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Mathematics Grade as Correlate to Performance in the National Achievement Test

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ABSTRACT

Tests in schools can be informative. However, the Department of Education administered a set of examinations like National Achievement Test which is designed to determine the learner's achievement level, strengths, and weaknesses in five curricular subject areas at the end of the school year. The study intended to look into the relationship between academic performance in Mathematics and NAT results. There has been a purposive universal sampling design. It is purposive because the research is only studying the academic performance in Mathematics, and universal because the subjects of the study are all the grade six pupils of Victoriano D. Tirol Advance Learning Center for four consecutive school years. Documentary analysis was used as to the data of existing records on the academic performance and National Achievement Test results in Mathematics. The association between academic achievement and NAT outcomes in Mathematics was investigated using correlation analysis and one-way analysis of variance (ANOVA). The analyses revealed that there is a significant correlation between the pupil's academic performance and NAT results. Also, there is a significant degree of variance in the student's performance as to National Achievement Test Results in four consecutive school years.

Keywords: Education, Academic Performance, National Achievement Test, Quantitative-Documentary Analysis, Pearson r, ANOVA, Philippines, Philippines, Asia

INTRODUCTION

Mathematics is "a difficult subject." That is what most of the students say. And if ever they had a choice to get rid of it in the curriculum, it would have done long time ago. Mathematics has and will always be a part of their lives. They might not realize it, but they're using the concept of Mathematics almost every second. Mathematics is not just a subject that should be taken for granted since it spreads through all parts of our

lives at any age and circumstances. Thus, its value does not just lie in the four corners of a classroom. Often, the subject is misunderstood. They wouldn't like Mathematics because they thought that the lessons were just too much to handle. In reality, if they give math a chance and internalize, they would realize that Mathematics wasn't that bad, and they too can handle Mathematics after all. Besides, getting the correct answer after a long series of the solution is somehow satisfying on a student's part.

To fully understand the concept of Mathematics, the Department of Education developed programs and curricula that would help students in their learning. One of these is the learning competencies explicitly designed to guide students in the different subject matter. To assess the learning competencies in Mathematics, a set of examinations is administered by the Department of Education to Grade three and six pupils in the Elementary Level addressing the major subjects taught in school, including Mathematics. This examination is known as the National Achievement Test (NAT).At the end of the school year, this test is used to identify a learner's achievement level, strengths, and weaknesses in five core curricular subject areas for both public and private school pupils.

This study has been backed up by a number of theories. Jean Piaget developed the Theory of Cognitive Development, which explains how cognition develops with age. While many components of the original cognitive development hypothesis have been disproven, the objective properties of cognitive development remain true. The journey from early perceptions and realizations of object permanence in infancy to the formation of logic and cause-and-effect links in childhood, and finally the emergence of abstract cognition in adolescence, are examples of such elements. Thinking is the result of cognitive development. Experience inspires the intellectual mind to create. As a result, children must learn to represent the "recurrent regularities" in their surroundings as they get older.

According to Bruner, significant learning outcomes include the ability to "create" concepts, categories, and problem-solving methods previously invented by the culture, as well as the ability to "invent" these things for oneself. The relationship between innate human skills and "culturally developed technology that serve as amplifiers of these talents" is central to cognitive development.

Computers and television are examples of culturally invented technologies, as are more abstract concepts like how a society categorizes

objects and language itself. According to Jerome Bruner on the theory of Constructivism, a major theme in the theoretical framework is that learning is an active process of constructing new ideas or concepts based on the learners' current or previous knowledge. They choose and renovate information, construct hypotheses, and make judgments relying on a cognitive structure to do so. The cognitive structure provides sense and organization to experiences and allows the individual to "think outside the box." In terms of instruction, the instructor should encourage students to discover concepts on their own. The instructor and student should be involved in an active dialogue (i.e., Socratic learning). The instructor's task is to interpret information to be learned into a set-up appropriate to the learner's current state of understanding. The curriculum should be arranged to construct ideas based on what they already learned continually.

Andaya (2014) aimed to evaluate the relationship between students' successes and individual, instructional, classroom management, and evaluation aspects, as well as to discover the factors that affect students' achievements in Mathematics. The findings revealed that (a) students' performance in Math Courses (Fundamental Mathematics and Contemporary Mathematics) is poor; (b) students perform poorly in both subjects; (c) mathematics achievements are strongly correlated with individual and instructional factors and moderately correlated with classroom management and evaluation factors; (d) individual and instructional factors have a significant impact on fundamental math achievement; and (e) the instructional component has the most significant impact on pupils' mathematical achievement. According to the study of Baroody, Rimm-Kaufman, Larsen & Curby (2016), The contributions of engagement during mathematics instruction on fifth graders' (N = 387) social skills and achievement were described using many perspectives of evaluating engagement (i.e., student-, teacher-, and observer-report). Students' social skills in math class were highly connected with all three techniques to measure involvement. Teacher-reported student engagement and observer-reported student involvement were both strongly associated with students' mathematical achievement, whereas student-reported engagement was not. Boys and girls had similar relationships between math involvement and results, according to moderation analyses. The findings are useful when contemplating how to assess involvement and encourage social interactions and accomplishment during mathematics instruction. In the study of Remali, Ghazali, Kamaruddin & Kee (2013),

factors contributing to disparities in students' academic performance, demographic characteristics, motivation factors, and learning styles were explored. The findings revealed that motivation components such as intrinsic motivation, extrinsic incentive, and self-efficacy substantially impact students' academic performance. In the National Elementary Achievement Tests (NEAT), administered to sixth-graders from 1993 to 1999, science and mathematics ranked the lowest or second-lowest among elementary school academic subjects. Victorino (2011) aimed to learn about the elements influencing respondents' NAT performance in terms of technology, extracurricular activities, media, study habits, and family motivational practices. Victorino used the triangulation approach, employing both quantitative and qualitative probes.

The findings showed that: (a) most students use cell phones and the internet; (b) most students do not participate in extracurricular activities; (c) students watch a lot of television; (d) students receive support and encouragement to work harder in school from their family members; and (e) students use technology, mechanization, and automation.

National exams or diagnostic tests may be utilized at the end of the school year to assess a student's standard competencies. It is used to evaluate the progress of children during the school year. Such an assessment could be carried out by the government or a private organization (Magno & Piosang, 2016).

Each student's rating is compared to national or worldwide standards for assessment. Because the competencies examined are dependent on the curriculum, national assessments are frequently standards-based. SBA's overall goal is to place a greater emphasis on each learner's learning abilities. The assessment should be matched with the students' learning competencies to be standards-based (Magno & Piosang, 2016). Kweon, Ellis, Lee & Jacobs (2017) study states that children need healthy school environments to study, play, and grow. Although there is a lack of studies especially concentrating on the effects of green spaces on academic performance, current research does show a correlation between more trees on campuses and higher academic achievement. After controlling for school size, student-teacher ratio, and free lunch enrollment, the study discovered that schools with more trees had a greater percentage of proficient or advanced results in Mathematics and Reading standardized examinations.

The study intended to compare the NAT results of Grade 6 students to their academic achievement in Mathematics at Victoriano D. Tirol - Advanced Learning Center during a four-year period. It also tried to see if academic achievement in Math is a good predictor of the National Achievement Test.

METHODOLOGY

The study utilized the purposive universal sampling design. It looked into the academic performance in Mathematics and universal because the subject of the study is all the grade six pupils of Victoriano D. Tirol – Advanced Learning Center for the four consecutive years. Documentary analysis was used as to the data of existing records on the academic performance, and National Achievement Test results in Mathematics of the subjects. The academic performance is the grade of the pupils in Mathematics as reflected in Form 137-B. The subjects of the study comprised all the 185 Grade Six pupils in the different school years. The locale of this study is the Victoriano D. Tirol – Advanced Learning Center – an institution whose vision is geared towards excellence with its tagline "Excellence for Life." It is one of the departments of the University of Bohol, which offers an education that starts at the toddler stage until senior high school.

The study used the existing NAT results of the Grade Six pupils for four consecutive school years. The researchers retrieved it from the Guidance Counselor while the Academic Performance was secured from the Registrar's office. Written formal permission was sent to the principal of Victoriano D. Tirol – Advanced Learning Center for her approval of the utilization of the National Achievement Test results thru the Guidance Counselor and the academic performance of the Grade Six pupils thru the Registrar.

The data gathered were then tallied in tables for the numerical data and were subjected to statistical analysis to test the null hypothesis posted by this study and for accurate interpretation of the data. Pearson product-moment coefficient of correlation and one-way analysis of variance (ANOVA) was used to determine the relationship between academic performance and NAT results in Mathematics. All statistical tests were set at 0.05 level of significance.

RESULTS AND DISCUSSION

Mathematics Academic Performance and NAT Results. Table 1 summarizes the students' academic performance and NAT Results in four consecutive school years. Academic performance is the final grade of students in mathematics. It is categorized into Outstanding, Very Satisfactory, Satisfactory, Fairly Satisfactory, and Did not meet Expectation. Meanwhile, the NAT results are the percentage scores obtained by an examinee. It is categorized into Mastered, Closely Approximating Mastery, Moving Towards Mastery, Average Mastery, Low Mastery, Very Low Mastery, and No Mastery at all. The academic performance of the four school years were labeled as satisfactory. As concluded in Kweon, Ellis, Lee & Jacobs (2017) study, children need healthy school environments to study, play, and grow. Schools with more trees had a greater percentage of proficient or advanced results in Mathematics and Reading standardized examinations. Since trees surround VDTALC, its academic performance is at a satisfactory level. On the other hand, the NAT results of the S.Y. 2011-2012 and S.Y. 2014-2015 were labeled as average mastery, while the NAT results of the S.Y. 2012-2013 and S.Y. 2013-2014 were labeled as moving towards mastery.

Table 1. Summary of the Academic Performance (AP) and NAT Results in Mathematics of Grade Six Pupils at VDT-ALC for Four Consecutive School Years

	2011-2012		2012-2013		2013-2014		2014-2015	
	AP	NAT Result	AP	NAT Result	AP	NAT Result	AP	NAT Result
Mean	82.71	61.76	83.07	74.6	83.26	69.58	81.23	58.38
F-above Mean	14	16	19	25	22	29	26	30
F-below Mean	24	22	25	19	26	19	29	25
F-above 75	37	15	40	25	46	26	54	12
F-below 75	1	23	4	19	2	22	1	43

Correlation between the Pupil's Academic Performance and NAT Results. To determine whether there is a significant correlation between the pupil's Academic Performance and National Achievement Test, the

data were subjected to Pearson Product Moment Correlation Test as shown in Table 2. The result revealed that there is a significant correlation between the pupil's academic performance and NAT results. With the significant correlation, it is further tested using t-test. Though the data are correlated, it shows that the academic performance of the pupils is above passing, but their NAT result is below passing. This contradicts the study of Victorino in "Factors Affecting the National Achievement Test Performance of Selected Second Year High School Students in Santa Maria, Bulacan" which depicts that due to certain factors the NAT results of students are not directly related to their academic performance.

Table 2. Summary of the Correlations between the Grades and performance in the NAT for four school years

School Year	Mathematics Grade	NAT Performance	r	P > 0.05	Remarks
2011-2012	82.71	61.76	0.89	0.32056	Significant
2012-2013	83.07	74.60	0.48	0.29764	Significant
2013-2014	83.26	69.58	0.82	0.28464	Significant
2014-2015	81.23	58.38	0.83	0.26624	Significant

The correlations between Mathematics Grade and Performance in the NAT were significant in 2011-2012 (r=0.89), 2012-2013 (r=0.48), 2013-2014 (r=0.82), and 2014-2015 (r=0.83). The coefficient of determination (r^2) indicates that close to 70% of the variances in the performance in the NAT are explained by the Math Grade. This suggests that Math Grade is a reliable correlate to NAT Results. This means the higher the Math grade, the higher is the performance in the NAT and vice versa. This implies a high predictive validity of grades in determining student's aptitude.

Analysis of Variance as to the National Achievement Test Results in the Four Consecutive School Years. Table 3 presents the analysis of variance among the NAT results of grade six pupils in the four school years. The result shows that the Nat results of the grade six pupils vary significantly in the four school years. It is further subjected to Scheffe's test. The result revealed significant variance in the school year 2012-2013 and 2014-2015. All four school years differ in their percentage scores as to national achievement tests. Such percentage scores of national achievement test from the school year 2011-2012 and 2014-2015 were considered to be Average Mastery, and percentage scores of national

achievement test from school year 2012-2013 and 2013-2014 were considered to be Moving Towards Mastery. According to the study of Remali, Ghazali, Kamaruddin & Kee (2013), factors contributing to disparities in students' academic performance, demographic characteristics, motivation factors, and learning styles were explored. Components such as intrinsic motivation, extrinsic incentive, and self-efficacy substantially impact students' academic performance.

Table 3. Analysis of Variance one-way classification as to the NAT Results in the Four School Years

Source of Variation	SS	df	MS	Computed F	Remarks	Critical Value @ 0.05
Between Groups	7741.7392	3	2580.58	5.6234	>	2.6
Within Groups	83061.35675	181	458.9025		Significant	
Total	90803.09595	184			Ho: Reject	

The performance of students in the National Achievement Test varied significantly across four years from 2011-2015. The student scored highest in 2011-2012 (74.60), followed by the mean in 2013-2014 (69.58) and then lowest in 2014-2015 with only 58.38. The differences could be attributed to changes in the aptitude of students in the different years.

CONCLUSIONS

1. There are slight fluctuations in the Mathematics grades of students in the four periods. However, the variations of NAT scores are significant in the same period.
2. Mathematics grades are significantly related to NAT scores, indicating a direct, high, and significant correlation. The higher the Math grade, the higher are the NAT scores.
3. Math grades account for 80% of the variance of NAT scores. Mathematics grades are essential and reliable determinants of NAT aptitude.

RECOMMENDATIONS

With the result of the findings, the following are the recommendations:

1. Teachers handling the subject must be aware of the seventeen competencies in Mathematics, which are the basis for making test questions in NAT to be more efficient in dealing with and teaching the learners.
2. Level of performance concerning the learning competencies with the highest mean percentage scores should be maintained.
3. Students should be encouraged to engage in peer tutorials to have better understanding of the subject matter.
4. Students must be given more exercises/activities to be familiar with the terms and concepts that are said to be difficult in the subject.
5. Teachers and faculties shall continue to look for new ways to improve the performance of the students in their Academic Performance and National Achievement Test results.
6. There should be review classes to be conducted by the subject teacher focusing on the least competency.
7. Teachers should be encouraged to attend seminars and training for continuing professional education.
8. Contextualization in teaching solving word problems should be applied in teaching the subject.
9. School administrators shall continue to do close monitoring and evaluation of the school's operations.

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