levels of organization. They explain the process of energy transfer through trophic levels in food chains.

Learners use systems to analyze and explain natural phenomena and explain the dynamics of faults and earthquakes. They identify and assess the earthquake risks for their local communities using authentic and reliable secondary data. They use national and local disaster awareness and risk reduction management plans to identify and explain to others what to do in the event of an earthquake and/or tsunami. Learners explain the cause and effects of secondary impacts that some coastal communities may experience should a tsunami be produced by either a local or distant earthquake. Learners identify and explain how Solar energy influences the atmosphere and weather systems of the Earth and that these are the dominant processes that influence the climate of the country.

Learners employ scientific techniques, concepts, and models to investigate forces and motion, and describe their findings using scientific language, force diagrams, and distance-time graphs. They use their curiosity, knowledge and understanding, and skills to propose solutions to problems related to motion and energy. They use scientific investigations to describe the properties of heat energy. They apply their knowledge and problem-solving skills in everyday situations and explore how modern technologies may be used to overcome current global energy concerns.

Grade 8

At the end of Grade 8, learners apply knowledge and understanding of acceleration to everyday situations involving motion. They represent and interpret acceleration in distance-time, and velocity-time graphs to make predictions about the movement of objects. Learners link motion to kinetic energy and potential energy and explain transformations between them using everyday examples. Learners relate understanding of kinetic energy and potential energy to an appreciation of the hydroelectric resources of the country which generates electricity for use in homes, communities, and industries. They use scientific investigations to explore the properties of light and apply their learning to solving problems in everyday situations. Learners use models, flow charts, and diagrams to explain how body systems work together for the growth and survival of an organism. They represent patterns of inheritance and predict simple ratios of offspring. They explain that the classification of living things shows the diversity and the unity of living things. They describe the processes of respiration and photosynthesis, and plan and record a scientific investigation to verify the raw materials needed. They use flow charts and diagrams to explain the cycles in nature.

Learners describe the large-scale features of the 'blue planet' Earth and relate those features to the geological characteristics of the upper crustal layers of the Earth. They identify and describe the nature and impact of volcanic activity in building new crust and identify that these crust forming processes account for patterns and changes in the distribution of volcanoes, earthquakes,

and mountain chains that have occurred over time. Learners identify the relationships between landforms and oceans to explain the formation and impacts of typhoons. Learners describe the structure of the atom and how our understandings have changed over time. They draw models of the atom and use tables to identify the properties of subatomic particles. They explain that elements and compounds are pure substances. They identify elements, their symbols, their valence electrons, their positions in groups and periods on the periodic table. They design and/or create timelines or documentaries as interesting learning tools.

Grade 9

At the end of Grade 9, learners describe that the transmission of traits is determined by DNA, genes, and chromosomes and explain that high levels of diversity help to maintain stability of an ecosystem. They identify critically endangered plants and animals of the Philippines and strategies to protect and conserve them. They describe features of typical Philippine ecosystems and conduct a survey to explore possibilities to minimize the impact of human activities. Learners carry out a valid and reliable scientific investigation, showing the formation of a new substance. They demonstrate an understanding of the significance of valence and identify bonds as ionic, covalent, or metallic. They recognize the symbols of common elements and the formula for common compounds. They describe the properties of ionic, covalent, and metallic substances. They demonstrate critical and creative thinking in producing a learning tool about the role of bonds.

Learners exhibit skills in gathering information from secondary sources and identify the location and geological setting of the Philippines to explain its unique landforms and dynamic geologic activity in a global context. They recognize the size and scale of the Earth and describe evidence for a dynamic Earth. Learners demonstrate curiosity and open-mindedness to evaluate theories of the formation of the Solar System. They describe modern scientific processes and technologies used by scientists to investigate the nature and evolution of the Solar System. Learners demonstrate a practical understanding of Newton's three laws of motion and explain everyday application of Newton's laws. Learners explain the features of electricity and electrical circuitry in homes. Learners gather information from secondary sources to describe the nature and features of frequencies across the electromagnetic spectrum and identify practical applications and detrimental effects that electromagnetic radiation can have on living things.

Grade 10

At the end of Grade 10, learners describe and explain the geologically dynamic nature of the Philippine archipelago in relation to its plate tectonic setting, and use models to explain the earth structures, movements, and natural events that occur. They explain mechanisms that have contributed to the current distributions of continents and make predictions about changes that can be expected in the future. Learners describe rapid changes that are occurring in local and global climate patterns and propose solutions to address these changes. Learners describe qualitatively the factors that affect the trajectory of projectiles. They

distinguish different types of collisions and describe the impacts on the motion of objects. They carry out investigations using models to identify relationships that affect the motion of objects and apply their understanding to real-life situations. Learners gather information from secondary sources to identify, describe, and explain how science impacts human activities and the environment.

Learners explain that there are different indicators for classifying substances as acids, bases, or salts. They describe the identifying factors for a chemical reaction as well as the important types of chemical reactions. They explain how some important chemical reactions impact the natural and built environments. They write balanced chemical equations using formula and apply the principles of conservation of mass. They explain factors that affect the rate of a reaction and that some reactions are exothermic, and others are endothermic. They demonstrate the knowledge and the skills needed to plan and conduct valid and reliable scientific investigations and record them appropriately. Learners describe homeostasis as a process that allows an organism to maintain stability. They describe and discuss that natural selection is the driving mechanism of evolutionary change. They explain the meaning of the term biotechnology and debate the societal, environmental, and ethical implications of utilizing biotechnological products and methods. They discuss the factors that limit the ecosystem's carrying capacity and the role of population growth.

For the operational purposes of curriculum implementation in schools, the four domains in the Science curriculum have been assigned in quarters as shown below, with Grades 3 to 6 in the elementary school and Grades 7 to 10 in the junior high school.

SEQUENCE OF DOMAIN PER QUARTER

	Elementary				Junior High School			
	Grade 3	**Grade 4**	**Grade 5**	**Grade 6**	**Grade 7**	**Grade 8**	**Grade 9**	**Grade 10**
First Quarter	Materials	Materials	Materials	Materials	Science of Materials	Life Science	Force, Motion, and Energy	Earth and Space Science
Second Quarter	Living Things	Living Things	Living Things	Living Things	Life Science	Science of Materials	Earth and Space Science	Force, Motion, and Energy
Third Quarter	Force, Motion, and Energy	Force, Motion, and Energy	Force, Motion, and Energy	Force, Motion, and Energy	Force, Motion, and Energy	Earth and Space Science	Life Science	Science of Materials
Fourth Quarter	Earth and Space	Earth and Space	Earth and Space	Earth and Space	Earth and Space Science	Force, Motion, and Energy	Science of Materials	Life Science

SCIENCE CURRICULUM GUIDE

GRADE 3 – QUARTER 1: MATERIALS

Content	**Content Standards** *Learners learn that:*	**Learning Competency** *The learners…*
1. Science in our daily life 2. Science processes 3. Materials and their uses	1. Science is important in understanding how the natural world works. 2. Using science process skills, simple science equipment, and participating in guided activities leads to better understanding of science. 3. Physical properties of materials determine their use.	1. identify objects, activities, or natural events observed in their local environment that can be explained by science; 2. participate in guided science activities by asking questions and tinkering with materials; 3. describe the uses of various science equipment and materials used in simple activities, such as a ruler, hand lens, scissors, balloons, modeling clay, and cardboard; 4. describe different science process skills used in performing simple science activities, such as observing, predicting, and measuring using units such as millimeter, centimeter, and meter; 5. describe the physical properties of solid materials, such as hard, shiny, or stretchable; 6. explain that changes in materials can be harmful to living and non-living things in the environment, such as trash disposal, and burning household materials; 7. demonstrate proper handling and disposal of materials according to their properties, such as reusing objects, disposing of excess oil into garbage, and recycling paper, plastic or glass; 8. describe how changes in solid materials make them useful, such as when they are shaped, pressed, hammered, joined, or cut; and 9. identify the properties and uses of metals used by the local community such as iron, gold, silver, and copper.
Performance Standard *By the end of the Quarter, learners* demonstrate simple science processes to explore common local materials, their physical properties and uses. They participate in guided science activities including simple measurements using units, such as millimeters, centimeters, and meters. They demonstrate safe handling procedures to use equipment and materials.		
Suggested Performance Task Design a product out of recyclable materials that would be useful in everyday life, such as a vase, containers, clay pot, cardboard objects, recycled plastic clothes/hats, straw bags, and objects made out of aluminum or steel cans.		

GRADE 3 - QUARTER 2: LIVING THINGS

Content	**Content Standards** *Learners learn that:*	**Learning Competency** *The learners…*
1. Guided science activities using process skills 2. Living and non-living things 3. Characteristics of living things 4. Basic needs of living things	1. Using science process skills, simple pieces of science equipment, and participating in guided activities leads to a better understanding of science. 2. Characteristics of growth, response and reproduction identify living things. 3. Body parts of plants and animals enable them to live and grow. 4. All living things have the same basic needs that need to be met by their environment.	1. use the skills of observing, predicting, and measuring in performing simple guided science activities; 2. observe and describe the difference between living and non-living things and give examples of each that can be found in the local environment; 3. describe the characteristics of living things: they grow, respond, and reproduce; 4. observe and describe the outer body parts of animals, such as head, legs or wings, and identify their role to move and to gather food; 5. observe the outer parts of plants, such as leaves, roots, and stems and identify their role to get water and nutrients from the soil; 6. identify the basic needs of all living things, such as air, food, water, and shelter; 7. observe examples and explain how living things depend on one another and on the environment to meet their basic needs; and 8. recognize that there is a need to protect and conserve the environment for living things to survive.

Performance Standard

By the end of the Quarter, learners describe the basic needs of living things. They explain how the body parts allow them to carry out their daily activities. They recognize the need to protect the environment to ensure that the basic needs of living things can be met. They observe and measure living and non-living things in their local environment. They make models and collages of living things and their basic needs.

Suggested Performance Tasks

A. Make (create) a model of a chosen living thing using readily available recyclable or indigenous materials.
B. Make a collage of the basic needs of a chosen living thing using readily available recyclable plant or animal materials.

GRADE 3 – QUARTER 3: FORCE, MOTION, AND ENERGY

Content	**Content Standards** *The learners learn that:*	**Learning Competencies** *The learners…*
1. Exploring and Questioning 2. Moving objects 3. Light and sound	1. Objects that change position encounter a push or a pull. 2. Using science processes and curiosity is important in understanding how objects move. 3. Light and sound are examples of energy that affect daily life. 4. People can modify light and sound to make them useful.	1. explore and demonstrate different ways to make objects move by natural causes, such as wind and water, or by people, such as pushing, pulling, rolling, and carrying; 2. explore and describe things that affect the movement of objects, including size, shape, heaviness, material, and surface texture; 3. measure and describe changes in the position of people or objects in relation to their original position, such as moving closer, farther, left, or right; 4. explore and describe how sound is made and transferred in everyday situations, such as the ringing of a bell or the hearing of noises; 5. describe sources of light and their use in everyday situations; 6. participate in guided science activities to explore and describe sources of light, how it behaves or can be changed, and its uses in everyday situations; 7. explain how light and sound can be harmful to people and make suggestions on how to protect oneself from them; and 8. participate in guided activities to explore and describe some ways to use movement, sound, and light to send information between two people.

Performance Standard

By the end of the Quarter, learners use everyday language to explore, describe, and make suggestions about simple movements of objects. They identify and explore sources of light and sound in their local environment and suggest how to use them safely in their lives. Learners apply their curiosity in the world around them and their creativity to propose solutions to simple challenges.

Suggested Performance Tasks

A. Choose a children's storybook and identify scenes where movement, light, or sound is used. Describe and show to the class how movement, light or sound is being used or changed in the story to make it real or interesting.

B. Design and make a working model that can be used to send a simple message to another learner who is 5 meters away. Your device should send a message using either *movement*, light, or *sound*. Show the class your finished invention and be ready to describe how it works and how you have used *movement*, *light* or *sound* to carry or transfer the message. Indicate any problems you had and how you could improve your design.

GRADE 3 – QUARTER 4: EARTH AND SPACE

Content	**Content Standards** *The learners learn that:*	**Learning Competencies** *The learners…*
1. The Non-Living environment 2. Patterns in the weather 3. Celestial objects	1. Non-living things found in the environment are the sources of useful products. 2. Weather affects our daily activities and may pose threats to health and safety. 3. The natural objects in the sky affect the activities of people.	1. participate in guided activities to locate and describe different types of non-living things found in and around their school, such as rocks, soil, water, air, metals, clouds, rain, and sunlight; 2. identify some useful things that people have made from non-living materials and describe what natural materials have been used to make the items; 3. recognize that the non-living materials that make up the environment are referred to as 'earth materials'; 4. observe and record changes in the weather during a day or over some days and describe the different types and patterns of weather that occur in the local area; 5. describe how changes in the weather can affect daily activities and explain how some types of weather can be dangerous for people; 6. participate in guided activities to carefully observe and describe the natural objects commonly seen in the sky during daytime and nighttime, including the Sun, the Moon, planets, and stars; 7. participate in guided activities to explore and record how and when the Sun, the Moon, planets, and stars can be seen moving across the sky; 8. explain how natural objects in the sky affect activities of people; and 9. describe safety measures that people can use to avoid the harmful effects of the Sun's light.

Performance Standard

By the end of the Quarter, learners explore their immediate neighborhood to locate and describe useful non-living things that can be used by people to produce useful materials and objects. They learn through guided activities to make safe and careful observations of natural objects in the sky and demonstrate scientific ways of recording observations to reveal patterns in nature.

Suggested Performance Task

A. Express ideas creatively through artwork, poems, and songs, about health and safety measures to avoid the harmful effects of Sun's heat. Express ideas about safety measures during different weather conditions creatively.

B. Record, organize, and present observations on the changes in the weather over a period of 5 to 7 days.

GRADE 4 – QUARTER 1: MATERIALS

Content	**Content Standards** *Learners learn that:*	**Learning Competency** *The learners…*
1. Science inventions 2. Materials and their uses 3. Gathering scientific information	1. Science inventions have brought about major changes to our daily lives. 2. Chemical properties of materials determine their uses. 3. Communication skills and open mindedness are needed in solving environmental issues.	1. use information from secondary sources to identify a famous Filipino and/or foreign scientist and their invention/s; 2. use information from the home or the local community to identify a science invention and explain its impact on their everyday life; 3. describe the chemical properties of materials, such as they can be burnt, react with other materials, or are degradable or biodegradable; 4. describe changes in properties of materials when exposed to certain changes in temperature, such as changes when wood or coal are burned; 5. demonstrate ways to minimize harmful changes in materials, such as restriction of burning of waste materials, and care in handling reactive materials; 6. identify issues and concerns in the local community and how they could be addressed by science, such as the treatment of waste; and 7. apply science process skills and attitudes in conducting a guided survey about environmental issues and concerns including grouping and classifying, communicating, and open mindedness.

Performance Standard

By the end of the Quarter, learners describe chemical properties of materials and changes to them. They demonstrate an understanding that science processes can solve everyday problems and use creativity and determination to provide examples. They exhibit objectivity and open-mindedness in gathering information related to environmental issues and concerns in the community.

Suggested Performance Task/s

A. Create a simple model, illustration or write a story about a favorite science invention that you use in everyday life.

B. Plan and produce a sample of useful fertilizer from household waste.

GRADE 4 – QUARTER 2: LIVING THINGS

Content	**Content Standards** *Learners learn that:*	**Learning Competency** *The learners…*
1. Systems in plants and animals 2. Plants and animals and their habitats 3. Life cycles of animals 4. Animals and the food they eat 5. Food chains	1. Animals and plants have systems that function to keep them alive. 2. Animals and plants live in habitats that meet their basic needs. 3. Animals have life cycles that include development and reproduction. 4. Animals can be grouped according to the food that they eat. 5. Food chains show a series of living things that depend on each other for food. 6. Using drawings, tables, and flowcharts is an important skill in learning science concepts and in learning about science processes.	1. describe in simple terms how the following human body systems work: muscular, skeletal, digestive, circulatory, and respiratory; 2. observe the root and shoot system in plants and describe why they are important; 3. use a drawing or diagram to classify some Philippine animals and plants, based on their habitat: some live on land (terrestrial), live in water (aquatic) or fly in the air (aerial); 4. make a list or draw up a table with examples of animals and plants in a particular habitat, such as a garden, rice field, seashore, and mangrove swamp; 5. use flow charts to compare the different stages in the life cycle of animals, such as a butterfly, frog, chicken, and human; 6. use information from secondary sources to group animals according to the food they eat. Some are: a. plant eaters (herbivores), b. meat eaters (carnivores), and c. plant and meat-eaters (omnivores); and 7. draw a simple food chain using living things from the Philippines and label them as herbivores, carnivores, and omnivores.
Performance Standard *By the end of the Quarter, learners* identify that plants and animals have systems whose function is to keep them alive. They observe, describe, and create representations to show how living things interact with their habitat, survive, and reproduce in specific environments. They use flowcharts to show the feeding relationship among different organisms within a given environment.		
Suggested Performance Task Create a diorama, terrarium, or an aquarium to illustrate how some plants or animals live on land or in water.		

GRADE 4 – QUARTER 3: FORCE, MOTION, AND ENERGY

Content	**Content Standards** *The learners learn that:*	**Learning Competencies** *The learners…*
1. Forces and movement 2. Observing, measuring, and predicting 3. Magnets 4. Sound, light, and heat energy	1. Science processes help in observing and predicting how things move. 2. Pushes and pulls can change the position and shape of objects. 3. Gathering scientific information helps explain the behavior of objects and materials. 4. Magnets affect some objects and materials without touching them. 5. Energy is present whenever there is movement, sound, light, or heat.	1. participate in guided activities to discover and predict how rigid and soft objects can be moved and/or changed in shape; 2. measure accurately the distance and time when things move using simple equipment; 3. identify that how far an object moves in a given time is called speed; 4. construct and label simple graphs of different speeds including stationary and uniform speeds, both fast and slow; 5. participate in guided activities to demonstrate that pushes and pulls can be used to change the speed and direction of an object including making it go faster, turn it to a different direction, slow it down, and stop it; 6. determine how forces can change the shape of objects such as when they are pushed, pulled, stretched, bent, twisted, or squeezed; 7. carry out guided investigations to identify the properties of magnets, including how they affect other magnets and objects made of different materials; 8. identify examples of how objects can affect other objects even when they are not in contact with each other, such as magnets attracting other objects, light from the sun affecting our eyes, and skin, and loud noises hurting our ears; 9. identify that energy is something that can cause change including light, sound, and heat energy; and 10. observe and identify sources and uses of light, sound, and heat energy at school, at home and in the local community.

Performance Standard

By the end of the Quarter, learners use simple equipment and processes to measure and record data related to movement and describe and predict the way things around them move using more scientifically technical language and concepts, such as speed and force. They demonstrate an understanding that science processes are used to gain deeper understanding about forces and energy that cannot be seen directly, including the properties of magnet, light, sound, and heat. Learners apply their observation skills and objectivity to identify where energy is evident in their local communities and how it is used by people.

Suggested Performance Tasks

A. Develop a poster to show some sources and uses of heat energy in your home or neighborhood.
B. Collaborate in a small group to develop a safety guide that explains how to stay safe around intense light and sound. Include information on ways to protect eyes and ears and explain how the suggested ways could provide protection.

GRADE 4 – QUARTER 4: EARTH AND SPACE

Content	**Content Standards** *The learners learn that:*	**Learning Competencies** *The learners…*
1. Soils 2. Characteristics of weather 3. Characteristics of the Sun	1. Soil and water resources are needed by plants and animals to live and grow. 2. Characteristics of the weather can be observed and measured. 3. The Sun is a ball of hot gases about 100 times the size of Earth, which radiates light energy needed by living things.	1. participate in guided activities using simple equipment to compare different types of soil including sandy, clay, silt, and loam, including comparing the ability of the soils to hold water; 2. recognize that water is one of the basic needs of plants and animals; 3. participate in a guided investigation to identify the effect of different types of soil on the growth of plants; 4. identify some of the basic characteristics used to describe the weather, such as air temperature, air pressure, wind speed, wind direction, humidity, rain, and cloud cover; 5. use weather instruments to measure and record some of the characteristics of weather during a school day; 6. examine a local weather chart to make simple interpretations about the local weather and how it might change and describe and practice safety precautions to use during poor or extreme weather conditions; 7. describe some of the overall characteristics of the Sun, such as its composition, its size, and the main energy it radiates; 8. describe the changes in the direction and length of shadows from a shadow stick and use the information to infer why the Sun changes position during a day; and 9. make suggestions about the importance of the Sun to living things for a group or class discussion and confirm and record ideas by referring to trustworthy secondary sources of information.
Performance Standard *By the end of the Quarter, learners* use simple equipment to identify how types of soil hold water to support the growth of plants. They use instruments and secondary sources to measure and describe the characteristics of weather and use the information to make predictions about weather patterns in their local area. They demonstrate appreciation for the dangers of extreme weather events and use safe practice to protect themselves if they are caught in bad weather. Learners use personal observations and reliable secondary information sources to describe the Sun and explain its importance to life on Earth.		
Suggested Performance Task Construct a sundial that can indicate the time of the day.		

GRADE 5 – QUARTER 1: MATERIALS

Content	**Content Standards** *The learners learn that:*	**Learning Competency** *The learners…*
1. Matter in daily life 2. Matter and the three states 3. Scientific investigation	1. Scientists identify three states of matter based on shape and volume. 2. Temperature can cause changes of state. 3. Planned simple scientific investigations require several steps and processes. 4. An understanding of matter can be applied to solve real world problems.	1. describe matter as anything that has mass and takes up space; 2. identify that matter has (exists in) three states called solids, liquids, and gases; 3. describe the properties of solids, liquids, and gases in terms of shape and volume: a. solids: definite shape and volume b. liquids: no definite shape; definite volume c. gases: no definite shape or volume; 4. identify objects at home and in the classroom as solid, liquid or gas; 5. use measuring cylinders or beakers to measure volume using units, such as milliliters (mL), and liters (L); 6. describe how changes in temperature cause matter to change in state, such as solid to liquid to gas; 7. describe the steps of a simple science investigation: a. What is the problem? b. What materials do you need? c. What do you need to do? d. What have you found out/learned?; 8. identify and appropriately use units in simple science activities, such as milligrams (mg,) grams (g), kilograms (kg), and degrees centigrade (^{o}C); and 9. plan simple scientific investigations in answering questions, such as “Do gases (like air) or liquids (like water) have mass?”, using appropriate simple science equipment, such as a balance, and a thermometer, with appropriate units.
Performance Standard *By the end of the Quarter, learners* describe three states of matter based on properties of shape and volume and identify that heat is involved in changes of state. They plan a simple scientific investigation following appropriate steps and using units such as milliliters, liters, grams, kilograms, and degrees Celsius for measuring.		
Suggested Performance Task Plan and carry out a scientific investigation on a simple everyday problem such as “do gases have weight”?		

GRADE 5 – QUARTER 2: LIVING THINGS

Content	**Content Standards** *Learners learn that:*	**Learning Competency** *The learners…*
1. Body systems in animals 2. Plants, animals, and microorganisms 3. Life cycles of living things 4. Specialized structures in plants.	1. Animals have systems that help them grow, respond, and reproduce. 2. Living things can be grouped as plants, animals, and microorganisms based on their characteristics. 3. The life cycles of plants and animals allow them to survive and reproduce. 4. Plants have specialized structures that help them overcome unfavorable conditions.	1. identify from pictures and labeled diagrams the parts of the digestive system as mouth, gullet, stomach, small intestine, and large intestine, and describe how they work; 2. identify from pictures and diagrams the parts of the respiratory system as the nose, windpipe, and lungs, and describe how they work; 3. identify from pictures and labeled diagrams the parts of the female reproductive system as ovaries, uterus, and vagina and those of the male reproductive system as the prostate, testis, and penis and describe how they work; 4. use a table to show how living things can be classified into groups based on similar characteristics: a. plants including flowering and non-flowering; b. animals including mammals, reptiles, insects, birds, fish, amphibians, and reptiles; c. microorganisms including fungi and bacteria; 5. identify which groups of animals reproduce by giving birth to live young, such as mammals, and which reproduce by laying eggs, such as birds and reptiles; 6. compare the life cycles of mammals from birth to adulthood, birds from egg to a mature organism, and plants from seed to a young plant, and then to a mature plant; 7. describe the purpose of specialized structures in plants, such as rhizomes, tubers, thorns, bulbs, and aerial roots; 8. explain how some plants have adapted to unfavorable conditions in the environment, such as lack of rain or floods; and 9. use information from secondary sources to describe examples of how some animals have changed to better suit their environment, such as mimicry or camouflage.

Performance Standard

By the end of the Quarter, learners describe and create models of the body systems whose function is to help humans grow, develop, and reproduce. They use tables to group living things as plants, animals, or microorganisms. They use skills of observation, predicting, measuring, and recording to plan and carry out a simple activity to observe the life cycle of a plant and compare it to the life cycles of animals.

Suggested Performance Tasks

A. Make a model using local recyclable materials of one of the human body systems to show how it works.
B. Set up a simple science activity to observe and record the changes in plants as they grow from seed to maturity.

GRADE 5 – QUARTER 3: FORCE, MOTION, AND ENERGY

Content	Content Standards *The learners learn that:*	Learning Competencies *The learners…*
1. Contact and non-contact forces 2. Investigating scientifically 3. Friction 4. Gravity 5. Static electricity 6. Conductors, insulators, and simple circuits	1. Science investigations provide evidence to support predictions and explanations. 2. Forces are pushes or pulls that act in a specific direction. 3. Friction is an everyday force created by two surfaces interacting. 4. Gravity causes all objects to fall towards the ground. 5. Static electricity occurs when some materials rub on other materials causing charges to jump. 6. Electric current requires a pathway for charges to flow.	1. carry out simple investigations to demonstrate that contact forces cause objects to move in the same direction as the direction that the force is applied; 2. plan and carry out a scientific investigation to determine the effect of different surfaces on the size of frictional forces; 3. demonstrate how friction can produce heat and investigate ways of reducing and increasing friction; 4. identify gravity as a non-contact force that affects the behaviors of materials and objects on Earth in predictable ways; 5. predict and explain whether heavier objects will fall faster than lighter objects due to the force of gravity; 6. observe and describe the effects of gravity to the motion of an object; 7. investigate the effects of static electricity using common materials, such as a comb, plastic and glass rods, and balloons; 8. assemble and draw a simple circuit using batteries, wires, switch, and bulb and/or toy motor or buzzer; 9. design and construct a simple electrical circuit to identify what materials will conduct electricity and use it to identify materials from the environment that will and will not conduct electricity; and 10. make a simple electromagnet and observe and record its properties.

Performance Standard

By the end of the Quarter, learners use objectivity and measurement to carry out scientific investigations using fair tests and multiple trials to explore how forces influence the movement of familiar objects and extend their understanding to predict how gravity affects objects on Earth. They plan and carry out valid and reliable scientific investigations to explore frictional forces by identifying and controlling variables. They observe and describe basic features of static electricity and electric current through practical activities and use their understanding and interest to explain and show appreciation for some applications of forces and electrical energy in the home and community.

Suggested Performance Tasks

A. Develop a graphic organizer, such as a concept map or Venn diagram, to show the similarities and differences between contact forces and non-contact forces. Include examples of situations and materials that demonstrate contact and non-contact forces and suggest ways these could be used to improve everyday life in the community.

B. Set up an inclined plane for toy cars, and apply the concept of friction to stop the toy car as fast as possible after it moves past the inclined plane.

C. Develop a graphic organizer, such as a concept map or Venn diagram, to compare and contrast conductors and insulators of electricity. Include examples of materials that conduct and insulate and suggest ways that recycled materials could be used to develop better conductors and insulators.

GRADE 5 – QUARTER 4: EARTH AND SPACE

Content	**Content Standards** *The learners learn that:*	**Learning Competencies** *The learners…*
1. Landforms, rocks and minerals 2. Weathering and erosion 3. Using models 4. The Water Cycle 5. Weather disturbances 6. The Solar System	1. Landforms influence living and non-living components of the environment. 2. Rocks are composed of grains of minerals that break down to form soil. 3. Weathering and erosion shape the Earth's surface by breaking down and transporting rocks. 4. The Water Cycle includes processes of evaporation, precipitation and transportation. 5. Weather disturbances feature low pressure, strong winds, and storms. 6. The planets and moons vary in physical features and composition. 7. Phases of the Moon depend on its position relative to Earth and Sun.	1. identify local examples of natural landforms and bodies of water such as mountains, valleys, rivers, and coastlines, and describe how they influence non-living and living components of the environment; 2. explore the school grounds or the local area to observe or collect different types of rocks, describing their similarities and differences in terms of their features, such as texture, color, and grain crystal size; 3. classify common rocks from provided samples using a simple rock classification system, such as a dichotomous key; 4. explain how soil is formed from rocks and minerals; 5. demonstrate how erosion transports Earth materials; 6. explain the role of the water cycle in the environment; 7. construct a model to communicate some of the key processes in the water cycle; 8. describe some effects of weather disturbances that occur in or near the Philippines; 9. describe the weather conditions according to a Public Storm Warning Signal issued by the Philippine Atmospheric, Geological and Astronomical Services Administration (PAGASA); 10. describe typical weather conditions before, during and after a tropical cyclone; 11. describe the general structure of the solar system, identifying the names of the major celestial objects, their main features, and general composition; and; 12. make drawings or a simple model to show the motion of the Earth and Moon relative to the Sun to explain the phases of the moon that people see from Earth.

Performance Standard

By the end of the Quarter, learners relate changes in landforms and earth materials to processes and effects of the water cycle. They explain causes and impacts of extreme weather and identify appropriate and safe ways to respond to such events. They demonstrate curiosity as they make detailed observations guided by science classification systems and demonstrate creativity in communicating information about earth processes to other people. They show an appreciation of the scale of space in describing the features of the solar system and use models to communicate significant relationships and movements.

Suggested Performance Tasks

A. Create a video of a weather report or act out a TV weather broadcast segment explaining a weather disturbance.
B. Construct a scale model of the sun and the inner planets of the solar system showing the planet's relative sizes and distances from the sun.

GRADE 6 – QUARTER 1: MATERIALS

GRADE 6 FIRST QUARTER- Materials		
Content	**Content Standards** *Learners learn that:*	**Learning Competency** *The learners…*
1. Diagrams and flowcharts 2. Processes of changes of state 3. Physical and chemical change 4. Mixtures and separation techniques	1. Diagrams and flowcharts demonstrate processes involving heat energy and changes of state. 2. Changes in materials can be either reversible or irreversible. 3. Mixtures and the products of their separation techniques are very useful in our daily lives. 4. Scientific investigations need to satisfy the features of a fair test and use accurate and reliable measurements.	1. describe changes of state for solids, liquids, and gases as melting, evaporation, freezing, condensation using diagrams and flowcharts; 2. explain the role of heat energy in change of state processes; 3. explain why physical changes are reversible, and chemical changes are irreversible; 4. describe useful everyday examples of uniform and non-uniform mixtures, such as solutions and suspensions; 5. describe air as a mixture of oxygen, carbon dioxide, nitrogen, and water vapor; 6. demonstrate various techniques in separating mixtures, such as decantation, winnowing, scooping, picking, evaporation, filtering, sieving, and using magnets; 7. explain the benefits of each mixture separation technique in preparing useful products; 8. apply the features of a fair test: a. change one factor, b. measure one factor, and c. keep all other factors the same; and 9. recognize the features of a fair test and that scientific investigations also involve a) doing at least three trials, or use replication, and b) observing, measuring, and recording accurately.
Performance Standard *By the end of the Quarter, learners* demonstrate an understanding of the benefits of various separation techniques. They use diagrams and flowcharts to describe changes of state. They use the words reversible and irreversible to describe changes to materials. They demonstrate skills in the use of equipment. They recognize and apply their understanding of the features of a fair test.		
Suggested Performance Tasks A. Apply an appropriate separation technique to solve a local or household problem. B. Plan and conduct a simple scientific investigation involving a physical change, such as “Does sugar dissolve faster in hot or cold water?” Use your understanding of a fair test to answer the question.		

GRADE 6 – QUARTER 2: LIVING THINGS

Content	**Content Standards** *Learners learn that:*	**Learning Competency** *The learners…*
1. The circulatory system 2. Reproduction in plants 3. Vertebrates and invertebrates 4. Food webs 5. Interactions between living things 6. Biotic and abiotic factors in an ecosystem.	1. Animals have systems that help them grow, respond, and reproduce. 2. There are several modes of reproduction in plants. 3. To be valid and reliable, scientific investigations need to include fair tests and multiple trials. 4. Animals can be grouped as vertebrates or invertebrates based on their characteristics. 5. Producers, consumers, scavengers, and decomposers have important roles in food webs. 6. Interactions within an ecosystem can have important impacts on the living things within it.	1. identify from pictures and diagrams the parts of the circulatory system as heart, blood, and blood vessels, and describe how they work; 2. describe the different ways that plants reproduce, such as pollination, seed production, and plant propagation; 3. plan a simple scientific investigation that includes the features of a fair test, replication, and accurate measurement to determine which type of plant propagation, such as cutting, budding, layering, grafting, works best for garden plants; 4. describe the differences between animals with a backbone (vertebrates) and animals without backbones (invertebrates) by using common local examples of each group; 5. describe the roles of producers, consumers, scavengers, and decomposers in a food web; 6. use information from secondary sources to describe that living things interact with each other in the natural environment, such as through competition, or predation; 7. describe living things, such as animals and plants, as biotic factors and light, water, temperature, and soil type, as abiotic factors of an ecosystem; and 8. explain how interaction between living things and interactions between living and non-living things may bring good or harm to the living things involved.

Performance Standard

By the end of the Quarter, learners demonstrate an understanding of the different ways that plants reproduce. Plan a simple scientific investigation to determine which method works best in a given habitat. They describe and provide examples of vertebrates as animals with a backbone and invertebrates as animals that do not have a backbone. They design an example of a food web showing the role of consumers, producers, scavengers, and decomposers. They identify the technical terms biotic and abiotic as referring to living and non-living things.

Suggested Performance Tasks

A. Apply the features of a fair test to investigate how much water is needed to grow a common garden plant from a seed.
B. Select an appropriate medium to design an example of a food web in a local ecosystem.

GRADE 6 – QUARTER 3: FORCE, MOTION, AND ENERGY

Content	Content Standards *The learners learn that:*	Learning Competencies *The learners…*
1. Simple machines 2. Properties of water and sound waves 3. Longitudinal and Transverse waves	1. Simple machines allow people to change the direction and size of forces. 2. Waves transfer energy between source and receiver. 3. Science processes and concepts help solve everyday problems.	1. observe and describe examples and uses of simple machines found at home, at school, and in the community; 2. demonstrate through guided investigation the advantages and limitations of simple machines such as inclined planes, wedges, levers, and pulleys; 3. carry out fair tests to show how levers can be used to change the magnitude and direction of a force; 4. identify that waves carry energy from a source to a receiver; 5. carry out investigations with water waves in a ripple tank, a big tub of water or improvised ripple tank and observe and describe the features of the waves including their: a. shape, such as crests and troughs; b. size, such as width and height; and c. patterns of movement, such as how they bend, or reflect off walls; 6. research using secondary sources to identify how the properties of waves are described using scientific terms such as amplitude, frequency, wavelength, and velocity; 7. identify differences and similarities between longitudinal waves and transverse waves; 8. demonstrate using simple models how longitudinal waves and transverse waves carry energy; 9. identify some examples of longitudinal waves, and transverse waves; and 10. describe and explain how sound changes when the source or the receiver are moving.

Performance Standard

By the end of the Quarter, learners demonstrate objective inquiry by carrying out investigations to critically observe patterns and systems scientifically. They support their observations and conclusions using secondary sources to explain occurrences and concepts using technical scientific language. They use critical thinking skills and creativity to make models and other devices to communicate their understanding to other people.

Suggested Performance Tasks

A. Develop an information poster that aims at showing learners who are interested in music-related subjects to consider the benefits of studying science. The poster should use words, pictures or drawings and labelled diagrams to explain how musical instruments utilize the properties of sound waves. The poster may suggest ways that learners could use scientific processes to develop their musical techniques.

B. Design and propose or improve the design of a simple machine that can be used at home, in school, or in the community. Include the following details:
   1. Name and purpose of the simple machine;
   2. Description of how the simple machine works and its intended function;
   3. Materials needed for constructing the simple machine;
   4. Sketch or diagram illustrating the design and functionality of the proposed simple machine; and
   5. Explain how the proposed simple machine can be useful in the chosen setting (home, school, or community) and its potential benefits.

C. Utilize the concept of motion and gravity to write a creative story, poem, or any written art.

GRADE 6 – QUARTER 4: EARTH AND SPACE

Content	**Content Standards** *The learners learn that:*	**Learning Competencies** *The learners…*
1. Volcanic activity and safety 2. Seasons in the Philippines 3. Motions of the Earth 4. Constellations 5. Understanding stability and change	1. Volcanoes are vents from which molten rock from Earth's crust erupts onto the surface releasing pressure and gases. 2. The Philippine volcanoes can violently and unpredictably erupt lava, ash, and ballistic projectiles. 3. Weather and climate have predictable patterns throughout the year, which affect human activities. 4. The revolution and the rotation of the Earth demonstrate observable patterns. 5. Constellations are patterns of stars in the sky.	1. explain what volcanoes are and how they are formed; 2. use local information or other reliable sources to identify where the nearest active and inactive volcanoes are located and assess the risk of impacts from eruptions to their local community; 3. discuss the patterns of volcanic eruptions in the Philippines over the last 100 years with family and community members to assess and describe how predictable patterns of eruptions are; 4. identify and describe some of the materials formed during volcanic eruptions in the Philippines; 5. Interpret PHIVOLCS Volcano Monitoring (Alert Levels) to demonstrate what to do before, during, and after a volcanic eruption; 6. describe the different seasons in the Philippines and suggest activities that are appropriate for each season; 7. demonstrate the rotation of the Earth on its axis using a globe to explain day and night; 8. make a Sun-Earth-Moon system model to demonstrate and explain the observable effects of predictable patterns and events including: a. changes in seasons, b. changes observed in the patterns of visible star over a year, and c. solar and lunar eclipses; 9. explain why ancient human cultures relied on constellations to indicate directions and verify seasons; and 10. gather information from local indigenous community members or from reliable secondary sources to investigate ways that indigenous people of the Philippines represented and communicated understandings of: a. the predictability of solar and lunar eclipses, and b. patterns /interpretations in the night sky and their use for tracking time.

Performance Standard

By the end of the Quarter, learners appreciate that volcanoes can have unexpected and severe impacts on communities and that the uncertainty and impacts of unpredicted eruptions can be offset by understanding and following alerts from authorities. Learners appreciate weather patterns that produce seasons that are largely predictable, and they use models to scientifically understand and describe natural processes and timing that can be relied upon, such as the changes of season. Learners identify that scientific models are valuable in explaining other observations of patterns in nature, such as the apparent movement of celestial objects across the sky. They exhibit respect for cultures and interpretations of natural phenomena by indigenous people over generations and balance that with respect for explaining phenomena using scientific inquiry and objectivity.

Suggested Performance Tasks
A. Design and describe an evacuation plan for a house or school in the event of a nearby and intensifying volcanic eruption. Indicate planned actions to reach a safe place and outline the reasoning behind the planned actions.
B. Select a constellation that can be seen from the Philippines and describe its features. Explain its practical and cultural significance for Filipino people in the past and present.

GRADE 7 – QUARTER 1: SCIENCE OF MATERIALS

Content	**Content Standards** *Learners learn that:*	**Learning Competency** *The learners…*
1. Use of models 2. The Particle model and changes of state 3. Planning, following, and recording scientific investigations 4. Solutions, solubility, and concentration	1. Scientists use models to explain phenomena. 2. The particle model explains the properties of solids, liquids, and gases and the processes involved in changes of state. 3. Diagrams and flowcharts are very useful in demonstrating and explaining the motion and arrangement of particles during changes of state. 4. There are specific processes for planning, conducting, and recording scientific investigations. 5. The properties of solutions such as solubility and reaction to litmus determine their use.	1. recognize that scientists use models to explain phenomena that cannot be easily seen or detected; 2. describe the Particle Model of Matter as "All matter is made up of tiny particles with each pure substance having its own kind of particles."; 3. describe that particles are constantly in motion, have spaces between them, attract each other, and move faster as the temperature increases (or with the addition of heat); 4. use diagrams and illustrations to describe the arrangement, spacing, and relative motion of the particles in each of the three states (phases) of matter; 5. explain the changes of state in terms of particle arrangement and energy changes: a. solid → liquid → vapor, and b. vapor → liquid → solid; 6. follow appropriate steps of a scientific investigation which includes: a. Aim or problem, b. Materials and equipment, c. Method or procedures, d. Results including data, and e. Conclusion. 7. make accurate measurements using standard units for physical quantities and organize the collected data when carrying out a scientific investigation; 8. identify the role of the solute and solvent in a solution; 9. express quantitatively the amount of solute present in a given volume of solvent; 10. demonstrate how different factors affect the solubility of a solute in a given solvent, such as heat; 11. identify solutions, which can be found at home and in school and that react with litmus indicator, as acids, bases, and salts; and 12. demonstrate proper use and handling of science equipment.
Performance Standard *By the end of the Quarter, learners* recognize that scientists use models to describe the particle model of matter. They use diagrams and illustrations to explain the motion and arrangement of particles during changes of state. They demonstrate an understanding of the role of solute and solvent in solutions and the factors that affect solubility. They demonstrate skills to plan and conduct a scientific investigation making accurate measurements and using standard units.		
Suggested Performance Task Design and carry out an investigation to determine the amount of salt in a sample of seawater.		

GRADE 7 – QUARTER 2: LIFE SCIENCE

Content	**Content Standards** *Learners learn that:*	**Learning Competency** *The learners…*
1. Science equipment: the compound microscope 2. Plant and animal cells 3. Cellular reproduction 4. Levels of biological organization 5. Trophic levels and the transfer of energy	1. Familiarity and proper use of a compound microscope are essential to observe cells. 2. The organelles of plant and animal cells can be identified using a compound microscope. 3. Cells are the basic unit of life and mitosis, and meiosis are the basic forms of cell division. 4. Fertilization occurs when a male reproductive cell fuses with a female reproductive cell. 5. Sexual reproduction is the basis of heredity. 6. The level of biological organization provides a simple way of connecting the simplest part of the living world to the most complex. 7. Identifying trophic levels helps understand the transfer of energy from one organism to another as shown in a food pyramid.	1. identify the parts and functions, and demonstrate proper handling and storing of a compound microscope; 2. use proper techniques in observing and identifying the parts of a cell with a microscope such as the cell membrane, nucleus, cytoplasm, mitochondria, and chloroplasts; 3. recognize that some organisms consist of a single cell (unicellular) like in bacteria and some consist of many cells (multicellular) like in a human; 4. differentiate plant and animal cells based on their organelles; 5. recognize that cells reproduce through two types of cell division, mitosis and meiosis, and describe mitosis as cell division for growth and repair; 6. explain that genetic information is passed on to offspring from both parents by the process of meiosis and fertilization; 7. differentiate sexual from asexual reproduction in terms of: a) number of parents involved, and b) similarities of offspring to parents; 8. use a labelled diagram to describe the connections between the levels of biological organization to one another from cells to the biosphere; 9. describe the trophic levels of an organism as levels of energy in a food pyramid; and 10. use examples of food pyramids to describe the transfer of energy between organisms from one trophic level to another.

Performance Standard

By the end of the Quarter, learners demonstrate understanding of the parts and function of a compound microscope and use this to identify cell structure. They recognize that the cell is the basic unit of life and that some organisms are unicellular and some are multicellular. They explain that there are two types of cell division, and that reproduction can occur through sexual or asexual processes. They use diagrams to make connections between organisms and their environment at various levels of organization. They explain the process of energy transfer through trophic levels in food chains.

Suggested Performance Task

Create a visual representation, such as poster, model, or e-poster, explaining the trophic level in a chosen ecosystem.

GRADE 7 – QUARTER 3: FORCE, MOTION, AND ENERGY

GRADE 7 THIRD QUARTER - Force, Motion, and Energy		
Content	**Content Standards** *The learners learn that:*	**Learning Competencies** *The learners…*
1. Balanced and unbalanced forces 2. Motion: displacement and velocity 3. Distance-Time graphs 4. Identifying and controlling variables 5. Heat transfer	1. Scientists and engineers analyze forces to predict their effects on movement. 2. Vectors differentiate the concepts of speed and velocity. 3. Graphing motion provides more accurate predictions about speed and velocity. 4. The particle model explains natural systems and processes. 5. Scientists and engineers conduct innovative research to find solutions to the current global energy crisis by seeking renewable energy solutions.	1. identify that forces act between objects and can be measured. 2. identify and describe everyday situations that demonstrate: a. balanced forces such as a box resting on an inclined plane, a man standing still, or an object moving with constant velocity; b. unbalanced forces, such as freely falling fruit or an accelerating car; 3. draw a free-body diagram to represent the relative magnitude and direction of the forces involving balanced and unbalanced forces; 4. identify that when forces are not balanced, they can cause changes in the object's speed or direction of motion; 5. explain the difference between distance and displacement in everyday situations in relation to a reference point; 6. distinguish between speed and velocity using the concept of vectors; 7. describe uniform velocity and represent it using distance-time graphs; 8. explain the difference between heat and temperature; 9. identify advantageous and disadvantageous examples of conduction, convection, and radiation; 10. explain in terms of the particle model the processes underlying convection and conduction of heat energy; and 11. gather information from secondary sources to identify and describe examples of innovative devices that can be used to transform heat energy into electrical energy.
Performance Standard *By the end of the Quarter, learners* employ scientific techniques, concepts, and models to investigate forces and motion and represent their understanding using scientific language, force diagrams, and distance-time graphs. They use their curiosity, knowledge and understanding, and skills to propose solutions to problems related to motion and energy. They explore how modern technologies might be used to overcome current global energy concerns.		
Suggested Performance Task Develop a 2-4 page brochure for parents or leaders in your community to inform them about modern technologies that can be used sustainably to transform heat into electricity in the local community.		

GRADE 7 – QUARTER 4: EARTH AND SPACE SCIENCE

Content	**Content Standards** *The learners learn that:*	**Learning Competencies** *The learners…*
1. System models 2. Earthquakes 3. The Sun's influence on Earth	1. Rapid movements along normal, reverse or strike-slip faults cause earthquakes. 2. The damage or effects on communities depend on the magnitude of and distance from an earthquake. 3. Sunlight is the Earth's external source of energy. 4. Solar energy influences the atmosphere and weather patterns. 5. The revolution, rotation, and the tilt of the Earth explain the patterns of day and night and the seasons.	1. classify geological faults according to the angle of the fault plane and direction of slip; 2. use models or illustrations to explain how movements along faults generate earthquakes and identify and explain which types of faults are most likely to occur in the Philippines and explain why; 3. describe how the effects of earthquakes on communities depend on their magnitude; 4. use the PHIVOLCS FaultFinder or other reliable information source to identify where the nearest fault system is located from their community and assess the risk of earthquakes to their local community; 5. make models of fault scenarios to illustrate: a. the epicenter of an earthquake from its focus, b. the intensity of an earthquake from its magnitude, and c. how underwater earthquakes may or may not generate tsunamis; 6. refer to the local disaster readiness plans to demonstrate what to do during and after an earthquake; 7. explain how earthquakes result in tsunamis that devastate shoreline communities; 8. describe procedures that the authorities have in place to alert communities of pending tsunamis and what procedures can be implemented should a tsunami impact a community; 9. explain how energy from the Sun interacts with the atmosphere; 10. make a physical model or use drawings to demonstrate how the tilt of the Earth relative to its orbit around the Sun affects the intensity of sunlight absorbed by different areas of Earth over a year; 11. explain, using models, how the tilt of the Earth affects the changes in the length of daytime at different times of the year; and 12. explain how solar energy contributes to the occurrence of land and sea breezes, monsoons, and the Intertropical Convergence Zone (ITCZ).

Performance Standard

By the end of the Quarter, learners appreciate the value of using systems to analyze and explain natural phenomena and demonstrate their understanding in explaining the dynamics of faults and earthquakes. They are confident in identifying and assessing the earthquake risk for their local communities using authentic and reliable secondary data. They use the country's disaster awareness and risk reduction management plans to identify and explain to others what to do in the event of an earthquake. Learners explain the cause and effects of secondary impacts that some coastal communities may experience should a tsunami be produced by either local or distant earthquake activity. Learners use reliable scientific information to identify and explain how solar energy influences the atmosphere and weather systems of the Earth and use such information to appreciate and explain the dominant processes that influence the climate of the Philippines.

Suggested Performance Tasks
A. Design, test, and evaluate a model house that can withstand a model earthquake.
B. Design, test, and evaluate a model of an innovative house that can adapt to the different weather conditions in the country.

GRADE 8 – QUARTER 1: LIFE SCIENCE

Content	**Content Standards** *The learners learn that:*	**Learning Competencies** *The learners…*
1. Organ systems working together 2. Heredity 3. Taxonomic classification 4. Photosynthesis, respiration and cycles in nature	1. Organ systems work together for the growth and survival of the organism. 2. Inherited traits passed from parents to offspring are governed by the rules on the patterns of inheritance. 3. Classification of living things shows life's diversity. 4. Photosynthesis and respiration are processes that show how living things obtain energy and nutrients from the environment.	1. using a labeled diagram, trace how food travels through the digestive tract and explain how different digestive processes work, including mechanical processing, secretion, digestion, absorption, and elimination; 2. use models, flow charts, diagrams, and simulations to explain how body systems work together, such as digestion and excretion; 3. describe how plant organs (leaf, stem, roots) work together as the transport system; 4. represent patterns of inheritance of a simple dominant/ recessive characteristic through generations of a family; 5. predict simple ratios of offspring genotypes and phenotypes in crosses involving dominant/recessive gene pairs; 6. describe the importance of the six-kingdom system and the three-domain system of classification of living things; 7. explain why humans are classified under Class Mammalia and the Order Primates; 8. using flow charts and labeled diagrams explain the role of plants and animals in the cycles of nature, such as the carbon, oxygen, and water cycles; 9. describe the process of photosynthesis and respiration, and identify its raw materials needed and products; 10. using information from secondary sources identify the different parts of the cell where photosynthesis and respiration occur; 11. plan a scientific investigation to verify the raw materials needed for photosynthesis.
Performance Standard *By the end of the Quarter*, learners demonstrate the use of models, flow charts, and diagrams to illustrate how body systems work together for the growth and survival of an organism. They represent patterns of inheritance and predict simple ratios of offspring. They explain that the classification of living things shows the diversity and unity of living things. They describe the processes of respiration and photosynthesis and plan and record a scientific investigation to verify the raw materials needed. They use flow charts and diagrams to explain cycles in nature.		
Suggested Performance Task Conduct a scientific investigation to verify the raw materials needed for photosynthesis.		

GRADE 8 – QUARTER 2: SCIENCE OF MATERIALS

Content	**Content Standards** *The learners learn that:*	**Learning Competencies** *The learners…*
1. Use of timelines and charts 2. The Atomic Model 3. Subatomic particles 4. Elements and compounds 5. The Periodic table	1. The use of timeline and charts can illustrate scientific knowledge of the structure of the atom has evolved over time. 2. The current structure of the atom includes subatomic particles, their symbol, mass, charge, and location. 3. Elements and compounds are identified as pure substances. 4. The periodic table is a useful tool to determine the chemical properties of elements.	1. develop a timeline for the historical background of the development of the current Atomic Model that identifies tiny particles as atoms; 2. draw the structure of an atom in terms of the nucleus and electron shells; 3. differentiate the subatomic particles protons, neutrons, and electrons in terms of their symbol, mass, charge, and location within an atom; 4. describe the properties of pure substances as: a. having fixed chemical composition, examples of which are elements and compounds, and b. that all the atoms of an element have a unique number of protons; 5. discuss the significant contributions of early scientists in the development of the periodic table; 6. identify the names and symbols of the first 20 or several common elements of the periodic table; 7. explain that the arrangement of elements in the periodic table as 7 periods and 18 groups is based on their atomic structure and chemical properties, such as reactivity; 8. explain that the electron structure of an atom determines its position on the periodic table; 9. calculate the number of protons, neutrons, and electrons in the atom of several elements, such as aluminum; and 10. explain that the elements within a group in the periodic table have the same number of valence electrons.
Performance Standard *By the end of the Quarter, learners* demonstrate an understanding of the structure of the atom and how our understandings have changed over time. They draw models of the atom and use tables to represent the properties of subatomic particles. They demonstrate their knowledge and understanding of the periodic table by identifying the elements, their symbols, their valence electrons, and their positions within the groups and periods. They design and/or create timelines or documentaries as interesting learning tools.		
Suggested Performance Task Design an illustrated timeline or create a documentary that describes and discusses the development of the models of atomic structure contributed by Dalton, Thomson, Rutherford, and Bohr.		

GRADE 8 – QUARTER 3: EARTH AND SPACE SCIENCE

Content	**Content Standards** *The learners learn that:*	**Learning Competencies** *The learners…*
1. Distribution of the continents 2. Crustal features and interactions 3. Typhoons 4. Tides	1. The distribution of continents and oceans on Earth is related to the presence of the oceanic crust and continental crust. 2. Volcanic terrain is built by the slow accumulation of erupted lava. 3. The earth's surface is made of separate and movable plates. 4. Bodies of water and landforms affect typhoons. 5. The interaction between the Sun, Earth, and Moon causes tides.	1. identify what proportion of the Earth's surface is covered with water as opposed to land; 2. gather information from secondary sources to name and describe the upper crustal layers of the solid earth; 3. describe the different types of volcanoes found around the world according to their: a. activity b. type of eruption c. location in the crust; 4. relate the shape of a volcano's cone to its composition; 5. relate the location and distribution of active volcanoes, earthquake epicenters, and major mountain belts to the distribution of oceanic crust and continental crust; 6. identify how oceanic crust and continental crust is associated with the Earth's lithospheric plates; 7. gather information from secondary sources to explain: a. how typhoons develop, and b. why the Philippines is prone to typhoons; 8. use a map and a record of tracking data to trace the path of typhoons that enter the Philippine Area of Responsibility (PAR); 9. discuss how bodies of water and landforms affect typhoons; 10. gather information from the Department of Science and Technology (DOST) and other reliable websites to identify how authorities support communities affected by typhoons; 11. relate the relative movements of the Earth, Moon, and Sun with the occurrence of tides; and 12. draw on information from secondary sources to identify situations where tidal difference could be exploited to generate renewable energy.

Performance Standard

By the end of the Quarter, learners demonstrate an appreciation of the large-scale features of the 'blue planet' Earth and relate those features to the geological characteristics of the upper crustal layers of the Earth. They identify and describe the nature and impact of volcanic activity in building new crust and identify that these crust forming processes account for patterns and changes in the distribution of volcanoes, earthquakes, and mountain chains that have occurred over time. Learners draw on their understanding of the relationships between landforms and oceans to explain the formation and impacts of typhoons. They also identify that predictable interactions of the Sun-Earth-Moon system result in tidal effects.

Suggested Performance Task

Design and construct a model house to withstand a simulation of wind speed in a typhoon, test the model, and redesign if needed.

GRADE 8 – QUARTER 4: FORCE, MOTION, AND ENERGY

Content	**Content Standards** *The learners learn that:*	**Learning Competencies** *The learners…*
1. Acceleration 2. Distance-time and Velocity-time graphs 3. Kinetic and Potential energy 4. Work and energy 5. Renewable energy 6. Properties of light	1. Forces cause objects to accelerate. 2. An object is accelerating if the magnitude and/or direction of its velocity changes. 3. Kinetic energy is the energy of movement, and potential energy is stored energy. 4. As an object falls from a height its energy is conserved because its potential energy is transformed to kinetic energy. 5. The resources of the Philippines provide many benefits to its people and their activities.	1. identify that forces cause objects to accelerate, and that acceleration of an object is its rate of change of velocity; 2. observe and describe examples of accelerating objects at school and in the local community, including objects that show uniform circular motion; 3. construct and annotate distance-time graphs and velocity-time graphs to represent uniform and non-uniform acceleration; 4. describe kinetic energy as the movement of objects or particles, and potential energy as energy stored due to the position of objects or particles; 5. identify examples of everyday situations that demonstrate: a. kinetic energy being transformed to potential energy, and b. potential energy being transformed to kinetic energy; 6. recognize that work is done when a force causes the displacement of an object; 7. recognize that power is the rate of doing work; 8. explain that the mechanical energy of an object is the sum of the kinetic energy and the potential energy available to do work; 9. describe conservation of energy in everyday situations involving gravity, such as when objects fall; 10. gather information from secondary sources to explain how potential energy stored in lakes and dams in the Philippines is used to produce kinetic energy to generate electricity for use in homes, communities, and industry; and 11. carry out guided investigations to describe and illustrate the reflection of light using plane and curved mirrors and the refraction of light using transparent blocks, lenses, and prisms with examples from everyday applications.

Performance Standard

By the end of the Quarter, learners demonstrate understanding of the technical meaning of acceleration and apply their understanding to everyday situations involving motion. They represent and interpret acceleration in distance-time and velocity-time graphs to make predictions about the movement of objects. Learners link motion to kinetic energy and potential energy and explain transformations between them using everyday examples. Learners relate understanding of kinetic energy and potential energy to an appreciation of the hydro-electric resources of the Philippines for the generation of electricity for use in homes, communities, and industries. They use scientific investigations to explore the properties of light and apply their learning to solving problems in everyday situations.

Suggested Performance Tasks

Make a working model of a party light that uses batteries as the power source. Describe the scientific ideas that you have utilized to change the properties of light.

GRADE 9 – QUARTER 1: FORCE, MOTION, AND ENERGY

Content	**Content Standards** *The learners learn that:*	**Learning Competencies** *The learners…*
1. Newton's Laws 2. Force and energy 3. Electric current 4. Electrical circuits 5. Interpreting patterns in data 6. Electromagnetic waves	1. Newton's laws explain and predict how objects move due to the forces that act on them. 2. Electricity is a flow of electrons and can be measured and understood using current, voltage, and resistance in circuits. 3. Electromagnetic radiation travels using transverse waves of different wavelengths. 4. Scientists and engineers use electromagnetic radiation to design modern technologies that benefit people and society.	1. identify inertia as the tendency for an object to stay at rest or in motion unless acted on by an unbalanced net force; 2. demonstrate in practical situations and describe that acceleration is a change in speed and/or direction as the result of a net force; 3. investigate the relationship among force, acceleration, and mass; 4. explain that when any two objects interact, there are equal but opposite forces exerted between them, which is evident in many practical situations and applications; 5. observe and identify action-reaction pairs in everyday situations such as stepping off a boat, or a book on a table, and draw force diagrams to explain how the pairs affect the motion of objects; 6. identify that electricity is a flow of electrons and show appreciation for the need to observe safe measures in handling electricity; 7. participate in guided investigations to infer the relationship among current, voltage, and resistance in assembled series and parallel circuits with varying number of loads and battery; 8. draw diagrams of and assemble series and parallel circuits, showing switch, battery, loads/resistors, ammeter, and voltmeter; 9. collaborate in a class discussion to recognize the advantages and limitations of using series or parallel circuits; 10. describe electromagnetic radiation (EMR) as energy that is created by the vibrations of electrically charged particles which allows it to travel through materials or space as transverse waves; 11. compare the relative wavelengths and frequencies of different types of electromagnetic waves, including radio waves, microwaves, infrared, visible light, ultra-violet, x-rays, and gamma radiation; 12. identify practical applications of electromagnetic radiation, such as radio waves used in telecommunications, and x-rays and gamma rays in medicine; and 13. gather information from secondary sources to explain the harmful effects that EMR can have on living things.

Performance Standard

By the end of the Quarter, learners demonstrate a practical understanding of Newton's three laws of motion to describe relationships between variables and use these to explain everyday application of Newton's laws. Through practical investigations, learners demonstrate qualitative understanding of the features of electricity and apply their understanding of electrical circuitry in homes. Learners exhibit skills in gathering information from secondary sources to describe the frequencies across the electromagnetic spectrum and identify practical applications and detrimental effects that electromagnetic radiation may have on living things.

Suggested Performance Tasks

A. Design a model vehicle from recycled materials using the Law of action-reaction to carry a 15-gram payload over a 5-meter displacement. Describe the forces interacting and the motions evident when your vehicle is moving, including any vectors that are relevant.
B. Use secondary sources regarding problems associated with the distribution of electrical energy from power plants to homes. Use the findings to develop a system that can address the problems.
C. Develop a poster that identifies the useful and dangerous attributes of the 7 main energies of the EMS.

GRADE 9 – QUARTER 2: EARTH AND SPACE SCIENCE

Content	**Content Standards** *The learners learn that:*	**Learning Competencies** *The learners…*
1. Scale, proportion and quantity 2. Plate boundaries 3. Structure of the Earth 4. Geologic time 5. Origin of the Solar System 6. Space Technologies	1. Evidence for continents moving includes jig-saw matching of coastlines, rock types, and the presence of similar fossils in places separated by vast distance. 2. The movement of lithospheric plates provides a theory for understanding Earth's geological history. 3. The geological time scale organizes major stages in the history of the Earth over more than 4 billion years. 4. Radioactive decay of material inside the Earth since it was formed is its internal source of energy. 5. The Earth's interior is made up of layers of varying characteristics. 6. Models represent the size, structure, and relationship of components of the Solar System 7. Observable evidence and models help explain the nature and origin of the Solar System.	1. identify and explain evidence that current continents are separate parts of what was a single continent millions of years ago; 2. participate in a collaborative group or class task to examine and describe the topographical and geological evidence for plate boundaries occurring in the area where the Philippines is located; 3. describe the types of plate boundaries found around the Earth; 4. describe how fossils can be used for dating the age of rocks and sediments; 5. describe how relative and absolute dating techniques are used to determine the subdivisions of geologic time; 6. explain how the geologic time scale helps to recount the history of the Earth; 7. describe how seismic wave data has been used to develop a model for the internal structure and composition of the Earth; 8. create a scale drawing to represent relative thicknesses of the layers of Earth's interior, including the crust, lithosphere, asthenosphere, mantle, outer core, and inner core; 9. distinguish among comets, meteoroids, asteroids, and dwarf planets, and describe how they help us to understand the nature and formation of the Earth and the Solar System; 10. gather information from secondary sources to discuss the regular occurrence of meteor showers; and 11. explain how modern research about celestial objects uses new space technologies including telescopes and space probes.

Performance Standard

By the end of the Quarter, learners exhibit skills in evaluating information from secondary sources, and draw on their scientific understanding of the location and geological setting of the Philippines to explain its unique landforms and dynamic geologic activity in a global context. They demonstrate an appreciation of the size and scale of the Earth and describe evidence for a dynamic Earth over its long geological history as well as the evidence that is used to build a model for the internal structure of the Earth. Learners demonstrate curiosity and open-mindedness in extending their knowledge and

understanding of the dynamic Earth to evaluate evidence for theories for the formation of the Solar System. They describe modern scientific processes and technologies that are used by scientists to investigate the nature and evolution of the Solar System and Universe.

Suggested Performance Tasks

A. Design and build a 3D model of the features of the Earth including its interior structure.

B. Develop an information report to describe and explain how modern space technologies are used to conduct groundbreaking research about the nature and origin of the Solar System.

GRADE 9 – QUARTER 3: LIFE SCIENCE

Content	**Content Standards** *The learners learn that:*	**Learning Competencies** *The learners…*
1. DNA replication and mutations 2. Biodiversity and endangered species 3. Types of ecosystems in the Philippines	1. Transmission of traits is determined by DNA, genes, and chromosomes. 2. High biodiversity means populations are more likely to overcome adverse conditions. 3. Human activities can adversely affect animals and plants in a variety of ecosystems.	1. use models and labeled diagrams to represent the double helix structure of DNA (deoxyribonucleic acid); 2. explain the role of DNA, genes, and chromosomes in the transmission of traits; 3. describe mutations as changes in DNA or chromosomes and discuss some of the factors that cause mutations, such as infectious agents, radiation, and chemicals; 4. use information from secondary sources to explain the beneficial, harmful, and neutral effects of mutations; 5. explain the advantage of high biodiversity in maintaining the stability of an ecosystem during difficult conditions, such as food shortages, disease, and climate change; 6. use information from secondary resources to classify animals and plants of the Philippines as critically endangered, endangered, or vulnerable species; 7. discuss as a class how threats to biodiversity can lead to species extinction; 8. use information from secondary sources to research how to protect and conserve endangered and/or economically important species in the local community; 9. describe using labeled diagrams the biotic and abiotic features of tropical rainforests, swamps, estuaries, mangrove forests, and coral reefs; 10. use information from secondary sources to describe the possible effects of human activities, such as deforestation, pollution, and introduction of invasive species, on living things in an ecosystem; and 11. plan to conduct a survey to explore the possibilities for minimizing the negative impacts of human activities on an ecosystem.

Performance Standard

By the end of the Quarter, learners describe that the transmission of traits is determined by DNA, genes, and chromosomes. They explain that high levels of diversity help to maintain stability of an ecosystem. They research to classify critically endangered plants and animals of the Philippines and to identify strategies to protect and conserve them. They use drawings and diagrams to describe features of typical Philippine ecosystems and they conduct a survey to explore possibilities to minimize the impact of human activities.

Suggested Performance Task/s

A. Write a report on an environmental action group analyzing their principles and their actions or activities regarding the human impact on the biosphere.
B. Conduct a research project on a specific Philippine ecosystem and investigate its biodiversity, ecological interactions, and conservation challenges. Present your research findings through a scientific report or multimedia project.

GRADE 9 – QUARTER 4: SCIENCE OF MATERIALS

Content	**Content Standards** *The learners learn that:*	**Learning Competencies** *The learners…*
1. Valid and reliable investigations 2. Chemical bonding 3. Ionic compounds 4. Covalent compounds 5. Metallic bonds 6. Chemical formula	1. Valid and reliable scientific investigations include identification and control of variables. 2. Formation or breaking down of ionic or covalent bonds results in a chemical change. 3. Bonds are formed between atoms either by sharing or transferring of electrons. 4. The type of bond formed determines whether the result is a covalent or ionic compound. 5. Symbols for the elements are used as a basis for writing chemical formula of compounds. 6. The properties of pure substances depend on the type of bonding within them.	1. carry out a valid and reliable scientific investigation to show the formation of a new substance, such as formation of a carbonate (carbon dioxide in limewater), or formation of a precipitate (from silver nitrate solution); 2. explain that the formation of new bonds or the breaking of existing bonds constitutes a chemical change and the formation of a new substance; 3. describe a valence electron as an electron in the outer shell of an atom that can take part in formation of bonds; 4. identify the number of valence electrons of oxygen based on its position in the periodic table; 5. explain the formation of ions as either the loss or gain of electrons to produce ionic bonds, using examples, such as the formation of sodium chloride; 6. write the chemical formula and chemical names of some common ionic compounds, including sodium chloride (NaCl), magnesium oxide (MgO), potassium chloride (KCl) and magnesium chloride ($MgCl_2$); 7. explain the formation of covalent bonds using a molecule of water and a molecule of carbon dioxide; 8. write the chemical formula and chemical name of some common covalent compounds, including water (H_2O), carbon dioxide (CO_2), and ammonia (NH_3); 9. show by using models that ionic compounds form crystalline structures whereas covalent compounds form individual molecules; 10. explain properties of metals in terms of their structure and metallic bonding (sea of electrons model); and 11. investigate the properties of ionic, covalent, and metallic substances, such as melting point, hardness, electrical and thermal conductivity.

Performance Standard

By the end of the Quarter, learners carry out a valid and reliable scientific investigation showing the formation of a new substance. They demonstrate an understanding of the significance of the valence electron of an element in the formation of bonds and identify bonds as ionic, covalent, or metallic. They use their knowledge of the symbols of elements to write the formula for a number of common compounds. They draw models of possible structures of ionic compounds and research the properties of ionic, covalent, and metallic substances. They use cartoons/comic strips to create interesting learning tools.

Suggested Performance Task/s

Create a cartoon/comic strips portraying the main characters as “ionic”, “covalent”, and “metallic” bonds. The cartoon should communicate each character’s role in holding atoms and/or molecules together and may show what happens to them in the way the substances are used in everyday life.

GRADE 10 – QUARTER 1: EARTH AND SPACE SCIENCE

Content	**Content Standards** *The learners learn that:*	**Learning Competencies** *The learners…*
1. Plate Tectonics 2. Global climate 3. Global interactions 4. Global and local Sustainability	1. Current models explain tectonic plate movement as part of a gravity-driven convection system that pushes young hot plates away from spreading ridges and pulls old cold plates down into subduction zones. 2. Plate movements and continental evolution account for the major surface features of the Earth. 3. Climate change and its impacts on the environment and people pose serious challenges which require solutions and action at local and global levels. 4. The rich natural resources of the Philippines require sustainable management.	1. identify modern scientific processes used to detect and measure the displacement of tectonic plates; 2. describe the structures, movements and events that occur at each type of plate boundary; 3. identify the locations of major mountains, faults, volcanos, and ocean trenches using a map of the Philippine Archipelago, and interpret the features in relation to plate tectonics; 4. predict the position and shape of the Philippine Archipelago in 50 million years, based on the current velocity of the Philippine Plate; 5. gather information from secondary sources to describe and explain what mechanisms that drive the movement of tectonic plates including the role of the asthenosphere; 6. explain how the subduction of an oceanic plate impacts on the plate above it; 7. explain how plate tectonics can be used to explain the formation of the largest mountain ranges on Earth including the Himalayas and the Andes mountains; 8. identify evidence of global warming and climate change; 9. identify the role of greenhouse gases in enhanced global warming and climate change; 10. describe how global climatic phenomena, such as the El Niño Southern Oscillation, may impact weather systems; 11. identify local impacts of global climate change and suggest ways that individuals can do to reduce the impact of global warming; and 12. explain how increased societal uses of renewable energies could mitigate the effects of global climate change, including how the Philippines could make better use of its plentiful natural resources.

Performance Standard

By the end of the Quarter, learners describe and explain the geologically dynamic nature of the Philippine Archipelago in relation to its plate tectonic setting and use models to explain the earth structures, movements, and natural events that occur. They use critical thinking and modeling to explain mechanisms that have contributed to the current distributions of continents and make predictions about changes that can be expected in the future. Learners gather information from secondary sources to describe rapid changes that are occurring in local and global climate patterns and propose solutions to address these changes at the local and global levels by drawing on awareness, responsible personal behavior to conserve materials and energy, and through the better societal management of the natural resources of the country.

Suggested Performance Tasks

A. Plan and enact a community education strategy based on scientific understanding, data, and processes, to encourage and empower viewers to be responsible in their use of local natural resources.

B. Develop a discussion paper on the value of mining green metals, such as cobalt and nickel for modern battery production. Include information about how modern batteries can contribute to addressing energy supply and other energy-related issues. The paper should provide information about the green metal reserves of the Philippines and what would be involved in establishing industries to produce batteries locally.

GRADE 10 – QUARTER 2: FORCE, MOTION, AND ENERGY

Content	**Content Standards** *The learners learn that:*	**Learning Competencies** *The learners*:
1. Projectile motion 2. Momentum and Collisions 3. Large-scale generation and distribution of electricity 4. Renewable and non-renewable energy	1. Newton's laws can be used to explain projectile motion and collisions. 2. Momentum in collisions increases as mass or velocity increases. 3. The electric companies provides high voltage electricity through power generation, transmission, and distribution to many parts of the archipelago. 4. Responsible planning and innovation lead to efficient generation and distribution of electricity in the Philippines.	1. investigate and describe the relationship among the projectile variables including the angle and velocity of release, and projectile height and range, using everyday activities such as shooting basketballs or kicking footballs; 2. describe different types of collisions as elastic or inelastic by providing some examples; 3. use models to investigate elastic or inelastic collisions and describe the forces involved and their effects; 4. explain that momentum depends on the mass and the velocity of a moving object that can be used to predict the impact the object will have if it hits another object; 5. carry out guided investigations using different objects to describe momentum-related relationships, such as the more momentum an object has, the harder for it to stop; 6. identify and explain that to change the momentum of an object, it is necessary to apply a force on the object over a period of time; 7. gather information from secondary sources to identify ways to reduce the impact of collisions such as seatbelts, airbags, and crumple zones in vehicles; 8. identify that momentum is conserved before and after the collision of objects; 9. describe how high voltage electricity from power plants is generated and safely distributed to industries, businesses, and homes, including the role of substations (grid stations), and electric meters; 10. describe and explain the need for safety precautions in handling household electrical devices; 11. describe the similarities and differences between electric motors and electric generators; 12. collaborate in a class discussion to identify ways to reduce the use of electrical energy in Filipino houses and communities and explain what local and global benefits can be achieved; and 13. gather information from secondary sources to evaluate how renewable and non-renewable generation of electricity in the Philippines impacts human activities and the environment.

Performance Standard

By the end of the Quarter, learners display critical thinking in describing the factors that affect the trajectory of projectiles. They distinguish between different types of collisions and describe the impacts on the motion of objects. They carry out investigations using models to identify relationships that affect the motion of objects and apply their understanding to real-life situations. Learners gather information from secondary sources to identify, describe, and explain how science impacts human activities and the environment.

Suggested Performance Tasks

A. Conduct a survey of recent vehicular accidents in your locality to identify a high-risk spot where collisions are frequent. Offer a solution to mitigate collisions at the high-risk area by:

1. designing a structure aimed at reducing the impact of collisions, or
2. describe a system aimed at changing riders' or drivers' behavior by educating them about the collision danger in the location.

B. Design and describe the significant features (rationale) of a 'vehicle' that will save a raw egg from breaking when dropped onto a concrete surface from 3 meters. Learners will test their model in a class event.

GRADE 10 – QUARTER 3: SCIENCE OF MATERIALS

Content	**Content Standards** *The learners learn that:*	**Learning Competencies** *The learners…*
1. Chemical reactions 2. Acids, bases, and salts. 3. Types of chemical reactions 4. Chemical reactions in the environment. 5. Chemical equations 6. Rates of reactions	1. Several simple observations indicate if a chemical reaction has taken place. 2. Chemical indicators produce color changes with acids, bases, and salts. 3. Valid and reliable scientific investigations identify the dependent and independent variables and control other variables. 4. Many types of chemical reactions are important in our daily lives and in the biotic and abiotic parts of the environment. 5. Atoms rearrange during chemical reactions but abide by the principle of conservation of mass as illustrated in balanced chemical equations. 6. Rates of chemical reactions are critical in production and preservation of many useful materials.	1. describe the indicators for a chemical reaction as color change, the formation of a precipitate, the release of gas, and or odor, or a change in temperature; 2. identify common acids, bases, and salts (e.g., hydrochloric acid, sodium hydroxide, and saline solution) using different indicators; 3. describe important types of chemical reactions (combination, decomposition, single replacement, double replacement); 4. explain how important types of chemical reactions, such as combustion, acids on metals, acids on carbonates, photosynthesis, and respiration, relate to or impact the natural and built environments using information from secondary sources; 5. recognize that scientists: a. use chemical equations to describe chemical reactions, and b. write equations in word form and using formula for common chemical reactions; 6. explain that chemical equations demonstrate a rearrangement of atoms but the total mass of the system remains the same during a chemical reaction; 7. apply the principles of conservation of mass to balance chemical equations; 8. explain the factors affecting the rates of chemical reactions as applied in food preservation and materials production, control of fire, pollution, and corrosion; and 9. identify that chemical reactions may be exothermic or endothermic

Performance Standard

By the end of the Quarter, learners demonstrate an understanding that household products can act as indicators for important chemicals. They describe the indicators of a chemical reaction and identify important types of chemical reactions. They explain how some important chemical reactions impact the natural and built environment. They write balanced chemical equations using formula and apply the principles of conservation of mass. They explain factors that affect the rate of a reaction and that some reactions are exothermic, and some are endothermic. They demonstrate skills to plan and conduct valid and reliable scientific investigations and record them appropriately.

Suggested Performance Task/s
A. Conduct a valid and reliable investigation to test a number of vegetables, such as carrots and red cabbage to determine their usefulness as indicators for common acids and bases, such as vinegar, lemon juice, and bleach.
B. Explore materials in the home to produce specific chemical reactions, such as mixing a solution of washing powder with a solution of baking powder.

GRADE 10 – QUARTER 4: LIFE SCIENCE

Content	**Content Standards** *The learners learn that:*	**Learning Competencies** *The learners…*
1. Homeostasis 2. Mechanisms of evolution 3. Biotechnology 4. Ecosystem's carrying capacity and population growth	1. Homeostasis is a self-regulating process that allows an organism to maintain stability. 2. Several theories provide lines of evidence about how organisms evolve. 3. The products and processes of biotechnology can have both beneficial and harmful effects on society and the environment. 4. Population growth influences the carrying capacity of an ecosystem	1. describe homeostasis as a state of balance among all the body systems in humans that needs to be maintained for survival and proper functioning; its indicators include body temperature, glucose level, and blood pressure; 2. explain how homeostasis is maintained through various feedback mechanisms, both positive and negative; 3. use information from secondary sources to describe natural selection as the primary mechanism driving evolutionary change; 4. discuss in small groups important concepts in the theories of evolution, such as variation, heredity, isolation, selection, and adaptation; 5. use information from secondary sources to explain how lines of evidence, such as fossils, biogeography, and comparative morphology, support the occurrence of evolution; 6. explain the term biotechnology and provide examples; 7. use information from secondary sources to identify the products of traditional biotechnology through fermentation (e.g. cheese, soy sauce, vinegar, *nata de coco*); 8. use information from secondary sources to identify examples of modern biotechnology, such as genetically modified organisms and processes (e.g. in vitro fertilization); 9. participate in a class debate on the societal, environmental, and ethical implications of using biotechnological products and methods; 10. discuss the factors that limit the ecosystem's carrying capacity, such as adequate food, shelter, water, and mates; and 11. explain that the ecosystem's population growth slows down as it gets closer to the carrying capacity.
Performance Standard *By the end of the Quarter, learners* describe homeostasis as a process that allows an organism to maintain stability. They describe and discuss in small groups that natural selection is the driving mechanism of evolutionary change. They explain the meaning of the term biotechnology and debate the societal, environmental, and ethical implications of utilizing biotechnological products and methods. They discuss the factors that limit the ecosystem's carrying capacity and the role of population growth.		
Suggested Performance Task Write a critical analysis of the use of biotechnology and its impacts on society or the environment.		

GLOSSARY

The curriculum organizers described below are used together to form the curriculum description in the Grades 3 to 10 Science Curriculum Guide. The definitions within this section are drawn from DepEd Order No. 8, s. 2015 and DepEd Order No. 21, s. 2019.

1) **Standard** – In its broadest sense, it is something against which other things can be compared to for the purpose of determining accuracy, estimating quantity or judging quality. It is a stated expectation of what one should know and be able to do.

2) **Key Stage** – This refers to stages in the K to 12 Program reflecting distinct developmental milestones. These are Key Stage 1 (Kindergarten – Grade 3), Key Stage 2 (Grades 4 – 6), Key Stage 3 (Grades 7 – 10), and Key Stage 4 (Grades 11 and 12).

3) **Key Stage Standard** – This shows the level or quality of proficiency that the learner is able to demonstrate in each key stage after learning a particular area in relation to the core learning area standard.

4) **Grade Level Standard** – This shows the level or quality of proficiency that the learner is able to demonstrate in each Grade after learning a particular area in relation to the core learning area standard.

5) **Content Domain** – This is a particular strand or domain of the curriculum in which the scope and sequence of a set of related topics and skills are covered.

6) **Content Standard** – The content standards identify and set the essential knowledge and understanding intended to be learned. They cover a specified scope of sequential topics within each learning strand, domain, theme, or component. Content standards answer the question, "What should the learners know?"

7) **Learning Competency** – This refers to a specific skill performed with varying degrees of independence. It has different levels of difficulty and performance levels. It also refers to the ability to perform activities according to the standards expected by drawing from one's knowledge, skills, and attitudes.

8) **Performance Standard** – The performance standards describe the abilities and skills that learners are expected to demonstrate in relation to the content standards and the integration of 21st century skills. The integration of knowledge, understanding, and skills is expressed through creation, innovation, and adding value to products/performance during independent work or in collaboration with others.

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