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Increasing Primary School Pupil's Interest, Self-Concepts and Achievement in Trigonometry and Geometry Using Peer Teaching Approach

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Abstract

This study focuses on the effect of peer teaching approach on primary schools pupils' interest, self-concept and academic achievement of geometry and trigonometry. The objectives of the study were to: determine the level of interest by Primary School Pupils in learning geometry and trigonometry when peer teaching approach is used as instructional strategy, Find out the level of self-concept pose by primary school pupils exposed to peer teaching approach and Determine the Academic Achievement of Primary school pupils who are exposed to peer teaching approach. The study adopted quasi-experimental design. Sample of 50 pupils were used for data collection. Results of the study revealed that there is a significant difference on pupils' interest, self-concept and academic achievement when exposed to peer teaching approach. As all the three hypotheses were accepted at 5% level of significance. It was recommended that teachers should incorporate group learning among pupils in other to build their competency.

Keywords: Self-concepts, Peer teaching, Interest, Geometry & Achievement

INTRODUCTION

Mathematics teaching in Primary Schools is still unsatisfactory. Despite the recognition accorded to the values of mathematics in our society, there are people who do not engage in solving simple tasks of the day. Kesiki and Bernard (2017) posited that in the course of teaching and interacting with students at different levels over the years, it is obvious that most of the students do not like mathematics as a subject taught in our schools. Focusing on how some selected mathematics branches are been taught by teachers, many of the teachers are those who memorized formulas and students lose focus when taught by such classes of teachers. Generally, mathematics enables an individual to reason well and interact in the society with a cultivated mind. It also trains the reasoning faculty of human, thereby helping pupils to developed intelligence. Indeed, it is difficult for anyone who is mathematically illiterate to function and interact well in today's world because such person will be severely handicapped.

Relatively, it is therefore to note that Nigeria as a nation needs to put hands on deck to build strong Mathematics skills in order for their learner to possessed interest, improve on their level of retentiveness and increase on their achievement. Iyekekpolor (2016) pointed that for a student to farewell in mathematics, he must fare well in the concepts and topics that make up mathematics including geometry and trigonometry. The researcher further purports that students' achievement in geometry and trigonometry has been low hence their concomitant low achievement in mathematics. Geometry and trigonometry plays a significant role in primary and secondary schools mathematics curricula in Nigeria and other countries, yet students failed to pick up interest, developed self-confidence and improve on their achievement in school examination and even the external exams conducted by WAEC and NECO. In spite of the role geometry and trigonometry plays in the field of mathematics, some concepts and shapes remain abstract to pupils. Children finds it difficult to recognized shapes and figures during their primary school education and they bring to such knowledge to secondary school which make mathematics concepts more difficult to retain.

However, to explore self-concepts, interest and upgrade students' achievement in geometry and trigonometry, the need to involved pupils to think, suggest and create knowledgeable facts between themselves could foster their understanding of Mathematics generally. As such, the researcher attempt to find out if peer teaching approach could help to increase

primary school pupils' interest, self-concepts and achievement in geometry and trigonometry. Though, some teaching method like conventional teaching method has its own usefulness but may not be an effective instructional method for improving students' achievement in skill-based subjects because students involvement in teaching and learning process is low, and this makes students rely on their teachers for their learning needs (Ezeagba, 2014; Mohammed, 2011). Recent findings by Charles, Hercy, Zhi-Hong, Calvin and Tak-Wai (2019) addressed that the existence of a significant percentage of low achieving students is probably due to teacher-led instruction, which still dominates mathematics classrooms in most Asian countries. A study by Lazarus (2014) revealed that peer tutoring has been researched as an effective strategy to engage students and promote academic success, it improves mathematics performance for students at risk or experiencing mathematics disabilities.

Peer teaching may be defined as s flexible teaching strategy in which half of the students (pupils) serve as academic teachers (tutors) and the other half serve as academic tutees (learners) (Topping, Dura and Van Keer, 2015). In view of the foregoing, peer teaching approach is a very old practice but a very insignificant interest by teachers are put on, to improve on students self-concept and interest of learning mathematics particularly geometry and trigonometry. These branches of mathematics are more of practical, visualizing and generating ideas, peer teaching approach in broad sense can increase to both the learner teaching and those taught. It is very clear to note that peer teaching strategy is not necessarily only about transmission from the more able experienced (those who already have skills of the concepts among the pupils) to the less able (those who are yet to acquire the skills). Evidently, both the experienced and inexperience pupils gain more skills to take home when they are allow to study cooperatively. Vividly, Topping (2011) excellently relates that peer tutoring (teaching) is often promoted on the grounds that, for the tutors, it is learning by teaching. He further noted, expanding on the old adage which says 'to teach is to learn twice'.

As a matter of fact, an increase in students' self-concepts usually results in an increase in their Academic achievement (Cvencek, Frybergs, Covarrubias and Meltzoff, 2018). So it goes to their interest. It is believe that Achievement is the transparency of pupils' interest. When pupils have positive interest while learning, they developed good sense of belonging and improve on their achievement. Studies by Charles, Hercy, Zhi-Hong, Calvin and Tak-Wai (2019) found out in their research study that there is an increase in students'

mathematics achievement, especially in the calculation and word problems. The further revealed that both the low-achieving students and the high-achieving students in the experimental school maintained a rather high level of interest in mathematics.

Statement of the Problems

Peer learning is still given less consideration by teachers of primary schools in Nigeria. Many of the pupils are those who rely on their teachers' upbringing and teaching styles to the level of their graduation in Primary Education. As such, pupils find it difficult to relate to one another and discussed their learning difficulty in schools. As documented by Colmar, Liem, Connor and Martin (2019); Sewasew and Schroeders (2019) that students with high self-concept may see failed attempts as exciting challenges and new opportunities while students with low self-concept will doubt their own abilities and give up early after few attempts. This scenarios supposed to be corrected in peer teaching strategy classroom, where pupils are allow to discuss their individual learning difficulty and perceptions through the guidance of the teacher but reverse is the different we faced with in our primary schools. Besides, transition from primary schools to secondary schools, pupils tend to loss interest as a result of poor skills to assimilate some mathematical concepts, geometry and trigonometry are not in exception. Many studies like Charles, Hercy, Zhi-Hong, Calvin and Tak-Wai (2019); Lidon and Francisco (2019); Uroko (2010); Ra'ed and Reem (2019) undertook research studies on interest, self-concept, Achievement and peer-tutoring which are not enough to filled research gaps, that is why the present research paper sought to investigate on increasing primary schools pupils' interest, self-concept and academic achievement in geometry and trigonometry using peer teaching approach. In view of the attempt, the pupils' in primary schools have a poor image when it comes to their interest in mathematics education, as suggested by other researchers, it could be the used of inappropriate instructional strategy which is not supportive. In this essence, the study will empirically find out answer to the question; does use of instructional strategy by the Mathematics Teacher, determine students interest, Self-concepts and Achievement in Primary Schools? An Evident to find out answer to the question will be the used of Peer teaching Approach which are not usually practiced by most teachers of Primary Schools.

Purpose of the Study

The broad objectives of this study is to investigate the increasing interest, Self-concepts, Achievement of Primary Schools Pupils in geometry and trigonometry using peer teaching Approach. Specifically the study sought to:

i. Determine the level of interest by Primary School Pupils in learning geometry and trigonometry when peer teaching approach is used as instructional strategy;

ii. Find out the level of self-concept pose by primary school pupils exposed to peer teaching approach;

iii. Determine the Academic Achievement of Primary school pupils who are exposed to peer teaching approach.

Research Questions

The following Research Questions are formulated to guide the Study:

i. To what level of interest does Primary School Pupils have in learning geometry and trigonometry when exposed to peer teaching approach?

ii. What level of Self-concepts does Primary School Pupils have in learning geometry and trigonometry when exposed to peer teaching approach?

iii. What is the Academic Achievement of Primary School Pupils who are exposed to peer teaching approach?

Research Hypotheses

HO_1: There is no significant difference on Pupils interest when exposed to peer teaching approach

HO_2: There is no significant Difference on Pupils Self-concepts when exposed to peer teaching approach.

HO_3: There is no significant Difference on Pupils Academic Achievement when exposed to peer teaching approach.

MATERIALS AND METHODS

The Design for this study is Quasi-experimental design for Pre-test, post-test. The sample is made up of One hundred and twenty Pupils, selected randomly from six Primary schools in Zing Local Government Area of Taraba State. Of this, 50 Pupils were selected from Primary five and six respectively. The instruments for the research were split into three (3). First instruments were 06 structured questions on Pupils Interest (Pupils Mathematics Interest Questionnaire), the second was on self-concepts also comprises of 06 Questions (Pupils Mathematics Self-concepts Questionnaire) and the other was also 10 questions (Pupils Achievement test). The PMIQ is in three dimensions namely: attitude, initiative & confidence. Both PMIQ and PMSCQ were answered using means and standard deviation with criterion mean of $\bar{x} > 3.0$ termed as Accepted and $\bar{x} < 3.0$ is not accepted. While Pupils Academic Achievement was scored based on Pupils responses to the Questions provided to them by the researcher in the selected schools. The 50 Pupils were divided into two groups 25 each. This was done in order to expose them to peer teaching approach and thereafter administer the achievement test to them. However, pupils with experience in trigonometry and geometry in primary five and six were selected and grouped together, considering them as tutors out of which 25 were selected and the remaining 25 were those who have no experience in trigonometry and geometry considering them as tutee. IBM SPSS Statistics version 23 package was used to analyze data from the respondents.

RESULTS

Research Question I

To what level of interest does Primary School Pupils have in learning geometry and trigonometry when exposed to peer teaching approach?

Table 1: Pupils Level of interest in Geometry and Trigonometry when Exposed to Peer teaching Approach.

S/N	Items	SA	A	D	UD	SD	X	SD
1	My teachers attitudes generally make me fear mathematics	15	09	06	03	17	3.04	1.6728
2	I pick more interest in geometry topics when we learnt together with my colleagues.	19	12	15	04	00	3.84	1.0000

3	I like the way our teacher initiate the class that everybody must contribute when learning in the class.	03	07	10	05	25	2.16	1.3321
4	I pick interest in trigonometry topics when my colleague teach me.	18	17	05	05	05	3.76	1.3048
5	I have good grade in trigonometry and geometry because it is quite interesting.	13	12	07	10	08	3.24	1.4361
6	I prefer my teachers style of teaching than by classmate	12	09	11	09	09	3.12	1.4232

Note X ≤ 3.00 is Rejected and X ≥ 3.00 is Accepted.

From the results in table 1, all the items were accepted at the decision rule of 3.00 points except item Number 3 was rejected.

Research Question 2

What level of Self-concepts does Primary School Pupils have in learning geometry and trigonometry when exposed to peer teaching approach?

Table 2: Pupils Self-concepts in Geometry and Trigonometry when Exposed to Peer teaching Approach.

S/N	Items	SA	A	D	UD	SD	X	SD
7	Are your peers good enough to teach you Mathematics generally?	12	16	00	02	20	2.96	1.7083
8	I have some colleagues who are competent enough to handle problems in geometry and trigonometry	05	07	11	03	24	2.32	1.4344
9	I translate the knowledge learnt in the class even to make used of them at home.	16	07	16	09	02	3.52	1.2205
10	I perceived a positive response when tutored by my classmate in school environment.	11	11	13	00	15	3.06	1.5154
11	I have higher scores compare to when our teacher teaches us	03	11	10	01	25	2.32	1.4204
12	My classmate that are good in mathematics explains to us better than the way our teacher does	12	09	11	09	09	3.12	1.4232

Note X ≤ 3.00 is Rejected and X ≥ 3.00 is Accepted.

Results in table 2 indicates that items 5, 2 and 1 were rejected at the criterion Mean Scores of 3.00 points. It shows that peers in the selected primary schools are not good enough to

teach their Classmate with low experience in Mathematics, they are not competent to handle geometry and trigonometry topics in the study area. While items 3, 4 and 6 were accepted. The level of self-concepts of pupils allow them to translate knowledge learnt in the Class to help them at home in carrying out daily activities, the pupils perceived a positive response when tutored by their classmate and that their classmate who are good in Mathematics can explain better to them than their teacher.

Research Question 3

What is the Academic Achievement of Primary School Pupils who are exposed to peer teaching approach?

Table 3: Mean and Standard Deviation of Pupils Achievement Exposed to Pe teaching Approach.

	N	Sum	Mean		Std. Deviation
Selected Pupils'	Statistic	Statistic	Statistic	Std. Error	Statistic
Pretest	50	987.00	19.7400	1.58740	11.22463
Posttest	50	1479.00	29.5800	1.23391	8.72503
Valid N (listwise)	50				

From the results in table 3, the pretest results of the pupils was 19.7400 and after exposing them to peer teaching approach, their results of mean scores was 29.5800 respectively.

Table 4: Pupils Achievement Grouped based on the Experience in Geometry and Trigonometry using peer teaching approach.

	N	Sum	Mean		Std. Deviation
Group	Statistic	Statistic	Statistic	Std. Error	Statistic
Tutee (Inexperience Pupils)	25	734.00	29.3600	1.92776	9.63881
Tutors (Experience Pupils)	25	745.00	29.8000	1.58008	7.90042
Valid N (listwise)	25				

The mean achievement of pupils exposed to peer teaching approach shown 29.36 and 29.80 respectively. This mean that their differences was just 0.44. Thus peer teaching approach can increase primary school pupil's achievement in geometry and trigonometry.

Hypothesis 1

HO_1: There is no significant difference on Pupils interest when exposed to peer teaching approach

Table 5: Chi-square Test of Pupils Response on their Interest in Geometry and Trigonometry when Exposed to Peer teaching Approach

	item1	item2	item3	item4	item5	item6
Chi-Square	14.000[a]	8.080[b]	30.800[a]	18.800[a]	2.600[a]	.800[a]
df	4	3	4	4	4	4
Asymp. Sig.	.007	.044	.000	.001	.627	.938

a. 0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 10.0.

b. 0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 12.5.

From the results above, items 1, 2, 3 and 4 were all rejected based on pupils' responses. It means that the enumerated items agrees that there is significant difference on pupils interest when exposed to peer teaching approach and while items 5 and 6 were retain that there is no Significant difference on pupils interest when exposed to peer teaching approach.

Hypothesis 2

HO_2: There is no significant Difference on Pupils Self-concepts when exposed to peer teaching approach.

Table 6: Chi-square Test of Pupils Response on their Self-concept in Geometry and Trigonometry when Exposed to Peer teaching Approach

	item7	item8	item9	item10	item11	item12
Chi-Square	14.320[a]	28.000[b]	14.600[b]	.880[a]	35.600[b]	.800[b]
Df	3	4	4	3	4	4
Asymp. Sig.	.003	.000	.006	.830	.000	.938

a. 0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 12.5.

b. 0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 10.0.

Results in table 6 indicates that items 7, 8, 9 and 11 were rejected based on the test at 5% level of significance, it follows that the responses supports that there is significant difference on pupils Self-concepts when exposed to peer teaching approach. Only items 10 and 11 retain the null hypothesis that there is no significant difference on pupils Self-concepts when exposed to peer teaching approach. Thus, since majority of the responses rejects the null hypothesis, we conclude that pupils believes that there is a significant difference on pupils' self-concepts when exposed to peer teaching approach.

Hypothesis 3

HO_3: There is no significant Difference on Pupils Academic Achievement when exposed to peer teaching approach.

Table 7: Tests of Between-Subjects Effects for Mean Achievement Scores of Pupils Exposed to Peer teaching Approach

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	342.227[a]	1	342.227	4.849	.033
Intercept	7478.769	1	7478.769	105.958	.000
Pretest	342.227	1	342.227	4.849	.033
Error	3387.953	48	70.582		
Total	47479.000	50			
Corrected Total	3730.180	49			

a. R Squared = .092 (Adjusted R Squared = .073)

From table 7 the ANCOVA was significant, F (1, 49) = 4.849, P < 0.05. Therefore, the null hypothesis was rejected and it was concluded that there is a significant Difference on Pupils Academic Achievement when exposed to peer teaching approach.

DISCUSSION

The study from the data analysis revealed that pupils pick interest in trigonometry and geometry topics when they learnt together with their colleague. They also believes that their teachers' styles of teaching is preferable to them. Based on further findings, which revealed that there is a significant difference on pupils' interest when exposed to peer teaching approach and also there is significant difference on pupils self-concepts when exposed to peer teaching approach, it supports Cvencek, Frybergs, Covarrubias and Meltzoff (2018) who found that an increase in students' self-concepts usually results in an increase in their academic achievement. Thus, it goes same to an improvement in their interest. Again, the pupils pretest achievement test scores was below the posttest of the mean scores. It might be as a result of poor used of instruction. In this case, it supports the contribution of Charles, Hercy, Zhi-Hong, Calvin and Tak-Wai (2019) who also found that there is an increase in students' mathematics achievement including trigonometry and geometry when peer teaching approach is used. In this research paper, it was revealed that there was a significant difference on pupils' academic achievement exposed to peer teaching approach as the test of between subject's effects for mean achievement scores of pupils exposed to peer teaching approach was significant i.e. there is a significant difference on pupils' academic achievement when exposed to peer teaching approach.

CONCLUSION

Based on the Findings in this research paper, it was concluded that pupils' interest, self-concept and Academic Achievement can be increased using peer teaching approach. However, Pupils exposed to peer teaching approach have differences on their interest, Self-concepts and Academic Achievement compared to those who are not exposed to the teaching approach.

Recommendations

It recommended in this study that: -

i. There is need for the Mathematics teachers to Allow Pupils to contribute on their pace in other to increase their learning interest of Trigonometry and Geometry topics.

ii. Teachers should incorporate group learning among pupils in other to build their competency.

iii. It was recorded that those who learnt from their experience Colleague performed better, so, the need to encourage peer tutoring should be vice versa. Do not allow certain individuals to keep tutoring their colleague.

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