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The Effect of Reading Comprehension on the Performance in Science and Mathematics

Assoc. Prof. Dr. Sait Akbaşlı
Hacettepe University, Faculty of Education, Ankara, Turkey

Assoc. Prof. Dr. Mehmet Şahin
Yıldız Technical University, Faculty of Education, Istanbul, Turkey
sahinmehmet033@gmail.com

PhD. St. Zeliha Yaykiran
Hacettepe University, Faculty of Education, Ankara, Turkey

Abstract
Mathematics and Science classes in schools have become a focus to be considered in terms of educational systems and administration around the world in the last decade. Related to the mentioned classes, there are many benefits that lead students to academic success. In the recent years, educators have found that there are so many different factors that effect students' performance in science and math classes. Especially reading comprehension has changed so many traditional procedures in teaching math and science. It also shows remarkable benefits. This research focuses on the effects of reading comprehension on mathematics and science achievement. Students' academic performance on the mentioned classes and their motivation towards those courses will also be the focus of the research. The research is based on the data gathered from the latest PISA results and the opinions of secondary school teachers and students. Findings of this research indicate that there is a correlation between reading comprehension results and student success in math or science classes. It also indicates that reading comprehension contributes positively or negatively to the success results in math or science classes.
Keywords: Education, PISA, Reading Comprehension, Performance in Math, Performance in Science

1. Introduction

Science and Mathematics are considered the most important core courses among others in the secondary schools. These classes have lots of similarities. Compared to other classes, critical thinking and problem solving skills are vital for both Science and Math. On the other hand, memorization and mimicry are not necessarily critical to become successful on these subjects. Recently, educational systems have been criticized for being unsatisfying all around the world and many researchers have focused on improving the students' performance. Therefore, math and science classes in schools have gotten the attention. In order to improve students' achievement in these classes, researchers have come up with new teaching methods and techniques. To do so, PISA results will project the current situation of countries and their educational systems. If there is a relation between Science and Mathematics learning, this relation will change some many traditional procedures in teaching. Recent studies show that reading comprehension has great contributions to students on Mathematics and Science learning. Not all approaches appeared to be equally effective but most evaluation studies reported significant positive effects on reading proficiency on Mathematics and Science.

Researchers also discuss the proficiency levels of the math, science, and reading courses. Students who have great level of understanding on what they read show remarkable achievement in both Mathematics and Science classes. PISA results, 15 year –old students' academic performances, allow educators to see the big picture of students' academic success in OECD-countries. This opportunity guides educators to improve some universal techniques in schools.

Lastly, it has been found that the cooperation of the school and families on reading comprehension plays an important role on the performance of the students. When teachers and parents involve in their children's education, not only students will have higher achievement in schools but also the morale and the motivation of the individuals will increase. Considering that reading is one of the most powerful sources of learning, reading books, articles, and newspapers is evidently a crucial concomitant of intellectual engagement. Because reading is not limited with respect to content, it comes close to the "hungry mind" that is open to new ideas (von Stumm et al., 2011, p. 583). Reading has also been described as the "desire to engage and understand [one's] world [...], a need to know" (Goff & Ackerman, 1992, p. 539), which seems best expressed by contemplation. Intellectual curiosity has been labeled as the "third pillar of academic performance" besides intelligence and effort (von Stumm et al., 2011, p. 574). If the items had been more strongly related to scientific inquiry, relations with mathematics and science achievement may have been stronger.

The fact that most math and science textbooks require reading skills has led several scholars to investigate the relation between students' reading ability and their achievements in these courses. Some researchers evidently suggest that students' reading ability is correlated with both their general school achievements and those in mathematics (Ní Ríordáin & O'Donoghue, 2009; Reikerås, 2006). Reikerås (2006), for example, found that low achievement in reading slightly interfered with students' development of arithmetic skills. Walker, Zhang & Surber (2008) believe that mathematics items designed to measure higher cognitive skills, such as problem solving and mathematical reasoning, are two-dimensional in that they measure both reading ability and mathematics skills (pp. 163– 164). In their study (Walker et al., 2008), they found that students' scores on these contextualized items were indeed influenced by their level of reading ability. Furthermore, Grimm (2008) reports that early reading comprehension (third grade) relates to a conceptual understanding of mathematics and the application of mathematics knowledge.

We did find several studies on this topic (mostly conducted in secondary education), which describe how students' comprehension of word problems can be improved (Borasj & Siegel, 1998; Brown & Ryoo, 2008; Carter & Dean, 2006; Helwig & Almond, 1999; Nathan, Kintsch & Young, 1992). This focus suggests the assumption that students' reading ability is related to their understanding of math/science. Brown & Ryoo (2008) demonstrated that students, who were taught via a "content-first" approach facilitating the transition from an everyday understanding of general phenomena to the use of scientific language, significantly improved their understanding of science. As regards the text comprehension in mathematics tests, Helwig & Almond (1999) have suggested a video format by which the questions are read by an actor on a video monitor, a method specifically meant for students with an above average mathematical understanding but low reading skills. Additionally, Nathan et al. (1992) proposed using computer-based tutors to help students improve their situational understanding of algebra word problems. Borasj & Siegel (1998) give examples of how reading strategies can support mathematics instruction. They argue that unfamiliarity with the vocabulary necessary to understand word problems can affect students' performance.

In the extensive math/science vocabulary, everyday words such as 'product' and 'volume' take on new meanings. Several scholars have suggested that teachers should explicitly teach their students this vocabulary. Whether all these methods can successfully improve students' understanding of word problems in science classes as well is as yet unclear. In recent years, increased attention has been paid to the role of vocabulary and, for example, analogies in teaching science in secondary education (e.g. Bellocchi & Ritchie, 2011). Mathematics teachers generally do guide their students in improving their reading comprehension of mathematics texts (Carter & Dean, 2006). Notwithstanding the importance of this kind of teacher support, however, Chapman (2006) reports that most teachers have little experience in dealing with context in their teaching (i.e. the narrative mode of knowing; see also Bell, Matkins & Gansneder, 2011 on the impact of contextual instruction on teachers' own understanding of science).

All in all, we found multiple indications in the literature that students' reading ability and their academic achievement in mathematics (and presumably also their achievement in science) are somehow related. Further, understanding of science and mathematics is essential for all students, not only those are pursuing careers in scientific fields. Adequate preparation in science and mathematics enables students to develop intellectually and socially, and participate fully in a technological society as informed citizens (Clark, 1996) It is important for teachers to help students develop to their maximum potentials by involving them in classroom experiences that will (a) challenge them intellectually, and (b) prepare them for a life of continuous learning.

Without sufficient instruction, many students, whether they are slow learners, average, high performers, or from other exceptional groups, will show little interest in science and mathematics. They will eventually "turn off" to science and mathematics and never realize their potential in these subjects. All students, minority students in particular, need to know the importance of science and mathematics in their daily lives. Knowledge of these subjects helps them to develop intellectually and socially. Science is a way of thinking, a way of understanding the world. Minority students need to understand that early involvement with the substance of science and mathematics can open gates for them into all the domains of knowledge and employment. Science and mathematics are shaping the future; studying these subjects prepares them for a place in that future.

1.1. The aim of the study

The aim of this study is to present whether or not there is a relation between students Reading performance on Mathematics and Science achievements? The specific questions addressed by this study are:

1. According to last three PISA results, what are the performances of students in math, science, and reading in different countries? Is there a correlation between the performances over the years?
2. Is there a relationship between the students' reading achievement toward Math & Science achievement?
3. How do other factors such as families and schools effect students' reading achievement toward Math & Science achievement?

2. Method

This study is based on the mixed method approach. It uses both quantitative and qualitative data to find out the findings of the research questions. The quantitative data is obtained from the use of Secondary Data, official statistics of PISA results which can be found from OECD website and the Qualitative data collected with field notes through observations a group of middle school students.

To make the long story short the last data gathering part is the observation, which was conducted with a group of middle school students. The 15-year-old students were observed whether or not they are getting any support related to reading from their families or school. As the results of the observation, the students who have high achievements in math and science classes are found as supported in reading by either their families or teachers. Those students find opportunities to read with their families or spend specific amount of time for reading at school daily. They also don't have any difficulties in understanding the math and science problems. In contrast, students with low or average performers in math and science classes are less supported or not supported to read by the individuals around them. So they couldn't see the importance of reading on academic success. Some of them are luckily successful in classes but the majority of the students who don't read have difficulties in understanding math, science and other courses as well.

3. Findings

In order to figure out the performances of the OECD countries we will take a close look at the last three official PISA results and try to figure out whether there is a correlation between performances of the countries over the years.

3.1. Student Performance in Mathematics

This section compares the countries and economies on the basis of PISA average mathematics scores. Additionally, compares the relative standing of countries with the most recent assessment in mathematics, major PISA domain – are presented. The country results are estimated because they are obtained from samples of students, rather than from all students, and they are obtained using a limited set of assessment tasks, not a population of all possible assessment tasks.

When interpreting mean performance, only those differences among countries and economies that are statistically significant should be taken into account. Figure below shows each country's/economy's mean score and also for which groups of countries/economies the differences between the means are statistically significant. The figure below lists each participating country and their last three PISA results. The main aim is to clarify country's achievement over the years. The values range from a high points for the partner economy Shanghai-China to a low o points for the partner country Indonesia.

3.1.1. Comparing countries and economics performance in mathematics (2012)

Average: 494

Top Performers		Average Performers		Low Performers	
Countries	Scores	Countries	Scores	Countries	Scores
Shangai-China	613	Czech Republic	499	Turkey	448
Singapore	573	France	495	Brazil	391
Hong Kong-China	561	United Kingdom	494	Colombia	376
Chinese Taipei	560	Iceland	493	Qatar	376
Korea	554	Latvia	491	Indonesia	375

Source: OECD, PISA 2012 Database.

3.1.2. Comparing countries and economics performance in mathematics (2009)

OECD Average: 496

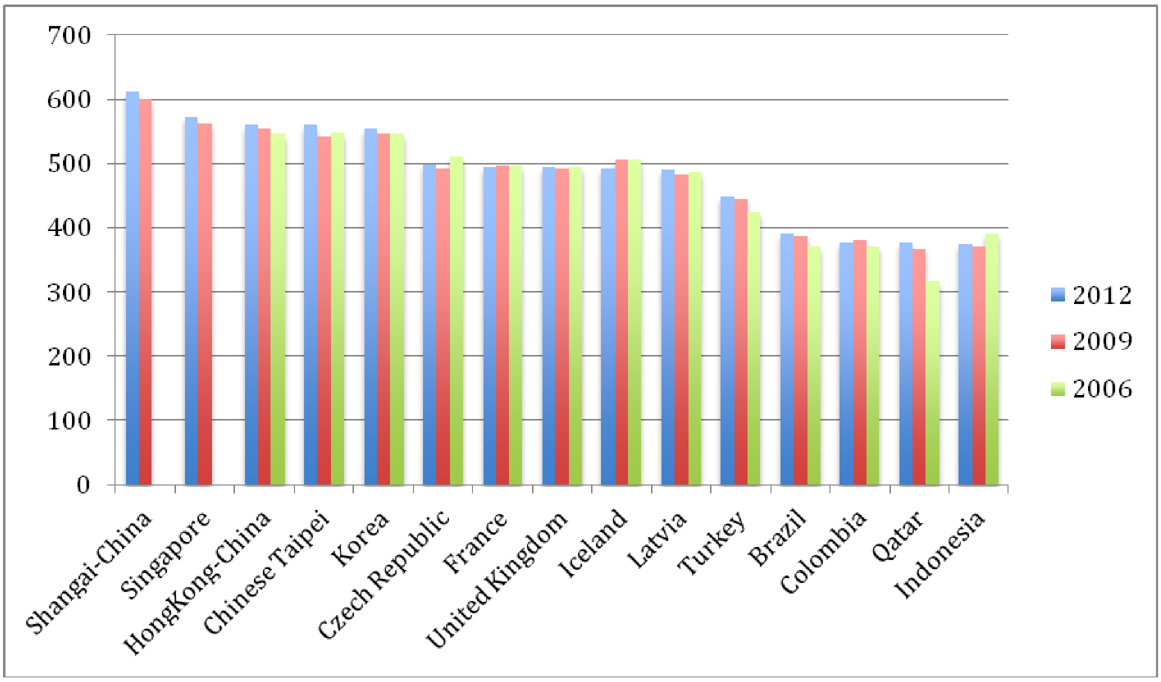
Top Performers		Average Performers		Low Performers	
Countries	Scores	Countries	Scores	Countries	Scores
Shangai-China	600	Czech Republic	493	Turkey	445
Singapore	562	France	497	Brazil	386
Hong Kong-China	555	United Kingdom	492	Colombia	381
Chinese Taipei	543	Iceland	507	Qatar	368
Korea	546	Latvia	482	Indonesia	371

Source: OECD, PISA 2009 Database.

3.1.3. Comparing countries and economics performance in mathematics (2006)
Average=498

Top Performers		Average Performers		Low Performers	
Countries	Scores	Countries	Scores	Countries	Scores
Shingai- China	-	Czech Republic	510	Turkey	424
Singapore	-	France	496	Brazil	370
Hong Kong-China	547	United Kingdom	495	Colombia	370
Chinese Taipei	549	Iceland	506	Qatar	318
Korea	547	Latvia	486	Indonesia	391

Source: OECD, PISA 2006 Database.



Over the years most of the mentioned countries improved their mathematics performance except Czech Republic, Iceland, Colombia, Indonesia, decreased their mathematics performances. Lastly France, and United Kingdom have stable mathematics scores over the last three PISA results.

3.2. Student Performance in Science
In PISA 2006 the mean science score for OECD countries was initially set at 500 points (for 30 OECD countries), then was re-set at 498 points after taking into account the four newest OECD countries. To help interpret what students' scores mean in substantive terms, the scale is divided into levels of proficiency that indicate the kinds of tasks that students at those levels are capable of completing successfully (OECD, 2006). One way to summarize student performance and to compare the relative standing of countries in science is through countries' mean performance, both relative to each other and to the OECD mean. For PISA 2012, the mean in science for OECD countries increased to 501 points. This establishes the benchmark against which each country's and economy's science performance in PISA 2012 is compared.
When interpreting mean performance, only those differences among countries and economies that are statistically significant should be taken into account. Figure shows each country's/economy's mean score and also for which pairs of countries/economies the differences between the means are statistically significant. For each country/economy shown in the middle column, the countries/economies whose mean scores are not statistically significantly different are listed. Moreover, countries and economies are divided into three broad groups: those whose mean scores are statistically around the OECD mean, those whose mean scores are above the OECD mean, and those whose mean scores are below the OECD mean.
As shown in the tables Shanghai-China, Hong Kong-China, and Singapore are the top performer countries in science category of PISA.

3.2.1. Comparing countries and economics performance in science (2012)
Average: 501

Top Performers		Average Performers		Low Performers	
Countries	Scores	Countries	Scores	Countries	Scores
Shangai-China	580	Czech Republic	508	Turkey	463
Singapore	551	France	499	Brazil	405
Hong Kong-China	555	United Kingdom	514	Colombia	399
Chinese Taipei	523	Iceland	478	Qatar	384
Korea	538	Latvia	502	Indonesia	382

Source: OECD, PISA 2012 Database.

3.2.2. Comparing countries and economics performance in science (2009)
OECD Average: 501

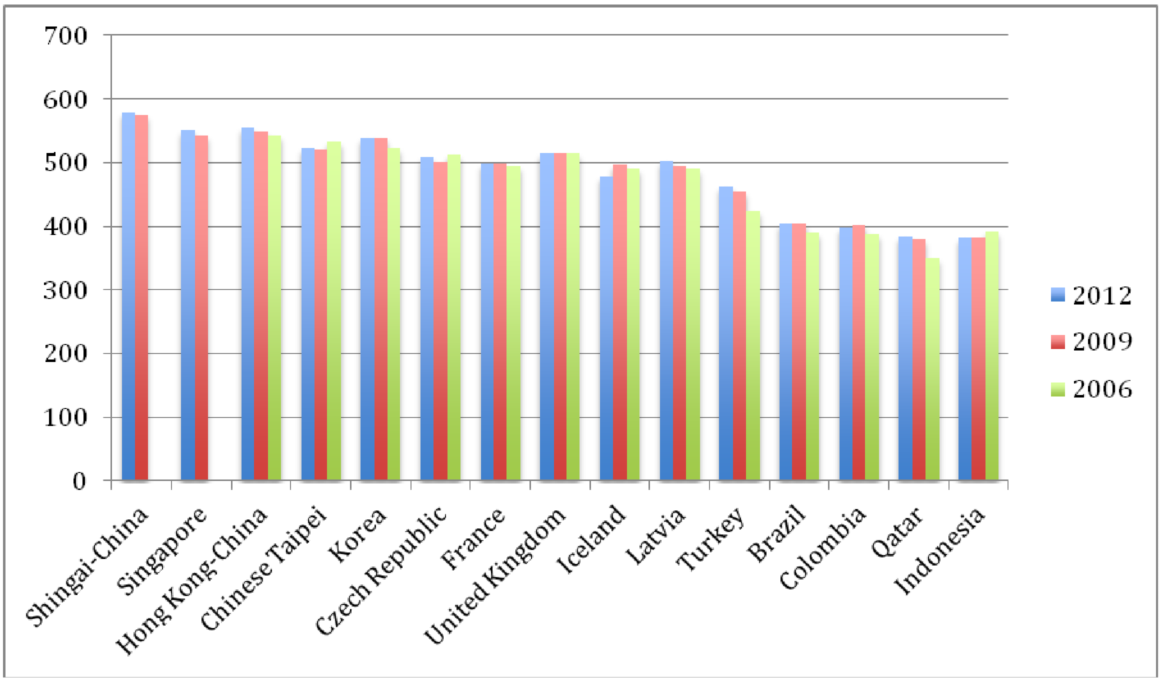
Top Performers		Average Performers		Low Performers	
Countries	Scores	Countries	Scores	Countries	Scores
Shangai-China	575	Czech Republic	500	Turkey	454
Singapore	542	France	498	Brazil	405
Hong Kong-China	549	United Kingdom	514	Colombia	402
Chinese Taipei	520	Iceland	496	Qatar	379
Korea	538	Latvia	494	Indonesia	383

Source: OECD, PISA 2009 Database.

3.2.3. Comparing countries and economics performance in science (2006)
Average: 497

Top Performers		Average Performers		Low Performers	
Countries	Scores	Countries	Scores	Countries	Scores
Shingai-China	-	Czech Republic	513	Turkey	424
Singapore	-	France	495	Brazil	390
Hong Kong-China	542	United Kingdom	515	Colombia	388
Chinese Taipei	532	Iceland	491	Qatar	349
Korea	522	Latvia	490	Indonesia	393

Source: OECD, PISA 2006 Database.



Over the years most of the mentioned countries improved their science performances except Chinese Taipei, Czech Republic, Iceland, Indonesia, decreased their mathematics performances. Lastly United Kingdom has almost stable mathematics scores over the last three PISA results.

3.3. Student Performance in Reading

The metric for the overall reading scale is based on a mean for participating OECD countries set at 500. To help interpret what students' scores mean in substantive terms, the scale is divided into levels of proficiency that indicate the kinds of tasks that students at those levels are capable of completing successfully (OECD, 2009). One way to summarize student performance and to compare the relative standing of countries in reading is through countries' and economies' mean performance, both relative to each other and to the OECD mean. For PISA 2012, the OECD mean is 496. This establishes the benchmark against which each country's and each economy's reading performance in PISA 2012 is compared.

When interpreting mean performance, only those differences among countries and economies that are statistically significant should be taken into account. Figure below shows each country/economy's mean score and also for which pairs of countries/economies the differences between the means are statistically significant. Moreover, countries and economies are divided into three broad groups: those whose mean scores are statistically around the OECD mean, those whose mean scores are above the OECD mean, and those whose mean scores are below the OECD mean.

As shown in the tables Shanghai-China, Hong Kong-China, and Singapore are the top performer countries in science category of PISA.

3.3.1. Comparing countries and economics performance in reading (2012)

Average= 496

Top Performers		Average Performers		Low Performers	
Countries	Scores	Countries	Scores	Countries	Scores
Shangai-China	570	Czech Republic	493	Turkey	475
Singapore	542	France	505	Brazil	410
Hong Kong-China	545	United Kingdom	499	Colombia	403
Chinese Taipei	523	Iceland	483	Qatar	388
Korea	536	Latvia	489	Indonesia	396

Source: OECD, PISA 2012 Database.

3.3.2. Comparing countries and economics performance in reading (2009)

OECD Average: 493

Top Performers		Average Performers		Low Performers	
Countries	Scores	Countries	Scores	Countries	Scores
Shangai-China	556	Czech Republic	478	Turkey	464
Singapore	526	France	496	Brazil	412
Hong Kong-China	533	United Kingdom	494	Colombia	413
Chinese Taipei	495	Iceland	500	Qatar	372
Korea	539	Latvia	484	Indonesia	402

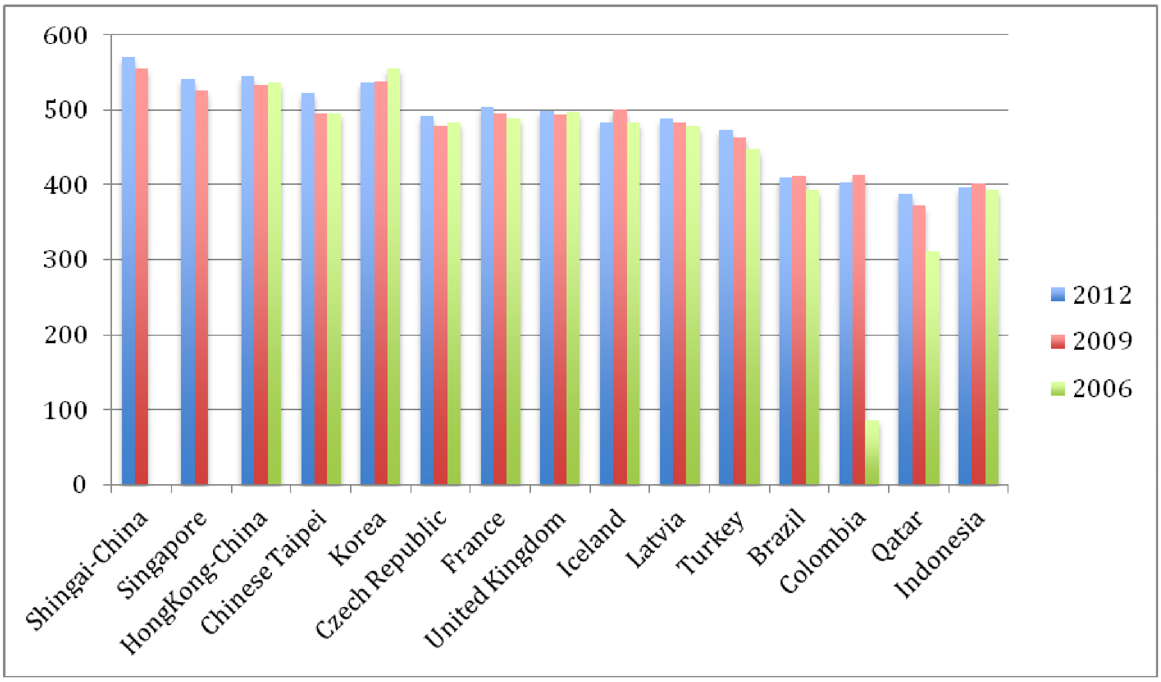
Source: OECD, PISA 2009 Database.

3.3.3. Comparing countries and economics performance in reading (2006)

Average= 494

Top Performers		Average Performers		Low Performers	
Countries	Scores	Countries	Scores	Countries	Scores
Shingai-China	-	Czech Republic	483	Turkey	447
Singapore	-	France	488	Brazil	393
Hong Kong-China	536	United Kingdom	498	Colombia	385
Chinese Taipei	496	Iceland	484	Qatar	312
Korea	556	Latvia	479	Indonesia	393

Source: OECD, PISA 2006 Database.



Over the years most of the mentioned countries improved their reading performances except Korea, United Kingdom, Iceland, and Indonesia. Countries, which show high performances, ensure the success over the years. Moreover countries with average and low performances also keep their ranks in the last three PISA results.

3.4. Student Proficiency Levels

3.4.1. Students at the different levels of proficiency in mathematics

The six mathematics proficiency levels are defined in the same way as the corresponding levels of the PISA 2003 scale, with the highest level labeled “Level 6”, and the lowest labeled “Level 1”. However, their descriptions have been updated to reflect the new mathematical process categories in the PISA 2012 framework and the large number of new items developed for PISA 2012. Figure below provides descriptions of the mathematical skills, knowledge and understanding required at each level of the mathematical literacy scale and the average proportion of students at each of these proficiency levels across OECD countries. Figure also shows the distribution of students on each of these six proficiency levels. The percentage of students performing below Level 2 is shown on the left side of the vertical axis.

Summary Descriptions for the Six Level of Proficiency in Mathematics are as follows:

Level	Lower score limit	Percentage of students able to perform tasks at each level or above (OECD average)	What students can typically do
6	669	3.3%	At Level 6, students can conceptualize, generalize and utilize information based on their investigations and modeling 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.
5	607	12.6%	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.
4	545	30.8%	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, 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.
3	482	54.5%	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.
2	420	77.0%	At Level 2, students can interpret and recognise 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.
1	358	92.0%	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.

Source: OECD, PISA 2012 Database, Figure I.2.21.

3.4.2. Students at the different levels of proficiency in science

When science was the major domain in PISA 2006, six proficiency levels were defined on the science scale. These same proficiency levels are used for reporting science results in PISA 2012. The process used to produce proficiency levels in science is similar to that used to produce proficiency levels in mathematics, as described earlier. Figure below presents a description of the scientific knowledge and skills that students possess at the various proficiency levels. Figure also shows a map of some questions in relation to their position on the science proficiency scale. The first column shows the proficiency level within which the task is located. The second column indicates the lowest score on the task that would still be described as achieving the given proficiency level. The last column shows the name of the unit and the task number. The score given for the correct response to these questions is shown between parentheses. The selected questions have been ordered according to their difficulty, with the most difficult at the top, and the least difficult at the bottom.

Summary Descriptions for the Six Levels of Proficiency in Science is as follows:

Level	Lower score limit	Percentage of students able to perform tasks at each level or above (OECD average)	What students can typically do
6	708	1.2%	At Level 6, students can consistently identify, explain and apply scientific knowledge and knowledge about science in a variety of complex life situations. They can link different information sources and explanations and use evidence from those sources to justify decisions. They clearly and consistently demonstrate advanced scientific thinking and reasoning, and they use their scientific understanding in support of solutions to unfamiliar scientific and

			technological situations. Students at this level can use scientific knowledge and develop arguments in support of recommendations and decisions that centre on personal, social or global situations.
5	633	8.4%	At Level 5, students can identify the scientific components of many complex life situations, apply both scientific concepts and knowledge about science to these situations, and can compare, select and evaluate appropriate scientific evidence for responding to life situations. Students at this level can use well-developed inquiry abilities, link knowledge appropriately, and bring critical insights to situations. They can construct explanations based on evidence and arguments based on their critical analysis.
4	559	28.9%	At Level 4, students can work effectively with situations and issues that may involve explicit phenomena requiring them to make inferences about the role of science or technology. They can select and integrate explanations from different disciplines of science or technology and link those explanations directly to aspects of life situations. Students at this level can reflect on their actions and they can communicate decisions using scientific knowledge and evidence.
3	484	57.7%	At Level 3, students can identify clearly described scientific issues in a range of contexts. They can select facts and knowledge to explain phenomena and apply simple models or inquiry strategies. Students at this level can interpret and use scientific concepts from different disciplines and can apply them directly. They can develop short statements using facts and make decisions based on scientific knowledge.
2	409	82.2%	At Level 2, students have adequate scientific knowledge to provide possible explanations in familiar contexts or draw conclusions based on simple investigations. They are capable of direct reasoning and making literal interpretations of the results of scientific inquiry or technological problem solving.
1	335	95.2%	At Level 1, students have such limited scientific knowledge that it can only be applied to a few, familiar situations. They can present scientific explanations that are obvious and follow explicitly from given evidence.

Source: OECD, PISA 2012 Database, Figure I.5.8.

3.4.3. Students at the different levels of proficiency in reading

The seven proficiency levels used in the PISA 2012 reading assessment are the same as those established for the 2009 PISA assessment, when reading was the major area of assessment: Level 1b is the lowest described level, then Level 1a, Level 2, Level 3 and so on up to Level 6. Figure below provides details of the nature of the reading skills, knowledge and understanding required at each level of the reading scale. The tasks related to each proficiency level are described according the three processes that students use to answer the questions. These three processes are classified as access and retrieve (skills associated with finding, selecting and collecting information), integrate and interpret (processing what is read to make sense of a text), and reflect and evaluate (drawing on knowledge, ideas or values external to the text). Figure also shows a map of some questions in relation to their position on the reading proficiency scale. The first column shows the proficiency level within which the task is located. The second column indicates the lowest score on the task that would still be described as achieving the given proficiency level. The last column shows the name of the unit, the question number and, within parentheses, the score given for the correct response to these questions. The selected questions have been ordered according to their difficulty, with the most difficult at the top, and the least difficult at the bottom.

Summary Descriptions for the Seven Levels of Proficiency in Reading is as follows:

Level	Lower score limit	Percentage of students able to perform tasks at each level or above (OECD average)	Characteristics of tasks
6	698	1.1%	Tasks at this level typically require the reader to make multiple inferences, comparisons and contrasts that are both detailed and precise. They require demonstration of a full and detailed understanding of one or more texts and may involve integrating information from more than one text. Tasks may require the reader to deal with unfamiliar ideas, in the presence of prominent competing information, and to generate abstract categories for interpretations. Reflect and evaluate tasks may require the reader to hypothesis about or critically evaluate a complex text on an unfamiliar topic, taking into account multiple criteria or perspectives, and applying sophisticated understandings from beyond the text. A salient condition for access and retrieve tasks at this level is precision of analysis and fine attention to detail that is inconspicuous in the texts.
5	626	8.4%	Tasks at this level that involve retrieving information require the reader to locate and organize several pieces of deeply embedded information, inferring which information in the text is relevant. Reflective tasks require critical evaluation or hypothesis, drawing on specialized knowledge. Both interpretative and reflective tasks require a full and detailed understanding of a text whose content or form is unfamiliar. For all aspects of reading, tasks at this level typically involve dealing with concepts that are contrary to expectations.
4	553	29.5%	Tasks at this level that involve retrieving information require the reader to locate and organize several pieces of embedded information. Some tasks at this level require interpreting the meaning of nuances of language in a section of text by taking into account the text as a whole. Other interpretative tasks require understanding and applying categories in an unfamiliar context. Reflective tasks at this level require readers to use formal or public knowledge to hypothesize about or critically evaluate a text. Readers must demonstrate an accurate understanding of long or complex texts whose content or form may be unfamiliar.
3	480	58.6%	Tasks at this level require the reader to locate, and in some cases recognise the relationship between, several pieces of information that must meet multiple conditions. Interpretative tasks at this level require the reader to integrate several parts of a text in order to identify a main idea, understand a relationship or construe the meaning of a word or phrase. They need to take into account many features in comparing, contrasting or categorising. Often the required information is not prominent or there is much competing information; or there are other text obstacles, such as ideas that are contrary to expectation or negatively worded. Reflective tasks at this level may require connections, comparisons, and explanations, or they may require the reader to evaluate a feature of the text. Some reflective tasks require readers to demonstrate a fine understanding of the text in relation to familiar, everyday knowledge. Other tasks do not require detailed text comprehension but require the reader to draw on less common knowledge.
2	407	82.0%	Some tasks at this level require the reader to locate one or more pieces of information, which may need to be inferred and may need

			to meet several conditions. Others require recognizing the main idea in a text, understanding relationships, or construing meaning within a limited part of the text when the information is not prominent and the reader must make low-level inferences. Tasks at this level may involve comparisons or contrasts based on a single feature in the text. Typical reflective tasks at this level require readers to make a comparison or several connections between the text and outside knowledge, by drawing on personal experience and attitudes.
1a	335	95.2%	Tasks at this level require the reader to locate one or more independent pieces of explicitly stated information; to recognize the main theme or author's purpose in a text about a familiar topic, or to make a simple connection between information in the text and common, everyday knowledge. Typically the required information in the text is prominent and there is little, if any, competing information. The reader is explicitly directed to consider relevant factors in the task and in the text.
1b	262	98.7%	Tasks at this level require the reader to locate a single piece of explicitly stated information in a prominent position in a short, syntactically simple text with a familiar context and text type, such as a narrative or a simple list. The text typically provides support to the reader, such as repetition of information, pictures or familiar symbols. There is minimal competing information. In tasks requiring interpretation the reader may need to make simple connections between adjacent pieces of information.

Source: OECD, PISA 2012 Database, Figure I.4.8.

3.5. Performances of Mathematics, Science, and Reading across OECD-Countries

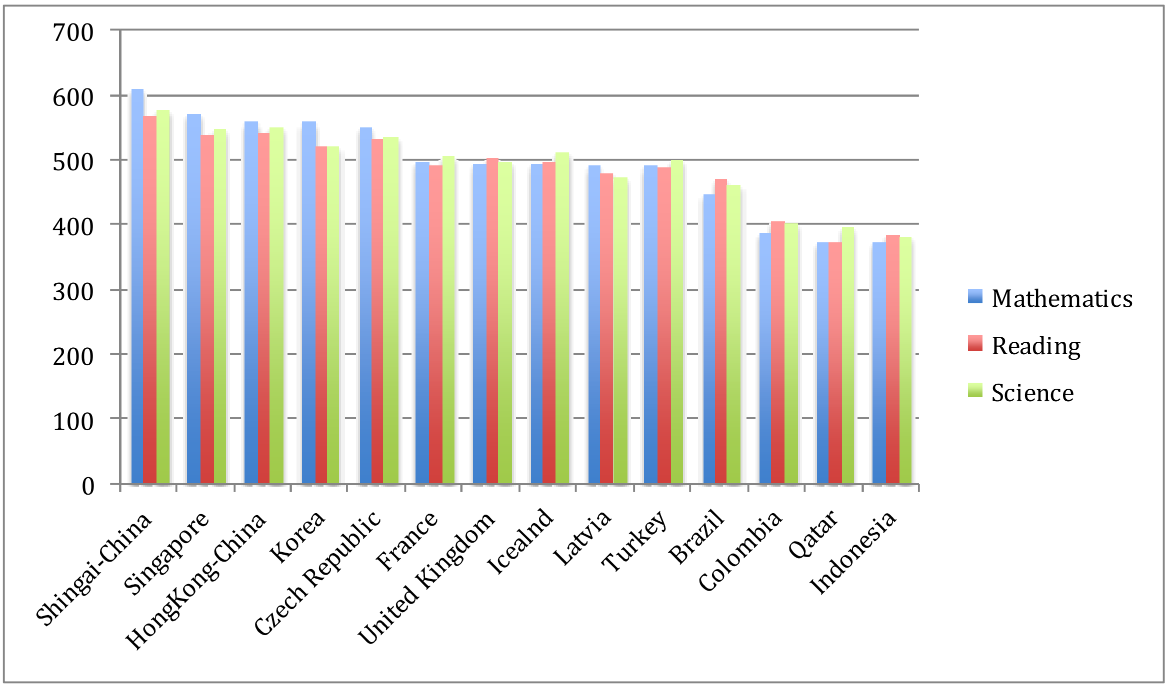
On average across OECD countries, 12.6% of students are top performers, meaning that they are proficient at Level 5 or 6. Among all participants in PISA 2012, the partner economy Shanghai-China (55.4%) has the largest proportion of students performing at Level 5 or 6, followed by Singapore (40.0%), Chinese Taipei (37.2%) and Hong Kong-China (33.7%). In Korea 30.9% of students are top performers in mathematics. Between 15% and 25% of students in Liechtenstein, Macao-China, Japan, Switzerland, Belgium, the Netherlands, Germany, Poland, Canada, Finland and New Zealand perform at Level 5 or above in mathematics. By contrast, in 36 countries, 10% of students or fewer perform at these levels. These include the OECD countries Denmark (10.0%), Italy (9.9%), Norway (9.4%), Israel (9.4%), Hungary (9.3%), the United States (8.8%), Sweden (8.0%), Spain (8.0%), Turkey (5.9%), Greece (3.9%) and Chile (1.6%). In Kazakhstan, Albania, Tunisia, Brazil, Mexico, Peru, Costa Rica, Jordan, Colombia, Indonesia and Argentina, less than 1% of students are top performers in mathematics

As we can see from the figure below there is a correlation between the top performers' countries. Meaning that the countries, which show high performance on reading classes also show great performance on math and science. On the other hand, the countries that perform close to the average don't show a statistical correlation among math, science, and reading. Addition to the average performers, the low performing countries also don't let us to draw a statistical conclusion between mentioned three different areas.

Performers in Mathematics, Reading, and Science are as follows:

		Mathematics		Science		Reading	
	Countries	Scores	Levels	Scores	Levels	Scores	Levels
Top Performers	Shanghai-China	613	5	580	4	570	4
	Singapore	573	4	551	4	542	4
	Hongkong-China	561	4	555	4	545	4
	Chinese-Taipei	560	4	523	4	523	3
	Korea	554	4	538	4	536	3
Average Performers	Czech Republic	499	3	508	3	493	3
	France	495	3	499	3	505	3
	United Kingdom	494	3	514	3	499	3
	Iceland	493	3	478	2	483	3
	Latvia	491	3	502	3	489	3
Lower Performers	Turkey	448	2	463	2	475	2
	Brazil	391	1	405	2	410	2
	Colombia	376	1	399	1	376	1a
	Qatar	376	1	384	1	388	1a
	Indonesia	375	1	382	1	396	1a

This table has been created by using multiple sources such as OECD, PISA 2012 Database, Tables I.2.1a, I.2.1b, I.2.3a, I.2.3b, I.4.3a, I.4.3b, I.5.3a, I.5.3b, OECD, PISA 2012 Database, Figure I.2.21, OECD, PISA 2012 Database, Figure I.5.8, and OECD, PISA 2012 Database, Figure I.4.8.



We may think success as a whole. Countries that are successful on math& science also show great achievements on reading.

To make the long story short the last data gathering part is theobservation, which was conducted with a group of middle school students. The 15-year-old students were asked whether or not they are getting any support related to reading from their families or school. As the results of the observation and field notes, the students who have high achievements in math and science classes are supported to read by either their families or teachers. Those students find opportunities to read with their families or spend specific amount of time for reading at school daily. They also don't have any difficulties in understanding the math and science problems. In contrast, students with low or average performers in math and science classes are less supported or not supported to read by the individuals around them. So they couldn't see the importance of reading on academic success. Some of them are luckily successful in classes but the majority of the students who don't read have difficulties in understanding math, science and other courses as well.

4. Discussion

According to the findings of the first research question, the performances of countries on PISA 2012,2009, and 2006 were discussed. While the high performer countries strengthen their places, the average and low performer countries couldn't show the required achievement to change their ranks. The second finding part includes an overlook to students reading, mathematics, and science scores. The aim was to figure out if there is a relationship between students reading achievement toward math & science achievement. According to the findings, it is found that the students who are successful on reading also show great success on math & science classes. As the last research question the study tried to figure out the effects of external support in student's achievement. For instance, family factor, students who have support of their families show more achievement than the ones who don't have family support. Especially on reading, the more parents focus on reading the better students scores we get on either math or science classes.

To sum up, all this data and analysis obviously displays us that reading has a significant effect on classes that requires quantitative intelligence such as math, and science. We cannot think an education depending on just quantitative or qualitative accomplishment. We need them both and find ways to improve them at the same time.

5. Conclusions and Recommendations

Academic achievement is a big concern all around the world. Some areas such as, math and science are playing a big role in students' school success. Researchers are focusing on the factors that affect math and science achievement. Reading comprehension has found as one of the biggest factor on math or science achievement. Data is gathered from the latest PISA results. The OECD countries were investigated according to math, science, and reading performances. A strong relationship has shown between the top reading performer countries and top math/science performer countries. On the other hand, there weren't any significant relation found between average and lower performer OECD countries. Lastly an observation was conducted to obtain student opinions on reading comprehension. Student who shows academic success are mostly feeling supported to read either by their families or teachers. In contrast, student with average or low academic success don't pay adequate attention on reading. They believe that they don't get any remarkable support from the individuals around them. The research was conducted with the mixed-method approach. At this point, in order to overcome the difficulties on academic success, students should improve their reading comprehension as well as they focus on mathematics and science. In this case students may need some support from their families and teachers. So the grown ups, families and teachers should encourage the students to read because students academic success quite much depends on students' understanding of what they read and how they feel about their selves. Educators, as guiders of the students, should also mention on the importance of reading comprehension in their classes and organize class lectures, and activities accordingly.

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