

The Relationship of Mathematics Inventory Test Scores and English Proficiency of Mathematics Teachers at Parañaque National High School-Main, Parañaque City

Marsam A. Salomon

Abstract

It may be difficult for Mathematics teachers to teach their subject if they are not proficient in the English language. Likewise, Mathematics teachers who have difficulties understanding Mathematics problems may not be able to solve it. Most of the research studies linked Mathematics to English language which led this study to investigate further the relationship of Mathematics score and English proficiency. The sample ($n = 12$) of this study was taken from the population ($N = 48$) of Mathematics teachers in Parañaque National High School-Main, Parañaque City. The subjects' scores in the Mathematics inventory and English proficiency test were analyzed using Pearson r correlation coefficient. ANOVA was used to test the significance of the relationship of Mathematics score and English proficiency. The results revealed that there is a weak positive correlation ($r = 0.20$) between the Mathematics score and English proficiency of Mathematics teachers of Parañaque National High School-Main, Parañaque City, however this relationship is not statistically significant ($\rho > 0.05, 0.53$). The result of this study indicated insufficient evidence to confirm the relationship between Mathematics scores with the English proficiency of Mathematics teachers at Parañaque National High School-Main, Parañaque City.

Keywords: *Mathematics inventory test, English proficiency test, Mathematics teacher*

Introduction

Mathematics is an essential subject in the school curriculum and is regarded important in the study of other subjects. However, Gafoor and Kurukkan (2015) study showed that majority of the students dislike Mathematics and their reasons were related to difficulty in understanding the subject matter and teacher or instructional related factors. According to Gafoor and Kurukkan (2015), students dislike math because they perceive it as a difficult subject. Furthermore, Suan (2014) pointed out students' attitude towards Mathematics as the main reason why students fail the subject. In fact, the international test result such as 2003 TIMSS, Philippines ranked 34th out of 38 countries in HS II Math. Moreover, during the 11th National

Convention on Statistics, Ogena, Laña and Sasota (2010) presented the performance of Philippine high schools with special curriculum in the 2008 Trends in International Mathematics and Science Study (TIMSS-Advanced) and according to them, even with only science high school participating in the Advanced Mathematics Category, Philippines performed least among the ten (10) participating schools. These problems motivated education leaders to create educational reforms aiming to improve students' performance in Mathematics.

Students' underachievement in Mathematics is affected by several factors. Suan (2014) identified three factors (student factors, teacher-related factors, and environmental factors) which may affect underachievement in Mathematics. Teacher-related factors include communication

skills. His findings showed that teacher factor is not significantly related to Mathematics performance. However, he suggested that other possible contributors must be taken into considerations.

Mathematics is associated to English in some ways. According to Fuentes (1998), solving Mathematics problems involves reading comprehension. Students need to improve their reading comprehension skills to improve their Mathematics performance. That is why Mathematics teachers must be at least proficient in the English language to create more chances for the students to learn.

Research studies like that of Rambely, Ahmad, Majid, and Jaaman (2013), Racca and Lasaten (2016), Henry, Nistor and Baltes (2014), Hafidz Omar and Yushau (2015), Grant, Gary Cook and Phakiti (2011), and Bagceci, Kutlar, and Cinkara (2014) confirmed the significant relationship between Mathematics performance and English language, thus triggered this study to further investigate the said relationship.

This study primarily aimed to determine the relationship between the Mathematics inventory and English proficiency test scores of the Mathematics teachers in Parañaque National High School-Main, Parañaque City. Likewise, this study attempted to determine and describe the performance in the Mathematics inventory and English proficiency tests of the Mathematics teachers at Parañaque National High School-Main, Parañaque City.

The results of this study could provide a concrete reference for more important education services. Furthermore, it could address to problems related to teaching and learning Mathematics. Teachers, administrators, and research enthusiasts could benefit from this study.

With the result of this study, Mathematics teachers in Parañaque National High School-Main could find reference regarding their English proficiency level thus giving them an important point to focus on the English proficiency skills identified weak among them. Additionally, school administrators could use the result of this study in formulating school programs that will enhance their teachers' English proficiency as well as their Mathematics performance. Finally, research

enthusiasts could get a useful data out of the results of this study for their research.

Literature Review

Teachers' competence in teaching the content is one of the several factors which contribute to successful teaching and learning. Krauss, Brunner, Kunter, Baumert, Blum, Neubrand, and Jordan (2008). study emphasized how very important secondary Mathematics teachers' pedagogical content knowledge is in teaching and learning. Thus, higher expertise in the Mathematics content offers greater opportunities for learning. Results of An, Kulm, and Wu (2004) comparative study indicated that mathematics teachers' pedagogical content knowledge in United States of America is significantly different from China. They explained that Chinese system relies on traditional but more rigid development of procedures while United States of America system uses variety of activities designed to promote creativity and inquiry to develop concept mastery, but often has a lack of connection between manipulative and abstract thinking, and between understanding and procedural development. Both approaches could be beneficial in teaching and learning Mathematics.

Mathematics is taught using English as the medium of instruction. Launio (2015) showed that medium of instruction used in teaching affects students' Mathematics achievement. According to her, teaching Mathematics in English supplemented by Hiligaynon is better than teaching the subject in English only, thus, students learn when taught in bilingual. However, Gerber, Engelbrecht, Harding, and Rogan (2005) study compared the Mathematics performance of first (Afrikaans) and second (English) language students in South Africa and found no significant difference between their Mathematics performance after both received the same lectures but different medium of instructions used.

Teachers must be at least proficient in the English language since most of the subjects used this language as their medium of instructions. A study conducted by Eslami and Fatahi (2008) revealed that proficiency of the language used in

teaching suggests sense of self-efficacy. That is, “the higher the teachers’ perceived proficiency in language skills, the more efficacious they felt” (Eslami and Fatahi, 2008, p.14). Nel and Muller (2010) studied the impact of teachers’ limited English proficiency on English second language in South Africa and found out that teachers’ limited English proficiency greatly affects learners’ acquisition of English as their second language.

Most of the research studies showed connection between Mathematics performance and English proficiency. In fact, Nillas (2002) study indicated that there is a significant but weak relationship between students’ self-concept of language and Mathematics proficiency and their achievement. Similarly, Adanur, Yagiz, and Izik (2004) studied the relation of Mathematics and language and found that Mathematics is related to language. According to them, Mathematics is a language itself because it uses symbols. Likewise, one of the findings of the study conducted by Racca and Lasaten (2016) indicated that students with high English language proficiency tend to perform well in Mathematics. This finding is consistent with Henry, Nistor, and Baltes (2014) finding which assert English language proficiency as a strong predictor of English language learners’ math scores. Like these findings is Hafidz Omar and Yushau (2015) study which indicated that students’ English proficiency level is a factor affecting their performance in Mathematics. Likewise, the study of Howie (2003) revealed that the pupils’ proficiency of English was a strong predictor of their success in Mathematics. Additionally, Beal, Cohen, and Adams (2010) study asserted that English reading skill was significantly related to Mathematics performance. Also, study of Abedi and Lord (2001) showed how students’ language backgrounds impacts on their performance on Mathematics word problems.

Theoretical Framework

This study is supported by several theories and viewpoints on the relationship of Mathematics and English language such as: (1) mental representation, (2) content literacy, and (3) cognitive process.

Mental Representation

Mental representation is created by the reader when reading a text. It describes how the reader understands the text. Kintsch (1998) distinguishes three components of the mental representation created when reading a text: the surface component, the text base, and the situation model.

If words and phrases are set in the mental representation together with the linguistic relations between them and not the meaning of the words and phrases, then it is the surface component of the mental representation. The text base is the meaning of the text and it consists of relations derived from the text itself. According to Kintsch (1998), to make more sense of the text, the reader uses prior knowledge to create a more complete mental representation. And the situation model is the construction of meaning that integrates the text base and the relevant aspect of the reader’s knowledge.

Content Literacy

McKenna and Robinson (1990) defined content literacy as the ability to read, understand and learn from texts from a specific subject area. McKenna and Robinson also distinguish three components of content literacy: general literacy skills, content-specific literacy skills, and prior knowledge of content.

Both the general and the content-specific literacy skills refer to some general type of knowledge that is independent on the content of a specific text. This type of knowledge is used to create a text base in the mental representation. Prior knowledge of content refers to knowledge that is connected to the content of a specific text and is used to create a situation model in the mental representation.

Mathematics needs content-specific literacy skills. While, reading comprehension in mathematics depends on general literacy skills and prior knowledge of content. However, the symbolic language used in mathematics seems to be a probable cause for the need of content-specific literacy skills. Also, comprehension of one mathematical text not using mathematical

*Corresponding Author: Marsam A. Salomon
Paranaque National High School, Paranaque City
E-mail: marsamsalomon@rocketmail.com

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symbols depended on the use of general literacy skills.

Cognitive Process

It is natural that one must read the problem with comprehension to understand the problem. In such case, Kintsch (1998) explained that problem is solved using mainly unconscious cognitive processes, that is, the problem is solved through pure comprehension. As a result, a mental representation is created and that is mental representation of the problem. However, students with good reading skills do not necessarily need to create a mental representation of the problem. A pure text base in the mental representation and situation model is needed in comprehension of the problem, that is, reader should not only create meaning of the text but also relate the created meaning to the reader's knowledge.

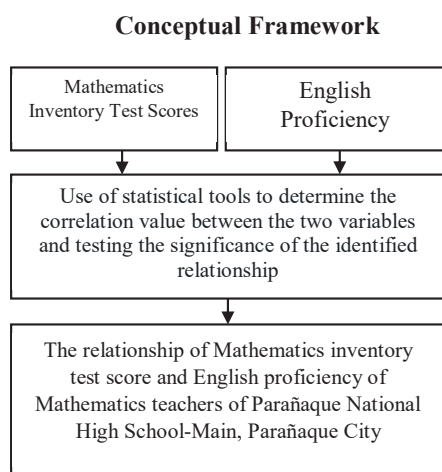


Figure 1. The research conceptual model

Research Questions

This study was designed to determine the relationship between the Mathematics inventory and English proficiency test scores of the Mathematics teachers at Parañaque National High School-Main, Parañaque City.

Specifically, the study sought to answer the following questions:

1. What is the performance of Mathematics teachers of Parañaque National High

School-Main in the Mathematics inventory test?

2. What is the performance of Mathematics teachers of Parañaque National High School-Main in the English proficiency test?
3. What is the performance of Mathematics teachers of Parañaque National High School-Main in the three English skills (grammar, vocabulary, and reading comprehension) test?
4. Is there a significant relationship between the Mathematics inventory and English proficiency test scores of the Mathematics teachers at Parañaque National High School-Main in Parañaque City?

Methodology

This section presents the research methods followed by the researchers before coming up with the results of this study. Most specifically this provides information about the participants of the study, the criteria for inclusion, who the participants were, and how they were sampled. Moreover, the research data collection procedures are presented in this section.

Research Design

The descriptive-correlation design was used in this study. This design is most appropriate since this study deals with recording and tabulating data to come up with factual result and deals with determining the significant relationship of respondents' scores in the Mathematics inventory and English proficiency test.

Data Collection and Instruments

The respondents of this study were the Mathematics teachers (N = 48) at Parañaque National High School-Main, Parañaque City represented by a sample (n = 12). This study used simple random sampling technique to identify the research participants.

Two research instruments were used in

the data gathering, the test instrument of the Mathematics inventory test which was developed and administered by the schools division education program supervisor in Mathematics of Parañaque City, Dr. Emma R. Cunanan, while the other instrument was an English proficiency test developed by Transparent Language, Inc. The inventory test is a yearly administered to gauge math teachers' competency on Mathematics contents. The test is composed of 50 items covering all the contents taught in Mathematics. The teachers' responses to the inventory test were scored one (1) point for correct answer and no point for incorrect answer. This gives fifty (50) as the highest possible score and zero (0) as the lowest possible score. The English proficiency test is composed of 50 items multiple-choice type of test with three (3) parts: (1) English Grammar; (2) English Vocabulary; and (3) Reading Comprehension. The scoring rubrics used in the Mathematics inventory test were also used as the scoring rubrics for the English proficiency test.

Data Analysis

Descriptive method was applied using mean and mean percentage score. Scores of the inventory and English proficiency tests were presented graphically. To determine the relationship between the Mathematics score and English proficiency, Pearson r correlation coefficient was used. The significance of the relationship was tested using Analysis of Variance (ANOVA) using

$\alpha = 0.05$. Both Pearson r and Analysis of Variance ANOVA were done using Microsoft Office Excel 2013.

Ethical Considerations

The research participants of this study were informed clearly of what the study all about, how vital their honest responses will be, and that their responses will be treated with utmost confidentiality. Before they started answering the questionnaire, a letter of consent was given to each participant to ensure that their participations are voluntary. Personal data and private information of the participants such as name, age, address,

and other data except those that can be used in the attainment of the research objectives were not asked for the participants' privacy and protection.

Results and Discussion

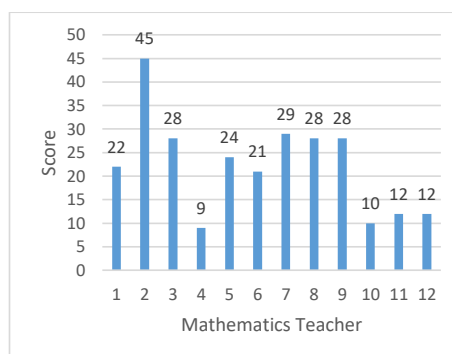


Figure 2. Performance of Mathematics teachers of Parañaque National High School-Main, Parañaque City in the inventory test

As shown in Figure 2, majority of the teachers scored at least 20 points in the Mathematics inventory test. The average score of the teachers is 22 points. Consequently, at least 44% of the test items were answered correctly by the teachers. This data shows that Mathematics teachers of Parañaque National High School-Main performed least during the inventory test. This finding is supported by the findings of Toledo and Bagaforo, as cited by Diaz (2000), which asserted that teachers have average competence in their knowledge and ability in Mathematics. They emphasized that teachers need to update and upgrade their subject matter competence because according to Ragma (2017), content competence correlates pedagogical competence.

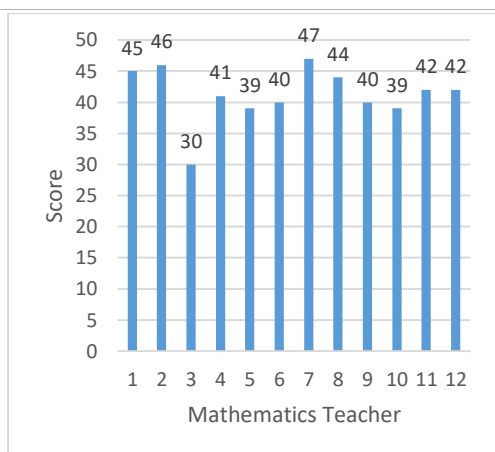


Figure 3. Performance of Mathematics teachers of Parañaque National High School-Main, Parañaque City in the English proficiency test

As shown in Figure 3, most of the teachers scored at least 40 points in the English proficiency test. Moreover, the average score of the teachers is 41 points. Consequently, at least 82 % of the test items were answered correctly by the teachers. Hence, Mathematics teachers in Parañaque National High School-Main, Parañaque City are proficient of the English language. This finding is supported by the English Proficiency Index (EPI) released last November 16, 2016 by Education First (EF) Ltd., as cited in (Singapore, Malaysia edge PHL in English-proficiency ranking, 2016), out of 72 countries, Philippines ranked 13th and among 19 countries in Asia, Philippines ranked 3rd. In the latest rank published in 2017, Philippines ranked 15th out of 80 countries (EF English Proficiency Index, n.d.). These facts imply that Filipinos, in general, are proficient of the English language as this is their second language.

Teachers' effectiveness in teaching could be associated with proficiency in the English language. This is supported by the study of Digap (2016). Digap (2016) highlighted the importance of English proficiency in teaching. In fact, the Department of Education mandated to include English proficiency test in the screening of aspiring public-school teachers with the objective of ensuring that teachers are competent not only in the subject matter they are teaching but also in communication.

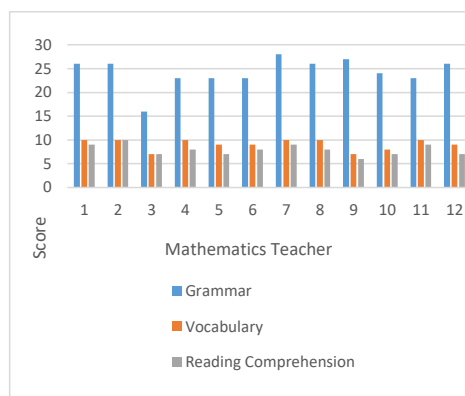


Figure 4. English proficiency test scores of the Mathematics teachers of Parañaque National High School-Main in Parañaque City in the three English skills

As shown in Figure 4, among the three English proficiency skills, reading comprehension is the weakest skill of the teachers. Furthermore, the mean percentage score of the teachers in grammar is approximately 81%, in vocabulary is approximately 91%, and in reading comprehension is approximately 79%. Hence, most of the teachers perform better in English grammar and vocabulary than that of reading comprehension. This finding is supported by the result of National Assessment of Educational Progress (NAEP) exams. Based on the result, progress in reading comprehension is lagging the improvement in Mathematics over the past two decades (The Problem With Reading, 2015).

Table 1

Relationship of Math Inventory and English Proficiency Test Scores of Mathematics Teachers of Parañaque National High School-Main in Parañaque City.

Summary	
N	12
df	11
r	0.201042308
p	0.530958634

As shown in Table 1, there is a weak positive relationship ($r = 0.20$) between Mathematics score and English proficiency of Mathematics teachers in

*Corresponding Author: Marsam A. Salomon
 Paranaque National High School, Paranaque City
 E-mail: marsamsalomon@rocketmail.com

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Parañaque National High School-Main, Parañaque City. However, the relationship is not statistically significant ($p > 0.05, 0.53$). These facts suggest that, statistically, there is not enough proof to confirm the relationship between Mathematics score and English proficiency. This result contradicts the findings of Bagceci, Kutlar, and Cinkara (2014). Bagceci, Kutlar, and Cinkara (2014) confirmed the significant relationship between Mathematics and English. Their study claimed that success in English implies success in Mathematics. Rambely, Ahmad, Majid, and Jaaman (2013) finding is similar with the finding of Bagceci, Kutlar, and Cinkara (2014). According to Rambely, Ahmad, Majid, and Jaaman (2013), mastering of English is needed to nurture and understand Mathematics subject to achieve excellent result. They also added that low English proficiency results to a shortage in Mathematics learning. Also, results of Grant, Gary Cook, and Phakiti (2011) study suggested that success in Mathematics is influenced by English language proficiency.

Conclusion

Based on the findings, relative to the scores obtained by the Mathematics teachers at Parañaque National High School-Main, Parañaque City, this study concludes that they performed least during the Mathematics inventory test conducted by education program supervisor in Mathematics, schools division of Parañaque City. In contrary, Mathematics teachers at Parañaque National High School-Main, Parañaque City performed well in the English proficiency test.

The results of this study revealed that there is no significant relationship between the Mathematics score and English proficiency of the Mathematics teachers at Parañaque National High School-Main, Parañaque City. Although findings of this study indicated no significant relationship between Mathematics score and English proficiency of the Mathematics teachers of Parañaque National High School-Main, Parañaque City, no details emerged to conclude the same in general.

References

- Abedi, J., & Lord, C. (2001). The language factor in mathematics tests. *Applied Measurement in Education*, 14(3), 219-234. https://doi.org/10.1207/s15324818ame1403_2
- Adanur, Y., Yagiz, O., & Isik, A. (2004). Mathematics and language. *Journal of Korea Society of Mathematical Education Series D: Research in Mathematical Education*, 8: 31-37.
- An, S., Kulm, G., & Wu, Z. (2004). The pedagogical content knowledge of middle school, mathematics teachers in China and the U.S. *Journal of Mathematics Teacher Education*, 7(2), 145-172. <https://doi.org/10.1023/b:jmte.0000021943.35739.1c>
- Bagceci, B., Kutlar, E.L., & Cinkara, E. (2014). The relationship between English and Math success and some variables at freshmen level. *Journal of Education and Practice*, 5(29), 6-10.
- Beal, C. R., Adams, N. M., & Cohen, P. R. (2009). Reading proficiency and mathematics problem solving by high school English language learners. *Urban Education*, 45(1), 58-74. <https://doi.org/10.1177/0042085909352143>
- Diaz, PU. (2000). Predictors of Mathematical Competencies of the public and Private Secondary Mathematics Teachers of the Division of La Union [Doctoral dissertation].
- Digap, A.L. (2016). Self-efficacy, English proficiency, and effectiveness of teachers of English in the secondary schools. *Philippine EJournals| Home*. <https://ejournals.ph/form/cite.php?id=9770>

- Eslami, Z., & Fatahi, A. (2008). Teachers' sense of self-efficacy, english proficiency, and instructional strategies: a study of nonnative EFL teachers in Iran. *In Teaching English as a Second or Foreign Language*, 11(4), 1-19.
- EF English Proficiency Index*. (n.d.). In Wikipedia. Retrieved June 12, 2018, from https://en.wikipedia.org/wiki/EF_English_Proficiency_Index
- English Proficiency Test (n.d.). In Transparent Language, Inc. Retrieved from <https://www.transparent.com/learn-english/proficiency-test.html>
- Fuentes, P. (1998). Reading Comprehension in Mathematics. *Clearing House*, 72(2), 81-88.
- Gafoor, K. A. & Kurukkan, A. (2015). Why high school students feel Mathematics difficult? An exploration of affective beliefs. *In UGC National Sponsored Seminar on Pedagogy of Teacher Education – Trends and Challenges. Kozhikode, Kerala.*
- Gerber, A., Engelbrecht, J., Harding, A., & Rogan, J. (2005). The influence of second language teaching on undergraduate mathematics performance. *Mathematics Education Research Journal*, 17(3), 3-21. <https://doi.org/10.1007/bf03217419>
- Grant, R., Gary Cook, H., & Phakiti, A. (2011). *Relationship between language proficiency and Mathematics achievement*. Report. In WiDA CONSORTIUM.
- Yushau, B., & Hafidz Omar, M. (2015). Mathematics performance and its relation to English language proficiency level of bilingual Arab University students. *Indian Journal of Science and Technology*, 8(13). <https://doi.org/10.17485/ijst/2015/v8i13/73226>
- Henry, D., Nistor, N., & Baltés, B. (2014). Examining the relationship between math scores and English language proficiency. *Journal of Educational Research and Practice*, 4: 11-29.
- Howie, S. J. (2003). Language and other background factors affecting secondary pupils' performance in mathematics in South Africa. *African Journal of Research in Mathematics, Science and Technology Education*, 7(1), 1-20. <https://doi.org/10.1080/10288457.2003.10740545>
- Kintsch, W., & Sir Walter Kintsch; C B E M A F R S. (1998). *Comprehension: A paradigm for cognition*. Cambridge University Press.
- Krauss, S., Brunner, M., Kunter, M., Baumert, J., Blum, W., Neubrand, M., & Jordan, A. (2008). Pedagogical content knowledge and content knowledge of secondary mathematics teachers. *Journal of Educational Psychology*, 100(3), 716-725. <https://doi.org/10.1037/0022-0663.100.3.716>
- Launio, R. (2015). Instructional medium and its effect on students' Mathematics achievement. *International Journal of Multidisciplinary and Current Research*, 3: 462-465.
- McKenna, M. C. & Robinson, R. D. (1990). Content literacy: a definition and implications. *Journal of Reading*, 34:184-186.
- Nel, N., & Müller, H. (2010). The impact of teachers' limited English proficiency on English second

language learners in South African schools. *South African Journal of Education*, 30(4), 635-650. <https://doi.org/10.15700/saje.v30n4a393>

Nillas, L. (2002). Does language make a difference: TIMS-R analysis. *In The Mathematics Educator 2002*, 6(2), 95-112.

Ogena, E., Laña, R., & Sasota, R. (2010). *PERFORMANCE OF THE PHILIPPINE HIGH SCHOOLS WITH SPECIAL CURRICULUM IN THE 2008 TRENDS IN INTERNATIONAL MATHEMATICS AND SCIENCE STUDY (TIMSS-ADVANCED)*.

Racca, R. M., & Lasaten, R. C. (2016). English language proficiency and academic performance of Philippine science high school students. *International Journal of Languages, Literature and Linguistics*, 2(2), 44-49. <https://doi.org/10.18178/ijlll.2016.2.2.65>

Ragma, F. (2017). CONTENT AND PEDAGOGICAL COMPETENCE OF MATHEMATICS TEACHERS IN THE SECONDARY SCHOOLS IN LA UNION, PHILIPPINES. *In 3rd International Conference on Education*, 3: 402-408.

Rambely, A. S., Ahmad, R.R., Majid, N., & Jaaman, S.H. (2013). The relationship of English proficiency and Mathematics achievement. Conference Paper. *In Recent Advances in Educational Technologies*, 139-145.

Singapore, Malaysia edge PHL in English-proficiency ranking. (16, November 2016). *In BusinessMirror*. Retrieved from <https://businessmirror.com.ph/singapore-malaysia-edge-phl-in-english-proficiency-ranking/>

Suan, J. (2014). Factors affecting underachievement in mathematics. *In Global Summit on Education 2014*, 14-20.

The Problem With Reading. (14, February 2015). *In Philippine Basic Education*. Retrieved June 12, 2018, from <http://www.philippinesbasiceducation.us/2015/02/the-problem-with-reading.html>