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Behind the Science Literacy Of Filipino Students at Pisa 2018: A Case Study In the Philippines' Educational System

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ABSTRACT

Purpose of the study: To find out the students' Science literacy experienced by the Philippines in the Programme for International Student Assessment (PISA) 2018 results.

Methodology: The methodology used Case Study design. The method used by collecting facts from various data, learning curriculum, culture and some Science discourse related to science literacy and PISA score. Various facts analyzed by group, classify and draw conclusions from the discussion.

Findings: Integration efforts from teachers, schools, and curriculum continue to be improved by the government, although the results of the Science literacy of students in PISA 2018 were not sufficient.

Novelty of this study: This study will provide an open picture to provide innovation, a literature study for the basis of thinking the importance of overall integrase in increasing Science literacy of students, not just teachers**.** Cultural influences on students' science literacy.

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1. INTRODUCTION

The Philippines is the largest archipelago in the world after Indonesia. The Philippines is a middle-income country with a national income of $ 3,580 per capita with 103.3 million population in 2016 [1]. The economic growth has increased substantially, although poverty rates are still overshadowed. The longest period of sustainable economic growth in recent history is between 2012 and 2016. The priorities of the education sector reform which has shifted over the years from access to quality. The quality of students' Science literacy is measured in PISA 2018, as a world-class ranking effort in literacy.

Student Science literacy is important in the development of education. According to the OECD [2], Science literacy is the ability of students to engage with issues related to science, and Science ideas, as reflective citizens. Science literate people will engage in reasoned discourse about science and technology, which require competence to explain phenomena Science, evaluate, design Science investigations, interpret data, and evidence Science. Science literacy is a form of student achievement, but also a form of teacher success in teaching science. The Philippine Program for International Student Assessment (PISA) shows a relatively low number[3]. In Science literacy, the average scores were similar. The average score for the Philippines was 357 versus the OECD average of 489[4]. So, it needs to be reviewed from various perspectives regarding possible causes, including the new curriculum (K-12), teacher and student readiness or unpreparedness in this assessment, or there are other possibilities.

Educational assessment plays an important role in evaluating the quality of education. Specifically, PISA assesses students who are nearing the end in compulsory middle School in the Philippines. It is an additional tool to measure the effectiveness of the curriculum and education system, and even teacher performance. The results describing students' daily Science abilities and learning processes, it can also be analyzed what, and how other contexts affect the PISA results.

2. RESEARCH METHOD

The study used by qualitative approach with dept analysis. The procedures were planned, data collection, analysis result [5]. The case raised the Science literacy of students in the Philippines against curriculum changes. The resources data used the Science literacy data of Filipino students and curriculum change data experienced by the education department.

3. RESULTS AND ANALYSIS

Here will be presented the results of research related to science literacy in the Philippines. The main study of the results of PISA 2018. Furthermore, the results of science literacy are described in the analysis of factors that are likely to influence, and at the end of the analysis will discuss solutions that may help improve students' literacy abilities.

Results PISA 2018

The PISA 2018 results for science literacy students in the Philippines can be broken down into seven main points:

1) Filipino students score an average of 357 points in Science Literacy, which is significantly lower than the OECD average of 489 points.
2) Girls students received an average score of 359 points for Science Literacy, which was slightly higher but did not differ significantly from the average score of boys students (355 points).
3) Students from private schools score an average of 399 points in Science Literacy, which is significantly higher than public school students who average 347 points.
4) Senior high school students (439 points) have far better performance than Junior high school students (356 points).
5) National Capital Region (NCR) achieved the highest Science Literacy scores (391) across the country
6) The average performance of students in urban areas for Science Literacy was 370 points, which was significantly higher than their average performance in rural areas (333 points)

Analysis

Program for International Student Assessment of the Organization for Economic Co-Operation and Development (OECD). This is the first three-year international test held in 43 participating countries in 2000. PISA sees the extent to which students aged 15 years, towards the end of their compulsory education, have acquired key knowledge and skills essential for full participation in modern society, with emphasis on how well students can estimate from what they have learned and can apply that knowledge in an unknown environment, both inside and outside of school[2]. This assessment covers three basic domains, specifically; Reading Literacy, Mathematical Literacy, and Science Literacy.

The first point, explains that the literacy ability of Filipino students is far lower than the OECD average score. The average grade of Filipino students is in Skill Level 1a. That is, the average 15-year-old Filipino student can use basic science knowledge to recognize or identify explanations of scientific phenomena. With additional guidance, they can conduct structured science investigations with at most two variables. In comparison, a 15-year-old student from OECD countries at Skill Level 3 can make use of content knowledge that is complex enough to compose explanations of known phenomena. Nearly four out of five (77.97%) students who qualify for PISA in the Philippines attain proficiency levels below Level 2. Specifically, 35% of Filipino students are classified as Skill Level 1a and the other 35% as Skill Level 1b. This shows that the majority were able to choose the best Science explanation for data provided in familiar, local and global contexts. They can identify simple patterns in the data, recognize basic Science terms and follow explicit instructions for carrying out science procedures. Those in the Skill Level 2 to 4 consisted of 21.97% of the distribution. About 5.6% and 1% of these students achieved Skill Levels 3 and 4, respectively. They can build explanations with relevant cues or support in less familiar or more complex situations.

The second point, explains the ability of Science Literacy of girls students is higher than boys but not significantly different. The average score of both sexes is classified as Fluency Level 1a. Meanwhile, the average score of boys and girls students in the OECD is in Skill Level 3 on the Science Literacy score. More boys students than girls students are at Skill Levels 1b and 4 for Science Literacy. Meanwhile, a higher percentage of girls students are classified as Fluency Levels 1a, 2, 3, and below Level 1b than their boys' counterparts. In addition, the percentage of those in Skill Level 5 to 6 is higher for boys students (0.09%) than girls students (0.03%). At Level 3, students can utilize knowledge content that is complex enough to identify or construct explanations about familiar phenomena. In less familiar or more complex situations, they can build explanations with relevant cues or support. They can use elements of procedural or epistemic knowledge to carry out simple experiments in limited contexts.

The third point, explains that literacy skills in private schools are significantly better than public schools, but both mean scores are both in Skill Level 1a on the Science Literacy score. The proportion of students below Level 1b proficiency in public schools (8.18%) is almost double that of private schools (4.34%). Similar results were found in Fluency Level 1b, with 38.65% of students in public schools and 20.31% of students in private schools. In addition, 35.92% of students in public schools achieved Skill Level 1a - only slightly higher than the proportion of students in private schools of 32.00%. The proportion of students in the Skill Level below 2 is 82.75% and 56.65% for public and private schools, respectively.

The fourth point, describing the average performance of Senior High School students in improving Science literacy skills is classified as Skill Level 2. Students have basic content, procedural knowledge, and epistemic that can be used for simple experimental designs and simple data sets. Meanwhile, Junior High School students are still at Skill Level 1 meaning significantly lower than the average score achieved by Senior High School students. This shows that they can identify simple causal. The majority of Junior High School students are at Level 1b (35.49%) or Level 1a (35.20%), respectively. The proportion of Senior High School students at Skill Level 2 (27.14%) is almost double the proportion of Junior High School students (15.28%) at the same level. Meanwhile, the proportion of Level 3 Senior High School Students Proficiency (26.76%) is almost five times that of those who are in Junior High School (5.46%).

Point five and six show that there is an uneven level of student literacy skills between urban and rural areas. The National Capital Region (NCR) achieves the highest Science Literacy score in the entire country. Region 7 (Central Visayas) and Region 11 (Southern Mindanao) each achieved the highest average scores in Visayas and Mindanao. Region 4A (CALABARZON), Region 7 (Central Visayas), National Capital Region (NCR), and Cordillera Administrative Region (CAR) achieved average scores higher than the national average of 357 points. Region 9 (West Mindanao), Region 12 (Central Mindanao), and CARAGA Administrative Region (CARAGA) have an average score in Fluency Level 1b in Science Literacy, while other regions reach Fluency Level 1a. However, the proportion of students in the National Capital Region (NCR) below Skill Level 2 is lowest at 62.03%. The same region received the highest percentage of Skill Levels 2 to 4 at 37.88%. On the other hand, CARAGA Administrative Region (CARAGA) has the smallest percentage (5.54%) of students in Skill Levels 2 to 4 and the largest percentage (94.47%) below Skill Level 2. Negros Island Region (NIR) has the largest number. students in Proficiency Levels 4 and 5 with 3.2% and 0.39%, respectively. Meanwhile, there are no students in Skill Level 4 from Region 10 (Northern Mindanao), Region 12 (Central Mindanao), and CARAGA Administrative Region (CARAGA)

The data analysis that illustrates the narratives of science literacy of students at PISA 2018 in the Philippines received input from the OECD in the form of; "The PISA 2018 results reflect the urgency of improving the quality of basic education in the Philippines[3]. The Department will lead this national effort through "Sulong EduKalidad", whereby it will implement aggressive reforms in four key areas: (1) Upskilling teachers and school leaders through a transformed professional development program; (2) Review and updating of curriculum; (3) Continuous improvement of the learning environment; and (4) Multi-stakeholder cooperation ".

From the data view, the researcher agrees with the directions from the OECD, but from the real situation in the field there are variations in views that might illustrate the rapid progress in science literacy but in this case, it is not sufficient to be started well in the PISA context. The above analysis will be decomposed into Science reasoning from several Science Science fields of view analysis, as follows;

Analysis of teachers

The teacher becomes the main focus when students' Science literacy skills are low, this is not entirely true. Various government efforts have been made to improve the quality of teachers such as The "Framework for Philippine Science Teacher Education[6], that is a form of a refutation of the quality of physics teachers in Philippine secondary schools is low [7]. In addition, the community has the notion that there is a shortage of qualified science teachers, so many criteria suggested by educational observers have been carried out until the peak of those who have a bachelor's degree must add to basic skills and must pass

the licensing exam for teachers. in addition, it was also found that teaching assignments were not in accordance with the educational background of the teacher [6]. The problem of the mismatch of teacher background is influenced by the alignment between the K-12 curriculum and the availability of science teachers. So that the possibility of a learning process going on is less interactive for science subjects. the ability to do practical reasoning and experimentation is also limited, while the quality of Science literacy is interrelated with the practicum [8]. After that, the government issued a number of policies to regularly monitor the skills and knowledge of teachers [9], also foster a good attitude of Science literacy [10]. Even to prosper, the government will increase teacher salaries in 2020.

PISA results become an opportunity for teachers to do new things to innovate to improve students' science literacy. Learning materials such as textbooks, supplementary materials, and science equipment are provided [11] but it would be better if learning activities were carried out outside the classroom as well. Science teachers who manage to develop students' skills in finding answers to questions about materials and phenomena in the environment, and those who empower their students to grow into knowledgeable decision-makers in the community, are considered effective teachers [12]. As a result, a committed science teacher must be a reflective, collaborative and lifelong learner[6]. In addition, Science literacy is not limited to numbers, Filipino teachers also teach science with teaching and learning related to culture [13]. Part of the original knowledge of the community that has social, health or environmental impacts [14]. More science courses also seem to be linked to the support of cultural beliefs [15].

Finally, whatever the outcome, the teacher remains the main focus of what happens to students. As stated in Science discourse [16] All these problems are only for the teacher, the teacher must have good quality in teaching, but other than that the welfare must be considered [17] in teacher problems, the curriculum does not correlate much. Therefore, giving freedom to teachers to develop the potential of science skills must be given in full, providing facilities, facilitating improving the quality of both training and further study at the nearest university, especially in improving the science process skills of teachers [18], or prospective teachers [19]. In addition, communication between teachers in a field of study will make a positive path in improving the quality of teaching. Given the reform of the K-12 concept of teacher leadership can be a great support for other teachers, students and schools [20]. The study also wants to emphasize that, as a case-oriented case study, these findings only represent what teachers actually experience.

Analysis of Culture in Schools

In the context of the K-12 Program, assessment results must be used to view student performance so that relevant and responsive policies/programs/reforms can be introduced to further improve the quality of teaching and learning at school and national levels. Released the results of PISA 2018 there is an imbalance between Senior high school and Junior high school, Rural and Urban areas, Private and public schools. This problem if described will form a broad and complex problem, but in a concise manner is caused by inequality of school facilities, if it continues to lead to a slowdown in the quality of student learning processes [21]. Lack of facilities does not mean quantity but on quality. for example, books, books tend to teach to calculate rather than teach reasoning. facilities must provide students the ability to reason deeply to find solutions to problems, this is the expected literacy ability. This requires thorough and centralized coordination for equitable distribution of facilities, with policy assessments at the lowest to highest units aimed at harmonizing initiatives in increasing the science literacy of students at the school level [22]. As a form of the program, all can go to school and complete compulsory education [23]. In addition to opportunities, equality and facilities all schools can provide are motivation and understanding for self-education. Because, some children who are burdened with low parental economic factors have no real impact on student psychology to be concerned about parents and decide not to go to school [24], environmentally and socially less supportive [25], including access to education [24].

The school is a formal learning center for improving the quality of people's lives with knowledge, understanding Science literacy as one of them. Therefore, students learn best when they are placed in a flexible environment to adapt teaching strategies to individual needs, orientation to problem-solving, from their social environment problems and what they are currently experiencing [27]. That ability can be measured by understanding student literacy, literacy does not mean only the ability to read but a way of reasoning/thinking. A formative assessment like that of the OECD can be seen as an important element of the personalized learning approach because it is characterized by identification and ongoing response to students' needs[28]. The PISA results encourage schools to innovate in determining literacy culture in general for students. this can be achieved if it is organized thoroughly by the DepEd so as not to cause ambiguity about how national policies are actually implemented at the ground level [29].

Literacy culture at the school level requires a thorough effort. Starting from small things, starting from the first step entering the school gate, for teachers, students, parents or school guests [30]. As

Batangueño Culture is found to be quite applicable in teaching physics, which not only links physics learning with ways of life, but also raises the spirit of nationalism and patriotism which creates optimistic changes towards the nation as responsible citizens[29]. Identical culture with language, the Philippines generally use English as a medium of instruction in schools, but not all literacy can be conveyed, so an innovative approach is needed. like, Codeswitching method to improve students' understanding of ability in learning science [31]. With good literacy skills, the quality of thinking of people will be more positive [32], the idea of building global literacy is also applied in the states of America [33].

Analysis of curriculum causes

Basic Education Program K to 12 'The Basic Education Program k-12 was introduced into primary and secondary education gradually starting in 2011[33]. 'K' in K to 12 stands for TK and '12' is an abbreviation of 12 years of education (Classes 1-12). K to 12 has 3 levels: TK (1 year); Basic education: Grades 1-6 (6 years); Secondary education: Junior High School (SMP): Class 7-10 (4 years) & Senior High School (SHS): Class 11-12 (2 years). At the junior high level, it is more about understanding basic environmental and social sciences. For high schools, they have followed the core curriculum, and they have chosen electives and currencies that are part of their interests. Like specialization in science, they will focus on science, with the science curriculum recognizing the place of science and technology in everyday human affairs. This received recognition from students, that the k-12 curriculum was very helpful [34]. It integrates science and technology in the social, economic, personal and ethical aspects of life. The science curriculum promotes a strong relationship between science and technology, including the local wisdom technology of the community. The relationship is connected to flexibly and critically open [35]. All that is intended for the welfare of the community, and foster environmental literacy [36]. The curriculum is designed around three domains of learning: understanding and applying Science knowledge in local settings and global contexts where possible, carrying out Science processes and skills, and developing and demonstrating Science attitudes and values. The acquisition of these domains is facilitated using the following approaches: a multi/interdisciplinary approach, a science-technology-community approach, contextual learning, problem/problem-based learning, and an inquiry-based learning. The approach is based on good educational pedagogy, namely, constructivism, social cognition learning models, learning style theories, and thinking-based learning [37].

For the first time, the Philippines took part in PISA and at the same time k-12 testing, although not absolutely. This is a good start to find out world rank in science literacy for Filipino students. PISA 2018 data collection takes place during the transition phase between the old and new education systems, with students completing half of each. Therefore, this time offers opportunities and challenges. Therefore, it is important that the state considers possible assessment results, and proposes a number of hypotheses to be investigated to be ready to deal constructively with the direction of the results [38]. However, if seen from point four gives a picture of the success of k-12, besides that k-12 provides a licensing qualification for teaching professionals. this is certainly, the presence of k-12 has a positive influence on student's literacy. Another thing, as a result of the low literacy value, is indicated by the low value of publication [39], although there is no direct relationship according to researchers, on the other hand, Science literacy improvement for students continues to be pursued [40].

The fact is in the Philippines The development of Science literacy has started early. Submission of Science literacy occurs in kindergarten classes [41], this illustrates that the enthusiasm to improve literacy culture is quite high, although it has some obstacles. However, synergies from among schools, industry, policymakers and the establishment of an appropriate curriculum for improving the community's economy which will have a national welfare effect will continue to be pursued by the DepEd [42]. This support is always commemorated in September in the Philippines, the literacy month. example DepEd launches "Brigada Pamaga," a movement that seeks to improve the reading skills of Filipino children. Researchers must dare to state that all do not have to justify what the community says, because the orientation of each institution is different, only the k-12 curriculum specifications have a goal for students ready to work in the field. This is because DepEd specifies programs in senior high school [43], but it is important to pay attention to the equality of opportunity in the quality of learning choices for boys and girls.

Integrating local knowledge into the basic science curriculum is a challenge for educators in the Philippines [44]. This makes it possible to integrate the knowledge of local wisdom in the science curriculum, because not only does it increase Science literacy it can also improve environmental literacy towards students, it also uses simple community technology to improve pedagogy, management, and accountability. Use the results of the assessment to build an empirical evidence base on the development of science skills in K-12. The Philippines will then have the opportunity to catch up with its more progressive neighbors in science, education and national progress. There are no shortcuts to move forward. Overall this is

a cultural change and mindset of humans. need to think about the design that is open, innovative, creative and problem-solving orientation.

Under the "K to 12" Program, the curriculum is in the process of being improved, but other basic problems of pedagogy are things related to teaching. For better pedagogy in schools, teachers play a very important role, and to fulfill their roles, teachers need adequate teaching facilities, materials and equipment. Thus classrooms and other physical resources of school teaching are also important [45]. For example, in providing library facilities, providing library libraries is an applicable solution to improve the culture of community literacy, where libraries are currently only in schools and institutionalized so that human resources that will form the socio-economic foundation of any community will be achieved in the improvement national Science literacy [45].

4. CONCLUSION

The Science literacy rate at PISA 2018 for Filipino students has not yet reached the OECD standard, but the effort and enthusiasm to improve the quality of learning is quite high as evidenced by changes in the curriculum (k-12). At present, efforts continue to be made to synchronize the quality and equity of education for all, including exemption from undergraduate tuition fees at the state university level in the Philippines. In addition, the government makes every effort to improve the quality of teachers by conducting a licensing examination every year to maintain the quality of teachers. however, as a form of innovation, the government must strive to provide library facilities at the level of membership through a grant program and a variety of educational actions to accelerate the improvement of students' Science literacy skills.

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