Original Paper

Correlates of Mathematics Performance of Students in Public Secondary Schools in the Division of Batangas, Philippines: Basis for Mathematics Intervention Programs

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Abstract

The study determined the correlates affecting the Mathematics performance of Junior High students in selected public secondary school in the Division of Batangas, Philippines which served as basis for the proposed Mathematics intervention programs to enhance students' performance in Mathematics. It looked into the scholastic standing of students as shown in their grade in Elementary Mathematics and grade in Geometry. Further, it also determined the extent of effect of the four correlates which includes; study habits, attitude towards Mathematics, fear and anxiety, and parental involvement to the Mathematics performance of students. Furthermore, it also identified which of the aforementioned correlates determines their performance. The researcher used the descriptive method of research using probability sampling technique to identify the respondents of the study. There were 379 students who participated in the survey. Result of the study revealed that most of the students are approaching proficient level relative to their elementary mathematics grade, and on the beginning level in geometry. It was also found out that all the four correlates affected the Mathematics performance of students to a great extent. Moreover, it was revealed that study habits, fear/anxiety level and parental involvement determined their elementary Mathematics and Geometry performance. In light of the forgoing, the Mathematics intervention programs are believed to help teach the right attitude and study habits required to do well in enhancing mathematics learning.

Keywords

attitude towards mathematics, fear and anxiety, mathematics performance, parental involvement, study habits

1. Introduction

Society has placed its expectancy upon the schools to produce Filipino students who are productive and responsible citizens equipped with the essential competencies and skills for both life-long learning and employment. Mathematics as one of the most developed branches of science has much to do with it, since proficiency in mathematics is seen as an essential precursor to success in modern society. It is a discipline that plays a very crucial role in changing the society in general and the students' daily lives in particular. Hence, it is not easily possessed nor gained; however, it is open to anyone who aspires for it. In view of this, it is imperative for the students to learn this area meaningfully and thoroughly.

Currently, the sad reality is that the mathematical competencies of students are deteriorating as revealed by statistical reports. In the local arena, the results of NCAE for the last 5 years have been really alarming since the mean average decrease annually, indicating the students' weakness every year, also, the results of standardized national tests on aptitude and achievement test such as NSAT showed poor performance in mathematics. Moreover, NAT results (a national examinations being taken by students who are about to start their college life) showed that there is a deteriorating competency as revealed by the mean percent score of 50.70 in 2004-2005, 47.82 in 2005-2006, and 46.37% in 2011-2012, which seems to be elusive compared to the 75% goal of DepEd.

The thinking that Mathematics is a difficult subject worsens the situation of Mathematics in the Philippine education system. Some students express disinterest and unwillingness in the subject. Instead of being challenged, they have resigned to the idea that they just cannot make it. In addition to this, the students' inability to comprehend and master mathematical concepts and develop skills which leads to low achievement in Mathematics, weak attainment of higher level skills, and unsatisfactory academic performance.

Despite the efforts on curricular changes and the introduction of other teaching strategies to develop a better curriculum and improve the educational system, there are proofs which revealed that poor results in Mathematics examinations and the students' eventual failure in the subject are very much alarming and need immediate attention.

Looking on this view, these serious problems in Mathematics and Mathematics performance must be addressed systematically. It is in this light that the researchers, who is a Mathematics teacher, prompted to undertake the study and determine the correlates which could be responsible in the student's performance in their Mathematics subjects.

2. Objectives of the Study

The study determined the correlates of mathematics performance of students in public secondary schools in the division of Batangas, Philippines.

To determine the mathematics performance of students as shown in their grade in Elementary Mathematics; and grade in Geometry? To determine the effect of four correlates to the mathematics performance of students in terms of: study habits; attitude towards mathematics; fear/anxiety levels;

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and parental involvement? To assess which among the aforementioned correlates determined the mathematics performance of students. To propose Mathematics intervention programs that can enhance the student's performance.

Hypothesis

- None of the four correlates determined the mathematics performance of students.

3. Method

This study used the descriptive method of research utilizing the quantitative techniques. This design helped identified how the students were affected by the four correlates of mathematics performance and which among these correlates determined students' performance in mathematics. The researchers used Raosoft calculator to identify the sample size and stratified proportionate sampling to identify the 379 student respondents.

The researchers used documentary analysis and questionnaire as instruments in data gathering. The questionnaire used in this research consists of items that determined the extent of effect of the four correlates namely study habits, attitude towards Mathematics, fear/anxiety level in learning Mathematics and parental involvement on the Mathematics performance of students.

The instrument was subjected to reliability test using Cronbach Alpha which resulted to .993 reliability index. This result indicates very high internal consistency of the instrument.

4. Results and Discussions

4.1 Mathematics Performance of Students

Mathematics performance is the degree of success attained by the student based on his mathematics achievement or on tests designed to mastery of subject matter (Collins & O'Brien, 2011). In this case it is manifested in the performance of students in terms of their grade in Elementary Mathematics, and grade in Geometry.

Shown in Table 1 is the result of the Elementary Mathematics grades of students. Based on the gathered data, the lowest grade is 75 and the highest grade is 94. The mean value of 81.29 indicates that 69 percent of students' grade in Elementary mathematics is in the range of 77.35-85.23, which is verbally interpreted as average. The other 31 percent are most probably coming partly from those who belong to the developing level and the rest are from proficient to advanced levels. Based on the standards of the National Assessment of Educational Progress (NAEP) on Mathematics achievement.

Table 1. Elementary Mathematics Grades of Students

Descriptive Statistics	Values
N	379
Minimum	75.0

Maximum	94.00
Mean	81.29
Std deviation	3.94

levels, the average performance of the students tends to show that the students demonstrate competency over this challenging subject matter.

This average performance of students is similar to the findings of the National Assessment of Educational Progress (NAEP) last 2009 which revealed that Grade 7 students performance in mathematics is average.

Shown in Table 2 is the academic performance of students in Geometry. Based on the gathered data, the lowest score is 5 and the highest score is 100. The mean value of 64.10 indicates that 69 percent of students' performance in Geometry is in the range of 47.7-80.5, which is verbally interpreted as below average. The other 31 percent is most probably coming partly from approaching

Table 2. Descriptive Statistics on the Academic Performance of Students in Geometry

Descriptive statistics	Values
N	379
Minimum	5.0
Maximum	100.0
Mean	64.10
Std deviation	16.40

proficient, proficient, and advance levels. Based on NAEP standards, below average indicates partial mastery of fundamental skills in the subject. This below average performance of students in their geometry subjects could probably be attributed to their attitude towards the subject. It was confirmed by Vinas (2012) who found out that students find Geometry as confusing and they consider geometry as a very difficult subject. They are careless in solving geometric exams and problems, and hesitate to ask questions although they do not understand the lesson. They lack patience in solving difficult problems and student unfavorable feelings towards the subject.

4.2 Assessment on the Extent of Effect of the Four Correlates on the Scholastic Performance of Students

The researchers determined the extent of effect of the four correlates on the scholastic performance of students as assessed by their mathematics teachers. The results are as follows:

4.3 Study Habits

The students' themselves determined the extent of effect of study habits on their mathematics performance and it is shown in Table 3.

Table 3. Extent of Effect of Study Habits to the Mathematics Performance of the Students

Study Habit As a student, I….	WM	VI
1. make a time table in studying lessons in Mathematics.	2.66	A
2. get the assignments done in time.	3.41	A
3. am studying regularly with my classmates.	3.12	A
4. look for a comfortable place to study.	3.22	A
5. use my free time to study.	2.83	A
6. spent more time solving difficult problems.	2.93	A
7. start reviewing for major exams, three days or a week before the exam.	3.0	A
8. prefer to have group study.	3.02	A
9. memorize the notes rather than try to understand, summarize and conceptualize them.	3.0	A
10. review and analyze the difficult lessons in Mathematics.	3.22	A
COMPOSITE MEAN	**3.04**	A

Legend: A-Agree/Affected to a Great Extent.

The composite mean of 3.04, verbally interpreted as agree which means affected to a great extent confirms that having good study habits will positively affect the mathematics performance in Mathematics. This result was also evident in study conducted by Choudhury and Das (2012) who also found that study habit influence the achievement in Mathematics. Moreover, he stresses that achievement in any subjects mostly depends on students study habit. Based on observation, students with good study habits generally perform better compared to those students who do not have the habit of studying their lessons. Further, Popham (2016) stressed that educators must continuously keep on finding solutions by considering the learning styles and study habits of the learners. This was premised on the context that learning can take place in two ways such as learning styles and study habits.

4.4 Attitude towards Mathematics

The Mathematics teachers also determined the extent of effect of attitude towards mathematics on the performance of students as exhibited in Table 4.

Table 4. Extent of Effect of Attitude towards Mathematics on the Performance of the Students

Attitude Towards Mathematics As a Subject As a student, I….	WM	VI
1. like to attend in the class because of new concepts.	3.05	A
2. find it difficult because of word problem solving.	3.10	A
3. are stimulated and challenged to determine the appropriate formula to be used in solving problems.	2.95	A
4. work hard and listen very well when the teacher discusses the lesson.	3.32	A
5. volunteer in answering the question.	3.02	A
6. never leave the problem without answer even if they find difficulty.	2.54	A
7. easily identify which is a parallel line and a perpendicular line.	3.07	A
8. work hard to improve their computation skills.	2.88	A
9. are confident in explaining the properties of real numbers.	2.93	A
9. are confident in explaining the properties of real numbers……….	2.93	A
10. use checking method to verify if the solutions in the given problem is correct.	2.93	A
COMPOSITE MEAN	**2.98**	A

Legend: A-Agree/Affected to a Great Extent.

As revealed by the composite mean of 2.98, verbally interpreted as agree which means that affected to a great extent shows that students have a growing interest towards Mathematics. Attitudes can be seen as more or less positive. A positive attitude towards Mathematics reflects a positive emotional disposition in relation to the subject and, in a similar way, a negative attitude towards mathematics relates to a negative emotional disposition. These emotional dispositions have an impact on an individual's behavior, as one is likely to achieve better in a subject that one enjoys, has confidence in or finds useful. For this reason, positive attitudes towards Mathematics are desirable since they may influence one's willingness to learn and also provide the benefits one can derive from Mathematics instruction (Waheed, 2011). This analysis is substantiated by Popham (2016), who considered learning mathematics as complex and technical that most students are afraid of, where such negative reactions of students towards the subject should be minimized.

4.5 Fear/Anxiety Level in Learning Mathematics

The Mathematics teachers were also tasked to assess the extent of effect of fear/anxiety level to the mathematics performance of students as shown in Table 5.

Table 5. Extent of Effect of Fear/Anxiety Levels to the Mathematics Performance of Students

Fear/Anxiety Level in Learning Mathematics	WM	VI
As a student, I		
1. am very anxious in learning the subject.	2.85	H
2. am doubtful of my answer to the assignments in Mathematics.	2.61	H
3. have no confidence and become nervous in solving problems in front of my classmates.	2.59	H
4. feel irritable and impatient in class discussion.	2.49	L
5. feel nervous when I am ask to solve problem before the class.	2.44	L
6. cannot get to sleep when Mathematics exams are near.	2.89	H
7. am worried that I will not be able to get a good grade in Mathematics.	2.56	H
8. cannot concentrate on my lessons in mathematics.	2.20	L
9. am afraid that I will fail in the exam.	2.59	H
10. can not directly look at my teacher because of fear that he might call me to answer.	2.82	H
COMPOSITE MEAN	2.60	H

Legend: H-High/Affected to a Great Extent.

Generally, results revealed that students have developed negative feeling towards Mathematics subjects as shown by the composite mean of 2.60 verbally interpreted as high which means affected to a great extent. This result can be used as a baseline data to find ways and means on how studying and learning Mathematics can be fun and easy.

This result was confirmed in findings of (Bielock, 2014). He found out that to many people math is a scary four-letter word. They don't like it, they don't feel like they are very good at it, and they just want to stay away from it. People who feel tension, and fear of situation involving math are said to have math anxiety. And perhaps not surprisingly, math anxiety is associated with poor Math performance in school. Students with high degree of math anxiety perform worse in math from elementary school through college, relative to their less math-anxious counterparts. With these, he recommended that since math anxiety is widespread and often tied to poor math skills, it's imperative to understand when anxiety about math starts to emerge, where it comes from, and what we can do to alleviate it.

4.6 Parental Involvement

Parental involvement was also taken into consideration if it somehow affected the scholastic performance of students in Mathematics. The result is shown in Table 6.

Table 6. Extent of Effect of Parental Involvement on the Mathematics Performance of Students

Parents' Involvement	WM	VI
My Parents….		
1. manifest appreciation and involvement in my school projects and other activities.	3.15	GE
2. show concern and appreciation of my performance, achievements and other undertakings especially in Mathematics.	3.17	GE
3. provide nutritious meals and a conducive environment for me.	3.15	GE
4. spent time with me while I am doing my assignments.	2.68	GE
5. keep track of my progress in school.	3.0	GE
6. make sure that there is place for me to study at home.	3.17	GE
7. help me with my homework when necessary.	2.93	GE
8. help me develop good study habits.	3.07	GE
9. are supportive in my projects and activities.	3.22	GE
10. encourage me to join different math competitions in school.	2.98	GE
COMPOSITE MEAN	3.05	GE

Legend: GE-Great Extent.

Based on result, the composite mean value of 3.05 verbally interpreted as affected to a great extent confirms that parental involvement on their child's school activities affects their mathematics performance. According to Merttens (2011), students with parents who are involved in their school work tend to have better scholastic performance, and are more likely to complete high school than students whose parents are not involved in their academics. This result was confirmed by Latterell (2015), who pointed out that students' with parents who are involved in their school tend to have better academic performance. It was also confirmed by Anderson who found out that parental involvement in a child's education is consistently found to be positively associated with a child's academic performance.

5. Correlates that Determined the Mathematics Performance of Students

Educators and parents long have been plagued by the problem of students' low achievement in school. With this, the researcher identified a model among the different models which can explain the learning behavior of learners that may affect their academic performance, one of which is the Regression Models of Students Performance by Pearson. Pearson's Model of Student Performance which include study habits, attitude towards mathematics, fear/anxiety level, and parental involvement, were examined as to their influence on Mathematics achievement.

The Regression Residual Model that exhibited an F-value of 338.779 and a probability value of .000 which is less than .05 level of significance indicates the applicability of the model in the student's

performance in Elementary Mathematics. The t-value of -3.002, -3.182, and 4.867 and a p-value of .005, .003, and .000 which are all less than .05 level of significance respectively revealed that study habits, fear/anxiety level, and parental involvements determines the student's performance in Elementary Mathematics.

This result was confirmed in the study of Anderson (2009), who found out that parent involvement in a child's education is consistently found to be positively associated with a child's academic performance along with proper study habits. These results also find connections in the study of Venkatesan (2009), who also found out that Math anxiety is related to poor math performance. Further, Ashcraft confirms that math anxiety which is a feeling of tension, apprehension, or fear interferes with Math performance.

On the other hand, student's attitude towards Mathematics cannot determine their performance in Elementary Mathematics. This was revealed by a t-value of .878 and a p-value of .385 which is greater than .05 level of significance.

Furthermore, the Regression Residual Model that exhibited an F-value of 230.159 and a probability value of .000 which is less than .05 level of significance indicates the applicability of the model in the student's performance in Geometry. The t-value of -3.342, -2.412, and 3.784 and a p-value of .002, .021, and .001 which are all less than .05 level of significance respectively revealed that study habits, fear/anxiety level, and parental involvements determines the student's performance in Geometry.

This result was also evident in study conducted by Choudhury and Das (2012), who also found that study habit influence the achievement in mathematics. Moreover, they stressed that the achievement in the subject mathematics mostly depends on pupils study habit. Also, it was found out by Latterell (2015), that parental involvement in school has also been found to positively affect student's performance especially if both parents are involved.

To sum it up, there are indications that from among the four identified correlates attitude towards Mathematics is the only correlate that cannot determine performance in Mathematics.

6. Enrichment Activities that May Enhance Student's Performance in Mathematics

Enrichment activities put the students into an engaged mode of learning. Even though these require more time and creative energy from the teachers, the students would benefit greatly from it. If each student is able to be an active participant, rather than merely a participant, then motivation, interest, and progress will multiply naturally.

One of the many benefits of enrichment activities is the lasting effects these have toward a student's motivation, character, attitude, and purpose. Enrichment activities are not just a convenient pursuit, but they are an invaluable endeavor that should be accessible to all, and something that everyone should strive to participate in as much as possible to enhance learning in Mathematics teachers must ensure that enrichment activities can help students generate patterns for creative proficiency, build good character, initiate an engaged mode for learning, and find purpose in studying. Enrichment activities

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can be a vehicle to develop the attitudes and habits required to do well in enhancing learning in Mathematics.

In line with these, the researcher proposed several enrichment activities to be reviewed and be considered to improve students' performance in Mathematics.

7. Suggested Enrichment Activities

- Consider utilization of Socratic Seminar where students can ask question about the topic which initiates conversation that continues with a series of responses and additional questions. With this, students will learn to formulate questions to address issues to facilitate their own discussion and arrive at understanding rather than mere memorization.

- Offer models of behavior. While others learned from the group, others may learn while working independently. Independent learning encourages students to model the behavior of their teachers. For example teachers showing students how to analyze information on problems that will make it easier to understand and remember.

- Prepare a time table or Gantt-Chart that gives longer time in studying lessons in Mathematics. This will also provide students to self-monitor, to see whether the strategies they are using are effective for achieving their learning goals.

- Organize a group study and consider of best performing classmates to help solve difficult problems—promotion of student's cooperation in working together, helping each other and discussing mistakes openly without embarrassment.

- Establish Math Club that is made up of a fun group of students who enjoy math or are involved with Math. Students in Math Club have opportunities to participate in math competition. Joining such contest will uplift the students spirit and will boost their confidence.

- Practice the Scaffolding Method—this method refers to the supportive structure provided by skilled teachers which aids students in learning.

- Use of varied mathematical games as teaching strategies can be considered to encourage interest in the subject. Game is valuable in developing social skills and serves as stimulus to free flowing discussions which are needed in Mathematics learning. Moreover, interactions among students are part of the process of games which may help illicit nervousness especially during oral recitations.

- Seminar workshop to both parent and teachers which are meant to educate both parents and children/students about the importance of Parental Involvement on their performance.

- Engagement Partnership with Parents (EPP)—regular communication with school staff to familiarize the students' schedule, courses, and progress in school.

8. Conclusions

Result of the study revealed that:

1) Most of the students are moving towards approaching proficient level on their elementary mathematics grade, and on the beginning level in geometry.

2) All the four correlates affected the Mathematics performance of students to a great extent.

3) Study habits, fear/anxiety level and parental involvement determined their performance in Elementary Mathematics and Geometry.

4) The suggested intervention programs are believed to help students to do well in their Mathematics subjects.

9. Recommendations

Based on the findings and conclusions of the study, the following recommendations are forwarded:

1) The suggested intervention programs may be reviewed and considered to help enhance students' performance in Mathematics.

2) The needs of the students should be assessed and necessary measures on correlates of performance in Mathematics, including study habits, attitudes towards Mathematics, fear/anxiety levels, and parental involvement should be addressed.

3) Other correlates of mathematics not included in the present study may be considered to come up with more comprehensive and generalized findings.

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