PERCEPTION OF ENUGU STATE BASIC TEACHERS ON USE OF POLYGONS IN BRINING OUT THE AESTHETIC VALUES OF MATHEMATICS FOR GLOBAL FUTURE DEVELOMENT

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Executive Summary

This study examined the Perception of Enugu State Basic Teachers numbering one hundred (n=100) on use of Polygons in bringing out the aesthetic values of mathematics for Global future development. The beauty and elegance of mathematics were showcased using diagrams of Triangles, Quadrilaterals, Pentagons and the like which were shown with properties of each. Extent of Basic Teachers Perception on use of each of the three groups of Polygons were found. Three research questions guided the study. Mathematics –Polygon Properties (MATHPOP). Questionnaire, made up of twenty items was used as instrument to collect data after trial testing The reliability of MATHPOP instrument was found to be 0.91using Cronbach alpha from SPSS Version 22. Mean and percentages were used for data analyses It was found that the Basic Teachers Perceived the use of Polygons as beautiful shapes that can promote students' understanding and increase high achievement in Polygon in particular and Mathematics in general. However, the Basic Teachers Perception on the third group of Polygons were also compared with first and second groups.

Keywords: Aesthetic Values; Perception; Global Future; Development

Introduction

Usefulness of Mathematics in every area of human endeavour cannot be overemphasized. This is so because mathematics is used in both formal and inform education (designing, sharing and skills acquisition leading to global development).

Federal Ministry of Education in conjunction with the National Teachers Institute (2020) stressed the need to train basic teachers for sustainable development especially in practical areas of which polygons were included. Similarly, the National Policy on Education by the Federal Ministry of Education (2013), indicated that basic Mathematics taught by basic teachers promote logical reasoning needed for development. Nigerian Educational Research and Development Council [NERDC] (2006) agree that plane shapes such as Polygons, both regular and irregular, can be related to real life situations. When basic teachers understand and perceive the use of polygons and their individual properties as beautiful shapes that can promote students' understanding and increase high achievement and also relate to real life situations, global future development is being expected as the end result.

Household properties such as blocks, tiles, roofs, plates and others appear inform of triangles, squares, pentagons. Even while plaiting one's hair, designers sometimes use combs to design triangular shapes squares, rectangles and the like in the business. One's choice of polygon has to be upheld to avoid conflict. When the designer fails to understand customer's choice of shape, quarrels do arise and to resolve the quarrel, there is need for proper understanding of what one want. This is in line with Onah, Ude and Obe (2017) who stated that use of multimedia packages found in e-learning while teaching promote understanding and e-learning has to be promoted to facilitate understanding.

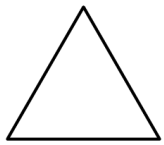
Similarly in classrooms, white boards which are mainly squares or rectangular in shape are seen. Teachers as curriculum implementers can prepare the different designs of polygons in PowerPoint environment project tot eh entire class for better understanding. This is in line with Onah (2015) who stated that multimedia packages such as diagrams of shapes improved understanding concepts in mathematics and promoted achievement and no one gives knowledge one gives knowledge one has not acquired and also since teachers are regarded as case resolvers in the village (Odozi-Obodo), basic teachers' perception therefore motivated this write up. The study examined the perception of basic teachers in real life situation both inside and outside the school. Some use polygons such as triangles, quadrilaterals, regular and irregular pentagon, hexagon, heptagon and the like in line with their diagrams and properties for designing different items. Three research question that guided the study include:

1. What is the extent of agreement of basic teachers on use of triangle for global future development?
2. What is the extent of agreement of basic teachers on use of quadrilaterals for global future development?
3. What is the extent of agreement of basic teachers on use of regular and irregular: pentagon hexagon, heptagon and the like for global future development?

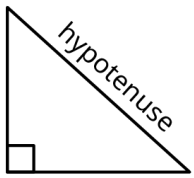
The above three research questions guided the study, Mathematics Polygon Properties (MATHPOP) Questionnaire, made up of twenty (20) items was used as instrument to collect data after trial-testing. The reliability of MATHPOP instrument was found to be 0.91 using Crombach alpha from SPSS version 22. The twenty (20) contents of (MATHPOP) instrument include eight (8) for triangle, eight (8) for quadrilateral and four(4) for other polygons like Pentagon, Hexagon, Heptagon, Octagon, Nonagon, Decagon

A. Triangles

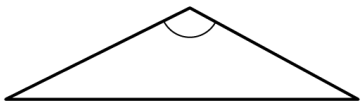
Some triangles and their properties are:
Acute angled triangle, here all angles are acute (more than zero but less than 90^o

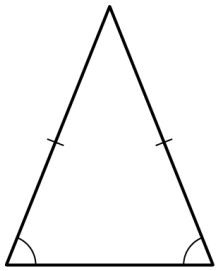


Right angle triangle, here one angle is 90^o.

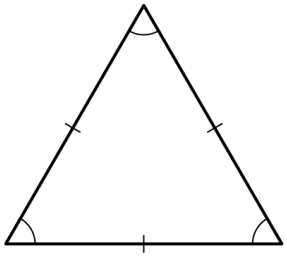


Obtuse angled triangle, here one angle is obtuse (more 90 degrees and less than 180degrees) .



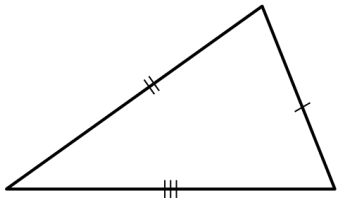


Isosceles triangle, here the two base angles are equal.



Equilateral triangle

All sides are equal. All angles are equal.

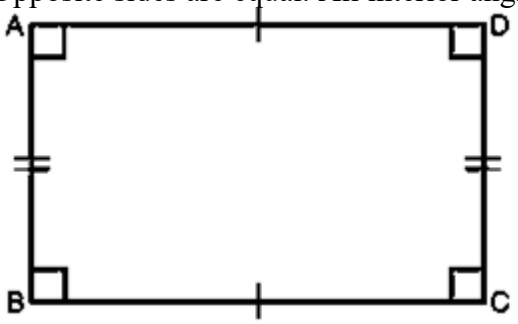


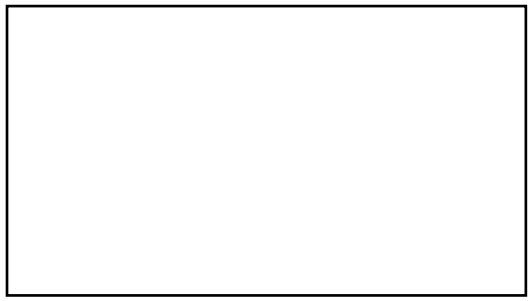
Scalene triangle, here all the sides have different lengths; all the three angles have different measures.

B. Quadrilaterals

Rectangles

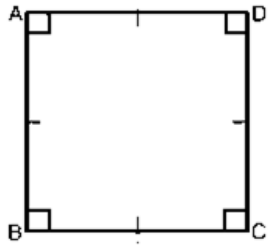
Opposite sides are equal. All interior angles are equal, each is 90º.

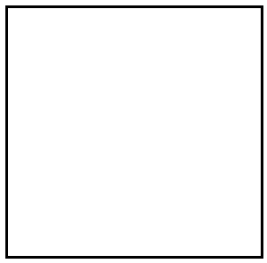




Square

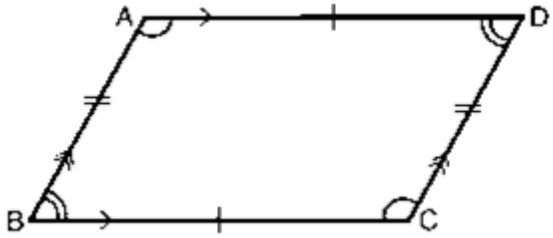
All the four sides are equal. All interior angles are equal, being 90º each.

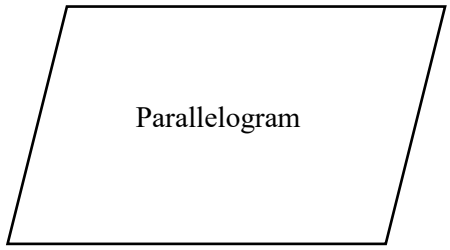




Parallelogram

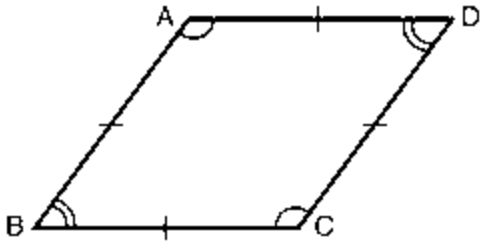
Opposite sides are equal and parallel. Opposite interior angles are equal.

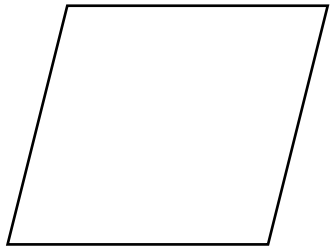




Rhombus

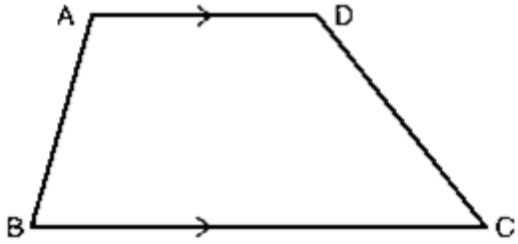
All four sides are equal. Opposite interior angles are equal.





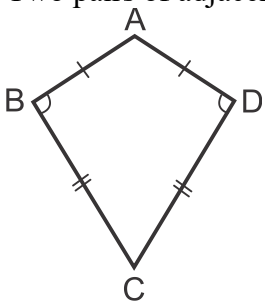
Trapezium

One pair of opposite sides is parallel



Kite

Two pairs of adjacent sides are equal. One pair of opposite interior angles are equal.

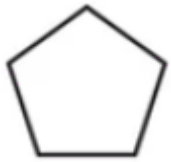


C. Regular Polygons and Irregular Polygons

Regular polygons

Pentagon, Hexagon, Heptagon, Octagon, Nonagon, Decagon are Equiangular and Equilateral as shown:

Pentagon

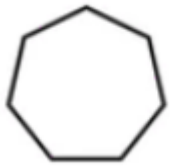


Five equal sides and equal angles

Hexagon

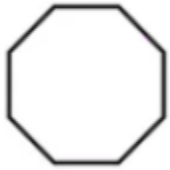
Six equal sides and equal angles

Heptagon



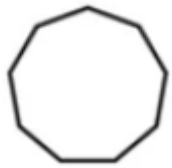
Seven equal sides and equal angles

Octagon



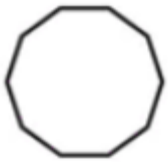
Eight equal sides and equal angles

Nonagon



Nine equal sides and equal angles

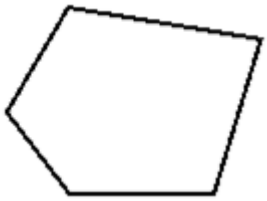
Decagon



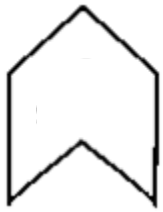
Ten equal sides and equal angles

Irregular Polygons

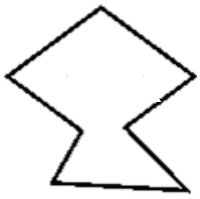
Irregular Pentagon



Irregular Hexagon



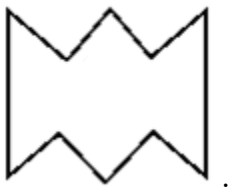
Irregular Heptagon



Irregular Octagon

Irregular Nonagon

Irregular Decagon



After viewing the items above with diagrams, the teachers reacted to the above items on a four point scale of Highly Agree (4) Agree (3), Disagree (2), Strongly Disagree (1).
Condition Decision: Responses of mean above 2.5 were for High Agreement while responses below 2.5 were for Low Agreement as shown in analyses below:

Results

Research Question 1
What is the extent of agreement of basic teachers on use of triangle for global future development?

Table1*: Mean and Percentage of Agreement on use of Triangles for Global Future Development*

S/N	Items	Mean	Percentage	Remark
1	Triangle is a three-sided polygon	3.8	95%	HA
2	Isosceles triangle has two equal sides	3.6	90%	HA
3	Right angled triangle has one angle of 90degrees	3.4	85%	HA
4	Equilateral triangle has three equal sides and angles.	3.2	80%	HA
5	Scalene triangle has none of the three sides equal	2.8	70%	HA
6	Interior angles of a triangle sum up to 180degrees	3.0	75%	HA
7	Exterior angles of a triangle sum up to 360degrees	3.6	90%	HA
8	A regular polygon is one in which all its sides and all the angles equal.	2.6	65%	HA

Key for Tables 1,2 and 3 : HA = High Agreement, LA = Low Agreement

In Table 1 above, all the responses of the basic presented High Agreement for Triangle and its properties.

Research Question 2
What is the extent of agreement of Basic Teachers on use of Quadrilateral for Global Future Development?

Table 2: *Mean and Percentage of Basic Teachers on use of Quadrilateral for Global Future Development*

S/N	Items	Mean	Percentage	Remark
9	Any four-sided polygon is called a equilateral.	2.8	70%	HA
10	Square is to quadrilateral as equilateral triangle is to triangle.	3.4	85%	HA
11	Squares are rectangles but rectangles are not squares.	3.6	90%	HA
12	A rhombus is a quadrilateral with four equal sides.	3.0	75%	HA
13	Kite is a quadrilateral with two adjacent sides equal.	3.4	86%	HA

14	Diagonal of Kite intersect at right angles.	3.6	90	HA
15	A rhombus has another name equilateral quadrilateral	3.6	90%	HA
16	A parallelogram is a polygon whose sides are parallel to each other and the pair of parallelogram sides are equal in length	3.0	75%	HA

In Table 2 above, all the responses of the basic teachers presented High Agreement for Quadrilaterals and their properties.

Research Question 3
What is the extent of agreement of Basic Teachers on use of Regular and Irregular. Pentagon Hexagon, Heptagon for Global Future Development?

Table 3: *Mean and Percentage of Basic Teachers on use of Regular and Irregular. Pentagon Hexagon, Heptagon ... for Global Future Department*

S/N	Items	Mean	Percentage	Remark
17	Pentagon, hexagon, heptagon, Octagon can be regular or irregular	2.6	65%	HA
18	A polygon having five equal angles and also equal sides is called a regular pentagon	2.4	60%	HA
19	Pentagon whether regular or irregular is a polygon with five sides.	3.0	75%	HA
20	Polygons especially regular ones help in bringing out aesthetic values of mathematic for Global Future Development	1.6	40%	LA

In Table 3 above, three of the four (4) responses of the basic teachers presented High Agreement for Regular and Irregular: Pentagon, Hexagon, Heptagon,…and their properties. One item, however presented Low Agreement on use of Polygons especially regular ones in bringing out the aesthetic values of mathematic for Global Future Development.The researchers are aware that basic teachers are curriculum implementers and cannot give knowledge not acquired. This Low Agreement is a problem that needs immediate attention.

Discussion

From table one (1), bearing eight items on triangles, one can view the perceptions of the basic teachers on use of triangle to be very high. This finding is in agreement with

the fact that everyone uses basic mathematics including polygons like triangles (Agwagah, Agashi and Obi, 2019).

The findings of the table two (2) revealed that all the eight (8) items for quadrilaterals were highly utilized by the teachers. This is more pronounced in the use of square for tile production, and the like. This finding is in agreement with Onah (2015) who portrayed square as the highest in use of all the quadrilaterals for technological development.

From table 3, the four items were not greatly used especially regular ones as they help in bringing out the aesthetic values of mathematics for global future development. This low result constitute worries to researchers and need to be addressed the more. The finding is in line with Agwagah, Agashi and Obi (2019) who attributed disadvantage of use of ICT to include non-availability in many areas of life.

Conclusion

Based on the findings, one can conclude that use of polygons in real life situations are needed to remove the abstract nature of some concepts in mathematics. Basic teachers everywhere should after each training, disseminate information on new knowledge gained to everyone in the society for global future development.

Recommendations

1. Training and retraining of basic teachers on current areas are highly called for in other to develop.
2. Practical concepts in the society should be addressed globally from time to time for future development
3. Every teacher (no matter the age should embrace ICT for better understanding of every concept so as to be digital native (born after 1980) or digital immigrant born (born before 1980) according to NTI (2020).
4. Teaching and learning with diagrams should be encouraged.

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