RELATIONSHIP BETWEEN VISUAL PERCEPTION OF GEOMETRIC SHAPES AND ACHIEVEMENT OF STUDENTS IN JUNIOR SECONDARY SCHOOLS.

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Abstract

Visual perception is the primary means by which individuals come into contact with the physical environment. Thus, the knowledge of geometry is basic to understanding the environment in which one lives. This paper attempts to investigate the relationship between visual perception of geometric shapes and achievement of students in geometry. 120 students were purposively sampled from three secondary schools in Kontagora, Niger State. The instruments used for data collection were test of geometric perception from the environment (TGPE) and test of geometric achievement (TGA) adopted and constructed by the researcher respectively. These were face validated and tested for reliability. Their reliability coefficients were 0.60 and 0.67 respectively. Three null hypotheses were formulated and tested at 0.05 significance level. It was found that there was significant relationship between visual perception of geometric shapes and achievement. Also there was significant difference in the mean scores of male and female students in the test of visual perception of geometric shapes from the environment. No significant difference was found in the mean scores of male and female students in the test of achievement in geometry. Based on the results, it was recommended that students should be exposed to the geometry of the immediate surrounding since this will restructure and enhance their cognitive and affective abilities in the learning of geometry.

Introduction

Geometry, a special branch of Mathematics involves the study of spatial relationships (position, shape and size). Its study can be carried out through observations, construction and other descriptions of shapes and location of points in one, two or three-dimensional space (Fajemidagba, 1992). The values derived from the study of geometry are substantial. It has helped to establish to a great extent the relationship between lines or shapes in the environment. It has helped man to think and find out the value of

image produced and how to combine two or three-dimensional shapes to create new ones in the environment. For example, pyramids, squares and cylinders are joined together in artistic work, architectural/ textile design and in other aspects of socio-cultural surroundings.

Geometrical representations and concrete models of this kind have indeed been introduced in classes by inspired teachers and mathematics educators in the process of enhancing reflective thinking and generating interest of the learner (Patronis et-al., 1990; Obioma 1990). Similarly, Warren and English (1995) posit that ability to recognize and manipulate plane shapes has been acknowledged by many educators as having a major intimate relationship between many aspects of mathematical learning such as the ability to visualize mathematically and the ability to conceptualise plane shapes. According to Fajemidagba (1992), to attain level 1 of van-hiele's model of geometric through, ability to identify geometric shapes in physical environment must be acquired. Hence, Fajemidagba's (1992) study revealed that, among randomly selected Junior Secondary School students in Kwara State, 3/5 of the subject had attained this level of geometric thought.

In another related development, Warren and English (1995) reported that, the use of super examples or prototype phenomena served as a visual limitation in geometrical learning. This occurred at the instance when an equilateral triangle is used by the teacher to teach the concept 'triangle' without bringing out the differences and similarities or properties of other triangles for the students to perceive and visualize for better understanding. After all, equilateral triangle is just a member of the triangle family. This imposes limitation of the concept, even though it is central to reasoning. Also, Warren and English (1995) emphasized that geometrical rigidity could affect visual perception and geometrical ability of the students.

In the same vain, Olugbemiro (1998) reported that scientific literature are constantly seeking for the most effective means of conveying scientific information to pupils in the most understandable manner to suit mental and developmental age. Thus, diagrammatic representation is one of such possible ways. Hence, to understand and interpret clearly the 3- dimensional shapes, pupils need to have the understanding of spatial relationships of the diagrams. Therefore, ability to perceive effectively has become very vital in geometry.

It is in the light of this, however, that the way one visually perceives and is able to apply the perception to recognize geometric objects seen in the environment becomes a pedagogical problem for

By the use of test re-test method with two weeks interval the reliability coefficients were found to be 0.60 for TGPE and 0.67 for TGA, using Pearson Product moment correlation coefficient. 4 mathematics educators from Ahmadu Bello University Zaria and Federal College of Education Kontagora respectively plus 5 mathematics teachers from secondary schools face-validated the instruments.

The researcher personally administered the instruments with the assistance of mathematics teachers in the sampled schools. One and a half hours was the time allowed for each of the two tests.

Analysis of Data

The analysis of data was done using the following statistical techniques. Mean, standard deviation, Pearson product moment correlation coefficient and T-test.

Table 1.1 The Mean, Standard Deviation For All Respondents.

Respondents	N	X	SD
All	120	16.17 21.63	5.11 4.18
Male	60	17.77 21.47	4.78 4.12
Female	60	15.28 21.13	5.09 3.94

Hypothesis Testing

Hypothesis 1

There is no significant relationship between students' scores in the test of visual perceptions of geometric shapes and their scores in the test of achievement in geometry.

Pearson product moment correlation was used to test the hypothesis at .05 significance level.

Table 1.2 Relationship Between Students' Scores And The Test Of Visual Perception Of Geometrical Shapes And Their Scores In The Test of Achievement In Geometry.

VARIABLE	N	MEAN	S.D	r cal	r crit	DF
Student geometric perceptions form the environment	120	16.17	5.11	0.34	0.174	118
Student geometric achievement.		21.63	4.18			

Table 1.2 indicates that there is significant relationship between the students' scores in the test of visual perception of geometric shapes and their scores in geometry, because the calculated r-value (.34) is greater than the critical r-value (.174) at .05 significant level and for 118 (DF). Thus, hypothesis 1 was rejected.

Hypothesis 2

There is no significant difference in the mean scores of male and female student's .in the test of visual perception of geometric shapes in the environment.

T-test was used to test the hypothesis at .05 significance level.

Tables 1.3 T-Test Analysis of The Mean Scores of Male And Female Students' In The Test of Visual Perception of Geometric Shapes From The Environment.

Variable	Respondents	N	$\bar{X}$	S.D	t-cal	t-crit	DF
Student achievement in the test of visual perception of geometric shapes from the environment	Male	60	17.77	4.78	2.76	1.66	118
	Female	60	15.28	5.09			

Table 1.3 shows that there is significant difference in the mean scores of male and female students in the test of Visual Perception of Geometric shapes from the environment because the

t-calculated (2.762) is greater than t-critical value (1.658) at .05 significance level and for 118 degrees of freedom. Thus, hypothesis 2 is rejected.

Hypothesis 3

There is no significant difference in the mean scores of male and female students' in the test of achievement in Geometry.

t-test was used to test the hypothesis.

Table 1.4 Analysis of t-Test on the mean Scores of Male And Female Students' As in The Test of Achievement in Geometry.

Variable	Sex	N	Mean X	S.D	t-cal	t-crit	DF
Test of geometric achievement	Male	60	21.47	4.12	0.46	1.66	118
	Female	60	21.13	3.94			

Table 1.4 shows that there is no significant difference in the mean scores of male and female students in the test of achievement in Geometry, because the t-calculated (.462) is less than the critical t-value (1.658) at 0.05 significant level and for 118 degree of freedom. Thus, hypothesis 3 was accepted.

Result and Discussion

The result obtained from the r-calculated and t-test values revealed that there is significant relationship between visual perception of Geometric shapes and achievement in Geometry. Similarly there is significant difference in the mean scores of male and female students in the test of visual perception of geometric shapes from the environment to the favour of the males. However, there is no significant difference in the mean scores of male and female students in the test of achievement in geometry. The results tend to agree with the ones in earlier studies that significant relationship exits between visual perception of Geometric shapes and student achievement (Inekwe 1999; Warren and English, 1995). The lesson to be drawn here is that teaching of Geometry should go beyond the four conners of the classroom. This is to enhance students understanding of geometry and their interest in geometrical learning.

The sex difference in the geometric perception from the environment may have some implications to learning perhaps

because gender difference in the current evidence suggests that at all ages the differences in mathematics performance between men and women are relatively significant, and if anything, they appear to be declining. (Clifford et-al, 1986) in (Freidman 1989).

Hence it is not surprising that few females enter into the rigour of mathematical concentration and activities. However no significant difference was observed in the scores of both sexes on the test of achievement in geometry, which implies that, achievement is not attributable to gender. Therefore the argument that males score higher than females in mathematics is contrary to traditional wisdom, females actually out perform males in mathematics in elementary and middle schools although by only a tiny amount. (Clifford 1986 et-al) in (Fennema and Lamor 1990).

Recommendation

In view of the findings of this study, the following recommendations are made; students should be exposed to geometry since, this will restructure their cognitive and affective abilities in geometry. Therefore, the teachers of mathematics should use appropriate reinforcing techniques to improve students' views of the geometry of their immediate surrounding. Similarly, because geometry is important to almost all branches of mathematics (Fajemidagba, 1992), mathematics teachers should improve their geometric teaching skills and be current in the latest information on general issues that relate to mathematics in general and geometry in particular.

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