

## **Effects of Same-Age Peer-tutoring on Orthopaedic Impairment Students Achievement in Geometry in Senior Secondary Schools, Oyo State**

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### **Abstract**

*This study examined the effects of peer tutoring teaching strategy on orthopaedic impairment students achievement in geometry in Senior Secondary Schools II Oyo State. The study employed pre-test, posttest, control group quasi experimental design. The population consists of 25 orthopaedic impairment students' in all inclusive Senior Secondary Schools II Oyo State. The sampling technique used is intact. The instruments used were Students Mathematics Anxiety Rating Scale (SMARS) ( $r=0.85$ ) Geometry Achievement Test for Students' (GATS) (KR 20 = 0.97), Geometry Lesson Plan (GLP) and Geometry Lesson Notes (GLN). Seven hypotheses were postulated and tested. Data were analyzed using ANCOVA. The results revealed significant main effect of treatment on students' with orthopaedic impairment achievement in geometry ( $F_{(2, 23)} = 12.94$ ;  $p < 0.05$ , partial  $\eta^2 = 0.65$ ). There was no significant main effect of*

*gender on students' with orthopaedic impairment achievement in geometry ( $F_{(1, 24)} = .03$ ;  $p > .05$ , partial  $\eta^2 = .002$ .  $\eta^2 = 0.03$ ). It was concluded that treatment have no effect on gender and anxiety on students' with orthopaedic impairment academic achievement. It was suggested that same-age peer tutoring should be employed to enhance orthopaedics impairment students' achievement in geometry*

**Keywords:** Orthopedic Impairment, Same-Age Peer Tutoring, Geometry, Achievement

**Word Count:** 144

### **Introduction**

Mathematics is a subject that study number patterns, measurement and number theories. It form basis for science and technology with many branches such as algebra, geometry, calculus, statistics, real analysis, complex analysis, mathematical modeling and topology (Ayeni, 2012). Olunloyo (2010) opined that Mathematics is a gatekeeper and air bag of intelligence, it is a pillar that form basis for creativity, logical reasoning and critical thinking. Mathematics has branches out of which every discipline form it ground. It is seen as a backbone of science and technology that prepare pupils for a useful and meaningful living and gives direction to human activities (Ekwueme & Onaife, 2017). One of the branches of mathematics is geometry.

Geometry is a branch of mathematics that express patterns, construct logical preposition or assumption by which ideas and concepts are convey; it is a way of organizing a logical proof that gives insight into the power of human mind and becomes a challenge to intellectual curiosity (Malik, 2017). But despite the importance of geometry to humanity, the performance of most secondary school students' in it is not encouraging. West Africa Examination Council (WAEC) Chief Examiners' reports of 2017, 2018 and 2020 indicated that secondary school students avoid to answer geometrical questions during external and internal examination and those that answer them failed (Popoola, 2004). This poor performance does not only peculiar

to certain categories of students but also included orthopaedic impaired students. Orthopaedic impaired students are students on wheelchair; students on crutches and students with amputated arms or legs these categories of students have challenges that affect their psychomotor domain which in turn made them unable to hold pen and write extensively in the classroom and during the period of examination (Berry, & Domene, 2017).

Mangan (2015) observed that the predicament faced by orthopaedics impairment students discouraged them to grasp the geometrical concepts, numerical facts, and procedures during teaching and learning process. Orthopaedics impairment students failed geometry because of their unreadiness and inadequate concentration during teaching and learning process, they find it difficult to recall, identify and reorganize geometrical concept in the instruction given during the lesson.

For instruction to be effective appropriate instructional material need to be employed Julie (2015). There are various process under peer tutoring these are: Cross Age Peer Tutoring (CAPT); class wide Peer tutoring (CWPT); Reciprocal Peer Tutoring (RPT) and Peer Assisted Learning Strategies (PALS) (Usman & Musa, 2015). Same-Age Peer Tutoring conveys knowledge and skills that one student has mastered to other students of the same age under supervision of a teacher. Peer teaching is a mutual learning process in which students of the same age teaches others the desired skills and knowledge under the supervision of the subject teacher to guide and correct where necessary. In same-age peer tutoring the tutor benefits from reinforcing existing knowledge of fundamental concepts and gaining a better understanding of the concepts (Kapil & Malini, 2017).

Same-age peer tutoring is an instructional strategy that consists of students' of the same-age peer together in order to share experience ideas and to have same academic achievement in Geometry. Adegoke, (2013) explained that same- age peer tutoring aids retention, raises students' self-esteem, allows for higher rates of student response and feedback, creates more opportunities for students to practice specific

skills, helps student tutor to gain deeper understanding of a topic by teaching it to another student.

Nevertheless, gender tells more on the performance of students in mathematics. There is general belief that male students perform better than female students in mathematics simply because female students' were burdened with domestic work and as a result have less time for their study. In some cases, gender difference influences the performance of orthopaedic impairment students' achievement in geometry as well, female students may have zeal to learn mathematics than male students this is so because female love reading and this act of reading can be transfer to the learning of mathematics. But to some people male students are believe to perform better than female from the fact that male students have no time for social engagement.

Moreover, anxiety has been linked with academic achievement of students with orthopaedic impairment. Anxiety is a panic and mental disorganization exhibited by students when solving problems (Isa 2017). Anxiety is often detrimental and debilitating to academic achievement of students with orthopaedic impairment. Etsu and Manko, (2019) observed that teachers approach to teaching and learning of geometry is found to play a major part in gender disparity and mathematics anxiety that resulted in poor performance of students with orthopaedic impairment. Teachers' systematically adoption of guided explicit method while teaching geometry to students with orthopaedics impairment will facilitate understanding, anticipate common misconceptions, highlight essential content, and remove distracting information during teaching and learning process. The future of Nigeria is at stake if the failure rate of students in geometry is not reduced or eradicated. The problem confronting orthopaedics impairment students in geometry were solved by same-age peer tutoring strategy in United State of America many years back (Owan, & Robert, 2019). Since this problem had been solved outside Nigeria however, the study want to examing whether same-age peer tutoring strategy can be used to solve the same problem confronting orthopaedics impairment students' achievement in geometry in Oyo State.

### **Statement of the Problem**

The poor performance of orthopaedic impaired students in mathematics is attributed to the challenges they have. Although, several study revealed that orthopaedic impairment students in other advance countries learned under conducive environment and given special consideration but reverse is the case in Nigeria. These category of students have finding it difficult to interpret, analyze and solve problems on geometry because of their predicament. These predicaments include physically deformed, amputated hands or legs and cerebral palsy. Before learning can take place, learners must be able to write legibly, physically balance and withstand stress. Majority of orthopaedic impaired students writing are not legible enough to read, the examiners find it difficult to read what they put down on their examination scripts and this affects their performance in geometry. Also, students on wheelchairs and students using crutches are restricted to some extent that not everywhere they can access in the classroom due to their condition. Some Mathematics teachers do frustrate students with orthopaedic impairment because they see them as a threat to their teaching profession. However, this study seeks to examine the effect of peer-tutoring and explicit strategies on academic achievement of students with orthopaedic impairment in geometry in senior secondary schools Oyo State.

### **Aim and Objectives of the Study**

This study aims to examine the effectiveness of same-age peer tutoring strategy in the teaching of geometry to students with orthopaedics impairment in senior secondary schools Oyo State.

### **Hypotheses**

Based on the stated objectives, the following null hypotheses was postulated and tested at a 0.05 level of significance.

H<sub>0</sub>I: There will be no significant effect of treatment (Same-age Peer Tutoring and Conventional Strategy) on orthopaedics impairment students achievement in geometry.

H<sub>0</sub>2: There will be no significant effect of gender on orthopaedics impairment students' achievement in geometry.

H<sub>0</sub>3: There will be no significant effect of mathematics anxiety on orthopaedics impairment students' achievement in geometry.

### **Methodology**

The study adopted the pretest, posttest control group quasi-experimental research design. The study employed one experimental groups and one control group; the experimental groups was exposed to same age peer tutoring strategy, while the control group was exposed to the conventional strategy. The population for the study are 25 orthopaedic impaired students. in Ijokodo High School Ibadan. The sampling procedure used was intact sampling techniques was used to select Fifteen (15) students from Chesire High School Oluyole Ibadan and ten (10) students from Ijokodo High School Ibadan. The instruments that were used to collect data were Students Mathematics Anxiety Rating Scale (SMARS); Geometry Lesson Plan (GLP); Geometry Lesson Notes (GLN) and Geometry Achievement Test for Students (GATS). The instruments were validated under content, construct, and face validity. The reliability of the Mathematics Anxiety Rating Scale, Cronbach's Alpha was used. The reliability coefficient obtained was  $r = 0.85$ . To ensure its reliability using Kuder Richardson Formular (KR20). The reliability coefficient of  $r = 0.97$  was obtained. The data collected were analyses using inferential statistics of Analysis of Covariance (ANCOVA).

### **Results**

This chapter presents the results, analysis and discussion of findings. The results and discussion of findings were presented based on the respondents' demographic data analysis, hypotheses and discussion of findings.

H<sub>0</sub>1: There will be no significant effect of treatment (Same-age Peer Tutoring and Conventional Strategy) on orthopaedics impairment students achievement in geometry.

**Table I : Analysis of Covariance (ANCOVA) showing main effect of treatment on students with orthopaedic impairment achievement in geometry.**

Source	Type III Sum of Square	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	292.141	10	29.214	5.692	.002	.803
Intercept	115.197	1	115.197	22.443	.000	.616
Pre achievement	94.941	1	94.941	18.497	.001	.569
Treatment	312.796	2	66.398	12.936	.001	.649
Gender	.132	1	.132	.026	.875	.002
Mathematics Anxiety	26.504	1	26.506	5.164	.039	.629
Treatment x Gender	1.182	2	.591	.115	.892	.016
Error	71.859	14	5.133			.000
Total Corrected	24080.000	25				
Total	364.000	24				

R. Squared = .80 (Adjusted R Squared = .66) Denotes significant  $p < .05$   
Source: *Fieldwork*,

Table revealed that there was a significant main effect of treatment on students' with orthopaedic impairment achievement in geometry ( $F_{(2, 23)} = 12.936$ ;  $p < 0.05$ , partial  $\eta^2 = 0.649$ ). The indicated effect size of 65.0% means that 65.0% of the total 66.0% variation observed (Adjusted  $R^2 = .66$ ) in students' with orthopaedic impairment post-achievement scores in geometry in this ANCOVA model was due to the significant main effect of the treatment. Therefore, hypothesis I was not accepted.

H<sub>0</sub>2: There will be no significant effect of gender on orthopaedics impairment students' achievement in geometry.

It also revealed in the table that there was no significant main effect of gender on students' with orthopaedic impairment achievement in geometry ( $F_{(1, 24)} = .026$ ;  $p > .05$ , partial  $\eta^2 = .002$ ). Therefore, hypothesis 2 was upheld. This means that gender had no effect on students' with orthopaedic impairment achievement in geometry.

Moreover, the table also indicated that there was a significant main effect of mathematics anxiety on orthopaedic impairment students' achievement in geometry. ( $F_{(1, 24)} = 5.164$ ;  $p < .05$ , partial  $\eta^2 = .629$ ). Hence, hypothesis 3 was rejected. This means that mathematics anxiety had effect on students' achievement in geometry. The table also revealed the effect of 62.9% which means that 62.9% of the variation in students' with orthopaedic impairment post-achievement scores in geometry was caused by main effect of mathematics anxiety.

### **Discussion of Findings and Implications**

The result showed that same-age peer tutoring was effective in improving the orthopaedic impairment students' achievement in geometry, while conventional strategy (Control) was least effective. Same-age peer tutoring is better than conventional strategy because learners within the same-age range relate together and solve problems together under the supervision of their teacher. These findings are in line with the study revealed that same-age peer tutoring gives room for students of the same age range to transmit knowledge, skills and ideas on how to solve mathematics problems among themselves (Tiamiyu, Salman & Issau, 2016).

Same-age peer tutoring is an intervention strategy that paired students that is above average with students below average in order to improve their performance, it increase students' participation, motivation and attendance rate (Malik & Salman, 2018). This is in agreement with the study that students of the same age range do free to interchange knowledge, skills and ideas during learning process (Fuentes, Myers, Swars, Smith & Smith, 2020). Furthermore, Same-age peer tutoring required students' attention, involvement and collaboration when solving problems related to geometry (Oladosun,



2009). The result also showed that orthopaedic impairment students taught with same-age peer tutoring achieved more than those taught by conventional strategy (Ching, 2017) contradicting the findings of Oragwam, (2006) that maintained that there was no significant effect of the peer tutoring strategy on students' achievement in science subjects. The contradiction might be due to disparity in the socio-cultural environment of the researchers which carried out the study among learners in one South Texas school district, in the United State of America.

Moreover, the finding of this study also revealed that there was no significant main effect of gender on orthopaedic impairment achievement students in geometry. This means that gender did not affect orthopaedic impairment students' achievement in geometry. The result of this finding supported the findings of Sinnes, (2006) that reported that gender difference does not affect students' achievement in learning (Scada, Jacobs, Becker & Glimer, 2015). The finding also revealed no significant difference between male and female students' achievement in mathematics contradicting the opinion of (Jacob & Linus, 2017) that shown that females achieved more than males in geometry.

This finding also revealed that there was a significant main effect of mathematics anxiety on orthopaedic impairment students' achievement in geometry. The result obtained in this study agree with the findings of (Peter, 2017) that reported the level of anxiety exhibited was related to the score obtained in a standardized Mathematics test (the high the anxiety level the less the score obtained. Ching (2017) reported a significant relationship between anxiety and achievement which contradicts the observation of Mahoney (2019) that said there is no significant difference between mathematics Anxiety and Mathematics performance.

Anxiety is seen as self-preoccupation with low self-esteem it leads to negative evaluation, lack of concentration, unpleasant physiological reactions, and low proficiency in test performance (Chapell & Mccann, 2017). The findings confirm the finding of (Campbell, Blanding, Takahashi, Silverstein, Newman, Gubi & Mccann, 2019) that

mathematics anxiety plays a significant role in academic settings and prevent some students from realizing their fullest academic potentials. This is in agreement with the findings of Ezeudu (2018) that reported a negative significant relationship between mathematics anxiety and achievement. The study was also in consonance with the findings of Akinsola & Nwajei (2013), whose study revealed that mathematics anxiety and depression are negatively related to academic performance.

### **Conclusion**

This study determined the effects of Same-age Peer Tutoring and Guided Explicit on academic achievement in Geometry of Students with Orthopaedic Impairment. It can be concluded from the study that students with orthopaedic impairment performed better in Geometry if Same-Age Peer Tutoring Strategy are used by the teacher to teach them. In addition, when Students with Orthopaedic Impairment are exposed to this teaching strategies, it will enable them to improve and have remarkable academic achievement in Geometry.

### **Recommendations**

The following recommendations are made based on the findings:

- i. To improve Students with Orthopaedic Impairment achievement in Geometry, Same-age Peer Tutoring Strategies should be adopted by Mathematics teachers.
- ii. Teacher should ensure that students with orthopaedic impairment are carried along during teaching and learning process irrespective of their sex to improve their performance in Geometry.
- iii. Mathematics teachers should endeavour to make students with orthopaedic impairment participate in the teaching and learning in order to reduce or eradicate their fear for mathemat

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