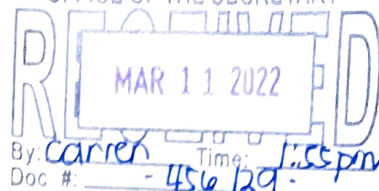




Republic of the Philippines
Department of Education
OFFICE OF THE SECRETARY

DEPARTMENT OF EDUCATION
OFFICE OF THE SECRETARY



MEMORANDUM

TO : UNDERSECRETARY REVSEE A. ESCOBEDO
ASSISTANT SECRETARY MALCOLM S. GARMA
ALL REGIONAL DIRECTORS

FROM :  SECRETARY LEONOR MAGTOLIS BRIONES

SUBJECT : SUPPLEMENTAL INSTRUCTIONS ON PISA 2022

DATE : March 11, 2022

As you are aware, we have reconfirmed during our joint ExeCom-MaMcom meeting on March 9 our participation in the 2022 round of PISA. This decision is aligned with *Sulong Edukalidad*, which is our ongoing program to improve education quality in the country. System assessments such as PISA and DepEd's National Achievement Test (NAT) provide the necessary feedback to inform policy decisions and reforms. Our participation in PISA 2022 will provide us continuity of data for monitoring improvements and for identifying gaps as well as areas of growth for basic education.

The Bureau of Education Assessment (BEA) under the Curriculum and Instruction Strand is overseeing the test administration preparations, and I understand that their coordination with participating Divisions and Schools is ongoing. I also understand that BEA has furnished you with the list of participating Divisions and Schools.

In addition to the test administration preparations, please ensure that the participating schools and students fully utilize the Briefer on PISA 2022 as well as the PISA Familiarization Tests provided by the Office of the Secretary, based on materials provided by OECD PISA. I enclose these materials for your ready reference. I hope that you will mobilize support for the participating schools and learners to afford them a fair opportunity to demonstrate their true proficiency, by reducing the barriers of novelty of a different form and method of assessment than what they are used to in classroom setting. One mechanism is to conduct test simulation as a familiarization activity using the materials that we provided, combined with the test administration protocols overseen by BEA.

Please submit updates as well as final report on your compliance with this instruction.



DEPARTMENT OF EDUCATION
OFFICE OF THE SECRETARY

PISA 2022 BRIEFER FOR PUBLIC SCHOOL TEACHERS AND LEARNERS

MARCH 2022

Introduction

The Programme for International Student Assessment (PISA) is an international large-scale assessment (ILSA) that is developed and implemented by the Organization for Economic Co-operation and Development (OECD). It is a triennial international test first administered to 43 participating countries in the year 2000, and most recently in 2018, to 79 participating countries and economies. In contrast to other ILSAs that aim to measure students' mastery of knowledge and skills from a specific curriculum, PISA looks into "the extent to which 15-year-old students, near the end of their compulsory education, have acquired key knowledge and skills that are essential for full participation in modern societies, with emphasis on how well students can extrapolate from what they have learnt and can apply that knowledge in unfamiliar settings, both in and outside of school" (OECD, 2018).

PISA measures the Reading Literacy, Mathematical Literacy, and Scientific Literacy of students. International experts work together to develop frameworks that articulate and explain these literacies, while test development contractors develop and implement the tests in partnership with the National Centers of the participating countries and economies. The focus shifts among these three domains for each assessment cycle, with the focus domain tested in greater detail than the two minor domains of the cycle. Moreover, one innovative domain is included in the test every cycle. The previous innovative domains were Creative Problem Solving in 2012, Collaborative Problem Solving in 2015, and Global Competence in 2018.

In addition to measuring students' level of literacy in the said domains, participating countries and economies may opt to have students, school principals, and teachers answer background questionnaires that will contextualize the results of the cognitive assessments. These background questionnaires seek information on:

- Students and their family backgrounds, including their economic, social and cultural capital;
- Aspects of students' lives, such as their attitudes towards learning, their habits and life in and outside of school, and their family environment;
- Aspects of schools, such as the quality of the schools' human and material resources, public and private management and funding, decision-making processes, staffing practices, the school's curricular emphasis and the extracurricular activities it offers;
- The context of instruction, including institutional structures and types, class size, classroom and school climate, and reading activities in class; and
- Aspects of learning, including students' interest, motivation and engagement (OECD, 2015).

The Philippines first participated in the PISA in 2018, and likewise participated in the Southeast Asia Primary Learning Metrics (SEA-PLM) 2019 and in the Trends in International Mathematics and Science Study (TIMSS) 2019. This initiative aligns with *Sulong Edukalidad*, which is the Department of Education's (DepEd) drive to improve education quality in the country. System assessments such as the ILSAs and DepEd's National Achievement Test (NAT) provide the necessary feedback to

the educational system, which in turn informs future policy decisions and reforms. Specifically, as articulated in DepEd Order 29 s.2017 entitled “Policy Guidelines on System Assessment in the K to 12 Basic Education Program”, system assessments are implemented for the following purposes:

1. Establish baselines for the basic education system and the implementation of the K to 12 curriculum in schools in terms of teaching and learning.
2. Monitor the implementation of the K to 12 curriculum in schools in terms of teaching and learning.
3. Measure effectiveness of instructional reforms that are part of the K to 12 basic education program.
4. Generate reliable data for purposes of international benchmarking.
5. Provide bases for the improvement of programs for learner development, curriculum implementation and school effectiveness.
6. Provide evidence that will aid policy formulation, planning, and programming at the division, regional, and national levels.

The results of the participation by the Philippines in these international large-scale assessments (ILSA) confirm the need to accelerate the efforts to improve education quality. One way to contribute to the improvement of quality of basic education is to **enhance the alignment of classroom assessment with ILSAs such as PISA**. Studies have shown that proper alignment between formative assessments and subsequent summative assessment is crucial in effective learning and assessment quality. For instance, Gulikers et al. (2013) submit that formative assessments should “change along with summative assessment innovations,” highlighting that teachers’ conceptions must be addressed to ensure the development of formative assessment practices that are aligned to such innovations. Further, according to Care (2018), “It is essential that there is strong alignment, not only between curriculum, assessment and pedagogy, but also across the different assessment levels - from classroom to national system - if stated learning goals and the educational philosophy of the country are to be realised.”

In response to this challenge, DepEd launched the *Professional Development Program on Assessment and Emerging Literacies with focus on PISA (Assessment PD Program)*, which is a professional development program for Junior High Schools teachers aimed at improving teachers’ assessment literacy and content knowledge in Reading, Math, and Science, **in order to empower them to align their classroom practice with the emerging literacies measured by international assessments**. The goal is for such alignment to translate to the improvement of the Reading, Math, and Science literacy of Junior High School Students. It was developed and is currently being implemented by a consortium headed by the Office of the Secretary, in partnership with the Bureau of Education Assessment, Bureau of Learning Delivery, and several learning service providers (LSPs) that are accredited by the National Educators Academy of the Philippines (NEAP), namely: FrontLearners Inc., Center for Educational Measurement, Inc., and the Assessment, Curriculum, and Technology Research Centre (ACTRC), and individual experts from the academe.

This brief aims to make the key learnings and resources from the Assessment PD program accessible to more teachers as well as to learners. The specific examples

and materials presented were curated for day-to-day use in classroom teaching and learning. Additionally, these materials will also be useful in the familiarization of the teachers and learners with the PISA testing environment, the next administration of which will be from March to May 2022.

The brief consists of four main parts:

Part 1 is ***An Introduction to the PISA framework***, which summarizes content from the PISA 2018 and 2022 Assessment and Analytical Frameworks to give learners and teachers an overview on what PISA measures, and how its articulation of Mathematical, Reading, and Science literacy are operationalized in the test. This part will also cover the matching of K to 12 competencies with the competencies measured in PISA.

Part 2 is a copy of the ***PISA 2022 CBA Familiarization Materials from OECD***. These familiarization materials are publicly available in the OECD-PISA website and are written specifically for students who will take the test to acquaint them with general information on PISA, as well as to set their expectations on what will happen on their scheduled test date. This part also includes some examples from PISA released items that illustrate the range of possible tasks and questions that may be included in the test

Part 3 introduces ***Supplementary Resources*** that were curated to orient the teachers and students on the relationship of the competencies measured in PISA and the competencies in the K to 12 curriculum. We provide the rationale and how-to-use guide that teachers may refer to in navigating and deploying the supplementary resources in their respective classes.

Part 4 is a brief orientation on how PISA 2022 will be administered. This portion outlines the profile of the test-takers, the schedule, and the key processes involved in the administration of the test.

Despite the challenges brought about by the COVID-19 pandemic, DepEd shall participate in the PISA 2022 Main Survey to gather further insights that will inform new policy directions and continuing reforms. The PISA 2022 data, along with our local assessments and research, will provide reliable evidence that will help push these reforms forward and improve education quality for the Filipino youth in the long run.

Part I

An Introduction to the PISA Frameworks

Part I: An Introduction to the PISA Frameworks

To do well in PISA, students have to be able to extrapolate from what they know, think across the boundaries of subject-matter disciplines, apply their knowledge creatively in novel situations and demonstrate effective learning strategies. If all we do is teach our children what we know, they might remember enough to follow in our footsteps; but if they learn how to learn, and are able to think for themselves, and work with others, they can go anywhere they want. Some people argued that the PISA tests are unfair, because they may confront students with problems they have not encountered in school. But then life is unfair, because the real test in life is not whether we can remember what we learned at school, but whether we will be able to solve problems that we can't possibly anticipate today.

(Schleicher, 2019)

Although PISA is not a curriculum-based assessment and is not intended to measure the knowledge of learners in particular topics, it still presumes that there is a set of basic competencies that 15-year-old learners globally are expected to have learned, given that they are nearing the end of their mandatory basic education.

The specific competencies measured by PISA are outlined in the Analytical Frameworks, which are summarized below. For the 2022 cycle, Math Literacy will be the focus domain; as such, OECD released an updated framework for Mathematics Literacy Framework last November 2020. In contrast, Reading and Science Literacy will still refer to the PISA 2018 Assessment and Analytical Frameworks.

MATHEMATICS LITERACY FRAMEWORK

PISA defines mathematics literacy as “(A)n individual's capacity to reason mathematically to formulate, employ, and interpret mathematics to solve problems in a variety of real-world contexts.”

PISA presupposes that mathematics literacy can help a person understand the of mathematics in the world and make evidenced-based decisions and judgments expected from *constructive, engaged, and reflective 21st Century citizens*.

The framework (see Figure 1) considers mathematical reasoning to be fundamental to mathematics literacy. It shows the relationship between mathematical reasoning and problem-solving processes. Also shown in the framework are the four content categories of mathematical content knowledge. Moreover, the framework describes four different real-world context categories in which PISA sees students might encounter challenges involving mathematics.

Below is a discussion of the key aspects of the 2022 Mathematics Assessment Framework.

Mathematical Reasoning

Although it has always been a part of the PISA framework, one of the emphases of the PISA 2022 assessment is mathematical reasoning. Individuals reason when evaluating situations, selecting strategies, drawing logical conclusions, developing and describing solutions, and recognizing how to apply those solutions. It is becoming necessary for people to reason logically and present arguments honestly and convincingly in the current world. Mathematics is

a science that trains the capacity of an individual to do that. Through mathematics, students can learn that they get truthful results that apply to varied real-life contexts through proper reasoning and assumption.

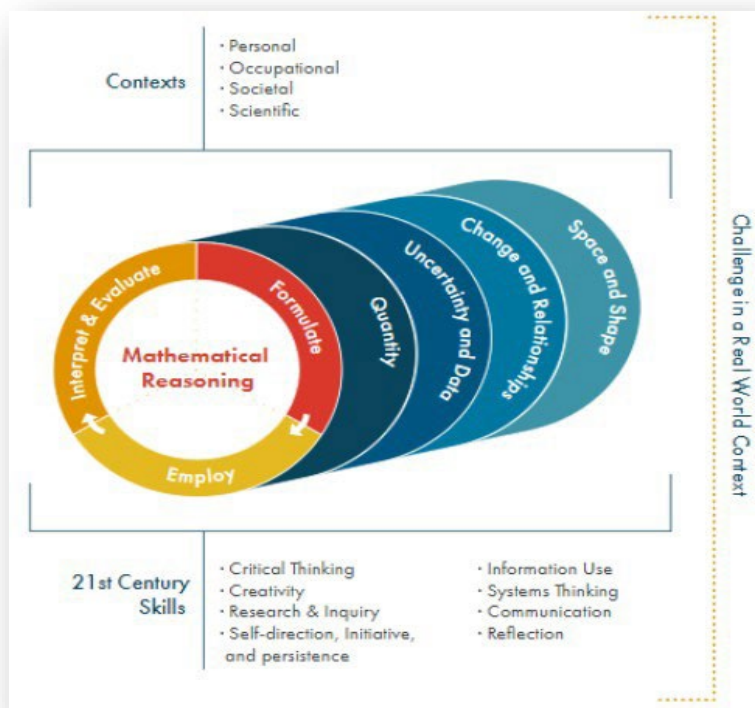


Figure 1 Mathematics Literacy Framework

A student who applies mathematical reasoning should be able to:

- Identify, recognize, organize, connect, and represent,
- Construct, abstract, evaluate, deduce, justify, explain, and defend; and
- Interpret, make judgments, critique, refute, and qualify.

Processes of the Problem-Solving (Mathematical Modeling) Cycle

The following processes provide structure for an individual to use mathematics in understanding and solving a problem in its specific context.

- *Formulating* situations mathematically.
- *Employing* mathematical concepts, facts, procedures, and reasoning; and
- *Interpreting*, applying and evaluating mathematical outcomes.

When **formulating**, individuals provide mathematical structure, mathematical representation, and specificity to a contextualized problem. They also reason and consider all assumptions and constraints. In **employing**, individuals apply concepts, facts, and procedures known in mathematics to solve the formulated problems. Individuals perform mathematics to arrive at a result with a solution. They use the mathematical formulation derived, make connections, and create mathematical arguments. Lastly, an individual **interprets** (and evaluates) when

they reflect about solutions and results or conclusions to a mathematical problem, relating these outcomes to the real-life context of the problem. They translate their mathematical solution or reasoning processes back to the context of the problem. And they evaluate how reasonable and sensible the solution, process, and outcome are.

Content Knowledge Categories

Listed in Table 1 are the topics under each content knowledge category.

Table 1 Topics covered in Mathematics Literacy

Quantity	Uncertainty and Data	Change and Relationships	Space and Shape
· Measurement · Estimation · Number and Number Sense · Numerical Trends and Patterns · Computer Simulation on Complex Problems	· Counting Principles · Probability in Predicting Events · Sampling · Data Collection · Measures of Central Tendency and Variability · Making Sense of Data · Statistics in Decision Making	· Algebraic Expressions and Functions · Equations and Inequalities · Algebra in Growth Phenomena · Relationship Between & Among Geometrical Objects	· Geometric Approximations · Spatial Visualization · Measurement · Algebra

Context Categories

Following are discussions of the context categories directly lifted from the PISA 2022 Mathematical Literacy Framework:

- **Personal** questions include those focusing on activities of oneself, one's family or one's peer group e.g., food preparation, shopping, games, personal health, personal transportation, sports, travel, personal scheduling, and personal finance.
- **Occupational** questions are centered on the world of work e.g., measuring, costing, and ordering materials for building, payroll/accounting, quality control, scheduling/inventory, design/architecture, and job-related decision making.
- **Societal** questions focus on one's community (whether local, national, or global) e.g., voting systems, public transport, government, public policies, demographics, advertising, national statistics, and economics. Although individuals are involved in all these things in a personal way, in the societal context category the focus of problems is on the community perspective.
- **Scientific** questions relate to the application of mathematics to the natural world and issues and topics related to science and technology e.g., weather or climate, ecology, medicine, space science, genetics, measurement, and the world of mathematics itself.

SCIENCE LITERACY FRAMEWORK

The PISA 2018 Science Framework underscores the foundational basis that holds the PISA assessment of scientific literacy together as an organized, interrelated domain. Science literacy is described as “the ability to engage with science-related issues, and with the ideas of science, as a reflective citizen”. Three competencies constitute the overarching definition of scientific literacy in PISA 2018:

- Explaining phenomena scientifically – using explanatory theories (i.e., content knowledge) to describe scientific phenomena.
- Evaluating and designing scientific enquiry – testing various hypotheses that were generated based on the scientists’ study of the natural world.
- Interpreting data and evidence scientifically – identifying patterns that explain scientific phenomena and coming up with evidence-based interpretations of such patterns.

Three forms of scientific knowledge are required in scientific literacy, namely:

- Content knowledge – ability to recall and use theories, explanatory ideas, information, and facts.
- Procedural knowledge – refers to the standard forms and procedures used in scientific enquiry to obtain content knowledge.
- Epistemic knowledge – understanding of one’s role and function in justifying the knowledge produced by science.

Aspects of the PISA scientific literacy assessment framework

For assessment purposes, the three interrelated aspects of the PISA 2018 scientific literacy framework are as follows:

- **Contexts**, which refers to both the present and past personal, local/national/global issues that require an understanding of science and technology. Some examples of domestic and international issues that provide contextual lens are the impact of artificial intelligence on human capital in the local and global workforce and the production of genetically modified organisms in various agricultural chains across the world, among others.
- **Knowledge**, which refers to the understanding of major facts, concepts, and explanatory theories that form the basis of scientific knowledge.
- The three scientific literacy **competencies** mentioned above.

READING LITERACY FRAMEWORK

Reading Literacy was the focus domain of PISA 2018. It is defined in PISA as “understanding, using, evaluating, reflecting on and engaging with texts in order to achieve one’s goals, to develop one’s knowledge and potential and to participate in society.” Similarly, Koyuncu and Firat (2020) and OECD (2021) define reading literacy as learners’ ability to not only read but also process and make sense of various texts found in real-life contexts. Thomson, Hillman, and De Bortoli (2013) and Romero and Papango (2020) emphasize further that learners need to be able to interact with texts as part of achieving their purposes for learning, imbibing additional information for increased academic and eventual professional competence, and actively pursuing social goals together with fellow community members.

Types of texts used in PISA 2018

The following are the parameters determined by PISA 2018 (OECD, 2021, p. 25) as to how examination writers and planners plot their items and select texts:

- **Source** - pertains to a particular text, which may be obtained online or offline. In any given item, there could be a **single** text source, or **multiple** text sources.
- **Organisational and navigational structure** – is defined as how learners are able to access and manipulate texts utilizing different features within a given text, especially if these are digital and interactive.
- **Format** – is classified into two types: **continuous** and **non-continuous**. Continuous texts pertain to prose texts that are mainly word-based with pictures and other figures to support the texts, such as magazine and newspaper articles, stories, social media posts, and other similar texts; in contrast, non-continuous sources are non-prose and refer to graphic illustrations that present concepts but are mainly visual, such as charts, graphs, advertisements, infographics, and other similar visuals-based materials.
- **Type** – refers to classes of texts based on main purpose as well as format and structure. OECD (2021) enumerates the following main types of texts: a) descriptions; b) narration; c) exposition; d) argumentation; e) instruction; and f) transaction (p. 25).

Reading Processes

PISA 2018 has utilized a framework that is used as a guide in describing the processes involved, particularly on the mental aspect. For PISA 2018, the reading processes measured in the test are described in Table 2, together with their respective skills (OECD, 2021, pp. 24-25).

Table 2 Reading processes and their respective skills.

READING PROCESSES	SKILLS UNDER EACH PROCESS
Locating Information	Accessing and retrieving information within a given text Searching for and selecting relevant text
Understanding	Acquiring a representation of the literal meaning of a text Constructing an integrated text
Evaluating and Reflecting	Assessing quality and credibility Reflecting on content and form Detecting and handling conflict

Proficiency levels and tasks per level

In terms of proficiency levels, PISA is composed of seven (7) levels, with the first two being Levels 1b and 1a and the last level being Level 6 (OECD, 2021). Levels 1b to 4 use single text sources, with 1b and 1a utilizing non-continuous texts and Levels 2 to 4 using continuous texts. In contrast, Levels 5 and 6 use multiple text sources, with continuous texts as the recommended type of text.

In summary, the proficiency levels are matched with their respective tasks expected of 15-year-old learners in Table 3 (DepEd, 2019, pp. 9 to 10):

Table 3 Competency levels and respective tasks in Reading Literacy.

LEVEL	TASKS EXPECTED
Level 1B (lowest)	Evaluate literal meanings within a text. Interpret literal meanings within a text. Search for given information.
Level 1a	Determine a text's overall theme. Deduce meaning of phrases or short sentences. Pinpoint the objectives of a given text.
Level 2	Compare and contrast a set of concepts. Determine the main idea of a text. Connect ideas with one another.
Level 3	Integrate ideas found in a text. Examine non-explicit relationships between ideas. Deduce an author's perception of a given idea based on the author's text.
Level 4	Make inferences using background knowledge. Interpret differences and deduce interpretations based on a text. Relate a given statement with an author's viewpoint.
Level 5	Determine causes behind phenomena. Detect biases or objectivity based on a given text.
Level 6 (highest)	Critique ideas and concepts of given text sets. Integrate all given information with one's understanding of a given set of multiple-source texts. Reflect on a given set of texts without relying on explicit information totally.

MAPPING THE K TO 12 CURRICULUM VIS-À-VIS THE PISA LITERACY FRAMEWORKS

MATHEMATICS LITERACY IN THE K TO 12 CURRICULUM

The topics covered in the PISA Mathematical Literacy Framework can be matched with several learning competencies in the K-12 curriculum. One such topic is that of equations and inequalities. Illustrating quadratic equations (M9AL-Ia-1) and inequalities (M9AL-If-1) are the competencies within the Grade 9 curriculum in which equations and inequalities can be observed. Moreover, the topic is also seen in the Grade 10 curriculum from the competency illustrating polynomial equations (M10AL-Ii-1).

Another topic from the framework is functions. This topic can be seen in the learning competencies of the Grade 9 curriculum to model real-life situations using quadratic functions (M9AL-Ig-2) and represent a quadratic function using: (a) table of values; (b) graph; and (c) equation (M9AL-Ig-3). A prerequisite of the Grade 9 learning competencies is the knowledge of Grade 8 linear functions. From the Grade 10 curriculum, functions can be observed within the learning competencies, illustrating polynomial functions (M10AL-IIa-1) and graphing polynomial functions (M10AL-IIa-b-1). Grade 8 linear functions and Grade 9 quadratic functions are the prerequisites of the Grade 10 learning competencies.

Growth phenomena is one more topic from the PISA framework that can be found in the K-12 curriculum. This is perceived when analyzing the effects of changing the values of a , h , and k in the equation $y = a(x - h)^2 + k$ of a quadratic function on its graph (M9AL-II-2). Moreover, growth phenomena can be comprehended in the Grade 10 curriculum competencies, solving problems involving polynomial functions (M10AL-IIb-2) and applying the distance formula to prove some geometric properties (M10GE-IIg-2).

The entry point for change and relationship, growth phenomena, and scientific context can also be observed within the K-12 curriculum through the learning competency solves problems involving quadratic functions (M9AL-II-j-2). Specifically, this can be found within the Grade 9 curriculum with a prerequisite of Grade 8 linear functions.

Percent, ratios, and proportions is a topic from the PISA Mathematical Literacy Framework. This topic can be seen in Grade 9 learning competencies such as describing a proportion (M5NS-IIj127), illustrating situations that involve the following variations: (a) direct; (b) inverse; (c) joint; (d) combined (M9AL-IIa-1), translating into a variation statement a relationship between two quantities given by: (a) a table of values; (b) a mathematical equation; (c) a graph, and vice versa (M9AL-IIa-b-1), solving problems involving variation (M9AL-IIb-c-1), illustrating the similarity of figures (M9GE-IIIg-1), finding the trigonometric ratios of special angles (M9GE-IVb-c-1), and illustrating laws of sines and cosines (M9GE-IVf-g-1).

Furthermore, the topic numbers and units can also be found in the K-12 curriculum. In the Grade 9 curriculum, the learning competencies that discuss numbers and units are as follows: applying the laws involving positive integral exponents to zero and negative integral exponents (M9AL-IIId-1), simplifying expressions with rational exponents (M9AL-IIe-1), writing expressions with rational exponents as radicals and vice versa (M9AL-IIIf-1), deriving the laws of radicals (M9AL-IIIf-2), and simplifying radical expressions using the laws of radicals (M9AL-IIg-1).

The PISA Mathematical Literacy Framework also covers discussion of algebraic expressions with rational exponents (M9AL-IIId-2). It also includes arithmetic operations topics such as operations and solving equations involving radical expressions (M9AL-IIh-1, M9AL-IIi-1). These learning competencies are part of the Grade 9 curriculum and are also fundamental to the topics in Grade 10. Arithmetic and geometric sequences are two of the main topics in the Grade 10 curriculum that require knowledge of arithmetic operations to determine the n th term of an arithmetic sequence (M10AL-Ib-c-1); find the sum of the terms of a given arithmetic sequence (M10AL-Ic-2); and determine geometric means and the n th term of a geometric sequence (M10AL-Ie-1).

One of the content strands that is included in the PISA Mathematical Literacy Framework is geometry. Understanding some of its core concepts on Coordinate systems, Measurement, Geometric approximations and relationships among geometrical objects can be observed in the Grade 9 curriculum with the needed prerequisite knowledge of triangles, area and volume of shapes. The learning competencies on the discussion of the coordinate systems in the Grade 9 and 10 curricula are as follows: to identify quadrilaterals that are parallelograms (M9GE-IIIa-1) and graph a circle and other geometric figures on the coordinate plane (M10GE-IIIi-1).

Measurement is a topic that is also emphasized in the PISA Mathematical Literacy Framework. This is widely considered in the K-12 curriculum especially the learning competencies in Grade 9, that is to find measures of angles, sides and other quantities involving parallelograms by using properties of triangles (M9GE-IIIb-1), illustrate angles of elevation and angles of depression (M9GE-IVd-1) and solve problems involving oblique triangles. (M9GE-IVh-j-1).

Key concepts on geometric approximation are also given much needed attention in the PISA Framework. The learning competencies that students must demonstrate are to: solve problems involving parallelograms, trapezoids and kites. (M9GE-IIIe-1), apply the fundamental theorems of proportionality to solve problems involving proportions (M9GE-III f-2), and use trigonometric ratios to solve real-life problems involving right triangles (M9GE-IVe-1) which can be seen in the Grade 9 curriculum. In addition, to solve problems involving parallelograms, trapezoids and kites (M9GE-IIIe-1) and apply the fundamental theorems of proportionality to solve problems involving proportions (M9GE-III f-2) the needed learning competencies in Grade 10.

The similarity of triangles is one topic from the PISA Framework with the learning competencies to prove conditions for SAS similarity theorem, SSS similarity theorem, AA similarity theorem, right triangle similarity theorem and special right triangle theorems (M9GE-IIIg-h-1); solves problem that involve triangle similarity and right triangles (M9GE-IIIj-1). The prerequisite of these learning competencies includes illustrating triangle congruence and inequalities.

The PISA Mathematical Literacy Framework covers counting principles as one of the topics in the material applicable for the K to 12 curriculum. This topic is discussed in Grade 10. With the code M10SP-III d-e-1, it simply discusses the means to solve problems that involve permutations and combinations.

One of the topics discussed in the PISA Mathematical Literacy Framework is about chance and probability, specifically for Grade 10 students. Competencies included in the topic are solving problems involving probability (M10SP-III i-j-1) and measuring of position: quartile, deciles, and percentiles (M10SP-IVa-1).

In the PISA Mathematical Literacy Framework, the topic on data collection, representation, and interpretation covers competencies on interpretation of measures of position (M10SP-IVc-1) and the use of appropriate measures of position and other statistical methods in analyzing and interpreting research data (M10SP-IVh-j-1). This topic is discussed to Grade 10 students.

The learning competency, solving problems involving measures of position (M10SP-IVd-e-1) discusses the topic data variability and its description. This topic is discussed for Grade 10 students and is part of the K to 12 curriculum.

The PISA Mathematical Literacy Framework includes computer simulation as a topic for Grade 9 students in the K to 12 curriculum. This covers analyzing the effects of changing the values of a , h and k in the $y = a(x - h)^2 + k$ of a quadratic function on its graph (M9AL-II-2), translating into a variation statement a relationship between two quantities given by: (a) a table of values; (b) a mathematical equation; (c) a graph, and vice versa. (M9AL-IIa-b-1), and solving problems involving variation (M9AL-IIb-c-1). For Grade 10, it covers topics such as determining geometric means and the n th term of a geometric sequence (M10AL-Ie-1), finding the sum of the terms of a given finite or infinite geometric sequence (M10AL-Ie-2), deriving inductively the relations among chords, arcs, central angles, and inscribed angles (M10GE-IIc-1), illustrating the center-radius form of the equation of a circle (M10GE-IIh-1), differentiating permutation from combination of objects taken at a time (M10SP-IIIc-2), solving problems involving permutations and combinations (M10SP-IIId-e-1), solving problems involving probability (M10SP-IIIj-1), and using appropriate measures of position and other statistical methods in analyzing and interpreting research data (M10SP-IVh-j-1).

Table 4 Mapping the PISA Mathematics Literacy Framework with the K to 12

PISA Content Knowledge	K to 12 Grade Level and Learning Competency	K to 12 Pre-requisite Competencies
Equations and inequalities	Grade 9 a. illustrates quadratic inequalities (M9AL-If-1) Grade 10 a. illustrates polynomial equations (M10AL-li-1)	Properties of inequalities (Gr. 7), Properties of equalities (Gr. 7),
Functions	Grade 9 a. models real-life situations using quadratic functions (M9AL-Ig-2) b. represents a quadratic function using: (a) table of values; (b) graph; and (c) equation (M9AL-Ig-3) Grade 10 a. illustrates polynomial functions (M10AL-IIa-1) b. graphs polynomial functions. (M10AL-IIa-b-1)	Linear functions (Gr. 8) quadratic functions (Gr. 9)
Growth phenomena	Grade 9 a. analyzes the effects of changing the values of a, h and k in the equation $y = a(x - h)^2 + k$ of a quadratic function on its graph. (M9AL-li-2) Grade 10 a. solves problems involving polynomial functions. (M10AL-IIb-2) b. applies the distance formula to prove some geometric properties (M10GE-IIg-2)	
Entry point for Change and Relationship, growth phenomena, scientific context	Grade 9 a. solves problems involving quadratic functions. (M9AL-li-j-2)	Linear functions (Gr. 8)
Percents, ratios and proportions	Grade 9 a. describes a proportion. (M5NS-IIj127) b. illustrates situations that involve the following variations: (a)	Translates English phrases to mathematical phrases (Gr. 7)

PISA Content Knowledge	K to 12 Grade Level and Learning Competency	K to 12 Pre-requisite Competencies
	direct; (b) inverse; (c) joint; (d) combined. (M9AL-IIa-1) c. translates into a variation statement a relationship between two quantities given by: (a) a table of values; (b) a mathematical equation; (c) a graph, and vice versa. (M9AL-IIa-b-1) d. solves problems involving variation. (M9AL-IIb-c-1) e. illustrates the similarity of figures. (M9GE-IIIg-1) f. finds the trigonometric ratios of special angles (M9GE - IVb-c-1). g. illustrates laws of sines and cosines. (M9GE-IVf-g-1)	Ratios and proportions (Grades 5 & 6) Linear Equation and Inequality (Grade 7) Linear Functions (Grade 8) Quadratic Functions (Grade 9)
Numbers and units	Grade 9 a. applies the laws involving positive integral exponents to zero and negative integral exponents. (M9AL-IIId-1) b. simplifies expressions with rational exponents. (M9AL-IIe-1) c. writes expressions with rational exponents as radicals and vice versa. (M9AL-IIIf-1) d. derives the laws of radicals. (M9AL-IIIf-2) e. simplifies radical expressions using the laws of radicals. (M9AL-IIg-1) Grade 10 a. generates patterns. (M10AL-Ia-1)	Exponents (Grade 6) Operations on Rational Numbers (Grade 7) Laws of Exponents (Grade 7)
Algebraic expressions	Grade 9 a. illustrates expressions with rational exponents. (M9AL-IIId-2)	Laws of exponents (Gr. 7)
Arithmetic operations	Grade 9 a. performs operations on radical expressions. (M9AL-IIh-1) b. solves equations involving radical expressions. (M9AL-IIi-1) Grade 10	Operations on Rational Numbers (Grade 7) Laws of Exponent (Grade 7) Sequence (Grades 5 & 6)

PISA Content Knowledge	K to 12 Grade Level and Learning Competency	K to 12 Pre-requisite Competencies
	a. determines arithmetic means and nth term of an arithmetic sequence. (M10AL-Ib-c-1) b. finds the sum of the terms of a given arithmetic sequence. (M10AL-Ic-2) c. determines geometric means and the nth term of a geometric sequence. (M10AL-Ie-1) d. finds the sum of the terms of a given finite or infinite geometric sequence. (M10AL-Ie-2)	Linear Equations and Inequalities (Grade 7) Linear Functions (Grade 8) Quadratic Functions (Grade 9)
Coordinate systems	Grade 9 a. identifies quadrilaterals that are parallelograms. (M9GE-IIIa-1) Grade 10 a. graphs a circle and other geometric figures on the coordinate plane. (M10GE-IIIi-1)	Regular and Irregular plane and solid figures (Gr. 5 & 6), Rectangular coordinate system (Gr.),
Measurement	Grade 9 a. uses properties to find measures of angles, sides and other quantities involving parallelograms. (M9GE-IIIb-1) b. illustrates angles of elevation and angles of depression. (M9GE-IVd-1) c. solves problems involving oblique triangles. (M9GE-IVh-j-1)	Properties of Triangles and Quadrilaterals (Grade 4) Perimeter and Area of Triangles and Quadrilaterals (Grade 4) Area of Composite Figures (Grade 6) Relationships of Geometric Figures (Grade 7) Key Concepts of Logic and Reasoning (Grade 8)
Geometric approximations	Grade 9 a. solves problems involving parallelograms, trapezoids and kites. (M9GE-IIIe-1) b. applies the fundamental theorems of proportionality to	Area and volume

PISA Content Knowledge	K to 12 Grade Level and Learning Competency	K to 12 Pre- requisite Competencies
	solve problems involving proportions. (M9GE-III f-2) c. uses trigonometric ratios to solve real-life problems involving right triangles. (M9GE-IV e-1) Grade 10 a. applies the distance formula to prove some geometric properties. (M10GE-II g-2) b. solves problems involving geometric figures on the coordinate plane. (M10GE-III j-1)	
Relationship within and among geometrical objects in two or three dimensions	Grade 9 a. proves the conditions for similarity of triangles. *** (M9GE-III g-h-1) • SAS similarity theorem • SSS similarity theorem • AA similarity theorem • right triangle similarity theorem • special right triangle theorems b. solves problems that involve triangle similarity and right triangles. (M9GE-III j-1)	Illustrate triangle congruence, triangle inequalities (Gr. 8)
Counting Principles	Grade 10 a. solves problems involving permutations and combinations. (M10SP-III d-e-1)	
Chance and Probability	Grade 10 a. solves problems involving probability. (M10SP-III i-j-1) b. measures of position: quartiles, deciles and percentiles. (M10SP-IV a-1)	
Data collection, representation and interpretation	Grade 10 a. interprets measures of position. (M10SP-IV c-1) b. uses appropriate measures of position and other statistical	Data variability and its description Representation and interpretation of

Content Knowledge	Grade Level and Learning Competency	Pre-requisite Competencies
	methods in analyzing and interpreting research data. (M10SP-IVh-j-1)	data using tables and graphs: bar graph, line graph, pie graph, histogram, ogive (Grade 7)
Data variability and its description	Grade 10 a. solves problems involving measures of position. (M10SP-IVd-e-1)	Concepts on variability, and central tendency of data sets (Grade 7)
Computer Simulation	Grade 9 a. analyzes the effects of changing the values of a, h and k in the equation $y = a(x - h)^2 + k$ of a quadratic function on its graph.*** (M9AL-li-2) b. translates into a variation statement a relationship between two quantities given by: (a) a table of values; (b) a mathematical equation; (c) a graph, and vice versa. (M9AL-IIa-b-1) c. solves problems involving variation. (M9AL-IIb-c-1) Grade 10 a. determines geometric means and the nth term of a geometric sequence. (M10AL-le-1) b. finds the sum of the terms of a given finite or infinite geometric sequence. (M10AL-le-2) c. derives inductively the relations among chords, arcs, central angles, and inscribed angles. (M10GE-IIc-1) d. illustrates the center-radius form of the equation of a circle. (M10GE-IIh-1) e. differentiates permutation from combination of n objects taken r at a time. (M10SP-IIIc-2)	

PISA Content Knowledge	K to 12 Grade Level and Learning Competency	K to 12 Pre-requisite Competencies
	f. solves problems involving permutations and combinations. (M10SP-IIIId-e-1) g. solves problems involving probability. (M10SP-IIIi-j-1) h. uses appropriate measures of position and other statistical methods in analyzing and interpreting research data. (M10SP-IVh-j-1)	

READING LITERACY IN THE K TO 12 CURRICULUM

The simplest type of reading process measured in PISA Reading Literacy is **Scanning and Locating information**. This process includes accessing and retrieving information within a piece of text and searching for and selecting relevant text when faced with multiple pieces of text.

This process is also a skill covered in the K to 12 curriculum, particularly in Junior High School (Grades 7-10). Some competencies in the K to 12 that involve scanning and locating information are:

Grade 7

- Use the appropriate reading style (scanning, skimming, speed reading, intensive reading, etc.) for one's purpose
- Scan for specific information
- Skim for major ideas using heading as guide

Grade 8

- Identify positions of a topic sentence
- Identify details that support the logic sentence
- Use the appropriate reading style

Grade 9

- Take note of sequence signals or connections to determine patterns of idea development
- Scan sequence signals or connectors to determine patterns of the idea development
- Listen to get important information from argumentative/persuasive texts
- Extract important from argumentative/persuasive texts
- Skim to determine key ideas and author's purpose

Grade 10

- Scan for needed information

The ability to search and select a piece of text from among a set of texts is an integral component of PISA Reading Literacy Framework. **Searching and**

selecting relevant text is another type of reading process that involves locating and selecting information. In this process, the readers are tasked to locate and select information among a set of several texts proficiently. This process is also included in the K to 12 curriculum, particularly in Junior High School (Grades 7, 9, and 10). Some competencies involved in searching and selecting relevant text are:

Grade 7

- Use the card catalog, the online public access catalog, or electronic search engine to locate specific resources
- Use appropriate mechanisms/ tools in the library for locating resources
- Gather current information from newspapers and other print and non-print media
- Get information from the different parts of a book and from general references in the library

Grade 9

- Get information from various print media like brochures, pamphlets, periodicals, and audio-video recordings

Grade 10

- Use location skills to gather information from primary to secondary sources of information
- Get vital information from various websites on the internet

Another type of reading process measured in PISA Reading Literacy Framework is Literal **Comprehension**. This process involves understanding the question and the target information within a passage. The reader may need to rank, prioritize or condense information at a local level.

This process is also a skill included in the K to 12 curriculum, particularly in Junior High School (Grades 7-8). Some competencies involved in the literal comprehension are:

Grade 7

- Read intensively to find answers to specific questions
- Distinguish between general and specific statements
- Sequence/ reorganize ideas or information
- Narrate events
- Retell a chosen myth or legend in a series of simple paragraphs
- Classify text types (narrative, expository, explanation, recount, persuasive)
- Differentiate literary writing from

Grade 8

- Predicts the gist of the material viewed based on the title, pictures, and excerpts
- Distinguish between and among verbal, situational, and dramatic types of irony and give examples of each
- Identify features of journalistic writing
- Distinguish among the types of journalistic writing (news report, opinion article, feature article, and sports news article)

Inference Comprehension is also one of the reading processes measured in PISA Reading Literacy Framework which involves understanding and interpreting text passages. In this process, the reader needs to generate various types of inferences, ranging from simple connecting inferences (such as the resolution of anaphora) to more complex coherence relationships (e.g., spatial, temporal, causal or claim-argument links) (van den Broek, Risden, and Husbye-Hartmann, 1995).

This process is also included in the K to 12 curriculum, particularly in Junior High School (Grades 7-10). Some competencies in the K to 12 that involve inference comprehension are:

Grade 7

- Transcode orally and in writing the information presented in diagrams, charts, tables, graphs, etc.
- Give the meaning of given signs and symbols (road signs, prohibited signs, etc.)
- Make predictions about the text.
- Cite evidence to support a general statement.
- Extract information from a text using a summary, precis, and paraphrase.
- Identify key ideas.
- Identify supporting details.
- Simplify ideas.
- Infer thoughts and feelings expressed in a text listened to.
- Use lexical and contextual cues in understanding unfamiliar words and expressions.
- Extract information from the text listened to.
- Organize information read into an outline.

Grade 8

- Transcode information from a graphic organizer to a topic sentence outline.
- Transcode information from linear to non-linear texts and vice-versa.
- Explain visual-verbal relationships illustrated in tables, graphs, and information maps found in expository text.
- Interpret and follow instructions, directions, notices, rules, and regulations.
- Synthesize essential information found in a given text.
- Organize information from a material viewed.
- Generate ideas and their and their relationships.
- Organize notes taken from an expository text.
- Arrange notes in one-step word, phrase, and sentence outline forms.
- Develop related support sentences.
- Use of a variety of techniques to formulate a conclusion.
- Expand the context of an outline using notes from primary and secondary sources.
- Highlight important points in an informative talk using appropriate presentation aids.
- Draw conclusions from a set of details.
- Synthesize essential information found in a given text
- Summarize information from the text listened to.

Grade 9

- Interpret information found in non-linear texts such as diagrams, maps, charts, etc.
- Organize information in various ways (outlining, graphics, representations, etc.)
- Infer thoughts, feelings, and intentions in the material viewed.
- Explain how words are derived from names of persons and places.
- Interpret the message conveyed in a material viewed.
- Interpret the information listened to.
- Draw generalizations and conclusions from the material listened to.
- Make inferences from what was said.
- Summarize the contents of the material viewed.
- Make generalizations.
- Formulate predictions based on the material viewed.
- Take note of sequence signals or connectors to determine patterns of idea development given in a text.

Grade 10

- Transcode information from linear to non-linear texts and vice-versa.
- Explain illustrations from linear to non-linear text and vice-versa.
- Switch from one listening strategy to another to extract meaning in the listening text.
- Get information that can be used in everyday life from news to informative talks, panel discussions, etc.
- Read closely to get explicitly and implicitly stated information.
- Get different viewpoints on various local or global issues.
- Express insights based on the ideas presented in the materials.
- Listen to simplify, reorganize, synthesize, and evaluate information, review or update knowledge.
- Share viewpoints based on the ideas presented in the material.
- Make generalizations.
- Distinguish the important points from less important ones in a text.
- Synthesize essential information about a chosen issue.
- Summarize important points discussed in the text listened to.

A major reading process measured in PISA Reading Literacy Framework is ***Assessing the quality and credibility of the text***. In this process, readers should be able to reason beyond the literal or inferred meaning of the text. Furthermore, they should be able to evaluate the quality and credibility of the information in a piece of text: whether the information is valid, up-to-date, accurate, and/or unbiased. Moreover, this process requires the reader's capability to identify and assess the source of the information: whether the author is competent, well-informed, and benevolent.

This process is also a skill covered in the K to 12 curriculum, particularly in Junior High School (Grades 7-10). Some competencies in the K to 12 that involve assessing the quality and credibility of the text are:

Grade 7

- Identify the persons speaking and the stand of the speakers based on explicit statements made

Grade 8

- Determine the issue and stand presented in the material viewed
- Examine biases (for or against) made by the author
- Evaluate the details that support assertions in a text
- Evaluate the accuracy of a given information
- Draw conclusion from a set of details

Grade 9

- Examine sample tests representative of each type
- Assess the relevance and worth of ideas presented in the material viewed
- Judge the relevance and worth of information/ideas
- Judge the relevance and worth of ideas, soundness of author's reasoning, and the effectiveness of the presentation
- Judge the relevance and truthfulness of the ideas listened to
- Judge the validity of the evidence listened to

Grade 10

- Evaluate text content, elements, features, and properties using a set of criteria
- Evaluate the accuracy of given information
- Evaluate the information contained in the material viewed in terms of accuracy and effectiveness
- Compare and contrast the contents of the materials viewed with outside sources of information in terms of accessibility and effectiveness
- Draw conclusion from the set of details
- Evaluate the information contained in the material viewed in terms of accuracy and effectiveness

Table 5 Mapping the PISA Reading Literacy Framework with the K to 12

PISA Reading Process	K to 12 Learning Competencies			
	Grade 7	Grade 8	Grade 9	Grade 10
Scan and Locate	a. Use the appropriate reading style (scanning, skimming, speed reading, intensive reading, etc.) for one's purpose b. Scan for specific information c. Skim for major ideas using heading as guide	a. Identify positions of a topic sentence b. Identify details that support the logic sentence c. Use the appropriate reading style	a. Take note of sequence signals or connections to determine patterns of idea development b. Scan sequence signals or connectors to determine patterns of the idea development c. Listen to get important information from argumentative/persuasive texts d. Extract important from argumentative/persuasive texts e. Skim to determine key ideas and author's purpose	a. Scan for needed information
Search and Select relevant text	a. Use the card catalog, the online public access catalog, or electronic search engine to locate specific resources b. Use appropriate mechanisms/tools in the library for	-	a. Get information from various print media like brochures, pamphlets, periodicals, and audio-video recordings	a. Use location skills to gather information from primary to secondary sources of information b. Get vital information from various websites on the internet

PISA Reading Process	K to 12 Learning Competencies			
	Grade 7	Grade 8	Grade 9	Grade 10
	locating resources c. Gather current information from newspapers and other print and non-print media d. Get information from the different parts of a book and from general references in the library			
Literal Comprehension	a. Read intensively to find answers to specific questions b. Distinguish between general and specific statements c. Sequence/ reorganize ideas or information d. Narrate events e. Retell a chosen myth or legend in a series of simple paragraphs f. Classify text types (narrative,	a. Predicts the gist of the material viewed based on the title, pictures, and excerpts b. Distinguish between and among verbal, situational, and dramatic types of irony and give examples of each c. Identify features of journalistic writing d. Distinguish among the types of journalistic writing (news report, opinion	-	-

PISA Reading Process	K to 12 Learning Competencies			
	Grade 7	Grade 8	Grade 9	Grade 10
	expository, explanation, recount, persuasive) g. Differentiate literary writing from	article, feature article, and sports news article)		
Inference Comprehension	a. Transcode orally and in writing the information presented in diagrams, charts, tables, graphs, etc. b. Give the meaning of given signs and symbols (road signs, prohibited signs, etc.) c. Make predictions about the text. d. Cite evidence to support a general statement. e. Extract information from a text using a summary, precis and paraphrase. f. Identify key ideas. g. Identify supporting details. h. Simplify ideas.	a. Transcode information from a graphic organizer to a topic sentence outline. b. Transcode information from linear to non-linear texts and vice-versa. c. Explain visual-verbal relationships illustrated in tables, graphs, and information maps found in expository text. d. Interpret and follow instructions, directions, notices, rules and regulations. e. Synthesize essential information found in a given text. f. Organized information from a material viewed.	a. Interpret information found in non-linear texts such as diagrams, maps, charts, etc. b. Organize information in various ways (outlining, graphic, representations, etc.) c. Infer thoughts, feelings, and intentions in the material viewed. d. Explain how words are derived from names of persons and places. e. Interpret the message conveyed in a material viewed. f. Interpret the information listened to. g. Draw generalizations and conclusions from the material listened to. h. Make inferences from what was said. i. Summarize the contents of the material viewed. j. Make generalizations.	a. Transcode information from linear to non-linear texts and vice-versa. b. Explain illustrations from linear to non-linear text and vice-versa. c. Switch from one listening strategy to another to extract meaning in the listening text. d. Get information that can be used in everyday life from news to informative talks, panel discussions, etc. e. Read closely to get explicitly and implicitly stated information. f. Get different viewpoints on various local or global issues.

PISA Reading Process	K to 12 Learning Competencies			
	Grade 7	Grade 8	Grade 9	Grade 10
	i. Infer thoughts and feelings expressed in a text listened to. j. Use lexical and contextual cues in understanding unfamiliar words and expressions. k. Extract information from the text listened to. l. Organize information read into an outline.	g. Generate ideas and their and their relationships. h. Organize notes taken from an expository text. i. Arrange notes in one-step word, phrase, and sentence outline forms. j. Develop related support sentences. k. Use of a variety of techniques to formulate a conclusion. l. Expand the context of an outline using notes from primary and secondary sources. m. Highlight important points in an informative talk using appropriate presentation aids. n. Draw conclusions from a set of details.	k. Formulate predictions based on the material viewed. l. Take note of sequence signals or connectors to determine patterns of idea development given in a text.	g. Express insights based on the ideas presented in the materials. h. Listen to simplify, reorganize, synthesize, and evaluate information, review or update knowledge. i. Share viewpoints based on the ideas presented in the material. j. Make generalizations. k. Distinguish the important points from less important ones in a text. l. Synthesize essential information about a chosen issue. m. Summarize important points discussed in the text listened to.

PISA Reading Process	K to 12 Learning Competencies			
	Grade 7	Grade 8	Grade 9	Grade 10
		o. Synthesize essential information found in a given text p. Summarize information from the text listened to.		
Assess quality and credibility	a. Identify the persons speaking and the stand of the speakers based on explicit statements made	a. Determine the issue and stand presented in the material viewed b. Examine biases (for or against) made by the author c. Evaluate the details that support assertions in a text d. Evaluate the accuracy of a given information e. Draw conclusion from a set of details	a. Examine sample tests representative of each type b. Assess the relevance and worth of ideas presented in the material viewed c. Judge the relevance and worth of information/ideas d. Judge the relevance and worth of ideas, soundness of author's reasoning, and effectiveness of the presentation e. Judge the relevance and truthfulness of the ideas listened to f. Judge the validity of the evidence listened to	a. Evaluate text content, elements, features, and properties using a set of criteria b. Evaluate the accuracy of given information c. Evaluate the information contained in the material viewed in terms of accuracy and effectiveness d. Compare and contrast the contents of the materials viewed with outside sources of information in terms of accessibility and effectiveness e. Draw conclusion from the set of details f. Evaluate the information contained

PISA Reading Process	K to 12 Learning Competencies			
	Grade 7	Grade 8	Grade 9	Grade 10
				in the material viewed in terms of accuracy and effectiveness

SCIENCE LITERACY IN THE K TO 12 CURRICULUM

The following content knowledge topics are reflected in the tasks which PISA uses to measure scientific literacy. The table illustrates the “entry points” between the PISA framework and the K to 12 curriculum pertaining to the subject of science.

Physical Systems are the first category covered by the PISA Scientific Framework. The first content knowledge topic under this is “Structures of Matter” including: the Particle Model, Bonds, Changes of State, and Thermal and Electrical Conductivity. Particle Models are also discussed in the K to 12 curriculum, particularly in Grade 8 (S8MT-IIIab-8 and S8MT-IIIef-10) and Grade 9 (S9MT-IIa210 and S9MT-IIa22). Bonds are discussed in the K to 12 curriculum in Grade 9 (particularly through S9MT-IIa13, S9MT-IIb14, and S9MT-IIg17). Changes of State are discussed in the K to 12 curriculum in Grade 8 (particularly through S8MT-IIIcd-9). Thermal and electrical conductivity are also discussed in the K to 12 curriculum in Grade 9 (particularly through S9MT-IIcd-15 and S9MT-IIef-16).

The second content knowledge topic under “Structures of Matter” is “Chemical Changes” which includes: Chemical Reactions, Energy Transfer, and Acids / Bases. Chemical Reactions are discussed in the K to 12 curriculum in Grade 8 and 10 (particularly through S8MT-IIIij-12 and S10MTIVE-g-23). Energy transfer is discussed in Grade 9 (S9MT-IIa22). Acids / bases are discussed in Grade 7 (S7MT-Id-3).

The third content knowledge topic under “Structures of Matter” is “Motion, Forces and Action at a distance” which includes: Velocity, Force and Friction, Gravitational Force (projectile motion), Electrostatic Force, and Magnetic Force. Velocity is discussed in the K to 12 curriculum in Grade 7 (S7FE-IIIa1 and S7FE-IIIb3). Force and friction is discussed in Grade 8 (S8FE-Ia-15, S8FE-Ia-16, S8FE-Ib-17, S8FE-Ib-18, S8FE-Ib-19). Gravitational force is discussed in Grade 9 (S9FE-IVa34 and S9FE-IVa35). Electrostatic Force is discussed in Grade 7 (S7LT-IIIj13 and S7LT-IIIj14), Grade 8 (S8FE-Ih-30, S8FE-Ii-31, S9FE-Ii-32, and S8FE-Ii-33), and Grade 9 (S9FE-IVhj-46). Magnetic Force is discussed in Grade 10 (S10FE-IIIi53 and S10FE-IIj54).

The fourth content knowledge topic under “Structures of Matter” is Energy and its transformation which includes: Mechanical Energy (KE and PE), Conservation of Energy, Dissipation of Energy, and Chemical Reactions. Mechanical Energy is discussed in Grade 8 (S8FE-Id-22 and S8FE-Id-23). Conservation of Energy is discussed in Grade 9 (S9FE-IVc39, S9FE-IVd40, S9FE-IVe41, S9FE-IVb36, S9FE-IVb37, S9FE-IVc38). Dissipation of Energy is discussed in Grade 9 (S9FE-IVe42, S9FE-IVf43, S9FE-IVf44, S9FE-IVg45). Chemical Reactions are discussed in Grade 10 (S10MTIVE-g-23 and S10MTIVh-j-24).

The fifth content knowledge topic under “Structures of Matter” is Interaction between Energy and Matter which includes: Mechanical Wave, Sound, Light, EM Waves, Seismic Wave. Mechanical Waves are discussed in Grade 7 (S7LT-IIIc- 4, S7LT-IIIc- 5, S7LT-IIId- 6). Sound is discussed in Grade 7 (S7LT-IIIe8, S7LT-IIId7, S7LT-IIIe9) and Grade 8 (S8FE-Ie-24 and S8FE-Ie-25). Light is discussed in Grade 8 (S8FE-If-26, S8FE-If-27, S7LT-IIIf10, S8FE-If-28) and Grade 10 (S10FE-IIg50, S10FE-IIg51, S10FE-IIh52). Electromagnetic Waves are discussed in Grade 10 (S10FE-IIab-47, S10FE-IIcd-48, S10FE-IIef-49). Seismic Waves are discussed in Grade 8 (S8ES-IIa14, S8ES-IIa15, S8ES-IIb16, S8ES-IIc17) and Grade 10 (S10ES – Ia-j-36.1).

Living Systems are the second category covered by the PISA Scientific Framework. The first content knowledge topic under “Structures of Matter” is Cells (i.e., structures and function, DNA, differences between plant and animal cells) which includes: Structures and Function, DNA, Hormones, Plants vs Animal Cells. Cell Structures and Functions are discussed in Grade 7 (S7LT-IIe-5), Grade 9 (S9LT-Id-28), and Grade 10 (S10LTIIIa-33). DNA is discussed in Grade 10 (S10LTIIId-37 and S10LTIIIf-38). Hormones are discussed in Grade 10 (S10LTIIIf-34 and S10LTIIIf-35). Differentiating plant and animal cells is discussed in Grade 7 (S7LT-IIe-4).

The second content knowledge topic under “Structures of Matter” is the concept of an organism (i.e., unicellular vs multicellular), which is discussed in SHS General Biology I.

Health, Nutrition, and Body Systems and their Relationships are under the topic “Humans” which is covered by the PISA Science Literacy Framework. These topics except for Nutrition were also discussed in the K to 12 curriculum particularly in Grade 8 (S8LT-IVb-14, S9LT-Ic-27, and S8LT-IVa-13) and Grade 9 (S9LT-Ic-27, S9LT-Ia-b-6, and S10LT-IIIc-36). On the other hand, the topic Nutrition is found in other subjects such as Health.

One of the core topics of Biology is “Population” which includes Species, Biodiversity, Evolution, and Genetic Variation. The learning competencies of these topics were also included in the K-12 Curriculum in Grade 7 (S7LT-IIe-6, S7LT-IIe-7 and S7LT-IIe-8), Grade 8 (S8LT-IVg-19, S8LT-IVh-20, S8LT-IVh-21, S8LT-IVd-16, S8LT-IVe-17, S8LT-IVf-18), Grade 9 (S9LT-Ie-f-30 and S9LT-Id-29), and Grade 10 (S10LT-IIIh-41, S10LT-IIIi-42, S10LT-IIIj-39, S10LT-IIIg-40).

The discussion on “Ecosystem” which tackles the topics Food Chains, Matter, and Energy Flow can be found on both PISA Science Literacy Framework and DepEd K to 12 Curriculum specifically on Grade 7 (S7LT-IIh-9, S7LT-IIh-10, and S7LT-IIj-12). Grade 8 (S8LT-IVi-23, S8LT-IVi-24, S8LT-IVi-22), and Grade 9 (S9LT-Ig-j-31).

The Biosphere’s topics such as Ecosystem Services and Sustainability are also one of the focuses of the PISA Science Literacy Framework which can be found as well on Grade 7 (S7LT-IIIi-11), Grade 8 (S8LT-IVj-25) and Grade 10 (S10LT-IIIj-43) of the DepEd K to 12 Curriculum.

Earth and Space Systems are the last category covered by the PISA Scientific Framework. “Structures of the Earth” is also included in K to 12 Curriculum. The learning competencies of the topic Interactions in the Atmosphere, Understanding Typhoons, and Climate can be found on Grade 7 (S7ES-IVd-5, S7ES-IVe-6, S7ES-IVf-7, S7ES-IVg-8, S7ES-IVh-9, and S7ES-IVi-10), Grade 8 (S8ES-IIId-18, S8ES-IIId-19, S8ES-IIe-20, and S8ES-IIIf-21), and Grade 9 (S9ES-LLe-30, and S9-IIIf-31) respectively.

The second content under this category is about the “Energy in the Earth” which focuses on the Protection and Conservation of Natural Resources particularly in Grade 7 (S7ES-IVb-3, and S7ES-IVc-4) of the K to 12 DepEd Curriculum.

Another content for the PISA Science Literacy Framework is the “Changes in the Earth” which includes: Earthquakes and Fault on Grade 8 (S8ES-IIa-14, S8ES-IIa-15, S8ES-IIb-16, and S8ES-IIc-17), Volcanoes on Grade 9 (S9ES-IIIa-25, S9ES-IIIa-27, S8ES-IIIb-28, and S9ES-IIIc-d-29), and Grade 10 (S10ES-Ia-j-36.1, S10ES-Ia-j-36.2, S10ES-Ia-j-36.3, S10ES-Ia-j-36.4, S10ES-Ia-j-36.5, and S10ES-Ia-j-36.6) of the DepEd K to 12 Curriculum.

Earth in Space is a content of the PISA Science Literacy Framework that includes Eclipses, Other members of the Solar System such as Comets, Meteors and Asteroids, and most importantly, the Comets. These topics can be found particularly on Grade 7 (S7ES-IVj-11, and S7ES-IVj-12), Grade 8 (S8ES-IIg-22, S8ES-IIh-23, and S8ES-IIi-j-24), and (S9ES-IIIg-32, S9ES-IIih-33, S9ES-IIIi34, and S9ES-IIIj-350).

Topics about “Earth’s History” and “The History and Scale of the Universe” are PISA Science Literacy Framework contents that are found on the SHS Earth And Life Science Curriculum.

Table 6 Mapping the PISA Science Literacy Framework with the K to 12

PISA Content Knowledge	PISA Sub-domain	K to 12 Grade Level and Learning Competency
Structure of Matter	Particle Model	Grade 8 a. explain the properties of solids, liquids, and gases based on the particle nature of matter; (S8MT-IIIab-8) b. determine the number of protons, neutrons, and electrons in a particular atom (S8MT-IIIef-10) Grade 9 a. describe how the Bohr model of the atom improved Rutherford’s atomic model (S9MT-IIa210) c. explain how the Quantum Mechanical Model of the atom describes the energies and positions of the electrons (S9MT-IIa22)
	Bonds	Grade 9 a. explain the formation of ionic and covalent bonds; (S9MT-IIa13) b. recognize different types of compounds (ionic or covalent) based on their properties such as melting point, hardness, polarity, and electrical and thermal conductivity; (S9MT-IIb14)

Content Knowledge	Sub-domain	Grade Level and Learning Competency
		c. explain how the structure of the carbon atom affects the type of bonds it forms; (S9MT-IIg17)
	Changes of State	Grade 8 a. explain physical changes in terms of the arrangement and motion of atoms and molecules; (S8MT-IIIcd-9)
	Thermal and electrical conductivity	Grade 9 a. explain properties of metals in terms of their structure; (S9MT-IIcd-15) b. explain how ions are formed; (S9MT-IIef-16)
Chemical Changes	Chemical Reactions	Grade 8 a. use the periodic table to predict the chemical behavior of an element. (S8MT-IIIj-12) Grade 10 a. apply the principles of conservation of mass to chemical reactions; and (S10MTIVe-g-23)
	Energy transfer	Grade 9 a. explain how the Quantum Mechanical Model of the atom describes the energies and positions of the electrons (S9MT-IIa22)

Content Knowledge	Sub-domain	Grade Level and Learning Competency
	Acids/bases	Grade 7 a. express concentrations of solutions quantitatively by preparing different concentrations of mixtures according to uses and availability of materials; (S7MT-Id-3)
Motion, Forces and Action at a distance	Velocity	Grade 7 a. describe the motion of an object in terms of distance or displacement, speed or velocity, and acceleration (S7FE-IIIa1) b. create and interpret visual representation of the motion of objects such as tape charts and motion graphs (S7FE-IIIb3)
	Force and Friction	Grade 8 a. investigate the relationship between the amount of force applied and the mass of the object to the amount of change in the object's motion (S8FE-Ia-15) b. infer that when a body exerts a force on another, an equal amount of force is exerted back on it (S8FE-Ia-16) c. demonstrate how a body responds to changes in motion (S8FE-Ib-17) d. relate the laws of motion to bodies in uniform circular motion (S8FE-Ib-18) e. infer that circular motion requires the application of constant force directed toward the center of the circle (S8FE-Ib-19)

Content Knowledge	Sub-domain	Grade Level and Learning Competency
	Gravitational force (Projectile motion)	Grade 9 a. describe the horizontal and vertical motions of a projectile (S9FE-IVa34) b. investigate the relationship between the angle of release and the height and range of the projectile (S9FE-IVa35)
	Electrostatic force	Grade 7 a. describe the different types of charging processes (S7LT-IIIj13) b. explain the importance of earthing or grounding (S7LT-IIIj14) Grade 8 a. infer the relationship between current and charge (S8FE-Ih-30) b. explain the advantages and disadvantages of series and connections in homes (S8FE-li-31) c. differentiate electrical power and electrical energy (S9FE-li-32) d. explain the functions of circuit breakers, fuses, earthing, double insulation, and other safety devices in the home (S8FE-li-33) Grade 9 a. explain how electrical energy is generated, transmitted, and distributed (S9FE-IVhj-46)
	Magnetic Force	Grade 10 a. demonstrate the generation of electricity by movement of a magnet through a coi (S10FE-IIIi53)

Content Knowledge	Sub-domain	Grade Level and Learning Competency
		b. explain the operation of a simple electric motor and generator (S10FE-IIj54)
Energy and its transformation	Mechanical Energy (KE and PE)	Grade 8 a. differentiate potential and kinetic energy (S8FE-Id-22) b. relate speed and position of object to the amount of energy possessed by a body (S8FE-Id-23)
	Conservation of Energy	Grade 9 a. explain energy transformation in various activities/events (e.g., waterfalls, archery, amusement rides) (S9FE-IVc39) b. perform activities to demonstrate conservation of mechanical energy (S9FE-IVd40) c. infer that the total mechanical energy remains the same during any process (S9FE-IVe41) d. relate impulse and momentum to collision of objects (e.g., vehicular collision) (S9FE-IVb36) e. infer that the total momentum before and after collision is equal (S9FE-IVb37) f. examine effects and predict causes of collision- related damages/injuries (S9FE-IVc38)
	Dissipation of Energy	Grade 9 a. construct a model to demonstrate that heat can do work (S9FE-IVe42)

Content Knowledge	Sub-domain	Grade Level and Learning Competency
		b. infer that heat transfer can be used to do work, and that work involves the release of heat (S9FE-IVf43) c. explain why machines are never 100-percent efficient (S9FE-IVf44) d. explain how heat transfer and energy transformation make heat engines like geothermal plants work (S9FE-IVg45)
	Chemical Reactions	Grade 10 a. apply the principles of conservation of mass to chemical reactions (S10MTIVe-g-23) b. explain how the factors affecting rates of chemical reactions are applied in food preservation and materials production, control of fire, pollution, and corrosion (S10MTIVh-j-24)
Interaction between Energy and Matter	Mechanical Wave	Grade 7 a. infer that waves carry energy (S7LT-IIIc- 4) b. differentiate transverse from longitudinal waves, and mechanical from electromagnetic waves (S7LT-IIIc- 5) c. relate the characteristics of waves (S7LT-IIIId- 6)
	Sound	Grade 7 a. explain sound production in the human voice box, and how pitch, loudness, and quality of sound vary from one person to another (S7LT-IIIe8) b. describe the characteristics of sound using the concepts of

Content Knowledge	Sub-domain	Grade Level and Learning Competency
		wavelength, velocity, and amplitude (S7LT-IIIId7) c. describe how organisms produce, transmit, and receive sound of various frequencies (infrasonic, audible, and ultrasonic sound) (S7LT-IIIle9) Grade 8 a. infer how the movement of particles of an object affects the speed of sound through it (S8FE-Ie-24) b. investigates the effect of temperature to speed of sound through fair testing (S8FE-Ie-25)
	Light	Grade 8 a. demonstrate the existence of the color components of visible light using a prism or diffraction grating (S8FE-If-26) b. explain the hierarchy of colors in relation to energy (S8FE-If-27) c. relate characteristics of light such as color and intensity to frequency and wavelength (S7LT-IIIIf10) d. explain that red is the least bent and violet the most bent according to their wavelengths or frequencies (S8FE-If-28) Grade 10 a. predict the qualitative characteristics (orientation, type, and magnification) of images formed by plane and curved mirrors and lenses (S10FE-IIg50) b. apply ray diagramming techniques in describing the characteristics and positions of

Content Knowledge	Sub-domain	Grade Level and Learning Competency
		images formed by lenses (S10FE-IIg51) c. identify ways in which the properties of mirrors and lenses determine their use in optical instruments (e.g., cameras and binoculars) (S10FE-IIh52)
	EM Waves	Grade 10 a. compare the relative wavelengths of different forms of electromagnetic waves (S10FE-IIab-47) b. cite examples of practical applications of the different regions of EM waves, such as the use of radio waves in telecommunications (S10FE-IIcd-48) c. explain the effects of EM radiation on living things and the environment (S10FE-IIef-49)
	Seismic Wave	Grade 8 a. using models or illustrations, explain how movements along faults generate earthquakes (S8ES-IIa14) b. differentiate the (1) epicenter of an earthquake from its focus; (2) intensity of an earthquake from its magnitude; (3) active and inactive faults (S8ES-IIa15) c. demonstrate how underwater earthquakes generate tsunamis (S8ES-IIb16) d. explain how earthquake waves provide information about the interior of the earth (S8ES-IIc17) Grade 10

Content Knowledge	Sub-domain	Grade Level and Learning Competency
		a. describe the distribution of active volcanoes, earthquake epicenters, and major mountain belts (including types of seismic waves) (S10ES – Ia-j-36.1)
Cells (i.e. structures and function, DNA, differences between plant and animal cells)	Structures and Function	Grade 7 a. explain why the cell is considered the basic structural and functional unit of all organisms (S7LT-IIe-5) Grade 9 a. describe the location of genes in chromosomes (S9LT-Id-28) Grade 10 a. describe the parts of the reproductive system and their functions (S10LTIIa-33)
	DNA	Grade 10 a. explain how protein is made using information from DNA (S10LTIId-37) b. explain how mutations may cause changes in the structure and function of a protein (S10LTIIe-38)
	Hormones	Grade 10 a. explain the role of hormones involved in the female and male reproductive systems (S10LTIIb-34) b. describe the feedback mechanisms involved in regulating processes in the female

Content Knowledge	Sub-domain	Grade Level and Learning Competency
		reproductive system (e.g., menstrual cycle) (S10LTIIIc-35)
	Plants vs Animal cells	Grade 7 a. differentiate plant and animal cells according to presence or absence of certain organelles (S7LT-IIId-4)
The concept of an organism (i.e. unicellular vs multicellular)	Unicellular vs multicellular	LCs related to this are found in SHS General Biology I
Humans	Health	Grade 8 a. explain how diseases of the digestive system are prevented, detected, and treated (S8LT-IVb-14) b. identify healthful practices that affect the digestive system (S8LT-IVc-15) Grade 9 a. infer how one's lifestyle can affect the functioning of respiratory and circulatory systems (S9LT-Ic-27)
	Nutrition	LCs related to this are found in other subjects (Health)

Content Knowledge	Sub-domain	Grade Level and Learning Competency
	Body Systems and their relationships	Grade 8 a. explain ingestion, absorption, assimilation, and excretion (S8LT-IVa-13) Grade 9 a. explain how the respiratory and circulatory systems work together to transport nutrients, gases, and other molecules to and from the different parts of the body (S9LT-Ia-b-26) b. describe how the nervous system coordinates and regulates these feedback mechanisms to maintain homeostasis (S10LT-IIIc-36)
Population	Species	Grade 7 a. identify beneficial and harmful microorganisms (S7LT-IIIf-6) b. differentiate asexual from sexual reproduction in terms of: b.1. 1 number of individuals involved; b.2. 2 similarities of offspring to parents (S7LT-IIg-7) Grade 8 a. explain the concept of a species (S8LT-IVg-19) Grade 10 a. explain how species diversity increases the probability of adaptation and survival of organisms in changing environments (S10LT-IIIh-41) b. explain the relationship between population growth and carrying capacity (S10LT-IIIi-42)

Content Knowledge	Sub-domain	Grade Level and Learning Competency
	Biodiversity	Grade 8 a. classify organisms using the hierarchical taxonomic system (S8LT-IVh-20) b. explain the advantage of high biodiversity in maintaining the stability of an ecosystem (S8LT-IVh-21)
	Evolution	Grade 9 a. relate species extinction to the failure of populations of organisms to adapt to abrupt changes in the environment (S9LT-Ie-f30) Grade 10 a. explain how fossil records, comparative anatomy, and genetic information provide evidence for evolution (S10LT-IIIIf-39) b. explain the occurrence of evolution (S10LT-IIIfg-40)
	Genetic Variation	Grade 7 a. describe the process of fertilization (S7LT-IIIfg-8) Grade 8 a. compare mitosis and meiosis, and their role in the cell-division cycle (S8LT-IVd-16) b. explain the significance of meiosis in maintaining the chromosome number (S8LT-IVe-17) c. predict phenotypic expressions of traits following simple patterns of inheritance (S8LT-IVf-18) Grade 9

Content Knowledge	Sub-domain	Grade Level and Learning Competency
		a. explain the different patterns of non-Mendelian inheritance (S9LT-Id-29)
Ecosystems (i.e. food chains, matter, energy flow)	Food Chains	Grade 7 a. differentiate biotic from abiotic components of an ecosystem (S7LT-IIh-9) b. describe the different ecological relationships found in an ecosystem (S7LT-IIh-10) c. predict the effect of changes in abiotic factors on the ecosystem (S7LT-IIj-12)
	Matter	Grade 8 a. analyze the roles of organisms in the cycling of materials (S8LT-IVi-23) b. explain how materials cycle in an ecosystem (S8LT-IVi-24)
	Energy Flow	Grade 8 a. describe the transfer of energy through the trophic levels (S8LT-IVi-22) Grade 9 a. differentiate basic features and importance of photosynthesis and respiration (S9LT-Ig-j-31)
Biosphere (i.e. ecosystem services, sustainability)	Ecosystem Services	Grade 7 a. predict the effect of changes in one population on other populations in the ecosystem (S7LT-IIi-11)

Content Knowledge	Sub-domain	Grade Level and Learning Competency
	Sustainability	Grade 8 a. suggest ways to minimize human impact on the environment (S8LT-IVj-25) Grade 10 a. suggest ways to minimize human impact on the environment (S10LT-IIIj-43)
Structures of the Earth	Interactions in the Atmosphere	Grade 7 a. discuss how energy from the Sun interacts with the layers of the atmosphere (S7ES-IVd-5) b. explain how some human activities affect the atmosphere (S7ES-IVe-6) c. account for the occurrence of land and sea breezes, monsoons, and intertropical convergence zone (ITCZ) (S7ES-IVf-7) d. describe the effects of certain weather systems in the Philippines; (S7ES-IVg-8) e. using models, relate: - e.1. the tilt of the Earth to the length of daytime; - e.2. the length of daytime to the amount of energy received; - e.3. the position of the Earth in its orbit to the height of the Sun in the sky; - e.4. the height of the Sun in the sky to the amount of energy received; - e.5. the latitude of an area to the amount of energy the area receives; (S7ES-IVh-9) f. how what causes change in the seasons in the Philippines using models; (S7ES-IVi-10)

Content Knowledge	Sub-domain	Grade Level and Learning Competency
	Understanding Typhoons	Grade 8 a. explain how typhoons develop; (S8ES-IIId-18) b. infer why the Philippines is prone to typhoons (S8ES-IIId-19) c. explain how landmasses and bodies of water affect typhoons; (S8ES-IIe-20) d. trace the path of typhoons that enter the Philippine Area of Responsibility (PAR) using a map and tracking data; (S8ES-IIIf-21)
	Climate	Grade 9 a. explain how different factors affect the climate of an area; (S9ES-IIIe-30) b. describe certain climatic phenomena that occur on a global level; (S9ES-IIIIf-31)
Energy in the Earth	Protection and Conservation of Natural Resources	Grade 7 a. recognize that soil, water, rocks, coal, and other fossil fuels are Earth materials that people use as resources; (S7ES-IVb-3) b. describe ways of using Earth's resources sustainably; (S7ES-IVc-4)
Changes in the Earth	Earthquakes and Faults	Grade 8 a. using models or illustrations, explain how movements along faults generate earthquakes; (S8ES-IIa-14) b. differentiate the b.1. epicenter of an earthquake from its focus; b.2. intensity of an earthquake from its magnitude;

Content Knowledge	Sub-domain	Grade Level and Learning Competency
		b.3. active and inactive faults; (S8ES-IIa-15) c. demonstrate how underwater earthquakes generate tsunamis (S8ES-IIb-16) d. explain how earthquake waves provide information about the interior of the earth (S8ES-IIc-17)
	Volcanoes	Grade 9 a. describe the different types of volcanoes; (S9ES-IIIa-25) b. differentiate between active and inactive volcanoes (S9ES-IIIa-27) c. explain what happens when volcanoes erupt (S9ES-IIIb-28) d. illustrate how energy from volcanoes may be tapped for human use (S9ES-IIIc-d-29)
	Plate Tectonics	Grade 10 a. describe the distribution of active volcanoes, earthquake epicenters, and major mountain belts; (S10ES-Ia-j-36.1) b. describe the different types of plate boundaries (S10ES-Iaj-36.2) c. explain the different processes that occur along the plate boundaries; (S10ES-Iaj-36.3) d. describe the internal structure of the Earth (S10ES-Iaj-36.4) e. describe the possible causes of plate movement; (S10ES-Iaj-36.5) f. enumerate the lines of evidence that support plate movement (S9ES-Ia-j-36.6)

Content Knowledge	Sub-domain	Grade Level and Learning Competency
Earth in Space	Eclipses	Grade 7 a. explain how solar and lunar eclipses occur (S7ES-IVj-11) b. collect, record, and report data on the beliefs and practices of the community in relation to eclipses (S7ES-IVj-12)
	Other members of the Solar System 1. Comets 2. Meteors 3. Asteroids	Grade 8 a. compare and contrast comets, meteors, and asteroids; (S8ES-IIg-22) b. predict the appearance of comets based on recorded data of previous appearances (S8ES-IIh-23) c. explain the regular occurrence of meteor showers (S8ES-IIi-j-24)
	Constellations	Grade 9 a. infer the characteristics of stars based on the characteristics of the Sun; (S9ES-IIIg-32) b. infer that the arrangement of stars in a group (constellation) does not change; (S9ES-IIIh-33) c. observe that the position of a constellation changes in the course of a night (S9ES-IIIi-34) d. show which constellations may be observed at different times of the year using models (S9ES-IIIj-35)
Earth's History		LCs related to this are found in SHS Earth and Life Science

Content Knowledge	Sub-domain	Grade Level and Learning Competency
The History and Scale of the Universe		LCs related to this are found in SHS Earth and Life Science

Part II

PISA 2022

Familiarization

Materials from OECD

PISA 2022 TEST FAMILIARIZATION MATERIALS

The OECD has prepared a set of materials with example questions from previous PISA surveys.

There are two sections:

- First, some general information on the test is included, and
- Second, a set of materials using example questions from Mathematics, Science and Reading.

Reading the general information on PISA and the example questions will help you become familiar with the types of questions included in the PISA survey.

The six example questions appeared in previous PISA surveys. The accompanying text explains the aim of the question and provides an answer for each question.

General Information on PISA

What is PISA?

The Programme for International Student Assessment (PISA) is a computer-based assessment of skills in **mathematics, science** and **reading**, carried out in over 80 countries and education systems.

In 2022, you may also be assessed on **creative thinking**.

The PISA assessment includes questions across a range of difficulty suitable for 15-year-old students.

The PISA assessment involves a **2-hour test session**, followed by a **questionnaire** session.

What happens during the PISA assessment day?

- During the test, you will be asked to respond to **questions on two areas** (for example, Reading and Mathematics).
- The computer will randomly decide which of the two areas you will answer questions on.
- The set of questions that you answer may be different to other students in your school.
- A **PISA Test Administrator** will be in charge of the test session and will help you if you have any technical difficulties. They will read a script aloud and keep track of time.

How am I scored in PISA?

In PISA, **some questions are scored by the computer** when you answer, while others will be reviewed and scored by a **team of trained coders** after the assessment.

- You are scored based on how well your answer responds to the question.
- You will **not** receive an individual score.
- You are asked to **try your best** in the time provided.

What can I do to prepare for PISA?

- You **do not need to prepare or practice** for the PISA Assessment.
- PISA does not test your ability to memorize facts you learnt in school. Instead, PISA measures how you use your knowledge and skills to understand information and solve problems.

Before the test, you will participate in an orientation. The orientation will:

- Explain the different **types of questions** and **answers** that you will see.
- Show you what to do on the **computer**.

SELLING NEWSPAPERS

In Zedland there are two newspapers that try to recruit sellers. The posters below show how they pay their sellers.

ZEDLAND STAR

NEED EXTRA MONEY?

SELL OUR NEWSPAPER

You will be paid :
0.20 zeds per newspaper
for the first 240 papers you
sell in a week, plus 0.40
zeds for each additional
paper you sell.

ZEDLAND DAILY

**WELL PAID JOB THAT
TAKES LITTLE TIME**

Sell the *Zedland Daily* and
make 60 zeds a week, plus
an additional 0.05 zeds per
newspaper you sell.

Question 1: SELLING NEWSPAPERS

On average, Frederic sells 350 copies of the *Zedland Star* every week.

How much does he earn each week, on average?

Amount in zeds:

EXAMPLE 1 – Calculate a number Mathematics

Some questions in PISA
ask you to **calculate** a
number.

In this example, you
must calculate Frederic's
average earnings in a
week selling 350 copies
of the *Zedland Star*.

Identify relevant
information in the
posters and calculate the
number.

In this example, the
answer is B: 92 zeds.

FAULTY PLAYERS

The Electrix Company makes two types of electronic equipment: video and audio players. At the end of the daily production, the players are tested and those with faults are removed and sent for repair. The following table shows the average number of players of each type that are made per day, and the average percentage of faulty players per day.

Player type	Average number of players made per day	Average percentage of faulty players per day
Video players	2000	5%
Audio players	6000	3%

Question 2: FAULTY PLAYERS

One of the testers makes the following claim:

“On average, there are more video players sent for repair per day compared to the number of audio players sent for repair per day.”

Decide whether or not the tester’s claim is correct. Give a mathematical argument to support your answer.

.....

.....

.....

EXAMPLE 2 – Show your work Mathematics

Some questions in PISA ask you to interpret data and **give an explanation or reason** for your answer.

This example is about a tester’s claim on the repair rate of video and audio players.

You must decide whether or not the claim is correct.

Your answer will be marked on the mathematical argument you use to support your answer. It should include that the tester is incorrect because 3% of 6000 is larger than 5% of 2000.

PISA 2022 FAMILIARIZATION MATERIALS

Running in Hot Weather

Question 2 / 6

► How to Run the Simulation

Run the simulation to collect data based on the information below. Click on a choice and then select data in the table to answer the question.

A runner runs for an hour on a hot and humid day (air temperature 35°C, air humidity of 60%) without drinking any water. This runner is at risk of both dehydration and heat stroke.

What would be the effect of drinking water during the run on the runner's risk of dehydration and heat stroke?

☐ Drinking water would reduce the risk of heat stroke but not dehydration.
☐ Drinking water would reduce the risk of dehydration but not heat stroke.
☐ Drinking water would reduce the risk of both heat stroke and dehydration.
☐ Drinking water would not reduce the risk of either heat stroke or dehydration.

★ Select two rows of data in the table to support your answer.

Air Temperature (°C)
 Air Humidity (%)
 Drinking Water ☒ Yes ☐ No

Run

Air Temperature (°C)	Air Humidity (%)	Drinking Water	Sweat Volume (Litres)	Water Loss (%)	Body Temperature (°C)

EXAMPLE 3 – Running a simulation Science

Some questions in PISA ask you to **run a simulation** to answer a question.

This example is about running in hot weather. You can run the simulation to generate data in the table on the right, **by varying the controls**.

You are asked to **select an explanation** and **select two rows of data** to support your answer.

In this example, the 2nd explanation is correct. To get full marks, the two selected rows of data must include:

- one with drinking water set to "No"
- another with drinking water set to "Yes"
- With air temperature and humidity fixed at 35°C and 60% in both rows.

Groundwater Extraction and Earthquakes

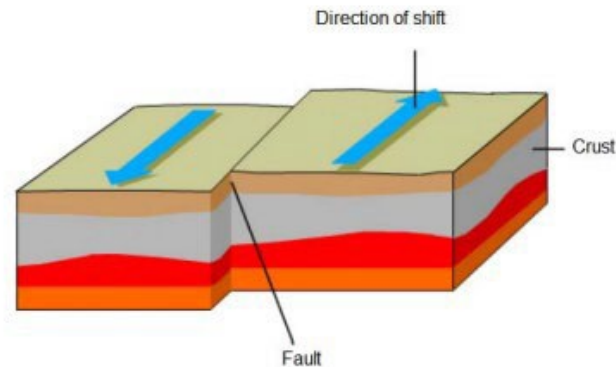
Question 1 / 4

Refer to "Groundwater Extraction and Earthquakes" on the right. Type your answer to the question.

Stress builds up naturally at faults. Why does this happen?

GROUNDWATER EXTRACTION AND EARTHQUAKES

The rocky crust is the uppermost layer of Earth. The crust is broken up into tectonic plates that ride on a layer of rock that is partially melted. The plates contain breaks called faults. Earthquakes happen when stress accumulated along the fault is released, causing parts of the crust to shift. An example of a shift along a fault is shown below.



**EXAMPLE 4 –
Open text response
Science**

Some questions in PISA ask you to **explain** phenomena scientifically in your own words.

This example is based on the earth's crust and stress-build up at faults.

Your answer will be marked on **your explanation of why this happens**. It should mention that:

- the movement of tectonic plates leads to the build-up of stress
- and/or that land moving in different directions is stopped by friction at a fault.

PISA 2022 FAMILIARIZATION MATERIALS

Sentences
Practice

Please read the sentence. Click **YES** if the sentence makes sense, or click **NO** if the sentence does not make sense.

The window sang the song loudly.

YES NO

EXAMPLE 5 – Sentences Reading

For this part of the PISA reading test, you will read sentences and decide **if they make sense or not**. You will have three minutes in total to respond to as many sentences as you can. The next sentence will appear as soon as you respond.

Once you have read the sentence, if you think **it makes sense**, then select “Yes”. If you think **it does not make sense**, select “No”.

For this sentence, the answer is: No.

PISA 2022 FAMILIARIZATION MATERIALS

Chicken Forum

Question 1 / 7

Refer to the Chicken Health Forum on the right. Click on a choice to answer the question.

What does Ivana_88 want to know?

- ☐ If she can give aspirin to an injured hen.
- ☐ How often she can give aspirin to an injured hen.
- ☐ How to contact a veterinarian about an injured hen.
- ☐ If she can determine the pain level of an injured hen.

www.chickenhealth.com/forum/aspirin-chickens

Chicken Health
Your online resource for healthy chickens

About Forum Pictures

Giving Aspirin to Chickens

Ivana_88

THREAD STARTER

Posted 28 October 18:12

Hello everyone!
Is it okay to give aspirin to my hen? She is 2 years old and I think she hurt her leg. I can't get to the veterinarian until Monday, and the vet isn't answering the phone. My hen seems to be in a lot of pain. I'd like to give her something to make her feel better until I can go to the vet. Thank you for your help.

NellieB79

Posted 28 October 18:36

I don't know if aspirin is safe for hens or not. I always check with my vet before giving my birds medicine. I know that some drugs that are safe for humans can be very dangerous for birds.

Monie

Posted 28 October 18:52

I gave an aspirin to one of my hens when she was hurt. There was no problem. The next day I went to the vet but she was already better. I think it might be dangerous if you give too much, so don't exceed the dose limits! I hope she feels better!

Avian_Deals

Posted 28 October 19:07

Hi! Don't forget to check out my super low deals on all bird supplies. I'm having a great sale right now!

Bob

Posted 28 October 19:15

Can someone please tell me how to know if a chicken is sick? Thanks.

Frank

Posted 28 October 19:21

Hello Ivana,
I am a veterinarian, specializing in birds. It is okay to give injured chickens aspirin if they are showing signs that they are in pain. When prescribing aspirin to birds, I follow the guidelines published in Clinical Avian Medicine. Chickens should receive 5mg of aspirin per kg of body weight. You can give this 3-4 times per day until you can see your veterinarian. It is very important to follow up with your vet. Good luck!

EXAMPLE 6 – Multiple choice Reading

Some questions in PISA ask you to **select an option** from a list provided.

In this example, you must read the post by Ivana_88 and understand its literal meaning.

Select the option that best describes what Ivana_88 wants to know.

In this example, the answer is the 1st option: “if she can give aspirin to an injured hen”.

Part III

Supplementary Resources

Central Visayan Institute Foundation – Dynamic Learning Program (CVIF-DLP)

Background Information

The Central Visayan Institute Foundation – Dynamic Learning Program (CVIF-DLP) is a 21st century innovative teaching method that is compliant with the Department of Education's K-12 curriculum. It develops independent student learners and improves their academic performance especially in the fields of Science, Technology, Engineering, and Mathematics (STEM).

This disaster-resilient and low-cost teaching pedagogy was developed by theoretical physicists Dr. Christopher Bernido and Dr. Ma Victoria Carpio-Bernido¹ who, in 2010, were conferred the prestigious Ramon Magsaysay Award for their work on the CVIF-DLP.

First implemented in 2002 at the Bernidos' school in Bohol – the Central Visayan Institute Foundation or CVIF – the CVIF-DLP is now being implemented by more than a hundred public and private schools, as well as in some Alternative Learning System (ALS) centers nationwide.

The CVIF-DLP has four key components:

- **Parallel Classes Learning Scheme** that fosters independent student learning;
- **Activity-based Multi-Domain Learning** composed of **Daily Learning Activities** that develop the highest level of learning;
- **In-School Comprehensive Student Portfolio** that compiles the student's body of work;
- **Strategic Study and Rest Periods** that promote a zero-homework policy and four academic days.

In light of the learning disruptions brought about by the COVID-19 pandemic, DLP offers one of the flexible learning options in the new normal particularly for teachers and students in low-resource settings. The learning competencies are translated and split into bite-sized learning activities that learners can easily digest and process.

How to Use a CVIF-DLP Learning Activity Sheet

Central to the CVIF-DLP teaching method is the usage of a learning activity sheet (LAS).

An LAS contains a lesson that must be copied, read, studied, and answered by the students individually without any prior lecture from the teacher. It can be

¹ Dr. Ma Victoria Carpio-Bernido passed away on January 6, 2022.

administered by the teacher and accomplished and submitted by the student with or without the use of internet.

An LAS can either be made by the teachers themselves or be downloaded by making an account at the [DLP's eLearning portal](https://www.facebook.com/DynamicLearningProgram/photos/a.3235083653215118/3252289198161230/).

Sample LAS:


Central Visayan Institute Foundation
 Jagna, Bohol 6308 Philippines
 

JHS LEARNING ACTIVITY

Name: Donna Marie Cruz

Grade and Section: Grade 7 - Mathematics

Subject (Check or choose from below)

☐ Religion/Values Education	☐ Filipino	☐ TLE / ICT
☐ Natural Sciences	☐ English	☐ MAPEH
☐ Araling Panlipunan	☐ Math	☐ CADT

Grade/Score: _____

Date: August 14, 2020

Type of Activity (check or choose from below)

☒ Concept Notes	☐ Laboratory Report	☐ Formal Theme	☐ Others: _____
☐ Skills Exercise / Drill	☐ Illustration	☐ Informal Theme	

Activity Title: Scrutinizing Civilization as Design of SUMER

Learning Target: Identify the major elements in the design of Civilization Sumer

References: 1. <https://www.facebook.com/DynamicLearningProgram/photos/a.3235083653215118/3252289198161230/>
2. <https://www.facebook.com/DynamicLearningProgram/photos/a.3235083653215118/3252289198161230/>
3. G. M. Menden and M. V. Corpuz-Bando, CIVIL Learning Activities

Ang Mesopotamia ang kailala bilang Diyos ng Sibilisasyon ng mado o 'Cradle of Civilization' dahil dito umiikop ang unang sibilisasyon kumusta ng hata Marahangyan ang Mesopotamia sa gitnang silangan ng Asya ng Mesopotamia ang Mesopotamia o 'Fertile Crescent' kung saan marahangyan ang kailala ng ilag ng Tigres at Eufrates.

Relihiyon ng Mesopotamia

- Polytheism - pananampalataya sa maraming diyos
- Anu - diyos ng kalangitan
- Enlil - diyos ng mga ulap at hangin
- Enki - diyos ng tubig at kaba

Mga Arayan ng Sumer sa Mado

- pagtatayo ng unang arayan at gilid - nangangailangan ang mga imbensyon na ito sa pagtatayo at transportasyon
- nangangailan ng sistema ng pagtatayo, ang kasalukutan
- pinatibay ang Matematika (Algebra, Geometry at iba pa)
- unang kagamitang pangkalapangan ang kagamitang Ziggurat na ginawa sa bato na lalong
- unang nagtatayo ng mga batas para sa lipunang
- Kalkulasyon ng linear na may 12 na buwan
- kasalukutan bilang unang panatili ng kailala

PAGSASALAY

1. Bakit ang dalawang arayan ng Sumer sa mado at tangin ang hangin. Pano kung ang mga panatili ng Sumer ang bilang at panatili ng mga kasalukutan? Ipinatibay
2. Bakit kung sa hangin ilag unang umiikop ang unang sibilisasyon?

Maraming sa hangin ilag unang umiikop ang unang sibilisasyon dahil dito nakakatawan ng pagtatayo at kasalukutan ang mga kasalukutan para makagawa ng kasalukutan

(Image lifted from

<https://www.facebook.com/DynamicLearningProgram/photos/a.3235083653215118/3252289198161230/>)

Steps on how to use an LAS:

1. Students must answer the basic information section.

The Activity Title, Learning Target, and References will all be provided by the teacher.



Central Visayan Institute Foundation
Jagna, Bohol 6308 Philippines



JHS LEARNING ACTIVITY

Name: _____ **Grade/Score:** _____

Grade and Section: _____ **Date:** _____

Subject (Check or choose from below)

☐ Religion/Values Education	☐ Filipino	☐ TLE / ICT
☐ Natural Sciences	☐ English	☐ MAPEH
☐ Araling Panlipunan	☐ Math	☐ CadT

Type of Activity (check or choose from below)

☐ Concept Notes	☐ Laboratory Report	☐ Formal Theme	☐ Others: _____
☐ Skills: Exercise / Drill	☐ Illustration	☐ Informal Theme	

Activity Title: _____

Learning Target: _____

References:
(Author, Title, Pages)

(Image lifted from
<https://www.facebook.com/DynamicLearningProgram/photos/a.3235083653215118/3252289184827898>)

- The student will write, read, and study the bite-sized lesson provided by the teacher.

Ang Mesopotamia ang kinilala bilang Duyan ng Sibilisasyon ng mundo o 'Cradle of Civilization' dahil dito umusbong ang unang sibilisadong lipunan ng tao. Matatagpuan ang Mesopotamia sa gitnang silangan na tinawag na Mayabong na Gasuklay o 'Fertile Crescent' kung saan matatagpuan ang kambal na ilog ng Tigris at Euprates.

Relihiyon ng tiga-Sumer:

- Polytheism - pananampalataya sa maraming diyos:
- Anu - diyos ng kalangitan
- Enlil - diyos ng mga ulap at hangin
- Ea - diyos ng tubig at baha

Mga Ambag ng Sumer sa Mundo:

- pag-imbento ng unang araro at gulong
- unang taong nagpaamo ng mga hayop.
- nagpaunlad ng sistema ng pagsulat, ang Cuneiform.
- pinaunlad ang Matematika (Algebra, Geometry at iba pa)
- unang tagapagtayo ng templo ang Ziggurat na ginawa sa luwad na laryo.
- unang nagsulat ng mga batas para sa lipunan
- Kalendaryong Lunar na may 12 na buwan
- Cacao ginagamit bilang unang pamalit ng kalakal

(Image lifted from
<https://www.facebook.com/DynamicLearningProgram/photos/a.3235083653215118/3252289241494559>)

3. Lastly, students copy and answer the lesson activity.
4. The hard copies of the accomplished LAS will all be compiled in a folder (one folder per subject) as part of his/her portfolio and will be returned to the teacher every week.
5. The teacher can then process the lesson with the student using whatever platform is accessible.

Using an LAS as a formative assessment tool helps students learn, process, and retain information by requiring them to handwrite all lessons. Students who face difficulties in writing and reading can resort to drawing concepts or ideas instead, depending on the design of the LAS. Though this method instills independent learning among the students, collaborative work is still encouraged because they can consult their classmates and teachers for guidance after accomplishing the LAS themselves. Using textbooks as references for the LAS is optional.

Frontlearners

Background Information

Frontlearners Inc. is an e-learning content and solution provider that helps schools and teachers implement technology-enabled teaching and learning systems that are aligned with the goals of DepEd's K to 12 Basic Education Program.

This ready-to-use and cost-effective e-school system was founded by Leo and Elaine De Velez as Uberlessons Co. Ltd. They renamed it to Frontlearners Inc. when the company was chosen as one of the 10 winners of the Ideaspaces Foundation Startup Competition and registered at Securities and Exchange Commission as a stock corporation.

First started in 2014, Frontlearners Inc. provides educational technology for learning. It is not internet-dependent, which reinforces their vision to address the development of the different skills of learners and to provide equal opportunity for all. They believe education technology can make education accessible to all and ignite students' desire to learn more. With the advancement of technology, they are convinced that they can transform the teaching and learning process to optimize enrollment and can boost student competency.

In light of the learning disruptions brought about by the COVID-19 pandemic, Frontlearners Inc. provides flexible learning options for students and teachers in low-resource settings. Furthermore, most lessons materials, with an integration of DepEd's most essential competencies and skills, are readily made available which students and teachers can access anytime and anywhere.

How to Use Frontlearners Inc. for Teachers and Students

Frontlearners Inc. contains e-lessons and e-quizzes for English, Filipino, Mathematics, Science, and Social Studies for Grades 1-10. Apart from that, they have e-learning materials for the Senior High School level, particularly in General Math, Probability and Statistics, Physical Science, Earth, and Life Science, Earth Science, Disaster Readiness and Risk Management, Reading and Writing, Oral Communication, Media and Information Literacy, Introduction to Philosophy of the Human Person, Personal Development, Understanding Culture, Society, and Politics, Pre-Calculus, Basic Calculus, Physics, Chemistry, and Biology.

Frontlearners Inc. materials can be accessed by the teachers and the students online using the DepEd Regional LMS (<https://lms.deped.gov.ph/>) It can also be

downloaded for offline reference using three versions: smartphone, laptop, and tablet.

Samples of Frontlearners Inc. Materials:

1. Sample Self-Learning E-Lesson Page with Audio Narration

Math 7

M7NS-Ic-1

Representing the Absolute Value of A Number on A Number Line as the Distance of the Number from Zero

Representing the Absolute Value of A Number on A Number Line as the Distance of the Number from Zero

Hi! Our topic is about representing the absolute value of a number on a number line as the distance of the number from zero. Let's begin.

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 FrontLearners

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⏭

PREV

NEXT

 FRONTLEARNERS™

Math 7

M7NS-Ic-1

Representing the Absolute Value of A Number on A Number Line as the Distance of the Number from Zero

Number Line

An infinite line on which points represent the real numbers

It is divided into two symmetric halves by the origin, that is the number zero.



A number line is an infinite line on which points represent the real numbers. It is divided into two symmetric halves by the origin, that is the number zero.

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PREV

NEXT

 FRONTLEARNERS™

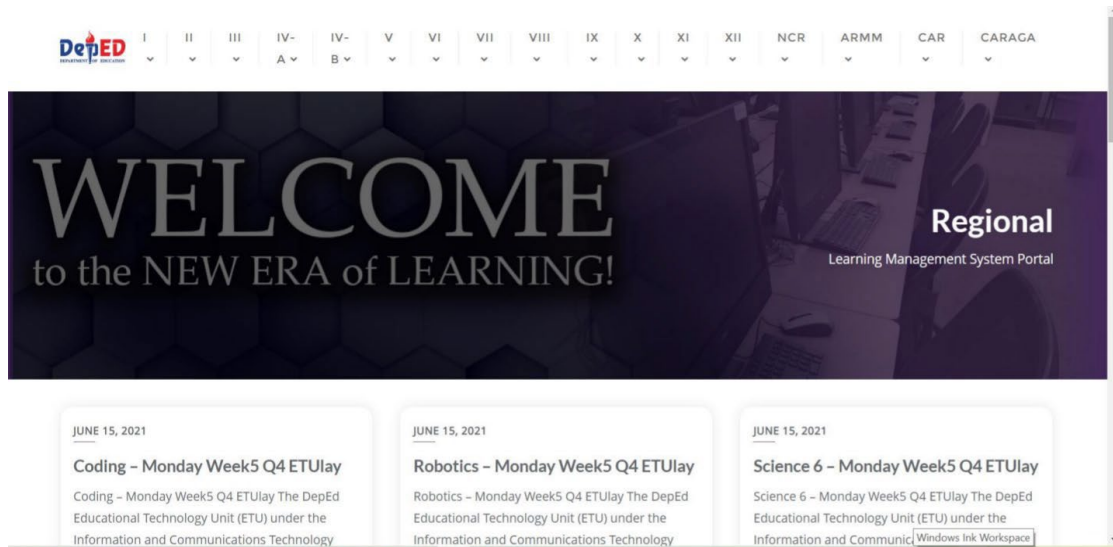
2. Sample Self-Learning E-Quiz with Auto-Scoring

The screenshot displays the 'Frontlearners Math 07' quiz interface. The top navigation bar includes the Department of Education Learning Management System logo and a user profile icon. The main header shows the quiz title 'Frontlearners Math 07' and a breadcrumb trail: Dashboard > My courses > Frontlearners Math 07 > 1st Quarter - Numbers and Number Sense > Mathematics7_005_Quiz. A 'Preview' button is visible. The quiz progress section indicates: Started on Tuesday, 15 June 2021, 6:29 AM; State Finished; Completed on Tuesday, 15 June 2021, 6:32 AM; Time taken 2 mins 20 secs; Grade 5.00 out of 5.00 (100%). The 'Quiz navigation' panel on the right shows five questions, all marked as completed with green checkmarks. The main content area displays 'Question 1' as a 'Multiple Choice' question. The question text is 'Based on the number line, what is the absolute value of 1?'. Below the text is a number line diagram with arrows at both ends and tick marks at intervals of 1, ranging from -5 to 5. The question is identified as 'Math 7' and 'M7NS-4c-1'.

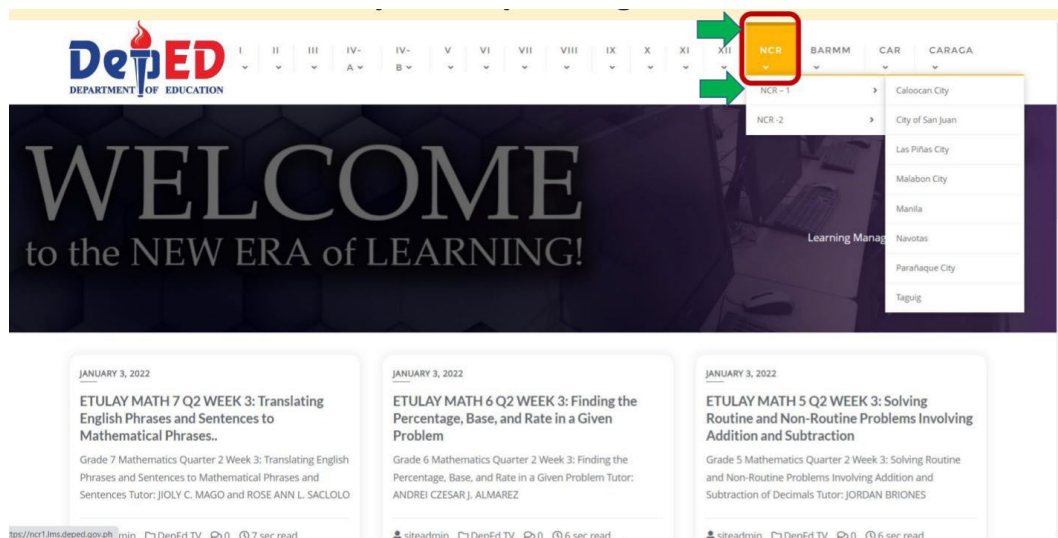
The screenshot displays the 'Frontlearners Math 07' quiz interface for 'Question 5'. The top navigation bar and breadcrumb trail are identical to the previous screenshot. The quiz progress section indicates: Question 5; Not yet answered; Marked out of 1.00. The 'Quiz navigation' panel on the right shows five questions, with the fifth question highlighted in blue. The main content area displays 'Question 5' as a 'True or False' question. The question text is 'The absolute values of -2 and 2 are equal.'. Below the text are two buttons: 'True' and 'False'. The question is identified as 'Math 7' and 'M7NS-4c-1'. At the bottom of the question area, there is a small text box that says 'Identify if the statement is true or false. The absolute values of -2 and 2 are equal.' and a copyright notice: 'Copyright FREE from FrontLearners, Inc. Contains AT&T Natural Voices® text to speech technology licensed from Wizard Speech LLC. FrontLearners'.

Steps on how to access Frontlearners Inc. Materials:

1. Go to <https://lms.dep.ed.gov.ph>.



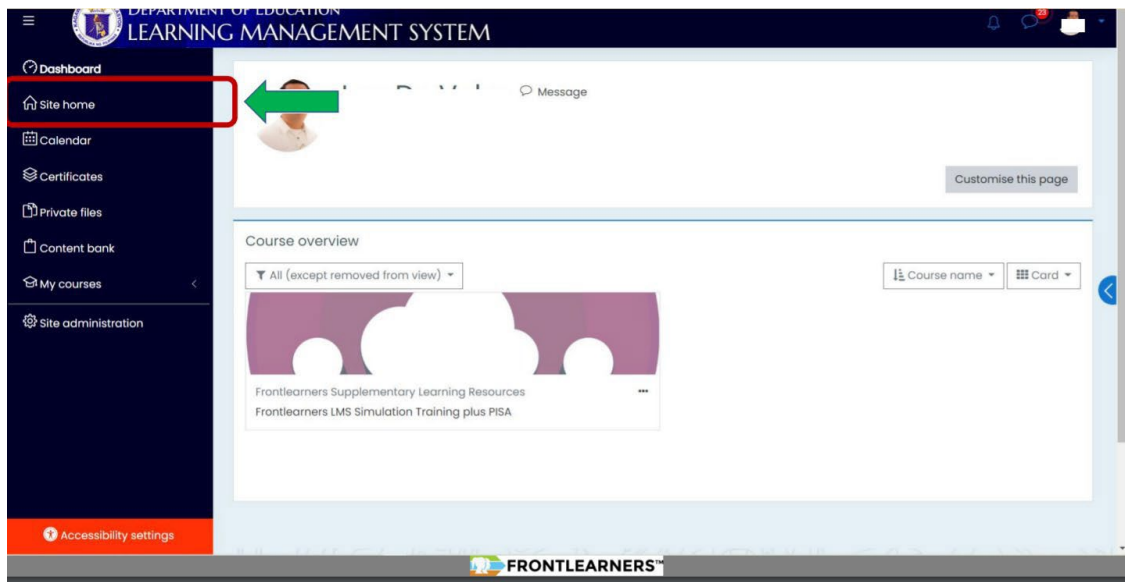
2. Go to your DepEd Regional LMS.



3. Log in using your DepEd username and password.



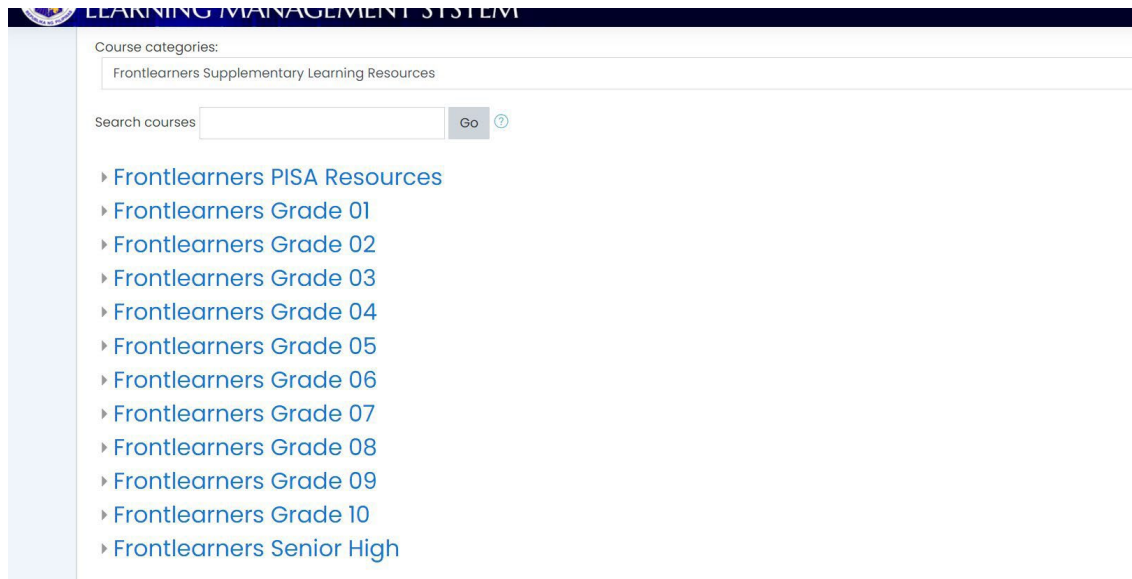
4. From the default DASHBOARD page, go to SITE HOME.



5. Click Frontlearners Inc. Supplementary Learning Resources



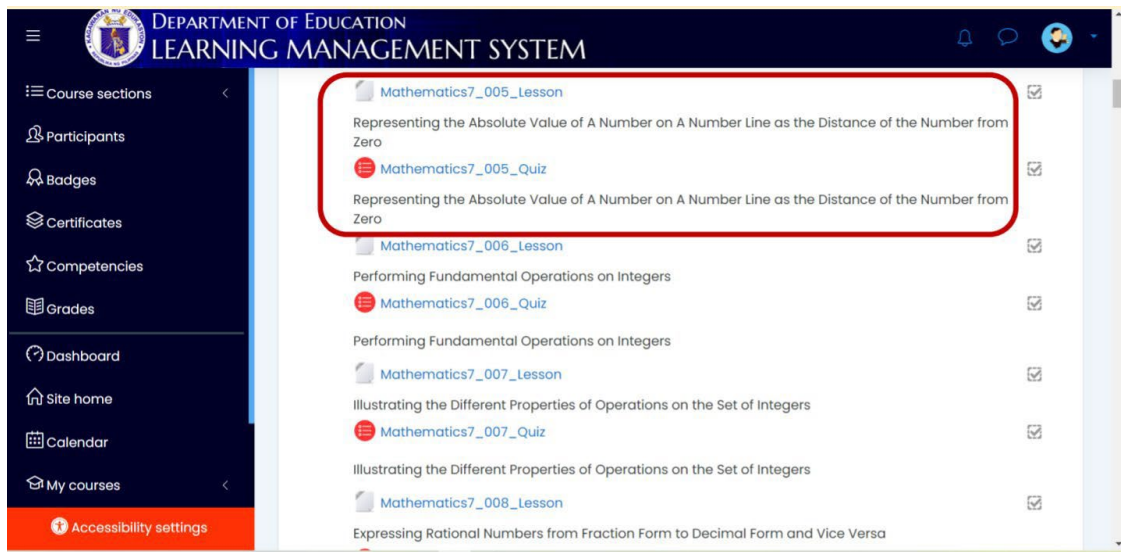
6. Scroll down and select the Grade Level from Grade 1 to SHS.



7. Select the Subject



8. Select the Lessons and Quizzes Needed



PISA READINESS TOOLKIT

Background Information

According to UNESCO (2019), one of the key principles in designing an effective large-scale assessment is ensuring that the test design is “ethical, fair and inclusive of the target population” at all stages, from the development of the test to the analysis and dissemination of the results. Providers of large-scale assessments must reduce measurement bias, which occurs when “a test or contextual instrument consistently discriminates against a particular group for reasons unrelated to the learning domain assessed or the background data collected.” For PISA, the OECD does this by allowing for adaptation of the test to the context of the participating countries, while still maintaining the comparability of the tests.

On top of this, however, efforts must be made to reduce the bias caused by the use of computer-based assessment. One of the factors that contributed to the Philippines’ poor performance in the 2018 PISA is our learners’ unfamiliarity with the interface of the Student Delivery System (SDS), and with *computer-based testing* in general. While it is important for Filipino learners to be equipped with computer and media literacy skills, we do not join PISA to measure such competencies; instead, we want our PISA scores to reflect our learners’ performance in the subject areas of Math, Science, and Reading, so that we can make strategic interventions in curriculum and instruction.

Another source of bias is the *format of the questions*. While effectively measuring the same curricular competencies, it was observed that the formats of our national and classroom assessments differ significantly from PISA. For example, in Reading, PISA expects students to be able to put together information from multiple sources; in contrast, the current testing culture in the country focuses heavily on multiple choice items based on a single source.

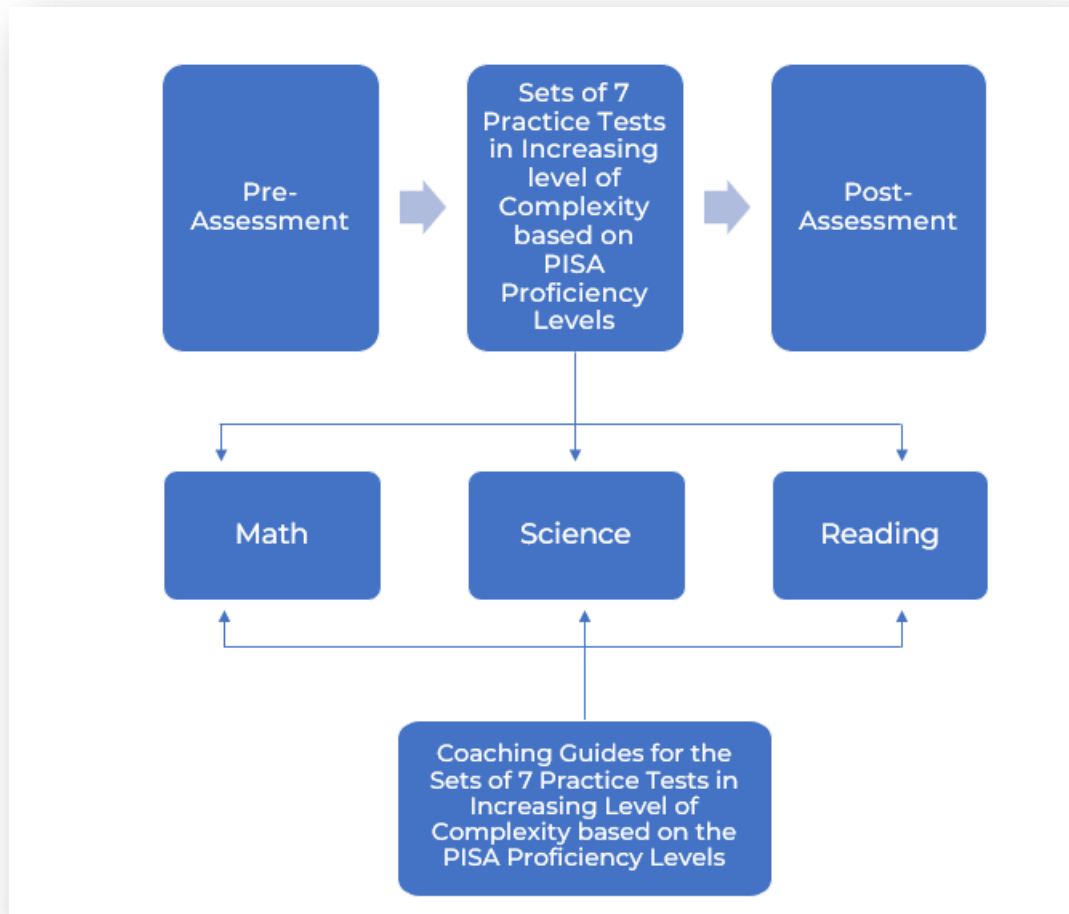
The **PISA Readiness Toolkit (PRT)** aims to reduce the novelty of the PISA by exposing both our teachers and students to the more complex style of questions, and to the more advanced mode of assessments, i.e., computer-based testing, which may be employed by international large-scale assessments like PISA. These interventions may also serve as a starting point in improving the testing culture in the country’s basic education system.

The PRT was developed by a team of resource persons engaged by the DepEd Office of the Secretary, namely Dr. Marilyn U. Balagtas, Dr. Adonis P. David, Dr. Carlo P. Magno, Dr. Allan S. Reyes, Dr. Rosario M. Belmi, Dr. Sterling M. Plata, along with a number of DepEd teachers as writers and validators, as experts from various higher education institutions as second-level validators and editors.

How to use the PISA Readiness Toolkit

The PRT is a set of computer-based assessment tools, exercises, and guides for the 15-year-old learners by the time of PISA cycle (e.g., students who will be 15-year-old by

2022). It has four components, namely: the pre-assessment tool, the developmental practice sets, coaching guides, and the post-assessment tool (see the figure below). The entire package of the PISA Readiness Toolkit may be accessed by teachers and their students through their respective regional learning managementsystem (LMS) sites (lms.deped.gov.ph).



Each component of the PRT is described below:

- 1. Pre-assessment.** The pre-test consists of 49 items, with 21 items for Math literacy, and 14 items each for Science and Reading Literacy. The objective of the pre-assessment is to determine the proficiency level of the learners before the introduction of the practice sets and the coaching guides.
- 2. Practice Sets.** This is a set of 21 formative assessment packages containing exercises in Math, Science, and Reading. The questions included in these packages have been curated and tagged following the proficiency levels specified in the PISA literacy frameworks. They are packaged as computer-based assessments, in a manner that will help familiarize learners with the PISA testing environment.

As the developmental practice sets are designed to be self-learning materials, every item should have a corresponding key to correction with model answers provided for more effective feedbacking.

Each item for a proficiency level indicates the competency it covers, the content, context, and cognitive domain it targets. Items have a stimulus material (e.g., figures, tables, text) from where the problem will be based. Like PISA, two-thirds of the items are multiple choice items, while the rest require constructed response.

For scoring, simple questions will be given 2 points, and complex items will be given 6 points for every correct answer.

Immediate feedback will also be given per option for multiple choice items. Choices may be tagged as correct, partially correct, or totally wrong, with corresponding scores.

3. **Coaching Guides.** This guide will have all the items in the practice sets with detailed explanation on how to solve the problems and with additional exercises for the competencies covered to ensure mastery of the skills targeted per set. The Coaching Guide will then be used for mastery of competencies and for the enhancement of students' test taking skills.
4. **Post-assessment.** The post-assessment is parallel to the pre-assessment in terms of coverage and number of items but may additionally include non-cognitive variables as a component of the test to gather data that could possibly explain assessment results. The objective of the post-test is to gather evidence of learning of the students and assess the effectiveness of the practice tests as an intervention activity.

Part IV

PISA 2022

Administration

Overview of the PISA 2022 Administration

Who will take the test?

The PISA target population are students who are 15 years and 3 months to 16 years and 2 months at the time of the assessment.

Those who will sit in the assessment were selected through a two-stage stratified random sampling. In the first stage, 190 schools were randomly selected from all the public and private schools of 16 regions (i.e., all regions, excluding BARMM). From the selected schools, a maximum of 42 learners who meet the PISA age requirement will be randomly selected in every sampled school. As of writing, the estimated number of learners who will participate in the PISA 2022 Main Survey nationwide is 7,678.

How will the test be implemented?

PISA will be implemented as a computer-based assessment. Within the testing centers, learners will be provided desktop computers with the Student Delivery System (SDS) installed via USB.

Learners who will be selected and who will be given parental consent to participate will need to go to their respective schools, which will serve as their official testing center.

The program of activities on the day of the test, including orientation and health protocol-related activities, may take around four hours, but the assessment process alone will take 2.5 hours. The time allocation is shown on the table below:

Domain	Total
Cognitive Assessment	2 hours
Mathematical Literacy	
Scientific Literacy	
Reading Literacy	
Creative Thinking	
Student Questionnaire	35 mins
	2 hours 35 mins

Transportation of PISA Students

The sample school may provide a service vehicle for the students to be transported from their pick-up point to the school and vice versa. Parents/guardians may personally accompany their children to the testing center. Alternatively, schools may designate a place which will serve as a meet-up place for all students coming from different barangays of the community and where they will be picked up on the day of the examination. If vehicles will be provided, all vehicles must be thoroughly sanitized before and after boarding of the passengers. The designated driver must be fully vaccinated and must wear personal protective equipment.

Before entry to the testing center

Before entering the testing center, all personnel and learners shall be subjected to temperature check and accomplish the contact tracing form at a designated screening area near the school entrance. Minimum health checks and assessment shall be facilitated by the Division Health Personnel for appropriate management, intervention, and referral.

Only those that passed the health checks will be allowed to enter the testing center. Entry of those with no direct role in the data collection on the testing day shall not be allowed. They may be allowed to stay at a designated area outside the testing center and should follow the health and safety protocols

Guidelines on managing the holding area

The school shall designate two holding areas, one for each test session. These rooms shall be utilized as snack and lunch areas for the students. Snacks and lunch will be provided for all participating learners.

Holding areas shall be arranged to ensure safety of the learners from COVID-19 transmission following the prescribed physical arrangement of chairs and other furniture inside the room for proper physical distancing. Each PISA student must be assigned to a specific table/chair in the holding area. The name of the students must be provided in their areas. Transferring and/or exchanging/sharing of seats, tables, food, water, and other belongings must be strictly disallowed. All holding areas must have proper air circulation. If an appropriate room is unavailable, the school may use larger areas in the school such as the school grounds, gymnasium, and other available school spaces.

Managing the testing center

Within the testing center, only the following materials are allowed: calculator, pencil, blank sheets of paper, drinking water, hand sanitizer, and the STQ form, which will be distributed by the testing personnel. Learners are not allowed to bring electronic gadgets/devices, USB drives, and food/snacks. Scanning and duplicating machines must also be removed from the testing room.

The target class size (TCS) for PISA 2022 MS is 42 students. To ensure observance of

the physical distancing and health safety protocols, the test will be administered in two (2) sessions, morning and afternoon. The PISA students shall be seated at least one (1) meter apart. Extra chairs and tables, and unnecessary furniture must be removed from the testing room.

Similar to the holding area, the testing room must be well-ventilated to allow good air circulation. In non-airconditioned rooms, windows, doors, and electric fans shall be opened during the entire test administration. In cases of airconditioned room, working high-efficiency particulate air (HEPA) filtration is recommended.

All concerned personnel and learners shall observe COVID-19 health and safety protocols, including physical distancing, proper hand hygiene, and wearing of personal protective equipment. All testing personnel shall be fully vaccinated.

When will the test be implemented?

The implementation of the PISA 2022 Main Survey will be spread out in five weeks, from March 28 to April 29 (see table below). To accommodate possible adjustments relative to the COVID-19 pandemic situation in the communities of the sample schools, a buffer week is also scheduled from May 16 to 20, 2022.

Batch No.	Dates (Excluding Pre-and-Post Travel Time)
1	March 28 – April 1
2	April 4 – 8
3	April 11 – 13
4	April 18 – 22
5	April 25 – 29
Buffer/Follow-up	May 16 – 20



DEPARTMENT OF EDUCATION
OFFICE OF THE SECRETARY

PISA FAMILIARIZATION PRACTICE TESTS

INTRODUCTION

The Programme for International Student Assessment (PISA) is an international large-scale assessment that tests 15-year-old students around the world to measure “the extent to which they have acquired key knowledge and skills essential for full participation in social and economic life” (OECD, 2019). In contrast to other local and international assessments that aim to measure students’ mastery of knowledge and skills from a specific curriculum, PISA specifically looks into *Scientific, Mathematical, and Reading Literacy* of students. Literacy, in contrast to simply reproducing knowledge, refer to the “students’ capacity to apply knowledge and skills in key subjects, and to analyse, reason and communicate effectively as they identify, interpret and solve problems in a variety of situations” (OECD, 2016).

Relative to this, the form of the PISA at this time may still differ from that of local assessments, in the following areas:

- **Emphasis on the application of knowledge to various contexts.** In PISA, test items do not directly measure knowledge, but instead present a context for using the knowledge through a stimulus or situation, thus requiring them to use their critical thinking and problem-solving skills to arrive at the best possible answer. The context of the item may be personal, occupational, local, or global.
- **Implementation of computer-based assessment (CBA).** Since 2015, PISA began offering a computer-based assessment in order to “to better reflect how students and societies access, use and communicate information” (OECD, 2016), which is now increasingly leaning towards digital communication. While still offering a paper-based option for countries that may have difficulties in implementing a CBA, 70 of the 79 participating countries and economies have, including the Philippines, have opted for the CBA in 2018 in order to maximize the features of the assessment.

- **Use of multiple sources of information.** PISA questions are often presented in continuous form, where students must use the information acquired from answering one item in accomplishing subsequent assessment tasks. Students may also be presented with multiple sources of information within a single test item.

To lessen the novelty effect of the PISA testing environment as we participate in its 2022 cycle, we are making the following familiarization materials available to public school teachers and learners through the various DepEd central office and regional learning management system (LMS) sites, as well as an open site. This is in addition to the PISA 2022 Briefer for Public School Teachers and Learners earlier released by the Office of the Secretary. This effort is important to familiarize the learners with the testing environment and methodology that may be different from the classroom assessment employed by our schools, as discussed above.

The following are the materials included here:

1. **FrontLearners Simulation for PISA.** This material consists of PISA released items that are publicly available in OECD documents and websites. These items were compiled and converted into interactive computer-based practice tests to help familiarize learners with the interface of the PISA.

These materials are available for teachers at training.deped.gov.ph, but we are also working on uploading them at the regional LMS sites, which are accessible through lms.deped.gov.ph, for access by students.

In the meantime, the same materials are available to students through the open site: pisa.ph.

2. **PISA Readiness Toolkit.** The Pisa Readiness Toolkit or PRT is a set of computer-based assessment tools, exercises, and guides for junior high school learners that capture the form of the PISA test in terms of interface, proficiency levels, and format, but are additionally tagged against K to 12 competencies, so that they can be used as supplemental materials for day-to-day teaching and learning activities. These materials are being developed as a component of the Professional Development Program on Assessment and Emerging Literacies with Focus on PISA, presently being implemented by a consortium led by the Office of the Secretary. These materials will soon be uploaded at training.deped.gov.ph, and through the at the regional LMS sites, which are accessible through lms.deped.gov.ph.

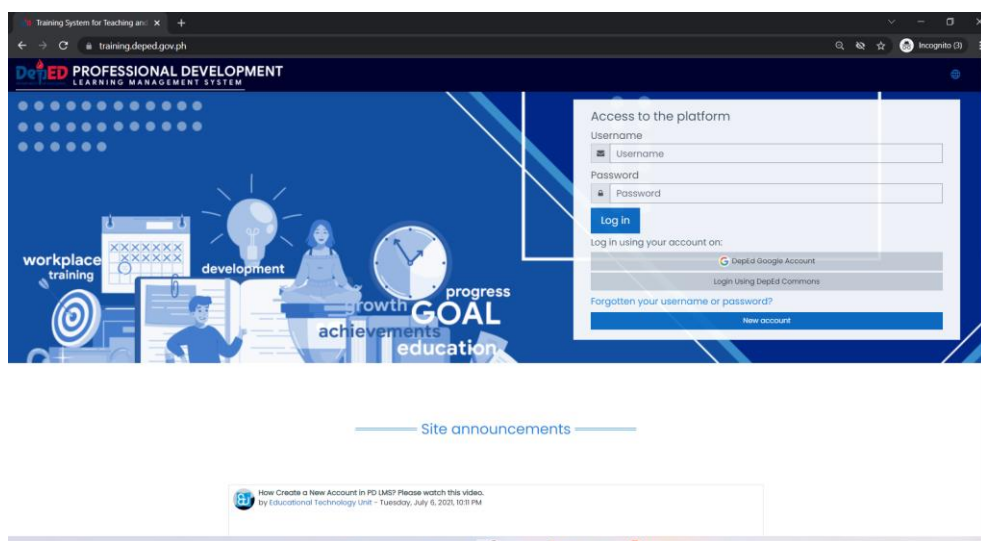
In addition to these, we are re-introducing curated supplementary learning resources, including the **CVIF Learning Activity Sheets**, and additional learning resources from **FrontLearners Inc.**

HOW TO ACCESS THE PISA FAMILIARIZATION PRACTICE TESTS

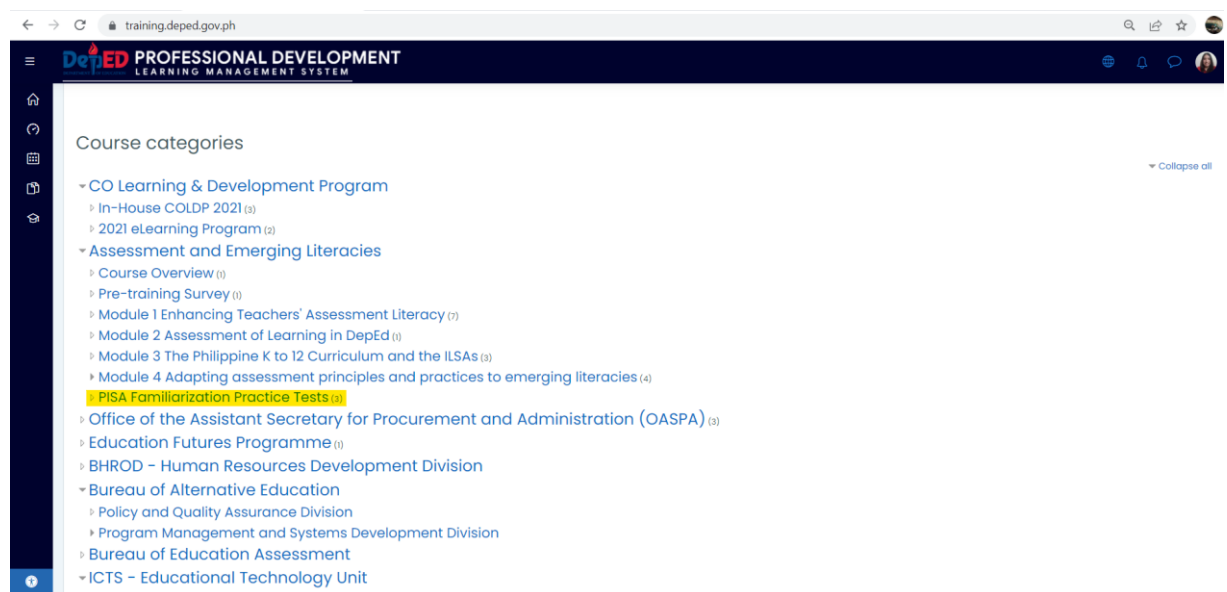
Option 1: Through the PD LMS (For teachers only)

Teachers may access the familiarization materials through the professional development LMS (training.deped.gov.ph). Below is a step-by-step guide for reference:

1. Go to training.deped.gov.ph and login to your account. If you do not have an account yet, you may refer to the video guide here: tinyurl.com/APDLMSAccountTutorial. You may also opt to sign in directly using your DepEd google account (email ending with @deped.gov.ph) or using your DepEd commons account.

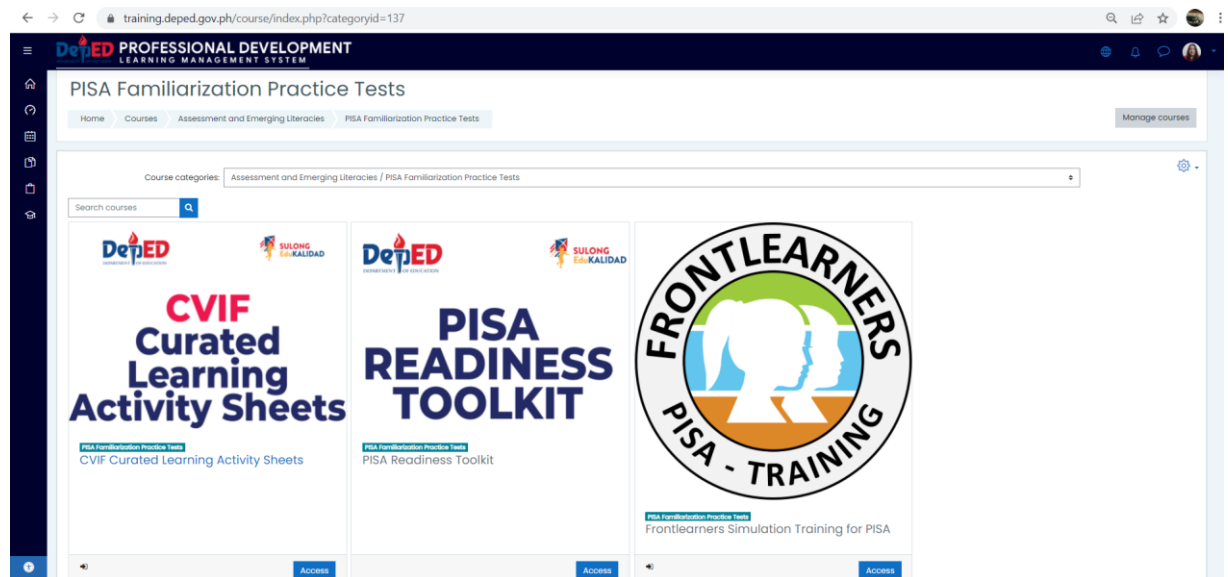


2. Click on the **Assessment and Emerging Literacies** category and select **PISA Familiarization Practice Tests**.



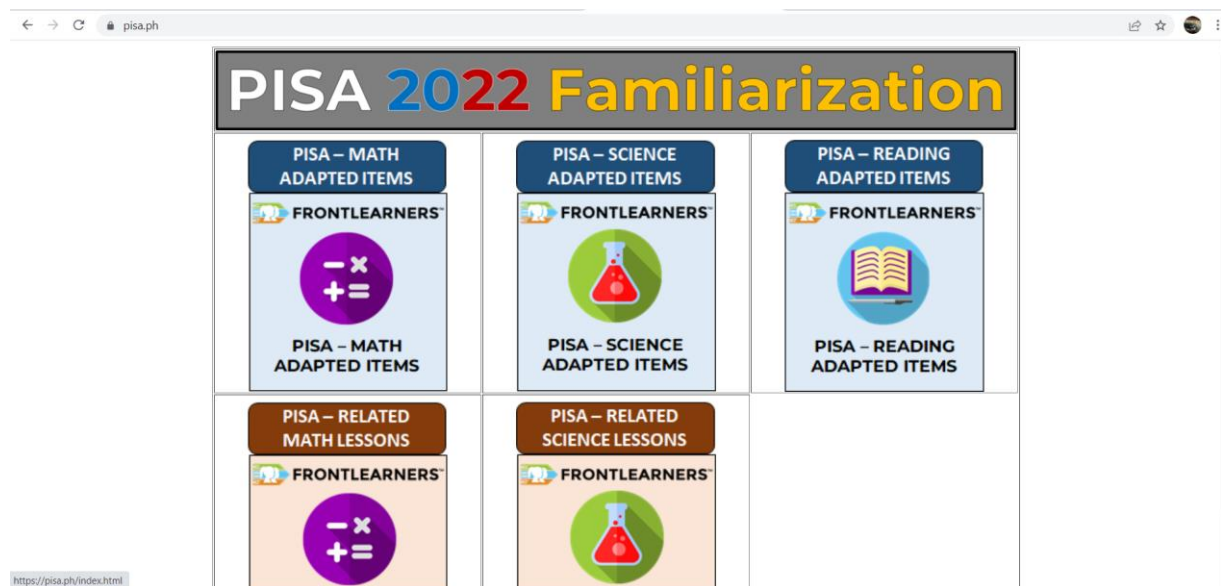
3. Select the course that you wish to review and access. For simulation

activities, we recommend that you start with the **Frontlearners Simulation Materials for PISA**.



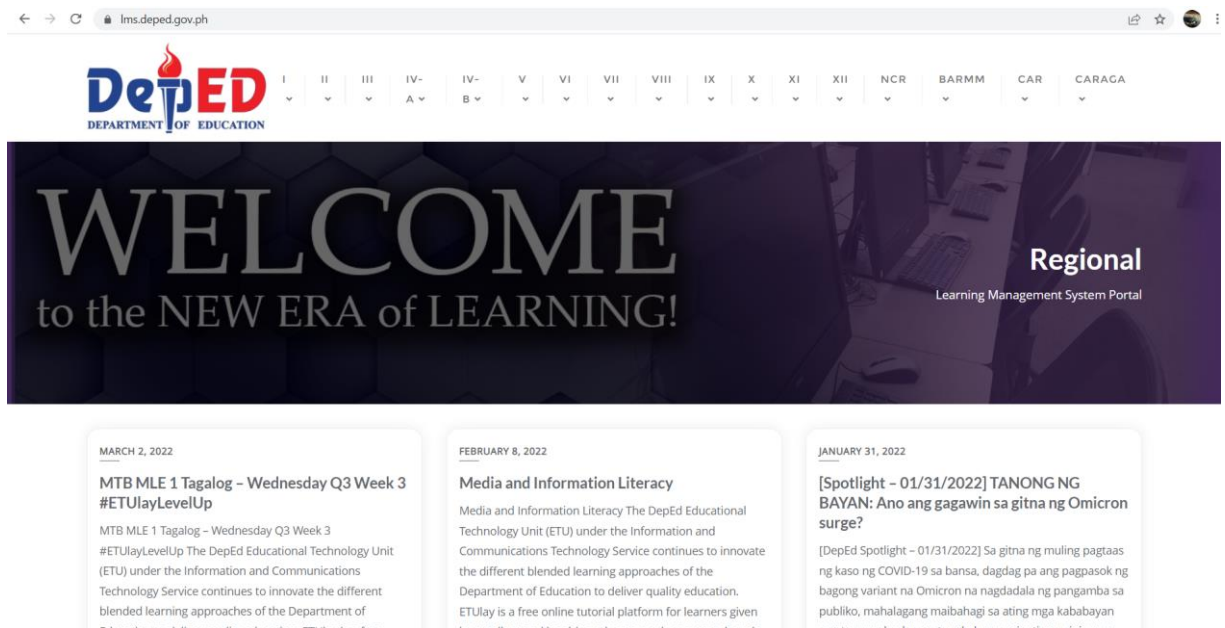
Option 2: Through the open site (For learners and teachers)

Go to pisa.ph and select the course that you wish to review and access.

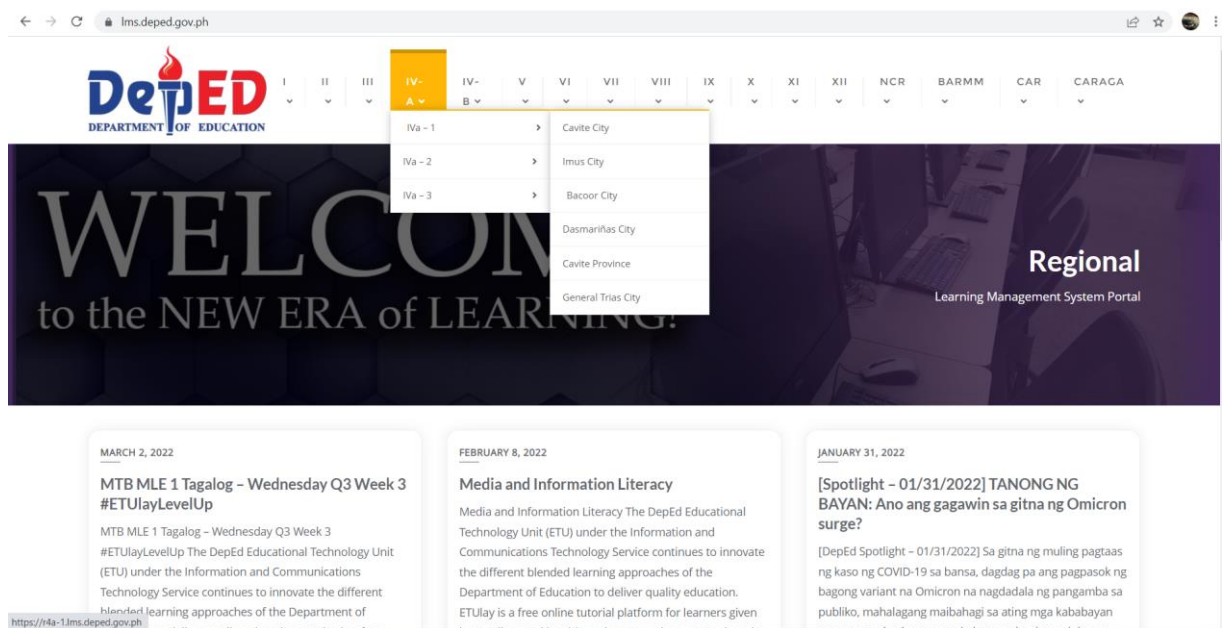


Option 3: Through the regional LMS sites

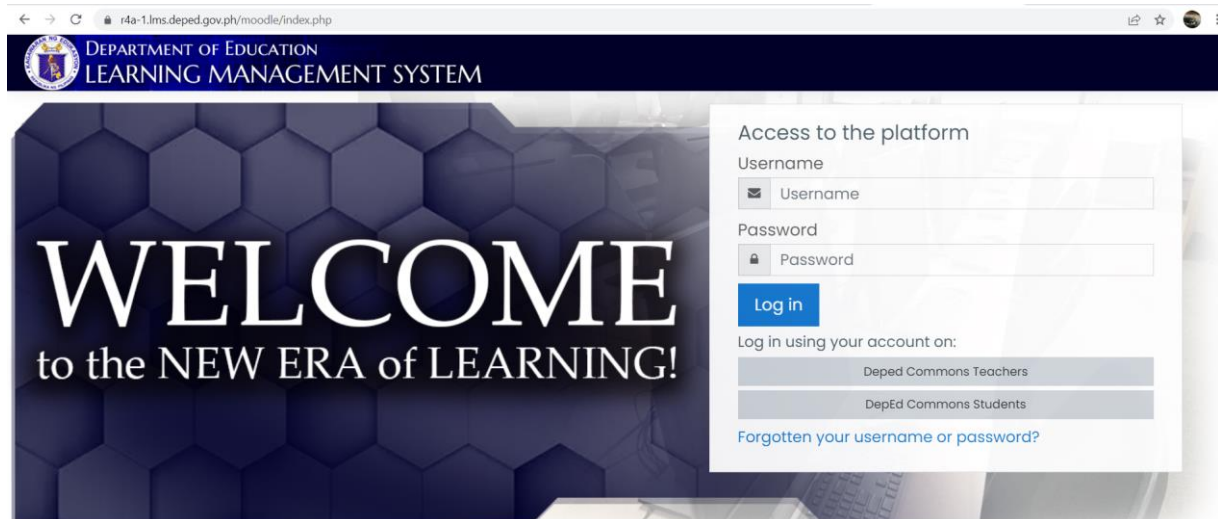
1. Go to lms.deped.gov.ph



2. Choose your region and division from the options in the header.



4. Login to your regional LMS. Similar to the PD LMS, if you do not have an account yet, you may refer to the video guide here: tinyurl.com/APDLMSAccountTutorial. You may also opt to sign in directly using your DepEd google account (email ending with @deped.gov.ph) or using your DepEd commons account.



5. Click on the **PISA Familiarization Practice Tests** category and select the course that you wish to review and access.