PERFORMANCE OF GRADE VI PUPILS ON ANGLES AND POLYGONS

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ABSTRACT

The study aimed to find out the levels of performance in Mathematics of the Grade VI pupils of DatuHalun Pilot School (DHPS) and Salamat Elementary School (SES) in Bongao, Tawi-Tawi, Philippines in identifying polygons by characteristics, finding parts of polygons and finding perimeters of polygons. It also determined if there were significant differences in their performance. The paper used descriptive-quantitative design. A researcher-made test was administered to gather data. Validity was established and KR₂₀ formula was used for its reliability. Findings revealed that the Grade VI pupils of DHPS performed less satisfactorily in identifying polygons by characteristics and in finding the perimeters of polygons, and least satisfactorily in finding the parts of a polygon. The Grade VI pupils of SES also performed less satisfactorily in identifying polygons by characteristics and in finding the parts of a polygon. The pupils performed satisfactorily in finding perimeters of polygons. As to the differences in the performance of pupils between schools, t-test revealed highly significant differences in the first and the third variables, but not on the second. It was concluded that the pupils of both schools had a minimal learning on the variables tested.

KEYWORDS: Angles, Polygons, Pupils' Mathematical Performance

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INTRODUCTION

Mathematics has become important because of its usefulness in careers such as environmental studies, business, engineering, medicine, psychology and biological, mathematical and physical sciences. This involves the skills in problem solving, organizing, simplifying, interpreting data and performing calculations in a systematic way (Academic American Encyclopedia, 1981).

Geometry is a mathematical system that deals with points, lines, surfaces and solids. It is derived from the Greek word "Geo" for earth and "Metron" for measure. It was originally used by the early Babylonians and Egyptians at least 5000 years ago. The Egyptians used geometry for land surveying. This is the earliest known use of geometry. Throughout the centuries it has been used in so many ways that it has greatly made influences on living. In modern times geometrys becomes part of everyday living. It is applied in occupations such as machinery, drafting, carpentry and plumbing. It is also used by engineers who build bridges, buildings and roads. (Smith, 1985). A plane geometry is a division of geometry that deals with points and line segments. One of the types of plane geometry is polygon. A polygon has sides and angles as its parts (Academic American Encyclopedia, 1981).

The New Elementary School Curriculum (NESC) and the 2002-2003 Revised Basic Education Curriculum (RBEC) posited that one of the most important objectives of the elementary school mathematics is the development of the mathematical skills of the pupils, not only verbal problems but also geometric problems (Aquino 1998). In the RBEC, teaching of mathematics has an increased time allotment to ensure that all lessons

are taught and activities are given to develop Higher Order Thinking Skills (HOTS). Since mathematics has a special form of language difficult to comprehend, the teaching of the subject should emphasize its creative endeavor and active process nature (Ulit et. al., 1995). Thus, open ended questions are encouraged in test constructions and hands-on activities. Generalization, application, explanation and discovery on mathematical concepts are advised in the classroom activities (Bandahala et. al., 2009).

In Grades V and VI the child is expected to have mastered the four fundamental operations of whole numbers, performed skills in decimals and fractions, conceptualized the meanings of ratio and proportion, percent, integers, simple probability, polygons, spatial figures, measurement and graphs. Simple concepts in Algebra are also introduced to be articulated in high school (PRIMER BEC, 2002).

The 1997 National Elementary Achievement Test (NEAT) revealed that the performance of Grade VI pupils of DatuHalun Elementary School in mathematics was both “poor” and “below average” (Nursali and Hapie, 1999). It was recommended that teachers do an extensive review on the basic concepts and principles in mathematics to meet the challenges in high school (Taalal and Abubakal, 1999).

Mathematical concepts continue to be difficult for Filipinos as shown by studies. The perception is that mathematics is abstract and inherently difficult to understand. This need not necessarily be the case because the subject can be made concrete and easy (Indangan, et al. 2001). Teaching the subject should be gradual to make the learners feel confident in teach the subject (Librios, 1981).

Despite the thrust to strengthen the teaching and learning of basic mathematical concepts, it is noticeable that learners find difficulty in mathematics. It was along this premise that this study was undertaken.

Statement of the Problem

This study focused on the level of mathematical performance of Grade VI pupils of DatuHalun Pilot School (DHPS) and the Grade VI pupils of Salamat Elementary School (SES) on angles and polygons, A.Y 2009-2010.

Specifically, it aimed to answer the following questions:

- What is the level of mathematical performance of Grade VI pupils of DatuHalun Pilot School and Salamat Elementary School in angles and polygons in terms of the following variables:
 - Identifying polygons by characteristics;
 - Finding parts of a polygon; and
 - Finding perimeters of polygons?
- Is there any significant difference in the mathematical performance of the Grade VI pupils of DatuHalun Pilot School and Salamat Elementary School along the above-mentioned variables?

Research Hypothesis

There is no significant difference in the mathematical performance of the Grade VI pupils of DatuHalun Pilot School and Salamat Elementary School along the above-mentioned variables.

Significance of the Study

The study was able to determine and assess the performance of Grade VI pupils of DatuHalun Pilot School and Salamat Elementary School in geometry, particularly on polygons. The result of this study would give insight to the pupils on their level of mathematical performance. It would also provide feedback to the parents to check the progress of their pupils. The result would serve as baseline data to teachers about the composition of the class, and strugglers will be given special attention through remedial lessons. It would serve as eye opener for school administrators to provide administrative support to teachers and pupils. This will serve as reference to further studies.

The research study could also offer contribution to mathematics education particularly in identifying and assessing performance of pupils. Further, it would generate insights on teachers' quality of instruction. The Department of Education will have basis in developing programs to raise pupils' achievement in mathematics to cope with global competitiveness.

METHODOLOGY

The respondents of this study were Grade VI pupils of DatuHalun Pilot School (DHPS) and Salamat Elementary School (SES) enrolled in the SY 2009-2010. There were eighty-five (85) Grade VI pupils, forty-three (43) from DHPS and forty-two (42) from SES. The study made use of the descriptive quantitative design as this described and quantified the mathematical performance of Grade VI pupils on angles and polygons.

The test instrument was a 30-item researcher-made test. The test items were prepared through consultation with the adviser and members of the panel. At the outset, the test consisted of 45 with 15 items in each of variables: identifying polygons by characteristics, finding parts of a polygon and finding perimeters of polygons. The research instrument was pilot tested at MSU CDC - Laboratory Elementary School, Bongao, Tawi-Tawi. The test results were item analyzed. KR_{20} was used to determine the reliability coefficient of the entire test, and the computed value was 0.88. The number of items in the final draft was reduced to 30 with 10 items per variable. Provided below is the instrument of the study.

Table 1: Table of Specification

Variables	Number of Items	Placement of Items
1. Identifying polygons by characteristics		1-10
1.1 Polygon		2&9
1.2 Triangle		
a. scalene		4
b. isosceles		8
c. equilateral		6
1.3 Quadrilateral		1
a. rectangle		3
1.4 Pentagon		5
1.5 Hexagon		7
1.6 Octagon		10
2. Finding parts of a polygon		11-20
2.1 Angles		
a. Angle measure		12, 17 & 20
b. Kinds of angle		11, 14 & 16
2.2 Sides		13, 15, 18 & 19

3.	Finding perimeters of polygons		21-30
3.1	quadrilateral		21
3.2	square		22
3.3	trapezoid		23
3.4	equilateral		24
3.5	pentagon	10	25
3.6	rectangle		26
3.7	octagon		27
3.8	rhombus		28
3.9	triangle		29
3.10	polygon		30

RESEARCH INSTRUMENT

- **Multiple Choice**

Directions: Encircle the letter of the correct answer.

Example:

An angle that measures more than 90° is called ____.

- a. Acute **b. Obtuse** c. Right d. Equilateral

1. A polygon that has four sides is called a ____.

- a. Quadrilateral b. Triangle c. Pentagon d. Hexagon

2. Which is a polygon among the following figures?

- a. b. c. d.

3. A rectangle has ____ pair/s of parallel sides.

- a. 0 b. 1 c. 2 d. 3

4. A/An ____ triangle has no congruent angles.

- a. Scalene b. Equilateral c. Obtuse d. Isosceles

5. Which of the following figures is a pentagon?

- a. b. c. d.

6. Rodrigo built a model bridge. For one section, he built triangles with equal sides of 4cm. What kind of triangles did he build?

- a. Right triangle b. Equilateral triangle c. Scalene d. Isosceles

7. A regular Hexagon has ____ congruent sides.
 a. 4 b. 5 c. 6 d. 7
8. Ramil made one triangle that measured 3cm on one side. The other two sides were twice as long as the first side.
 What kind of triangle did he make?
 a. Isosceles b. Scalene c. Equilateral d. Equiangular
9. A close figure is formed by line segments which meet only at their endpoints.
 a. Circle b. Quadrilateral c. Triangle d. Polygon
10. An octagon has ____ sides.
 a. 5 b. 6 c. 7 d. 8
11. An acute angle has a measure of ____ 90° .
 a. greater than b. equal to c. less than d. none of the above

12. Find the measure of B in this right triangle.

13. Name the NON-parallel side of this polygon

14. An angle that measures more than 90° but less than 180° is ____.

- a. Right b. Acute c. Obtuse d. Equiangular

For number 15 refer to the figures below.

15. What is the corresponding part of $\overline{BA}$?

- a. $\overline{BC}$ b. $\overline{XY}$ c. $\overline{ZY}$ d. $\overline{AC}$

16. An angle that measures 90° is ____.

- a. Acute b. Obtuse c. Scalene d. Right

17. Two angles of a triangle measure 20° and 109° respectively. What is the measure of the 3rd angle?

- a. 20° b. 51° c. 105° d. 180°

18. A regular nonagon has ____ sides.

- a. 8 equal b. 8 c. 9 equal d. 9

For number 19 refer to the figure below

19. What is the measure of $\angle BGD$?

- a. 180° b. 85° c. 60° d. 30°

20. What is the sum of the angles inside a hexagon?

- a. 90° b. 180° c. 360° d. 720°

21. What is a perimeter of a quadrilateral with sides 3cm, 4cm, 5cm and 6cm respectively?

- a. 18cm b. 20cm c. 25cm d. 30cm

22. One side of a square measures 8cm, what is its perimeter?

- a. 16cm b. 32cm c. 55cmd. 64cm

23. What is the perimeter of this trapezoid?

- a. 7 b. 12 c. 15 d. 19

24. What is the perimeter of an equilateral triangle that has a side of 20m?

- a. 60m b. 45m c. 30m d. 20m

25. One side of a regular pentagon measures 7cm, what is its perimeter? $P=5s$

- a. 49cm b. 40cm c. 35cm d. 30cm

26. Find the perimeter of this rectangle. $P=2l+2w$

25

- a. 100 b. 80 c. 55 d. 44

27. The perimeter of a regular polygon that has 8 sides is 40. What is the length of each side?

- a. 20 b. 15 c. 10 d. 5

28. Which among the following has the largest perimeter?

29. The distance around a polygon is called _____.

- a. measurement b. side c. perimeter d. circumference

30. Find the perimeter of a rhombus having 8cm on one side.

- a. 32cm b. 28cm c. 24cm d. 18cm

The Answer Key

1. a	6. b	11. c	16. d	21. a	26. b
2. d	7. c	12. b	17. b	22. b	27. d
3. c	8. a	13. a	18. c	23. d	28. b
4. a	9. d	14. c	19. c	24. a	29. c
5. b	10. d	15. b	20. d	25. c	30. a

Data Gathering and Analysis

The researcher-made mathematical test was administered to each Grade VI pupil of DatuHalun Pilot School and Salamat Elementary School. The scores were tabulated and subjected to statistical treatment of the data.

Mean scores were computed to determine the mathematical performance of Grade VI pupils by school. To determine the levels of mathematical performance, the following hypothetical mean score ranges were used in the

interpretation of the data gathered from the two schools.

Table 2

Mean Score Range	Interpretation
9-10	Excellent
7-8	Very Satisfactory
5-6	Satisfactory
3-4	Less Satisfactory
0-2	Least Satisfactory

The t-test was used to determine the significant difference in the mathematical performance of the respondents by school.

RESULTS AND DISCUSSIONS

Table 3: Level of Mathematical Performance of Pupils

Levels of Mathematical Performance of Pupils on Angles and Polygons by School and Variable						
Variables	School				Overall	Interpretation
	DHPS		SES			
	Mean Score	Interpretation	Mean Score	Interpretation		
1. Identifying the polygons by characteristics	2.65	Less Satisfactory	3.57	Less Satisfactory	3.11	Less Satisfactory
2. Finding parts of polygon	2.30	Least Satisfactory	2.83	Less Satisfactory	2.57	Less Satisfactory
3. Finding perimeter of polygons	2.84	Less Satisfactory	4.5	Satisfactory	3.67	Less Satisfactory
Overall	2.60	Less Satisfactory	3.63	Less Satisfactory	3.12	Less Satisfactory

Table 1 shows that the level of mathematical performance of the Grade VI pupils of DatuHalun Pilot School (DHPS) was Less Satisfactory on identifying polygons by characteristics and finding perimeters of polygons with corresponding mean scores of 2.65 and 2.84, respectively. The item analysis of test results on identifying polygons revealed that the grade VI pupils of DHPS incorrectly answered numbers 4 and 8 on scalene and isosceles kinds of triangles according to side and number 9 on the definition of polygon. In finding the perimeter, most of them incorrectly answered numbers 21 and 26 on the perimeters of quadrilaterals. In finding parts of polygons, Table 1 shows Least Satisfactory with mean score of 2.30. On this variable, the item analysis revealed that the pupils' most incorrect answers were on the following items: number 11, measure of an acute angle; number 13, name the nonparallel side of a trapezoid; number 15, corresponding part of the side of polygon; number 19, measure of the unknown angle; and number 20, sum of the angles inside the hexagon. The overall level of mathematical performance of the grade VI pupils of DHPS was Less Satisfactory with a mean score of 2.60.

As shown in Table 1, the Grade VI pupils of Salamat Elementary School (SES) showed Less Satisfactory level of performance on identifying polygons and finding the parts of polygons with mean scores of 3.57 and 2.83, respectively. The item analysis showed that in identifying polygons by characteristics, most of SES Grade VI pupils incorrectly answered numbers 4, 6 and 8, on the kind of triangles according to side, namely: scalene, equilateral and isosceles triangles respectively, and number 9, on the definition polygon. Most of the pupils failed to answer correctly numbers 12, measure of the unknown angle in a right triangle; 13 name the non-parallel side of a trapezoid; 14, on angle that measures more than

90 degrees; and number 20, the sum of all the angles in a hexagon. In finding the perimeter of polygons however, it showed Satisfactory with a mean score of 4.5. On this variable, most of the pupils failed to answer number 26 which is on finding the perimeter of rectangle given the measure of one of the opposite sides. The overall level of mathematical performance of the Grade VI pupils of SES was Less Satisfactory with a mean score of 3.63.

This means that majority of the Grade VI pupils had minimal learning on angles and polygons. Based on the result of item analysis, most of the pupils were just guessing in answering the test items. Among the three variables, most of the pupils failed to identify polygons by characteristics and to find parts of the polygons. The overall mean scores of the two schools by variables mean Less Satisfactory with mean scores of 3.11, 2.57 and 3.67, respectively. This implies that the pupils need to reinforce their skills in mathematics; they should take more time in studying the abovementioned skills. Teachers must employ more drills and enhancement activities in order to improve the pupils' mathematical performance.

Table 4: Significant Differences in Mathematical Performance

T-Test Results on the Differences in the Mathematical Performance on Angles and Polygons					
Variable	School	Mean Difference	T	P	Remarks
1. Identifying Polygons by characteristics	DHPS vs. SES	-0.9202658	-3.1136	0.0025	Highly Significant
2. Finding parts of polygon	DHPS vs. SES	-0.5310078	-1.5732	0.1195	Not Significant
3. Finding perimeter of polygons	DHPS vs. SES	-1.662791	-3.7412	0.0003	Highly Significant

Table 2 on the test of significance of mean differences shows that on identifying polygons by characteristics, the mean difference is highly significant with t value of -3.1136 and p value of 0.0025. This means that the SES pupils, although performing at the same level as those of DHPS, really did better. Thus, the hypothesis of no difference was rejected. On finding parts of a polygon, however, the t-test showed no significant difference between means registering t value of -1.5732 and p-value of 0.1195, thus, the hypothesis of no difference was not rejected. On the other hand, on finding the perimeter of polygons, the same t-test table shows that the mean difference is highly significant with t value of -3.7412 and p value of 0.0003. This means that the SES pupils really performed better than those of DHPS. Hence the null hypothesis is rejected.

This study has similar findings with Puig *et al.*, (2004), Custodio *et al.*, (2003) Ahid *et al.*, (2004), Arabani and Harija, (2000), and Esconde *et al.*, (2004) on mathematical performance and concepts in geometry. Majority of studies revealed "poor" or "less satisfactory" performance, only few studies like Nurjihi *et al.*, (2001), Halis *et al.*, (2003), and Ibnohasam *et al.*, (2000) showed satisfactory performance. This could mean that the teaching strategies and techniques of the teachers are weak in reinforcing basic mathematical concepts required by the Grade V and VI pupils as prescribed by the Department of Education.

CONCLUSIONS AND RECOMMENDATIONS

It is concluded that pupils of both schools had minimal learning on the variables tested namely: identifying polygons by characteristics, finding parts of a polygon and finding perimeters of polygons. It is recommended that: 1.)

Pupils be given re-teaching and more drills and exercises be employed on angles and polygons; 2.) Teachers keep themselves updated by attending seminars on mathematics teaching; 3.) Parents oversee their children's performance in mathematics, 4.) Administration provides necessary support and supervision; and 5.) Further studies should be undertaken for the development of mathematics education.

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