

# Senior High School Students' Performance in Math Core Courses - Transition from General Math to Statistics and Probability: A Cross Validation

Michael Angelo A. Legarde

Graduate School, Graduate Education Department  
Palawan State University  
Puerto Princesa City, Palawan, Philippines  
[malegarde@psu.palawan.edu.ph](mailto:malegarde@psu.palawan.edu.ph)

**Abstract:** This research investigation was conducted to determine the performance of Senior High School students in their mathematics core courses – General Mathematics and Statistics and Probability. Moreover, it also determined the extent of relationship between their performances in the two core courses. The analysis was centered on the performance of SHS students in one public high school in the Philippines in the two mathematics core courses as described by their grades. The data analysis indicates that on the average, the grade of the 100 randomly selected Senior High School students in General Mathematics is 85.8 with a standard deviation of 4.67. On the other hand, with regards to their performance in Statistics and Probability, their mean grade was found to be 86.07 with a standard deviation of 4.68. Considering the mean score and standard deviation as descriptive measures, this study found out that the respondents performed better in Statistics and Probability than General Mathematics. Furthermore, the correlation coefficient of 0.876 clearly shows that there is a very high positive correlation exists between their math core courses. This imply that when a student gets high grade in General Mathematics, it is certain that he/she will also get high grade in these two core courses. Moreover, the coefficient of determination indicates that 0.77 or 77% of the attributes of the respondents' performance in Statistics and Probability is because of their performance in General Mathematics. Therefore, as a teacher/educator in the field of mathematics, it is the researcher's belief that their performance in General Mathematics as described by their grades has something to do with their performance in Statistics and Probability. Further analysis also reveals that the relationship between the students' performance in General Mathematics and Statistics and Probability are statistically significant. This was confirmed by the p-value tested at 0.05 level of significance. Thus, mathematics teachers may use more interesting strategies in mathematics may be introduced to enhance enjoyment among students especially on the part of low group as it predicted their achievement in mathematics.

**Keywords—Core Courses, Mathematics Performance, Cross Validation, Achievement**

## 1. INTRODUCTION

Mathematics is a vital part of our life. Changes in our society and in the use of new technology in this new millennium require that we have a strong background as well as foundation in mathematics. The emphasis is not only on one branch of mathematics, but on developing our mathematical power. This power pertains to the capability of the students to solve problems within mathematics and other subject areas, the ability to use mathematics in the world beyond the classroom, ability to reason and think critically, and a virtue of understanding and appreciation of the nature and beauty of mathematics.

Moreover, mathematics provides students with an exceptionally potent toolkit for comprehending and transforming the world (Borais, 2009). These abilities include the capacity for abstract thought, logical reasoning, and problem-solving techniques. However, a lot of students find this subject extremely challenging to study, and numerous studies have shown that they still score poorly in it.

Children's success in school and in society at large is influenced by their mastery of mathematics, which is a crucial

literacy skill (Eagle, Gratham-McGregor, Black, Walker, & Wachs, 2007). For more than a century, educational and psychological research has frequently addressed the topic of mathematics learning and skill development (Geary, 2006). The mathematics curriculum in schools develops mathematical abilities for everyday living (Nur, 2006). According to Nur (2006), who referenced Cockcroft (1982), there is no question that mathematics should be taught in schools to all children. Another subject that is relevant to life at all ages and in all situations is mathematics. Its importance therefore transcends the classroom and the institution. Thus, learning mathematics in school requires a thorough and in-depth understanding of the subject (DepEd, 2013).

Students' performance is regarded as an important parameter for many educators (Andaya, 2016). She added that the society have always been particularly interested in how well students succeed in any academic endeavor. It has been established that teachers significantly impact students' academic success. Achievement scores are a way to gauge students' comprehension of various subject areas and emphasize their overall academic success in exams, both domestically and internationally. It is a known fact that the Philippines' schoolchildren have consistently performed worse

in mathematics. This was shown in the Philippines' poor performance in the Trends International Mathematics and Science Studies (TIMSS, 2003) where it placed 41st among the 45 participating countries and had been noted that mathematics learning is less attractive to them. They are inattentive, less interested and restless in mathematics classes. Mathematics educators are challenged to overcome some of these phenomena which rival mathematics learning in school. Thus, it is the duty of the teacher to motivate the students and find ways to let them learn mathematics because the subject is very important to prepare them for more thought-provoking task in the future.

In 2011, a recent modification was made to the Philippine educational system. In order to enable our nation, go through its process of transformation with the aid of this 21st century generation, K-12 education bill was signed into law in 2013. This added two years to the country's basic education curriculum. Many Filipinos argued before the K-12 curriculum guide was implemented that the extra years were an additional burden. However, the government reassures parents to view the new curriculum as two years less high education rather than two extra years of high school.

The 10-year education program has long been viewed as a drawback for our students entering a global labor market that is getting more and more competitive. Filipino students have thereby lagged behind pupils worldwide in the subjects of science, math, and languages. Compared to other students, low-performing students are less likely to complete high school and enroll in college; as a result, high school dropouts—even those who earn a General Equivalency Degree—have significantly lower adult wages than do graduates of both high school and college (American Council on Education 2001; Cameron and Heckman 1993).

The Department of Education (DepEd) emphasized that the new K-12 curriculum is meant to adequately prepare students who wish to pursue further education while also enabling graduates to enter the workforce immediately following high school. Additionally, the revised curriculum will help recent graduates who want to work overseas. According to DepEd, developed nations "view the 10-year education cycle as insufficient." The improved curriculum is intended to give everyone access to a comprehensive education. Now that it's less crowded, students will have more time to become proficient in their academic subjects and engage in extracurricular and community activities. Senior High School, with its specialized profession programs that prepare like college classes, is the most important section of K12. Every senior high school student must select one track to specialize in and base that decision on how they hope to progress once they have finished grade 12 or high school.

In local context, many schools in the country offered different academic tracks for Senior High School students namely: GAS (General Academic Strand) and HUMSS (Humanities and Social Sciences). As part of their curriculum, the Grade 11 Senior High School students are required to take

two mathematics core courses: General Mathematics during first semester and Statistics and Probability during second semester.

Accordingly, the researcher found that even Senior High School students in the two academic strands—GAS and HUMSS—have a variety of math performance and challenges. The researcher believes that these differences should be appropriately addressed by utilizing efficient teaching and learning strategies. In light of this, the researcher's inquiry on the Senior High School students' performance in their core mathematics courses serves as the basis for this research study.

## **2. METHODOLOGY**

### **2.1 Research Design**

In this study, the performance of SHS students in mathematics core courses was assessed using a descriptive-correlational approach. Given that the study's focus is on gathering and tabulating data to produce factual findings, this approach is the most suitable.

Detailed and thorough descriptions of a particular condition of events are the goal of descriptive research. This kind of study involves describing, analyzing, and interpreting what is available in order to obtain data about the current situation, according to Best (1981), as referenced by Barbacena (2009).

Additionally, correlation research design implies the potential of cause and effect and studies the link among variables within a single group. Finding relationships between variables is another one of correlational research design's key features. By demonstrating the relationships between variables, its primary goal is to make phenomena easier to explain (Franelkel and Hyun, 2012).

The purpose of this study is to determine the performance of Grade 11 SHS Students in their math core courses- General Mathematics and Statistics and Probability.

### **2.2 Research Instrument**

Consistent with descriptive-correlational method design employed in this study, quantitative measure was used in this study. This study attempted to expose students' performance in their math core courses. Furthermore, this investigation will identify the degree of correlation between their performances in General Mathematics and Statistics and Probability.

To gather the needed data, the researcher used 50-item tests in General Mathematics and Statistics and Probability. These instruments were used to determine the ability and performance of the Senior High School Students. Further, the Cronbach reliability coefficient of the instruments is 0.89 and 0.83 which indicate high reliability and adequacy of the tests.

### 2.3 Respondents of the Study

The researcher used simple random sampling focusing on a relatively small number of participants that is developed in order to offer in-depth understanding of the selected participants (Patton, 2002). In the current study, random sampling was chosen since the researcher is the instructor for the said samples in their mathematics subject. Furthermore, Sloven Formula was also utilized to identify the number of the target samples out of the population.

Out of 140 Grade 11 Senior High School Students in a public high school in the Philippines, the researcher randomly selected 100 respondents that served as the sample. To avoid bias, the researcher randomly selected 50 students from Grade 11 students from General Academic Strands (GAS) and another 50 students from Humanities and Social Sciences (HUMSS).

### 3. RESULTS AND DISCUSSIONS

This section presents the results and discussion on the performance of the respondents in their math core courses: General Mathematics and Statistics and Probability. Moreover, the presentation starts with the descriptive statistics of all the study variables, and then moves on to finding out the extent of correlation between students' performance in their math courses, and finally on the significant relationship between identified variables.

**Table 1**  
 Respondents' Performance in their Math Core Courses

Math Core Courses	Mean	Standard Deviation
General Mathematics	85.80	4.67
Statistics and Probability	86.07	4.68

Table 1 depicts the performance of the respondents in the two core courses. Based on the analysis, it can be gleaned that the students performed better in Statistics and Probability than General Mathematics with a mean score of 86.07 and a standard deviation of 4.68. Therefore, considering the performance of the students in their math core courses as described by their mean scores and standard deviation as descriptive measures, this study concluded that students performed well in Statistics and Probability than General Mathematics. That is, it may be certain that they experienced difficulty in dealing with mathematical concepts in General Mathematics than Statistics and Probability.

**Figure 1**  
 Distribution of the Students' Performance in General Mathematics

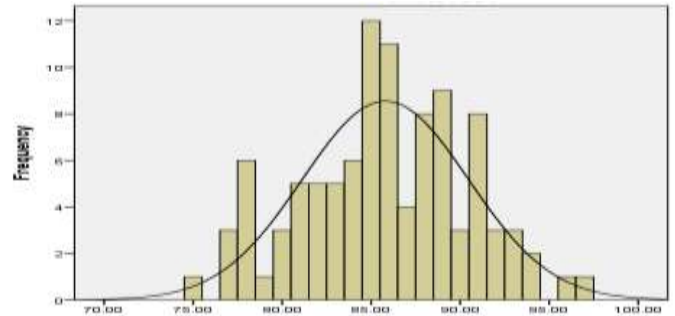


Figure 1 shows the distribution of the performance of the respondents in General Mathematics. It can be gleaned that 12 students or 12% of them have a grade of 85. This data was followed by 11 students with a grade of 86 and 9 students with a grade of 89. Furthermore, figure also suggests that the minimum and maximum grades of the students are 75 and 97, respectively.

**Figure 2**  
 Distribution of the Students' Performance in Statistics and Probability

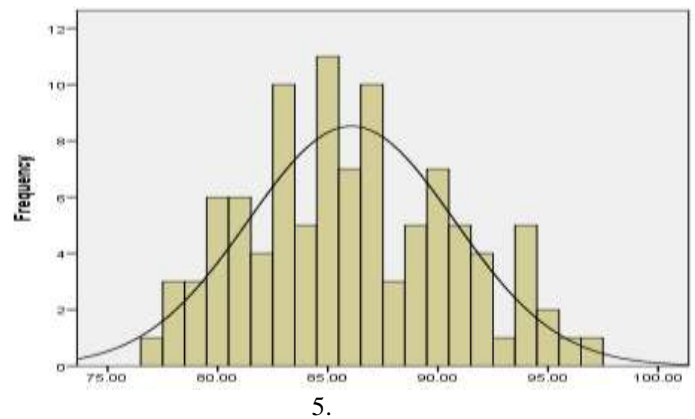


Figure 2 shows the distribution of the performance of the respondents in Statistics and Probability. Based on the analysis, the data suggests that majority or 11% of the students have a grade 85. This data was also followed by 10 students with a grade of 87 and another 10 students have a grade of 83. Moreover, it can be also noted that the minimum and the maximum scores are 77 and 97, respectively.

**Table 2**

Correlation of Respondents' Performance in their Math Core Courses

Math Core Courses	Pearson Correlation	Coefficient of Determination	Interpretation
General Mathematics	0.876	0.77	Very High Positive Correlation
Statistics and Probability			

**Legend:** 0.0 – 0.24 – Very Low ; 0.25 – 0.49 – Moderately Low ; 0.50 – 0.74 – Moderately High ; 0.75 – 1.0 – Very High

Table 2 shows the correlation between the performance of the Senior High School students in General Mathematics and Statistics and Probability. The Pearson Product Moment Correlation coefficient of 0.876 clearly shows that there is a very high positive correlation exists between their math core courses. This imply that when a student gets high grade in General Mathematics, it is certain that he/she will also get high grade in Statistics and Probability.

Moreover, the coefficient of determination indicates that 0.77 or 77% of the attributes of the Senior High School students' performance in Statistics and Probability is because of their performance in General Mathematics. Therefore, as a teacher in the field of mathematics, it is the researcher's belief that their performance in General Mathematics as described by their grades has something to do with their performance in Statistics and Probability.

**Table 3**

Relationship between respondents' Performance in their Math Core Courses

Math Core Courses	Pearson Correlation	p-value	Interpretation
General Mathematics	0.876	0.000**	Significant
Statistics and Probability			

**Legend:** 0.0 – 0.24 – Very Low ; 0.25 – 0.49 – Moderately Low ; 0.50 – 0.74 – Moderately High ; 0.75 – 1.0 – Very High  
\*\*\* Significant at 0,05 level of significance

Table 3 shows the relationship between the students' performance in General Mathematics and Statistics and Probability. It may be recalled that the Pearson correlation coefficient of 0.876 indicates that there is a very high positive correlation between their performances in their math courses. Moreover, further analysis also reveals that there is a

significant relationship between the students' performance in their two math subjects.

Since the p-value is lesser than the indicated alpha level of significance, there is sufficient evidence to support the claim that the relationship between the students' performance in General Mathematics and Statistics and Probability are statistically significant. This was confirmed by the p-value tested at 0.05 level of significance.

#### 4. CONCLUSIONS

This research study is classified as descriptive-correlational design which tried to capture the strengths of quantitative research. Specifically, this research determines the performance of the Senior High School students in their math core courses – General Mathematics and Statistics and Probability. Moreover, it is also hypothesized that the relationship between their performances in their math core courses are statistically significant.

The participants of the study consisted of 100 Senior High School students of a public high school in the Philippines. There were 50 from General Academic Strand (GAS) and 50 from Humanities and Social Sciences (HUMSS). Participants were drawn through simple random sampling and Sloven Formula was also used to determine the sample size.

The academic performance of the students was described by their grades in General Mathematics during the first semester and Statistics during the second semester. Data analysis was done by employing descriptive and inferential statistics such as frequencies, means, standard deviations, and coefficient of skewness, and Pearson Product Moment Correlation. All statistical calculations were performed using statistical software.

This research study investigated the extent of correlation of the Senior High School students' performance in General Math and Statistics and Probability.

#### *Students' Performance in General Mathematics and Statistics and Probability*

The data analysis indicates that on the average, the grade of the 100 randomly selected Senior High School in General Mathematics is 85.8 with a standard deviation of 4.67. On the other hand, with regards to their performance in Statistics and Probability, their mean grade was found to be 86.07 with a standard deviation of 4.68. Therefore, the analysis suggests that considering the mean score and standard deviation as descriptive measures, this study found out that the Senior High School students performed better in Statistics and Probability than General Mathematics.

Moreover, out of 100 Senior High School students, 12 students or 12% of them have a grade of 85 in General Mathematics. This data was followed by 11 students with a grade of 86 and 9 students with a grade of 89. Furthermore, figure also suggests that the minimum and maximum grades of the students are 75 and 97, respectively.

On the other hand, with regards to their performance in Statistics and Probability, majority or 11% of the students



have a grade 85. This data was also followed by 10 students with a grade of 87 and another 10 students have a grade of 83. Moreover, it can be also noted that the minimum and the maximum scores are 77 and 97, respectively.

#### ***Correlation between Senior High School Students' Performance in General Mathematics and Statistics and Probability***

The Pearson Product Moment Correlation coefficient of 0.876 clearly shows that there is a very high positive correlation exists between their math core courses. This imply that when a student gets high grade in General Mathematics, it is certain that he/she will also get high grade in Statistics and Probability.

Moreover, the coefficient of determination indicates that 0.77 or 77% of the attributes of the SHS students' performance in Statistics and Probability is because of their performance in General Mathematics. Therefore, as a Master Teacher in the field of mathematics, it is the researcher's belief that their performance in General Mathematics as described by their grades has something to do with their performance in Statistics and Probability.

#### ***Relationship between Senior High School Students' Performance in General Mathematics and Statistics and Probability***

It may be recalled that the correlation coefficient of 0.876 directs that there is a very high positive correlation between their performances in their math courses. Moreover, further analysis also reveals that there is a significant relationship between the students' performance in their two math subjects.

Since the p-value is lesser than the indicated alpha level of significance, there is sufficient evidence to support the claim that the relationship between the students' performance in General Mathematics and Statistics and Probability are statistically significant. This was confirmed by the p-value tested at 0.05 level of significance.

### **5. RECOMMENDATIONS**

1. More interesting strategies in mathematics may be introduced to enhance enjoyment among students especially on the part of low group as it predicted their achievement in mathematics.
2. Mathematics teachers must provide student consultation for remedial sessions, giving exercises, problem sets and drills as measures to remediate some of their difficulties in learning mathematics.
3. Future studies may consider profiling the best practices of outstanding secondary schools in teaching mathematics to build inspiration to other teachers teaching the same subject.
4. Similar study should be conducted in other branches of mathematics for SHS students, especially in the subjects where the percentage of failure is high.
5. Follow up of this research is needed. It is suggested therefore, that the said follow up of this study must

be taken account to determine any dimensions which is lacking in this study for better foundation and its significance for end users.

### **6. REFERENCES**

- [1] Andaya, O.J.F. (2013) Cognitive Structure of Freshmen Entrants of Philippine Normal University-Isabela Campus: An Approximation, REL Journal, Volume IV, Issue no. 1, January, pp 58-60.
- [2] Artizuela, M. A. (2008). Effects of DAMATH Remedial Instruction on the Performance and Attitude of Grade three-Low Achievers in Mathematics. Palawan State University.
- [3] Borais, D. B. and Barbacena, L. B. (2009) Portfolio Assessment in Mathematics IV: An Analysis. Bicol University, Philippines.
- [4] Bucsit, M. E. (2009). —Determinants of math I (college algebra) performance of freshmen computer science of private schools in San Fernando City.” Master’s Thesis. Don Mariano Marcos Memorial State University-Mid-La Union Campus, San Fernando City, La Union.
- [5] Canilla, L. L. (2012). The Comparative Effects of Two Enrichment Strategies in Improving Students’ Learning in Elementary Algebra. Palawan State University.
- [6] Capate, R.N. A and Lapinid, M.R.C. (2015) Assessing the Mathematics Performance of Grade 8 Students as Basis for Enhancing Instruction and Aligning with K – 12 Curriculum. De La Salle State University, Philippines.
- [7] Department of Education. (2010). Discussion Paper on the Enhanced k – 12 Education Program. Pasig City, Philippines.
- [8] Doorman, M. A. (2012). Difficulties in Solving Context-Based PISA Mathematics Tasks: An Analysis of Students Errors. Institute for Science and Mathematics Education, Utrecht University, the Netherlands.
- [9] Egodawatte, G. (2011). “Secondary school students’ misconceptions in algebra.” Dissertation, Ph.D in Curriculum Development. Department of Curriculum, Teaching, and Learning. University of Toronto. Canada.
- [10] Lapinid, M. C. (2014). Activity Based Teaching of Integer Concepts and Its Operations. De La Salle University, Manila Philippines.
- [11] Liu, Kuiyan, et al (2007). A study of college readiness for college algebra. Retrieved January 12, 2015 from [http://uwf.edu/cutla/publications/ Study of College Readiness for College Algebra.pdf](http://uwf.edu/cutla/publications/Study_of_College_Readiness_for_College_Algebra.pdf)
- [12] Limjap, A. A. (2009) Assessing the Mathematics Achievement of College Freshmen Using Piaget’s Logical Operations. De La Salle University, Manila, Philippines.
- [13] Mangaliman, R.A. (2004). Factors Affecting Students’ Failures in Mathematics. Unpublished Masteral Thesis, Saint Louis University, Baguio City, Philippines.

- [14] Marinas, B., & Clements, M. A. (2000). Understanding the problem: A prerequisite to problem solving in mathematics. *Journal of Science and Mathematics Education in South East Asia*.
- [15] Nanayakara, G. L. (2003). Assessment of pupil Achievement in Primary Mathematics with Special Reference to Analysis of Pupil Errors. Unpublished Doctoral Dissertation, Sussex University.
- [16] Tan, J.A. (2009). Students' Problem Solving Performance as Moderated by their Academic Achievement. Unpublished Dissertation.