الجمهورية اللبنانية
المركز التربوي للبحوث والإنماء

عرض تحليل نتائج إختبارات PISA 2015

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الجلسة
الثانية

المشروع:
نحو استراتيجية تقويم وطنية
اليوم الأول: 18 تموز 2018

Inspiring Quotes about the Power of Literacy

LEARNER PROFILE

You can't have people making decisions about the future of the world who are scientifically illiterate. That's a recipe for disaster. And I don't mean just whether a politician is scientifically literate, but people who vote politicians into office.

Neil deGrasse Tyson

«المثقفون في الحضارة العربية هم الذين يتكلمون ليقولوا ما يعرفون، ليقوموا بالقيادة والتوجيه في عصر صار فيه الحكم فناً في القول، قبل أن يكون شيئاً آخر، هو ذلك الذي يلتصق بهموم وطنه والذي يضع نفسه في خدمة المجتمع ويواجه تحدياته المختلفة دفاعا عن الحق والحقيقة»

عابد الجابري

PLAN of Presentation

- Framework of PISA 2015.
- Implementation Phase and Tools.
- Snapshots on Major Results.
- THE WHY?? And Recommendations.
- Science-related Career expectations and Attitudes Towards Science
- Equity in Education
- Challenges

الجمهورية اللبنانية
المركز التربوي للبحوث والإنماء
وبالتربية نبني معاً

PISA 2015

Programme For International Student Assessment

التعريف بالبرنامج الدولي لتقييم الطلبة PISA

يجمع الاختبار الدولي PISA بين ثلاثة مجالات محددة وهي القراءة والرياضيات والعلوم، من دون التركيز على محتوى المناهج الدراسية المتعلقة بها، بل على المعرفة والمهارات الأساسية التي يحتاجها المتعلّمون في حياتهم، إضافة إلى التركيز على استيعاب المفاهيم والقدرة على العمل بهدف قياس مدى نجاح المتعلّمين الذين بلغ سنهم 15 سنة ممن هم على وشك استكمال تعليمهم الإلزامي والاستعداد لمواجهة تحديات مجتمعاتهم اليومية، ويعتبر البرنامج الدولي لتقييم المتعلّمين جهدًا تعاونيًّا بين الأعضاء المشاركين من بلدان منظمة التعاون والتنمية الاقتصادية OECD، إضافة إلى عدد آخر من الدول المشاركة.

PISA Frameworks

Scientific, Mathematical &Reading Literacy

- Clear Definition of Literate Students at the Scientific, Reading, and Mathematical level.(1)
- Different Components of the Framework and the relation between them.(2)
- Distribution of Score points among the different components.(3)
- Item Response Formats.(4)
- Well Defined Benchmarks (Proficiency Levels). (5)
- Level of Difficulty of test items.

Clear Definition of Literate Students at the Scientific, Reading, and Mathematical level.

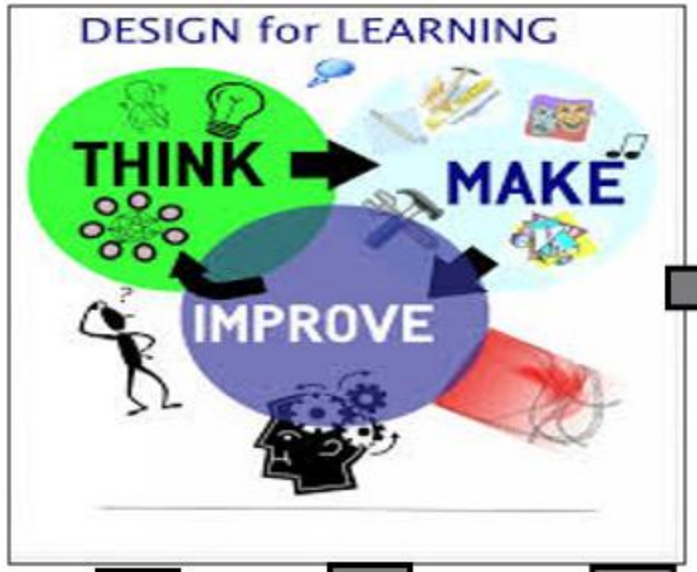
- ***Scientific literacy*** through the PISA lens, scientific literacy is "the ability to engage with science related issues, and with the ideas of science, as a reflective citizen" (OECD, 2016, p.13).

- ***Mathematics literacy*** means "the student's capacity to formulate, employ, and interpret mathematics in a variety of contexts" (OECD, 2016).

Reading literacy is defined as, "understanding, using, reflecting on and engaging with written texts, in order to achieve one's goals, to develop one's knowledge and potential, and to participate in society (OECD, 2016, p. 49).

Literate Learners for PISA

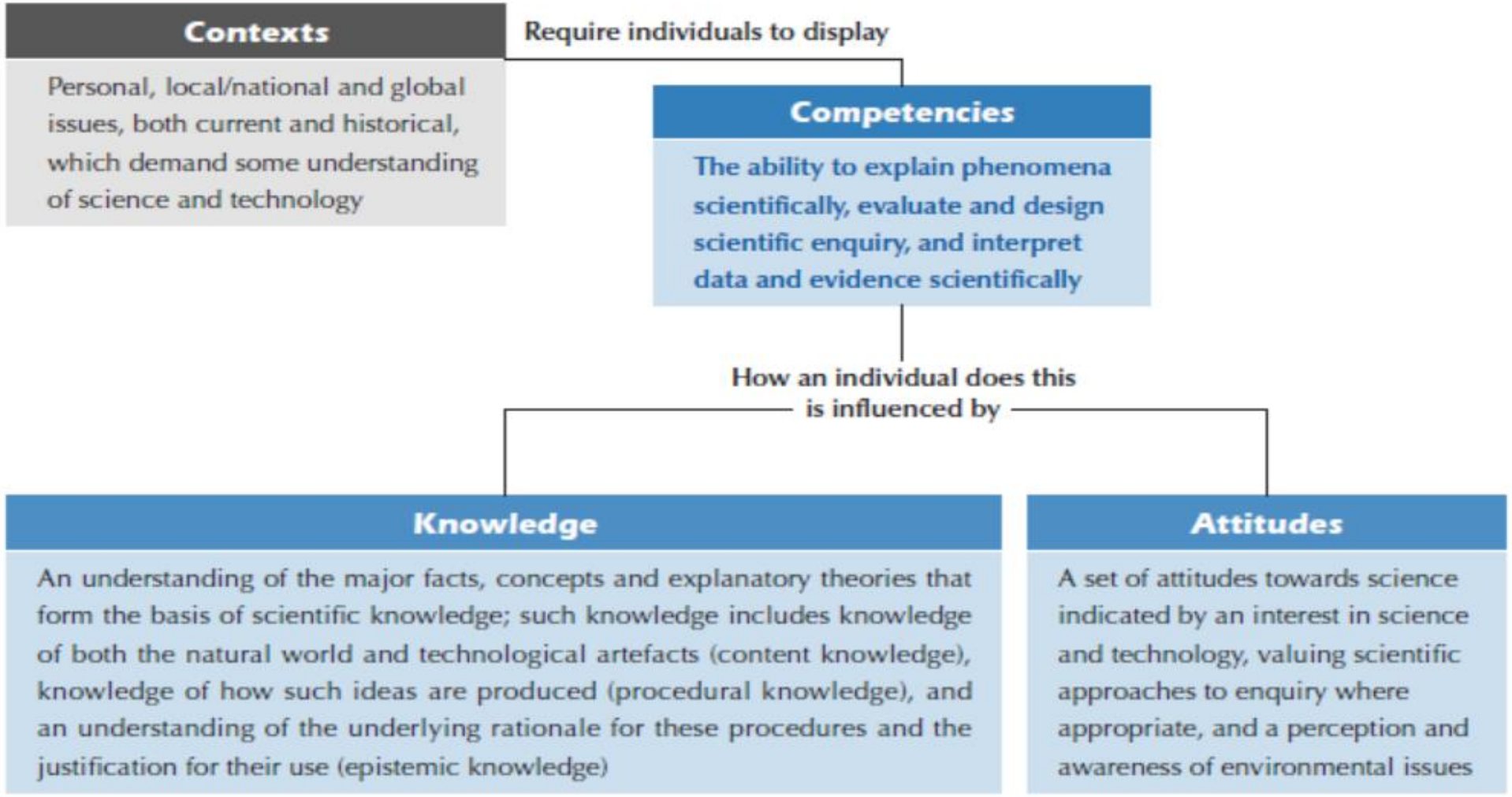
A Challenge in Real World Context



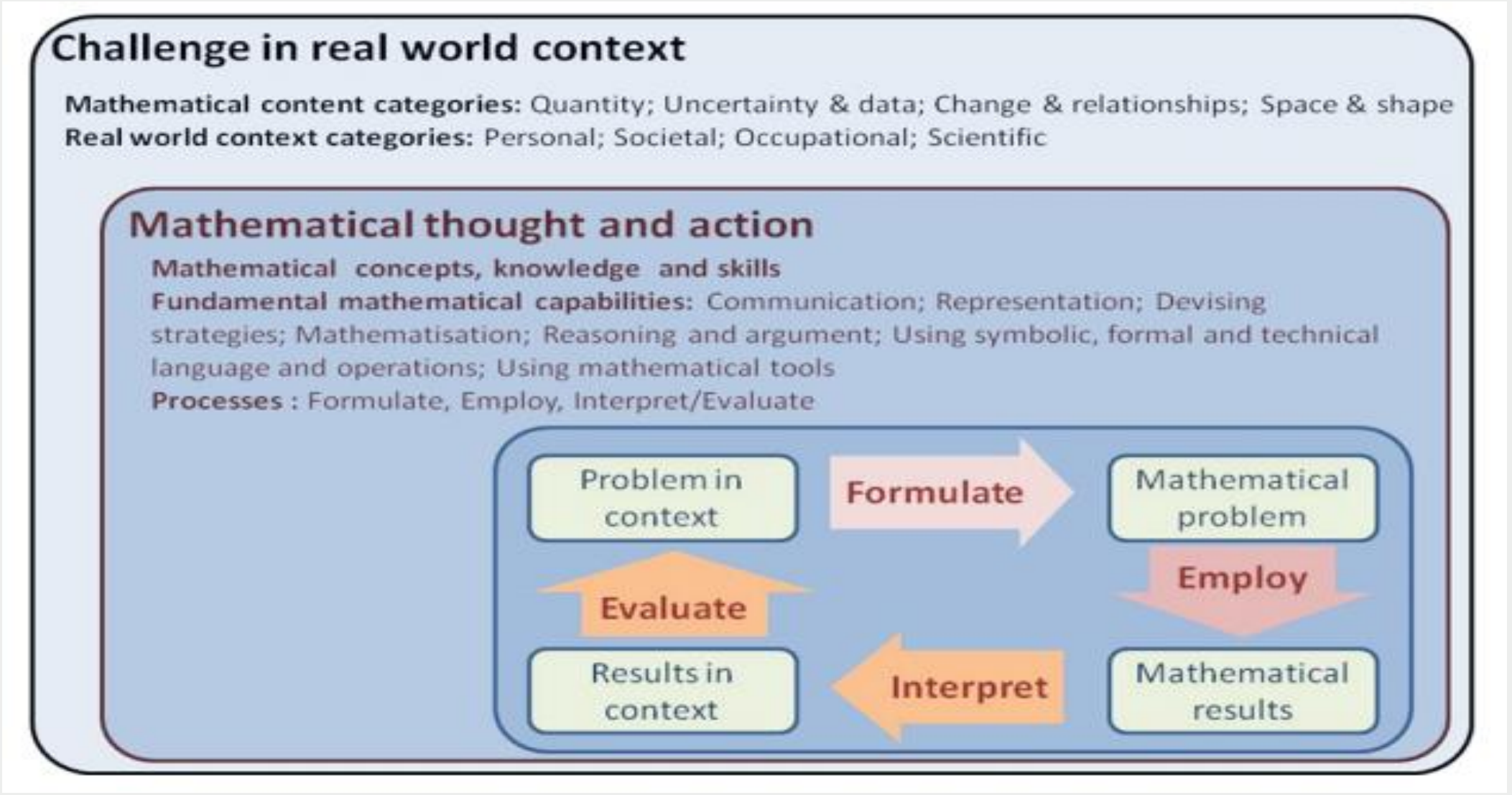
Constructive Engaged Reflective

Problem Solver
Citizen

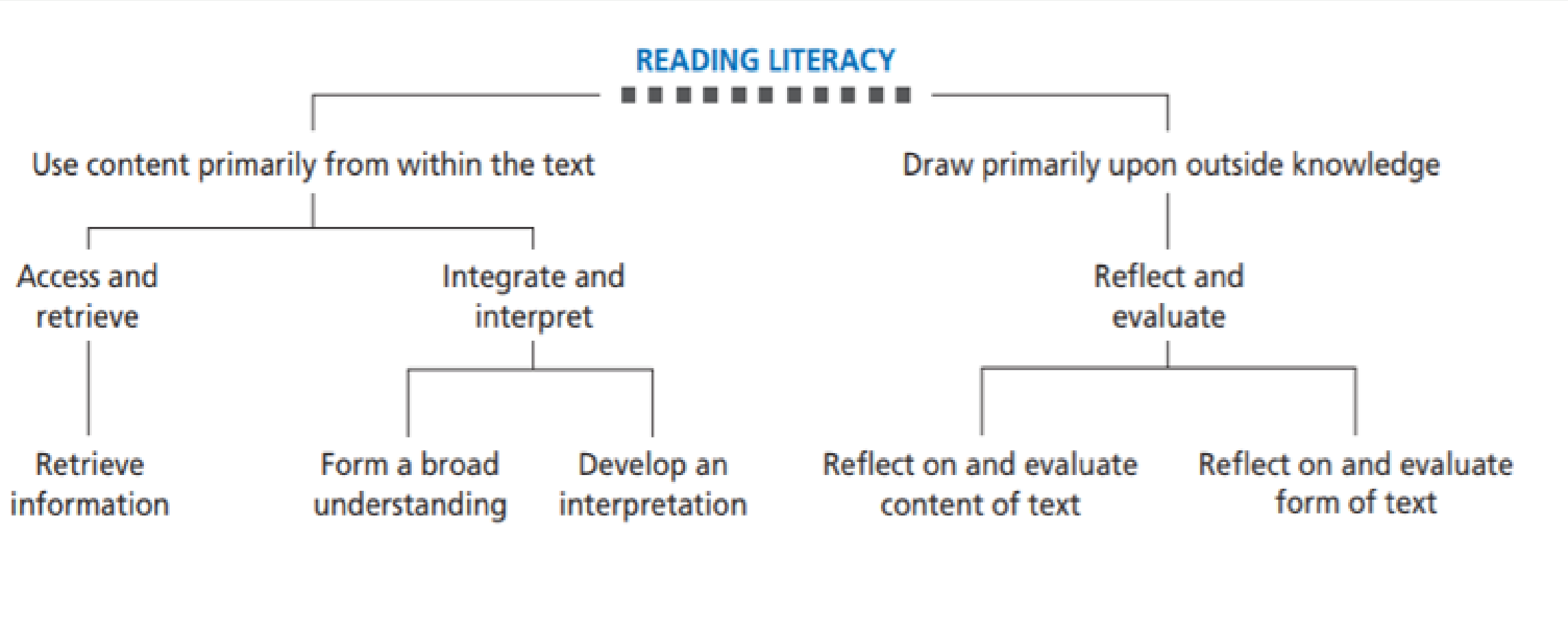
Components of the Scientific Literacy Framework and the Relation Among Them.



Components of the Mathematical Literacy Framework and the Relation Among them.



Components of the Reading Literacy Framework and the Relation Among them.



Distribution of score points

	Systems			
Knowledge types	Physical	Living	Earth & Space	Total over systems
Content	20-24%	20-24%	14-18%	54-66%
Procedural	7-11%	7-11%	5-9%	19-31%
Epistemic	4-8%	4-8%	2-6%	10-22%
Total over knowledge types	36%	36%	28%	100%

Scientific Competencies	% of score points
Explaining phenomena scientifically	40-50%
Evaluating and designing scientific enquiry	20-30%
Interpreting data and evidence scientifically	30-40%
TOTAL	

Context category	Percentage of score points
Personal	Approximately 25%
Occupational	Approximately 25%
Societal	Approximately 25%
Scientific	Approximately 25%
Total	100

Item Response Formats •

Types of Questions:

- Simple multiple-choice
- Complex multiple-choice
- Constructed response (short response items and extended response items)

- **Format wise** is a combination of continuous texts, non-continuous texts, or a mixture of both.
- **Texts Types** are description, narration, exposition, and argumentation.

Well Defined Benchmarks (Proficiency Levels)

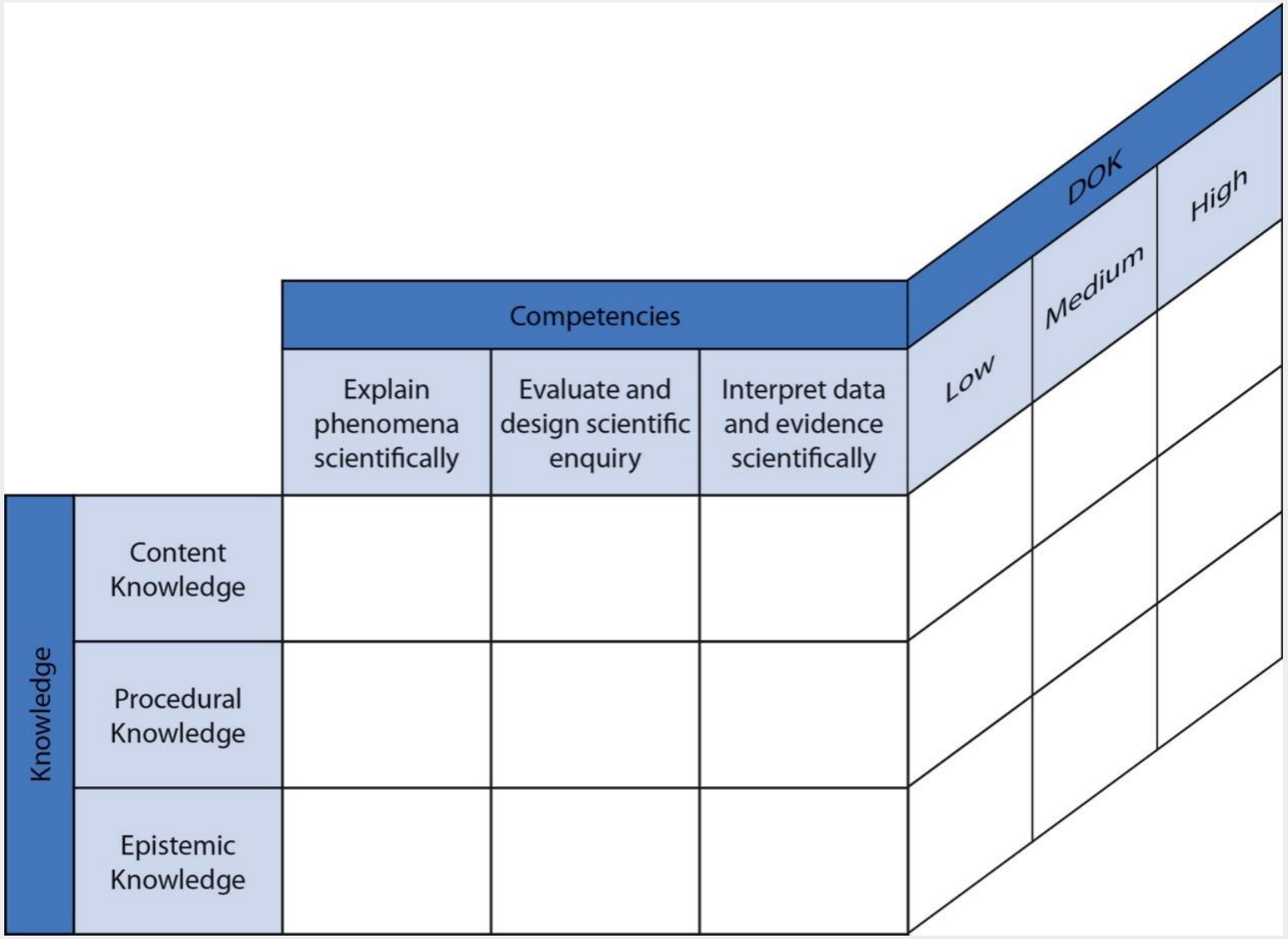
High Performers

Proficiency threshold level

Not Proficient

Proficiency levels and scale scores	Task description
Level 6 Score > 669	At Level 6, students can conceptualize, generalize and utilize information based on their investigations and modelling of complex problem situations and can use their knowledge in relatively non-standard contexts. They can link different information sources and representations and flexibly translate among them. Students at this level are capable of advanced mathematical thinking and reasoning. These students can apply this insight and understanding, along with a mastery of symbolic and formal mathematical operations and relationships, to develop new approaches and strategies for attacking novel situations. Students at this level can reflect on their actions, and can formulate and precisely communicate their actions and reflections regarding their findings, interpretations, arguments, and the appropriateness of these to the original situation.
Level 5 607 < score < 669	At Level 5, students can develop and work with models for complex situations, identifying constraints and specifying assumptions. They can select, compare and evaluate appropriate problem-solving strategies for dealing with complex problems related to these models. Students at this level can work strategically using broad, well-developed thinking and reasoning skills, appropriate linked representations, symbolic and formal characterizations, and insight pertaining to these situations. They begin to reflect on their work and can formulate and communicate their interpretations and reasoning.
Level 4 545 < score < 607	At Level 4, students can work effectively with explicit models for complex concrete situations that may involve constraints or call for making assumptions. They can select and integrate different representations, including symbolic ones, linking them directly to aspects of real-world situations. Students at this level can utilize their limited range of skills and can reason with some insight, in straightforward contexts. They can construct and communicate explanations and arguments based on their interpretations, arguments and actions.
Level 3 482 < score < 545	At Level 3, students can execute clearly described procedures, including those that require sequential decisions. Their interpretations are sufficiently sound to be a base for building a simple model or for selecting and applying simple problem-solving strategies. Students at this level can interpret and use representations based on different information sources and reason directly from them. They typically show some ability to handle percentages, fractions and decimal numbers, and to work with proportional relationships. Their solutions reflect that they have engaged in basic interpretation and reasoning.
Level 2 420 < score < 482	At Level 2, students can interpret and recognize situations in contexts that require no more than direct inference. They can extract relevant information from a single source and make use of a single representational mode. Students at this level can employ basic algorithms, formulae, procedures or conventions to solve problems involving whole numbers. They are capable of making literal interpretations of the results.
Level 1 Score>358	At Level 1, students can answer questions involving familiar contexts where all relevant information is present and the questions are clearly defined. They are able to identify information and to carry out routine procedures according to direct instructions in explicit situations. They can perform actions that are almost always obvious and follow immediately from the given stimuli.

Description of the Test Items



PISA 2015

العينة وأدوات الدراسة

العيّنة

- شارك في اختبار PISA 2015:
  - 273 مدرسة رسمية وخاصة.
  - 4546 متعلم من الصف السابع وما فوق.
  - يتم اختيار 25 متعلم من مواليد العام 1999 من كل مدرسة.
  - يتم اختيار عينة التلاميذ عشوائيًّا بواسطة برنامج KeyQuest المختص لإدارة العيّنة وتحديد رقم الكراس لكل تلميذ.

اجراء الاختبار في المدارس

- نفّذ الاختبار في جميع المدارس بحضور مندوب من المركز التربوي ومندوب من المدرسة.
- أجرى المتعلمون الاختبار وملأوا استبيان المعلومات الخاص بهم.

التوقيت الزمني للاختبار

النشاط	الزمن
المواد وقراءة التوجيهات العامة	15 دقيقة تقريبا
الاختبار	60 دقيقة
استراحة قصيرة	5 دقائق
استكمال الاختبار	60 دقيقة
استراحة	15 دقيقة
استبيان المتعلم	35 دقيقة
جمع مواد التقييم وانتهاء الدورة	5 – 10 دقائق تقريبا

تصحيح الاختبارات

- تمّ تصحيح الأسئلة المفتوحة من قبل أساتذة مختصين بالمواد المستهدفة.

- تمّ إدخال علامات الأسئلة المفتوحة وأجوبة التلاميذ عن الأسئلة المتعددة الخيارات على قاعدة بيانات بواسطة التطبيق Data Management Expert.

البيانات النهائية وتحليلها

- يستلم المركز التربوي البيانات النهائية بعد ضبطها وتهيئتها بشكل كامل من قبل المؤسسات المختصة المشاركة في برنامج PISA.

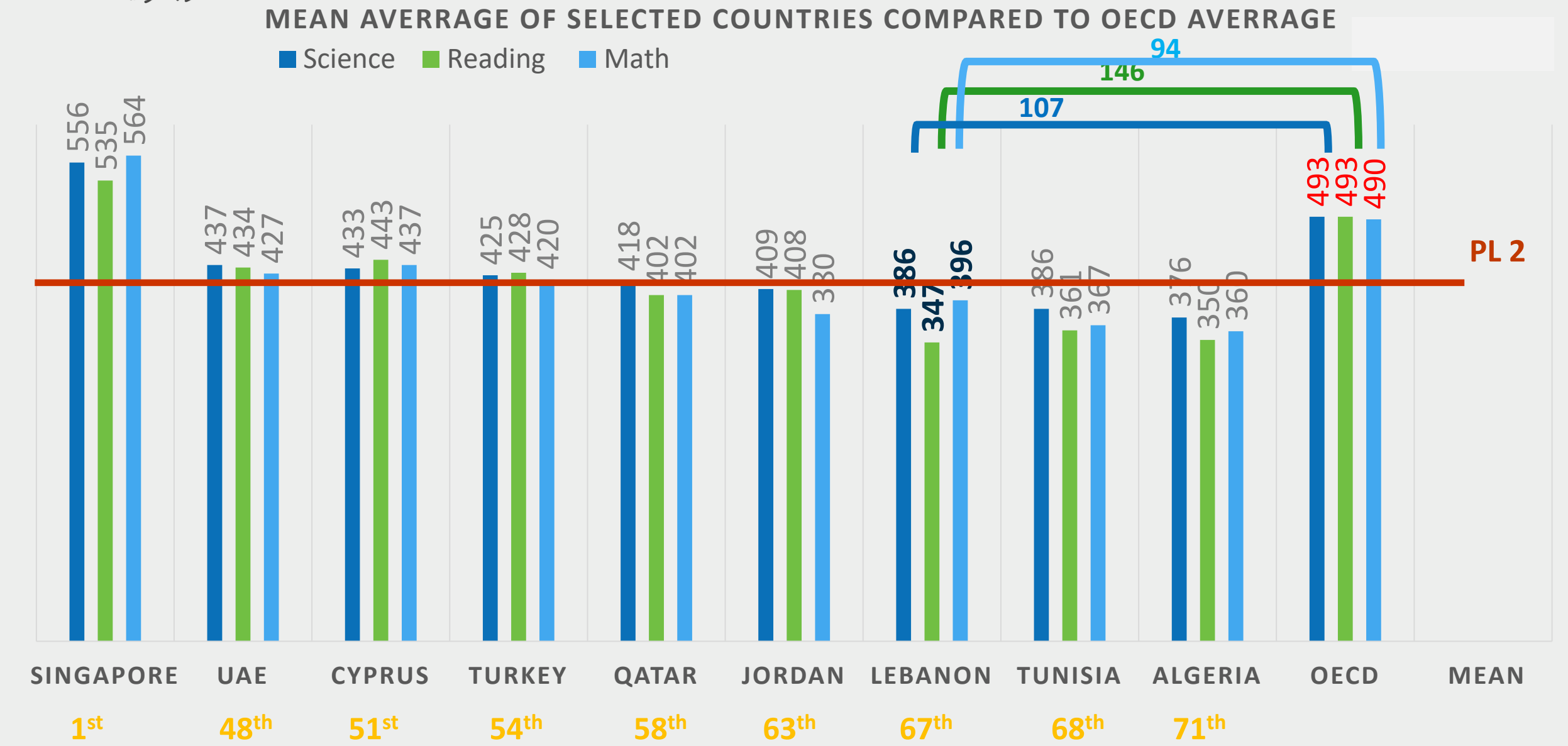
- يُستخدم البرنامج IDB Analyzer لتحليل النتائج واستخلاص الجداول الإحصائية اللازمة.

SNAPSHOTS on PISA Results

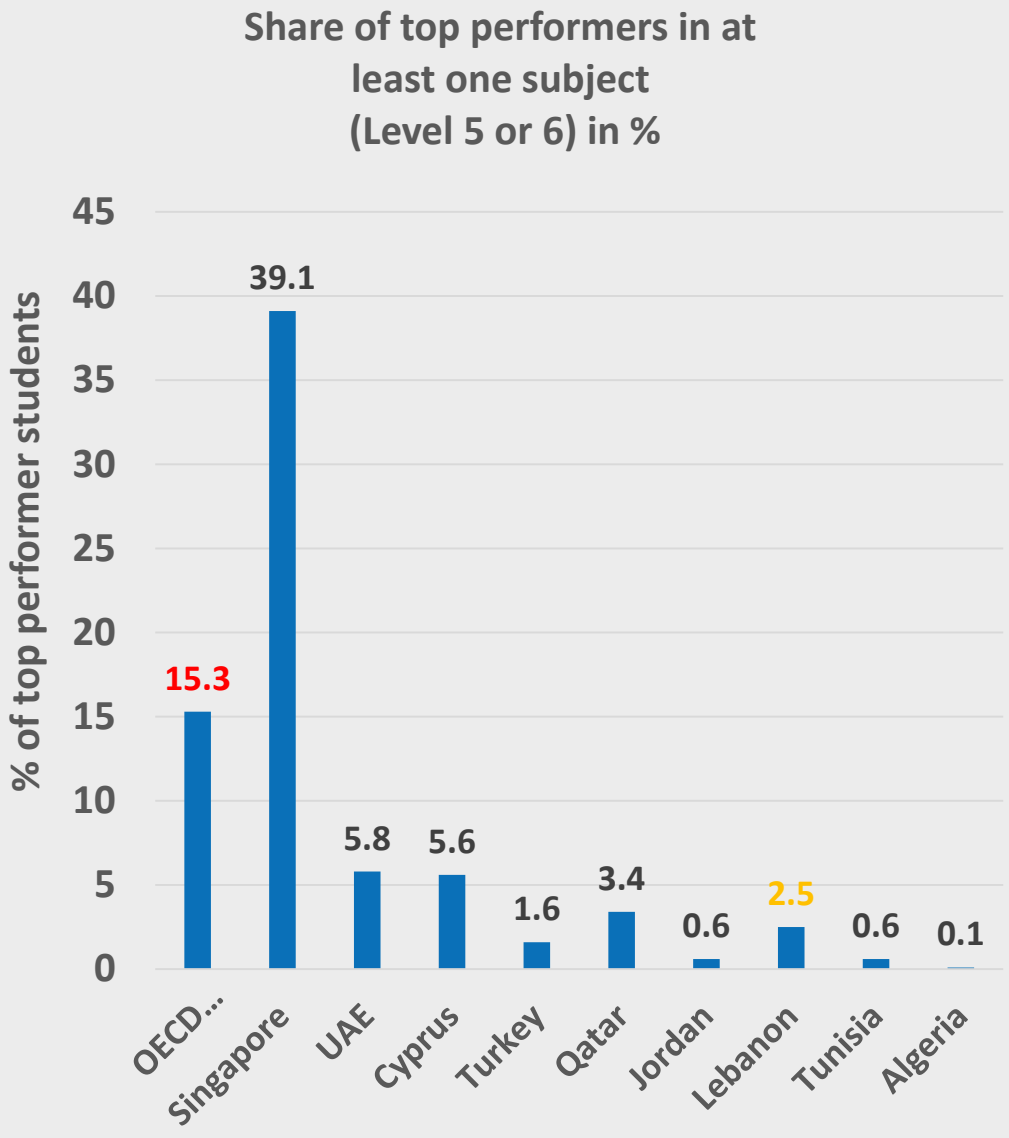
- Snapshots of students' performance in science, reading and mathematical literacy among the participating countries.

- Snapshots of students' performance in science, reading and mathematical literacy in Lebanon.

Lebanon average relative to OECD Average and other countries average

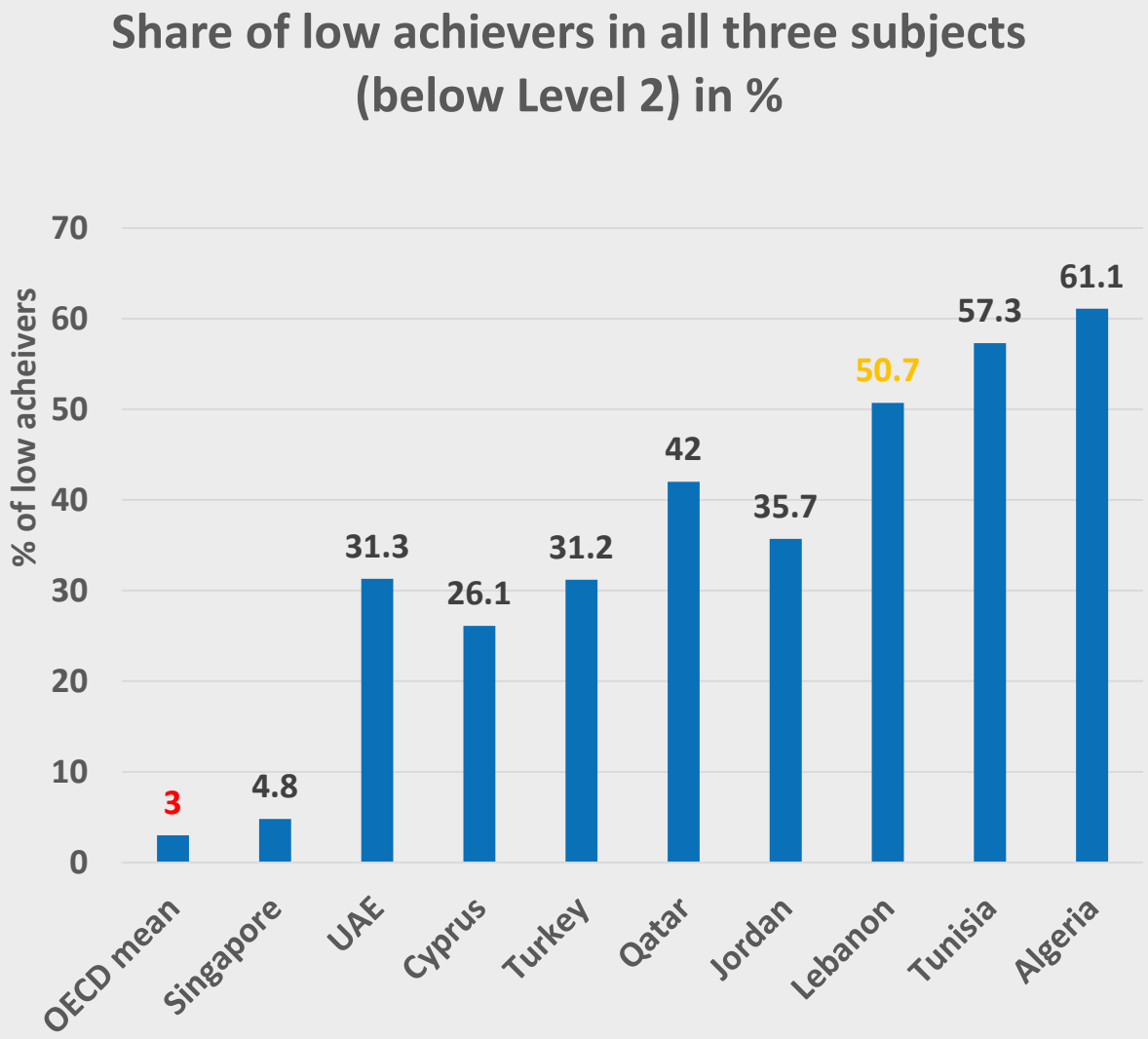


High Performers in at Least one Subject (level 5 or 6)



- Can use abstract scientific ideas or concepts to explain unfamiliar and more complex phenomena and events.
- Are capable of advanced mathematical thinking and reasoning.
- Can retrieve information that requires the student to locate and organise several pieces of deeply embedded information from a text or graph.
- According to the **International PISA Report (**OECD, 2016): in Lebanon less than 0.5 % of the students are top performers in Science. Approximately 2.5% of the high performers in PISA 2015 earned those grades in reading and math (less than 1% in the reading domain and approximately 2% in the mathematics domain)

Share of Low performers in all three subjects



Low Performers:

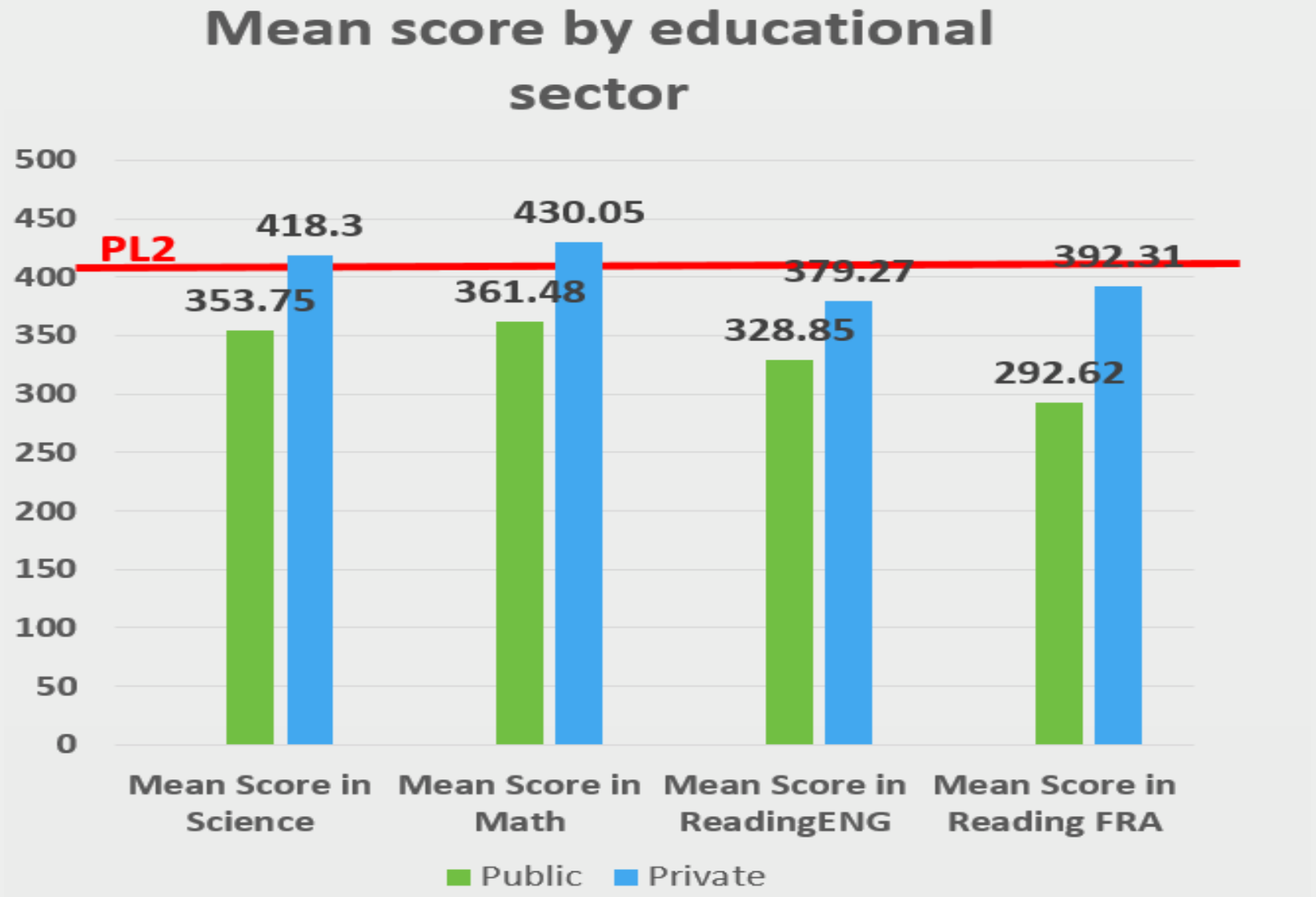
- Are unable to use basic or everyday scientific knowledge to interpret data and draw a valid scientific conclusion.
- Cannot compute the approximate price of an object in a different currency or compare the total distance across two alternative routes.
- Struggle with recognising the main idea in a text.

The Variation in Proficiency Levels in Scientific Literacy

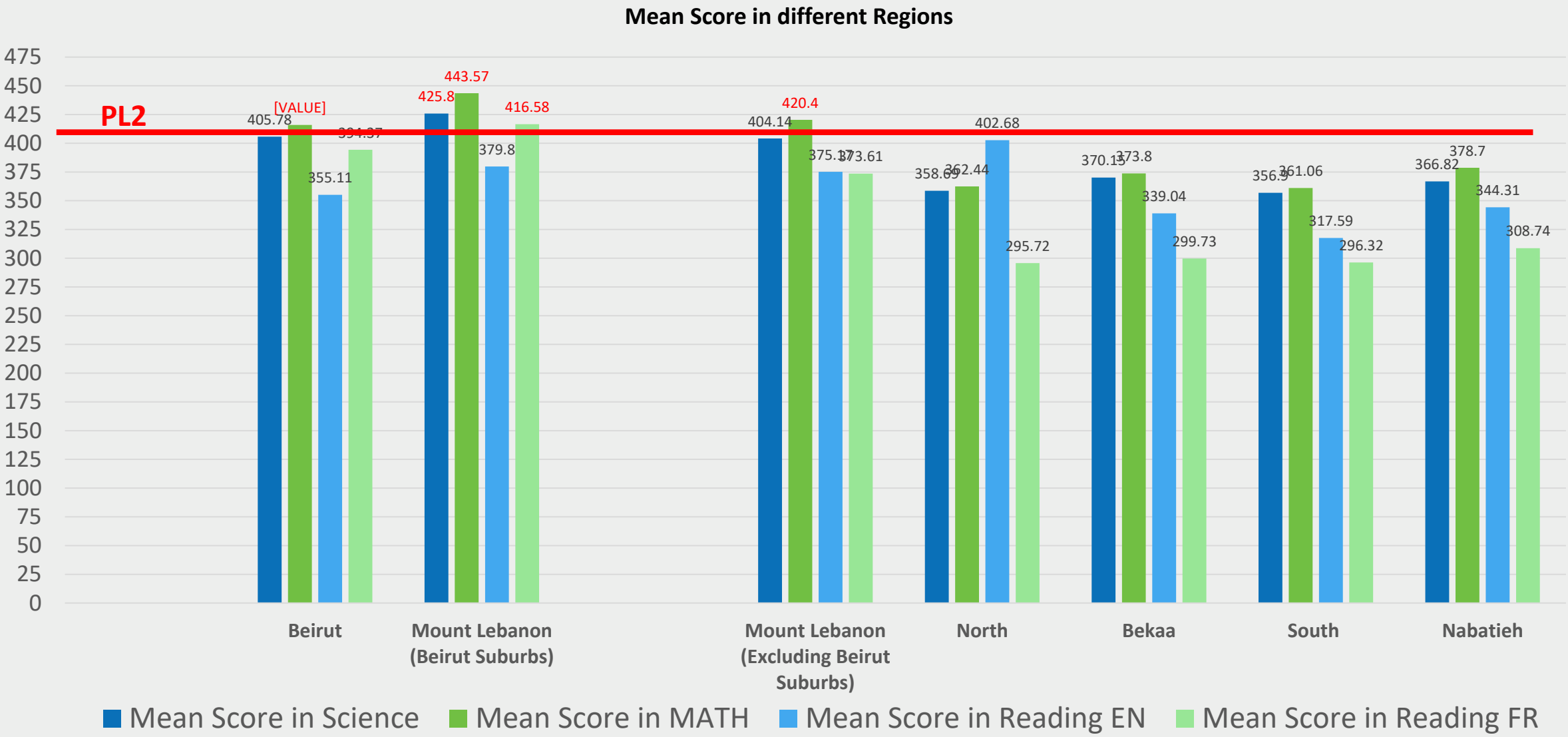
The mean score and variation in science performance in some neighbouring countries									
	Mean Score	Standard deviation	Percentile						
			5th	10th	25th	Median 50th	75th	90th	95th
Singapore	556 (1.2)	104 (0.9)	373 (3.7)	412 (2.8)	485 (2.2)	564 (1.6)	631 (1.8)	**683 (2.2)**	712 (3.1)
OECD Average	493 (0.4)	94 (0.4)	336 (1.3)	368 (0.6)	426 (0.6)	495 (0.5)	561(0.5)	615(0.5)	645(0.6)
UAE	437 (2.4)	99 (1.1)	284 (3.3)	312 (2.8)	364 (2.8)	431 (3.1)	505(3.2)	571(3.2)	608(3.0)
Cyprus	433 (1.4)	93 (1.2)	286 (2.9)	314 (2.5)	365 (2.1)	429 (2.0)	497(2.2)	557(2.8)	590(4.1)
Qatar	418 (1.0)	99 (0.7)	268 (1.9)	295 (1.8)	344 (1.3)	410 (1.4)	486(2.1)	554(1.9)	589(2.4)
Turkey (OECD)	425 (3.9)	79 (1.9)	301 (3.8)	325 (3.5)	368 (3.7)	421 (4.9)	482(5.5)	532(6.1)	560(5.7)
Jordan	409 (2.7)	84 (1.6)	268 (5.2)	299 (3.8)	351 (3.4)	410 (3.1)	468(3.0)	517(3.4)	544(3.5)
Lebanon	386 (3.4)	90 (1.8)	249 (4.6)	276 (3.9)	322 (3.6)	379 (4.2)	446(5.1)	511(4.9)	545(5.2)
Tunesia	386 (2.1)	65 (1.6)	287 (3.1)	306 (2.6)	341 (2.2)	382 (2.5)	428 (2.5)	472(3.8)	500(5.3)
Algeria	376 (2.6)	69 (1.5)	268 (3.4)	291 (3.3)	329 (2.5)	373 (2.5)	419(3.2)	465(4.5)	496(6.1)

legend	P.L <1b	P.L 1b	P.L 1a	P.L 2	P.L 3	P.L 4	P.L 5	PL6	

National Average by Sector



National Average by Region



More Probing of Scientific Literacy Results

Table 2.3.5a The Mean Score of PISA Population in Lebanon in Public Sectors in Different Regions

School Regions	Mean Score	Mean Difference	t-value (Refgroup Mount Lebanon-without Beirut suburbs)
Beirut	353.75	-28.27	-1.61
Mount Lebanon (Beirut suburbs)	358.94	-23.07	-1.38
Mount Lebanon (without Beirut suburbs)	382.02	0.00	Null
North	**339.00**	-43.01	**-2.82**
Beqaa	355.04	-26.98	-1.32
South	356.96	-25.06	-1,64
Nabataea	357.81	-24.21	-1.39

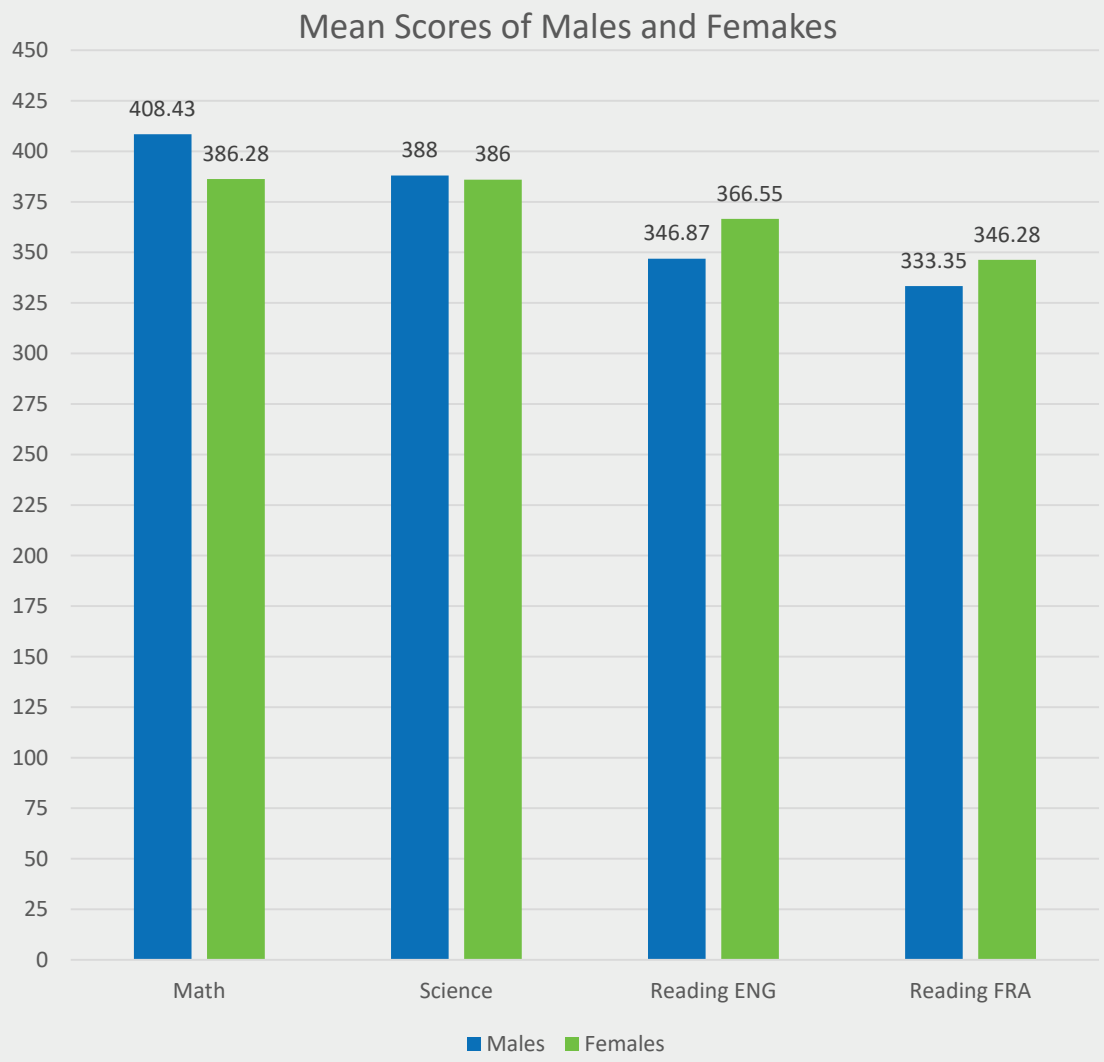
Note: bold t-value indicates that the difference is statistically significant.

Table 2.3.5b The Mean Score of PISA Population in Lebanon in Private Sectors in Different Regions

School Region	Mean Score	Mean Difference	t-value (Refgroup Mount Lebanon - Beirut suburbs)
Beirut	433.25	-14.48	-0.62
Mount Lebanon (Beirut suburbs)	447.73	0.00	NULL
Mount Lebanon (without Beirut Suburbs)	427.71	20.02	-0.99
North	395.73	-52.00	**-3.43**
Beqaa	388.14	-59.60	**-5.12**
South	356.82	-90.91	**-2.58**
Nabataea	386.55	-61.18	**-5.47**

Note: bold t-value indicates that the difference is statistically significant.

National Average by Gender



- Mean Scores of females is greater than that of males in Reading literacy with statistical significance. However, the Mean Score of males is greater than that of females in Scientific and Mathematical literacy.

National Average by Grade

Grade	% of students	Mean Score (Science)	Mean Score (Math)
7	3.71	**295.39**	**292.03**
8	8.29	**310.48**	**309.42**
9	16.59	**347.61**	**352.33**
10	62.32	409.32	422.58
11	8.98	407.72	417.45
12	0.13	375.08	418.23

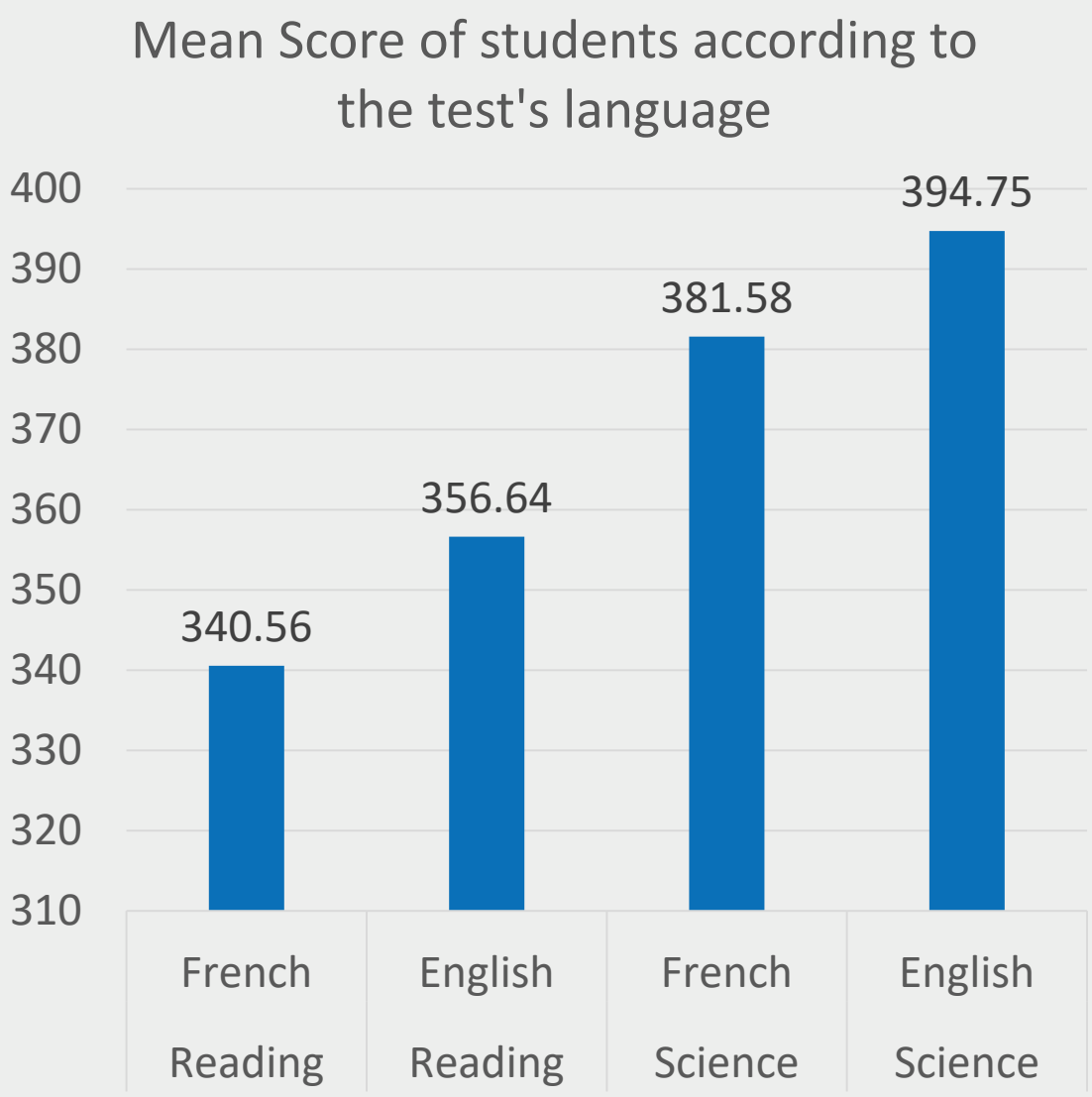
Note: bold t-value indicates that the difference is statistically significant.

The highest percentage of students was from grade 10. Moreover, The highest mean score is achieved by students in grade 10 where they approached the proficiency level 2 in Science, achieved it in Math, but remained much behind it in Reading literacy.

Mean score by grade in French /English reading literacy				
Grade	% of students (Reading FRA)	Mean Score (Reading FRA)	% of students (Reading ENG)	Mean Score (Reading ENG)
7	4.69	**223.03**	2.05	**240.84**
8	9.15	**244.45**	6.83	**264.29**
9	16.54	**289.99**	16.67	**306.92**
10	62.81	**376.95**	61.48	377.36
11	6.69	**337.71**	12.83	389.09
12	0.12	345.69	0.15	395.19

Note: bold t-value indicates that the difference is statistically significant.

National Average by the Study Language



- The students performed lower when the language of study was French in scientific literacy.
- The Pearson correlation test (r=0.81; p < 0.05) shows that there is a significant positive correlation between reading and science. This means that as the score of reading increases, the score of science increases.
- In addition, there was a significant correlation

$(r = .74)$ between the mathematics grades and the reading grades and similarly between the scores of science and mathematics $(r = .75)$. This means that students don't have a particular weakness in a specific subject, but they do have problems in their competencies in general.

WHY? And Recommendations

- Comparison Framework components with the curriculum
- Content
- Competencies/ skills/ Aspects
- Contexts
- Attitudes

Scientific Literacy Framework vs. Science Curriculum

- **At the level of 14 general objectives** of sciences curricula,go hand in hand with what is intended in PISA 2015. However, only around 4 to 6 out of these are reflected in the science books and become part of the taught curriculum.
- The National curriculum focuses more on **content knowledge** rather on procedural knowledge and epistemic knowledge.
- The national curriculum is **thematic based**, while the PISA curriculum is context based and the posed questions are anchored to real life contexts most of which are not well probed in our curricula (Demographic distribution of population, earth science, Frontiers,

Fig 2.3.7c Competency: Interpret data and evidence scientifically					PBA	PBA Lebanon %		
ITEM	Knowledge:	Context	Proficiency level	Level of difficulty	International % correct	Correct	Partial correct	Incorrect
S498Q04 Experimental Digestion (grade 9)	Procedural; Living	Local/National; Frontiers	3	moderate	41.38	55.67	16.50	**27.83**
S326Q01 Milk	Procedural; Living	Local/ National; Health and Disease	3	moderate	42.31	30.83	-	**69.17**
S326Q02 Milk			2		34.96	34.21	-	**65.79**
S131Q02 Good Vibrations	Procedural; Living	Personal; Health and Disease	3	moderate	32.46	41.43	-	**58.57**
S495Q03 Radiotherapy	Procedural; Living	Local/National; Frontiers	4	moderate	23.55	20.17	-	**79.83**
S519Q01 Airbags	Procedural; Physical	Personal; Frontiers	5	High	21.99	26.67	19.07	**54.26**

Rank of Competencies

Explain phenomena scientifically

Interpret data and evidence scientifically"

Evaluate and design scientific enquiry

Content, Context, and Form

- Content and Context

The **lack of content** from the curriculum or its suspension affected the percentage of correct items, especially **the content related to human health**, **the environment and the earth and space science**.

The **context** of the questions calls for integrated information from the different science subjects, and this is not very familiar to students in the Lebanese case.

- System

The students **performed better in physical science system related questions than in life science** system related questions

- Both differ in the question style that requires a great amount of reading.

Reflections

Here, the following questions emerge:

- are the students more motivated when studying physical sciences than when studying life science?
- Does the curriculum allocate more time for physics teachers to extend their learning to real life contexts unlike the time given to biology teachers?
- What about the teachers' self-esteem and confidence while teaching the different science subjects?

Mathematics National Curriculum Vs Mathematical PISA 2015

National program is somehoe content Oriented :

- Algebraic and numeric processes
- Numeric functions
- Geometric activities
- Problem solving and communication

PISA 2015 Framework is competency oriented

- Make use of information from different sources
- (text, table, diagram, graph, formulas, theorems, rules, etc.) to solve a problem.
- Use a variety of mathematical representations to model a certain situation (algebraic formula, equation, ……..).
- Conjecture, formulate, verify, and determine the validity domain.
- Distinguish between valid and invalid arguments.
- Demonstrate using different types of reasoning and mathematical methods (deductive, by induction, inductive, by contradiction…).
- Validate results and explain solutions.

Mathematics National Curriculum Vs Mathematical PISA 2015

- All the PISA mathematical knowledge is covered in the Lebanese curriculum by grade 10 except for counting, chance, and probability which are studied in grade 11.

- Both differ in the question style that requires a great amount of reading

- Both differ in applying mathematics in a *'variety of contexts'*;

Comparison between the Reading literacy framework and the reading component of the Lebanese curriculum

reading component of the Lebanese curriculum	Reading literacy framework in Pisa
Themes are limited	Themes are unlimited
the Lebanese curriculum does not link explicitly students' learning to the various situational domains	Domains : day to day situations, private or public, educational circumstances, and professional settings
Students are only familiar with relatively short continuous texts that are either fictitious or factual.	Format wise: There is a combination of continuous texts (60%), non-continuous texts (30%), and a mixture (10%) of both.
Types of texts: students identify the type and his indicators and writing requirements as a goal of reading texts.	Text Types: The PISA test focuses on the text type as a key for reading and writing

Reading literacy framework Vs LEB. Curr.

Skills: The majority of the questions that the students are familiar with require locating and retrieving information and a minor part requires integration and interpretation	**Aspects or the mental strategies:** Access and retrieve information from a text: 25% of the questions. Integrate and interpret: 50% of the questions. Reflect on and evaluate the content or the form: 25% of the questions
Type of Questions: The three ways are mentioned in the official texts, but the multiple choice questions are not utilized, and the open ended responses are rather writings that must follow a certain studied structure like a narrative essay for example. Here, the students will be evaluated according to their ideas, organization, language, style, … and not for higher order thinking.	**Type of Questions:** multiple choice questions , short response items, items that require extended responses

Reading Literacy Challenges

Tasks that our students find difficult :

- Produce inferences.
- Identify relevant elements or evaluate the relevance of an information or a choice.
- Ignorance of pragmatic issues of communication.
- Making assumptions.
- Analyze the difference between a specific passage and the rest of the text.
- Support an opinion.
- Identify the target audience.
- Link information.
- Identify an inconsistency.
- Lack of familiarity with authentic documents in which we read to act, or including a minimal mathematical language, which would raise the issue of the compartmentalization of school subjects and the dimension of the language of learning.

Science-related career expectations

Students' Career Expectations Percentage of students who expect to work in science-related professional and technical occupations when they are 30				
	Science and engineering professionals	Health professionals	Information and communication technology professionals	Science-related technicians and associate professionals
OECD average	8.8	11.6	2.6	1.5
Lebanon	17	21	1	1
Source: OECD, PISA 2015 Database, Table I.3.10a. http://dx.doi.org/10.1787/888933432284				

Science-related career expectations

Students' career expectations, by proficiency level in science Percentage of students who expect to work in science-related professional and technical occupations when they are 30				
	Low achievers in science (students performing below Level 2)	Moderate achievers in science (students performing at Level 2 or 3)	Strong achievers in science (students performing at Level 4)	Top achievers in science (students performing at or above Level 5)
OECD average	13	23	34	42
Lebanon	30	54	65	-

Motivation towards learning Science

Intrinsic Factors: Students' enjoyment of learning science

Average	A	B	C	D	E	
OECD	64	51	55	67	64	
Lebanon	70	65	71	80	79	

A: I generally have fun when I am learning science topics
B: I like reading about Science
C: I am happy working on Science topics
D: I enjoy acquiring new knowledge in Science
E: I am interested in learning about Science

Extrinsic Factors: Students' instrumental motivation to learn science

Average	A	B	C	D
OECD	69%	64	67	61
Lebanon	83	81	80	77

A: Making an effort in my science subjects is worth it because this will help me in the work I want to do later on.
B: What I learn in my science subjects is important for me because I need this for what I want to do later on.
C: Studying my science subjects is worthwhile for me because what I learn will improve my career prospects
D: Many things I learn in my science subjects will help me to get a job.

Equity in Education

Equity in Education							
		Inclusion		Fairness			
	Mean performance in science	Coverage of the national 15-year-old population	Percentage of students performing below Level 2 in science	Percentage of variation in science performance explained by students' socioeconomic status	Score-point difference in science associated with a one-unit increase in the ESCS1	Percentage of resilient students	Percentage of the between-school variation in science performance explained by students' and schools' ESCS
	Mean Score	Index	%	%	Score Difference	%	%
OECD	493	0.89	21	13	38	29	62.9
Lebanon	386	0.66	63	10	26	6	39.9

CHALLENGES

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