

**THE IMPACT OF PEER TUTORING AND COOPERATIVE LEARNING  
ON STUDENTS MATHEMATICS PERFORMANCE IN SECONDARY  
SCHOOLS**

**“A Case Study of Secondary Schools in Ibadan North Local  
Government of Oyo State”**

**BY**

**H. O. Aliu**

**MATRIC. NO: 07/081041**

**ECONOMICS/MATHEMATICS**

**A PROJECT SUBMITTED TO THE DEPARTMENT OF MATHEMETICS  
EMMANUEL ALAYANDE COLLEGE OF EDUCATION, OYO.**

**IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE  
AWARD OF NIGERIA CERTIFICATE IN EDUCATION (NCE)**

**JULY, 2014.**

**CERTIFICATION**

This is to certify that this project was carried out by H. O. Aliu and has been read and approved for the Department of Mathematics, at Emmanuel Alayande College of Education, Oyo.

.....  
MR. WAHEED A.A.  
SUPERVISOR

.....  
SIGNATURE AND DATE

.....  
MR. ASIRU T.M.  
HEAD OF DEPARTMENT (H.O.D)

.....  
SIGNATURE AND DATE

## **DEDICATION**

This project is dedicated to Almighty Allah, who has seen me through this programme.

## **ACKNOWLEDGMENT**

All praise and adoration belongs to Allah, he Lord of the Universe. I give thanks to him for his protection and guidance over me throughout the four years course of study.

I further thank my loving parents, Mr. and Mrs. Aliu for their support and encouragement. I wonder if I could have gone this far without them.

My sincere appreciation goes to my project Supervisor, Mr. Waheed A.A for putting me through in times of hardship and confusion.

I would not forget to thank my Coordinator Mr Adisa A.A, my mentor Mr Oyekanmi (Asst. Coordinator) and all my lecturers especially Mr. Odekunle for their immense contribution to this success.

And to my brothers, sisters, fellow colleagues, course mates and friends, I say a very big thank you. May the Lord reward you all abundantly.

## **ABSTRACT**

Peer tutoring and Cooperative learning are common instructional strategies used in classrooms. Peer Tutoring is a teaching strategy that involves people from similar social groupings who are not professional teachers helping each other to learn and learning themselves by teaching while Cooperative learning involves students working together in groups towards a common goal in a teaching-learning situation. This study was therefore carried out to determine the effectiveness of these methods of teaching on student mathematic achievement.

This study involved 200 students selected randomly from 5 secondary schools in Ibadan North Local Government Area of Oyo State i.e 40 students per school. The 40 students in each school were divided into two groups of 20 students each. A group, the control group was guided through peer tutoring by the researcher and later divided into five sub-groups of 4 students each for the cooperative learning session. The other group studied individually as in the traditional classroom setting. A set of 10 questions was given to the students on the mathematical concept revised to evaluate them.

This study investigated whether there is significant difference in the performance of students that took part in cooperative learning and peer tutoring and those taken in the normal classroom setting.

Pearson's product moment correlation method was adopted to analyze the data collected (i.e the score of the students after evaluation). It was found out from the result that the mean score of students that were taken with Peer Tutoring and Cooperative learning was greater than that of those taken in the normal classroom setting. There was also a positive correlation in their performance.

## TABLE OF CONTENTS

Title page	i
Certification	ii
Dedication	iii
Acknowledgement	iv
Abstract	v
Table of content	vi-viii
<b>CHAPTER ONE</b>	<b>1</b>
1.0 Introduction	1
1.1 Historical Background of the study	1
1.2 Problem Statement	2 – 3
1.3 Purpose of the study	3
1.4 Research objectives	3
1.5 Scope and Limitation	4
1.6 Research Questions and Hypothesis	4 – 5
1.7 Justification of the study	5 – 6
1.8 Definition of Terms	6
<b>CHAPTER TWO</b>	<b>7</b>
2.0 Review of Literature	7
2.1 What is Peer Tutoring?	7 – 8
2.2 Benefits of Peer Tutoring	8 –14
2.3 Peer Tutoring and Confidence	14–16
2.4 Peer Tutoring and Achievement	16–17
2.5 Role of the teacher in Peer Tutoring	17–19
2.6 Summary and Conclusion on Peer Tutoring	19–20
2.7 What is Cooperative Learning?	20–21

2.8	Real Maths/Maths for All (The Netherlands – National Curriculum Development Foundation)	21–22
2.9	Teachers role in cooperation	22–23
2.10	Comparison between the two models	23–24
	<b>CHAPTER THREE</b>	<b>25</b>
3.0	Methodology	25
3.1	Research Design	25
3.2	Research Population	25
3.3	Sample of the study	25
3.4	Sampling Technique	26
3.5	Research Instrument	27
3.6	Validity of the instrument	27–28
3.7	Reliability of the instrument	28
3.8	Method of data collection	28–29
3.9	Data Analysis	29
3.10	Testing of Hypothesis Interpretation	29–31
3.11	Procedures	31–34
	<b>CHAPTER FOUR</b>	<b>34</b>
4.0	Result and Discussion	34
4.1	Composition of the Respondents	34–35
4.2	Students Performance in each school	35–41
4.3	Testing of Hypotheses	41–43
4.4	Discussion	43–44
	<b>CHAPTER FIVE</b>	<b>45</b>
5.0	Conclusion and Recommendation	45
5.1	Conclusion	45–47
5.2	Recommendation	47

<b>Reference</b>	48–53
Appendix I	53
Appendix II	54–59
Appendix II	59–62
Appendix IV	63
Appendix V	64–65

# CHAPTER ONE

## 1.0 INTRODUCTION

### 1.1 HISTORICAL BACKGROUND OF THE STUDY

Ed Begle said, “We have learnt a lot about teaching better mathematics but not much about teaching mathematics better”. I have heard students say “I hated mathematics”, “Mathematics is too difficult”, “I can never know maths”, “only the gifted can understand maths”. Why should this be so? I would suggest that one reason is that in the past there has been far too much mechanical teaching, the children have always not been encouraged to discover the rules for themselves.

When perusing the history of teaching mathematics, it appears as if we constantly look for a magic method or strategy that will serve all students. There is no exhaustive formula that fits every learner. We need to realize that a variety of methods are necessary to meet the mathematical learning needs of all students. Our task, as teachers of mathematics, is to determine which method will be most beneficial to the mathematical learning of each student and when these strategies will be most effective. If a teacher uses a strategy with no positive result from the learner, at what point is that method abandoned in favour of another? What are the alternative methods that can even be tried? The decision is most often influenced by our own background, training, experiences, bias, and current curriculum.

Cooperative learning and Peer Tutoring in overcoming students poor Mathematics performance is an approach to organizing classroom activities into academic and social learning experiences. By having cooperative learning activities, students learn from discussion among each other and they would indirectly adopt new or suitable learning behaviour from the others within the same

group as reference on how one can overcome Mathematics questioning statement. Peer tutoring is an instructional strategy that consists of pairing students together to learn or practice an academic task. The pairs of students can be of the same or differing ability and/or age range. Peer Tutoring are more saving time than cooperative learning where it only comprises of two students in a small group and result of discussion will be produced immediately every time of an activity. Most of the time Peer Tutoring also consists of translating ones understanding into another by using their same level of communication bridge, in other words, students know students better than teacher to the students, which as additional, they might have common problem that they can well understand how to solve it together.

These techniques however require training for better understanding of how to apply them and when they should be best applied. The research gives a detailed description of methods, how they can be effectively utilized to enhance students Mathematics performance and some of their pitfalls.

## **1.2 PROBLEM STATEMENT**

After my Mathematics teaching and learning lesson, I expected my pupils to understand the concepts I was teaching. However, it seemed not happen to the students who had the high Mathematics anxiety and who were even afraid to ask questions. This I know when I tested them. So, I had to find different ways to overcome their Mathematics anxiety and make them enjoy in learning Mathematics. The issue there was the students avoid me and the lesson and they like to ask and talk with their friends. Thus I would like to introduce the

cooperative learning and peer tutoring and organize some suitable mathematics tasks for it to enhance their learning.

### **1.3 PURPOSE OF THE STUDY**

This research will determine how the creative teaching through cooperative learning and peer tutoring can well be used to reduce students discouraging poor mathematics performance and in opposite mean, increase the success in mathematics education. Thus, the research was design to simultaneously determine the level of understanding or appreciation of the subject, mathematics and how cooperative learning and peer tutoring can be used to boost students mathematics performance.

### **1.4 RESEARCH OBJECTIVES.**

The main concerns of this study are:

1. To expose some of the factors responsible for students' poor mathematics performance.
2. To decrease the level of anxiety of students while facing mathematics.
3. To build up their confidence level when working with mathematics through cooperative learning and peer tutoring.
4. To emphasize the essence of proper mastery and judicious application of the methods.

## **1.5 SCOPE AND LIMITATION**

The research work attempts to present Peer Tutoring and Cooperative learning as alternative strategies to compliment the teacher's explanation and facilitate the learning in the teaching-learning encounter of mathematics. This is intended to strictly help students overcome contributing factors to students' poor performance in mathematics.

It is however limited by the low number of schools (5 in all) and students used (200 in all). This might make it very difficult to generalize the outcome of the result as the sample is too small to represent the population. Poor reception from schools or teachers and inability to select mathematics task that could best be used to access the effectiveness of the strategies are other limitations.

## **1.6 RESEARCH QUESTIONS AND HYPOTHESIS**

### **RESEARCH QUESTIONS**

What effect does Peer Tutoring and Cooperative learning have on students' mathematical performance?

Is there any correlation the performance of students that take part in peer tutoring & cooperative and those that engaged in individual study?

### **RESEARCH HYPOTHESIS**

**H<sub>0</sub>:** There is no significant relationship between the performance of students taught with peer tutoring and cooperative learning and students taught in normal classroom setting.

## **1.7 JUSTIFICATION OF THE STUDY**

Peer tutoring and Cooperative learning have by far proved very successful because experiences have shown that students enjoy discussing mathematics concept with their friends rather than asking the teacher.

Studies comparing Peer tutoring and Cooperative learning with competitive and individualistic learning have demonstrated that the former two promotes higher achievement than the later ones. The methods involve students to be more actively involved in the learning process.

The socialization experiences that occur during peer tutoring can benefit both the tutor and the tutee by motivating students to learn and increasing their social standing among peers.

Also, students can work cooperatively on significant, interesting and complex tasks. Through working with others they can enhance their ability to communicate about mathematics to understand it, and to think critically about it.

In conclusion, discussing problems helps students become aware of what they know and what they do not know and what they understand and what they do not understand. This awareness leads to control over the problem solving process as students begin to see the need for specific problem solving strategies and the limitations of other approaches. When students find their approaches and outcome for the same problem differs, this discrepancy can stimulate reorganization and development of their thinking to a new and higher level.

## **1.8 DEFINITION OF TERMS**

**IMPACTS:** The powerful effect that something has on somebody or something. (Oxford Advance Learner Dictionary)

**PEER:** A person who is the same age or who has the same social status as you. (Meriam Webster's Dictionary)

**TUTOR:** A private teacher, especially one who teaches an individual student or a very small group. (Oxford Advance Learner Dictionary)

**TUTEE:** An individual student being taught by a private teacher. (Oxford Advance Learner Dictionary)

**COOPERATIVE:** Involving doing something together or working together with others towards a shared aim. (Oxford Advance Learner Dictionary)

**PERFORMANCE:** How well or badly you do something. (Oxford Advance Learner Dictionary)

**PEER TUTORING:** is defined teaching strategy whereby people from similar social groupings who are not professional teachers are helping each other to learn and learning themselves by teaching. (Keith Topping and Shirley Hill)

## **CHAPTER TWO**

### **2.0 REVIEW OF LITERATURE**

After I determined my topic of Cooperative learning, Peer tutoring and fractions, I began to search for common themes among research already done. I read many research articles and found that many of the themes that I was interested in had been explored on some level. To further strengthen the arguments on ground, I therefore decided to examine the research themes of combined peer tutoring & cooperative learning and student performance.

This chapter discusses literature regarding cooperative learning and peer tutoring and previous research conducted in various studies in which peer tutoring and cooperative learning were used in elementary school classrooms.

### **2.1 WHAT IS PEER TUTORING?**

Keith Topping and Shirley Hill define peer tutoring as having people from similar social groupings who are not professional teachers helping each other to learn and learning themselves by teaching. (Agnes G, Agnes T, Howard D. and Margaret O.)

The learning process is in term of complementary each weak section among different individual. Peer tutoring take place where, normally two students, helping each other or having discussion to study same concept or subject together.

Ferrari (2004) mentioned that peer mentoring challenges the traditional assumption that the mentor knows more and knows best (Robert Townsend, Melinda Delves, Tracy Kidd and Bev Figg, 2011).

Variations exist among instruction approaches. However, the underlying theory is consistent. Light Littleton (1999), Steinburg, Dornbusch and Brown (1992), Wentzel (1999) all agree that Peer interaction can have a powerful influence on academic motivation.

Maheady (2001) is of the opinion that peer tutoring allows teachers to accommodate a classroom of diverse learners including students with learning disabilities. He sees it as an instructional strategy which increases response opportunities for students, provides additional time for positive feedback and increases the amount of time a student is on-tasks.

Fuchs, D., Fuch, L.S., Mathes & Martinez (2002), Rohrbeck et. al (2003), Miller and Miller (1995) were also able to coined out from a research that socialization experiences that occur during peer tutoring can benefit both the tutor and tutee by motivating students to learn and increasing their social status among peers.

In conclusion, regardless of achievement level, content area, or classroom arrangement, peer tutoring demonstrates effectiveness in facilitating progress in the general education curriculum (Cohen, Kulik & Kulik, 1982; Cook, Scruggs, Mastropierri, & Casto, 1985; Johnson, Maruyama, Nelson & Skon, 1981).

## **2.2 BENEFITS OF PEER TUTORING**

“The list of benefits that students receive from peer tutoring is quite extensive.” (Olmscheid, 1999, p. 3). The benefits of peer tutoring that will be discussed in this section are:

1. Academic benefits,

2. Benefits to teachers through increased student engagement,
3. Social and behavioral benefits,
4. Effectiveness for varying learning levels of students, and
5. Attitude on school and learning.

### **Academic benefits**

Peer tutoring can be useful in a classroom for a number of reasons. First, peer tutoring has been shown in multiple cases to increase student academic achievement (Dineen, Clark, & Risley, 1977; Greenwood, 1997; Harris & Sherman, 1973; Kamps, Barbetta, Leonard, & Delquadri, 1994; Kourea, Cartledge, & Musti-Rao, 2007; Olmscheid, 1999; Pigott, Fantuzzo, & Clement, 1986; Simmons, Fuchs, Hodge, & Mathes, 1994; Topping, 2005).

According to Topping (2005), “The research evidence is clear that both peer tutoring and cooperative learning can yield significant gains in academic achievement” (p. 635). Topping (2005) discusses peer tutoring as a way to help students learn content areas more deeply. Peer tutoring can also be beneficial in helping students to retain more information (Greenwood, 2005). In a study conducted by Harris and Sherman (1973), which examined the math performance of two groups of elementary students, one which engaged in peer tutoring and another in which students worked individually, “it was found that the tutored students received better grades at the end of an academic quarter than did students in a matched control group who received no tutoring” (p. 588). Pigott et al. (1986) conducted a study examining the effects of peer tutoring in fifth grade classrooms.

Peer tutoring was used in this study by assigning each treatment group of four students a separate role during an arithmetic drill.

Each role provided the students the opportunity to work together and by either instructing, evaluating, or observing each other while completing the activity. This study signified the positive effect peer tutoring has on student achievement as well. Similar studies by Kamps (1994) and Simmons (1994) investigated student achievement regarding reading comprehension and fluency. Both studies' results demonstrated increases in comprehension in groups of students who had engaged in peer tutoring.

### **Benefit to teachers through increased student engagement.**

Peer tutoring is also beneficial to teachers because it allows teachers to provide all students the opportunity to be actively engaged in learning at the same time, each student working on their own specific level of need, even if there is only one teacher in the classroom (Greenwood, 1997; Harris & Sherman, 1973; Kourea et al., 2007; Olmscheid, 1999).

“One-on-one instructional procedures have been viewed as highly effective for students with diverse needs” (Brewer, Reid, & Rhine, 2003, p. 113). According to Harris and Sherman (1973), “In most public school classrooms, one teacher is expected to provide academic instruction to a group ranging in size from 15 to 40 students” (p. 587).

As Harris and Sherman (1973) discuss, in a classroom with this many students, as is the case in many elementary schools, it can be difficult or nearly impossible to provide daily one-on-one instruction for each student due to limited class time. Yet

“if there are significant differences in the skills and academic repertoires of the students in the class, a single common instructional method such as lecture may not efficiently meet the academic requirements of individual students” (Harris & Sherman, 1973, p. 587). For this reason, it is a necessity to find a more efficient way of addressing all students’ academic needs, and peer tutoring is an efficient method of allowing a teacher to do so.

According to Olmscheid (1999), “By utilizing peer tutoring in the classroom, teachers will ideally be able to teach more effectively” (p. 5). As students work one-on-one with each other, peer tutoring can increase academic engagement in the classroom (Greenwood, 1991; Olmscheid, 1999). Aside from increasing individual attention and student engagement, Levine, Glass, and Meister (1987) discuss the financial benefits of peer tutoring in stating, “Peer learning has also been noted to be among the most cost-effective of learning strategies” (p. 635). “Peer tutoring gives teachers the opportunity to maximize their instructional influence on the classroom as well as to provide individualized instruction” (Kourea et al., 2007, p. 106).

### **Social and behavioral benefits.**

There are also various social and behavioral benefits which derive from peer tutoring. “Peer learning encourages personal and social development” (Topping, 2005, p. 643). Working with, tutoring, or being tutored by another peer requires students to cooperate effectively with one another (Fitz-Gibbon, 1988). Communication skills can also be enhanced due to peer tutoring experiences (Topping, 2005). Peer tutoring requires both the helper and helped to explain concepts to one another, thus “embodying and crystallizing thought into language”

(Topping, 2005, p. 637). Topping (2005) discusses the many valuable communication skills used in peer tutoring, including questioning, listening, explaining, summarizing, speculating, and hypothesizing. Miller et al. (2010), Olmscheid (1999), and Topping (2005) also discuss peer tutoring as an effective way to increase self-esteem in students. Several peer tutoring studies have demonstrated gains in self-esteem (Miller et al., 2010). Extensive literature supports the many advantages of peer tutoring in addition to simply academic gains for students.

### **Effectiveness for varying learning levels of students.**

When regarding peer tutoring, one might ponder whether this teaching strategy would be beneficial for all students or solely those who are struggling academically. However, abundant research and literature support peer tutoring as a useful strategy for all levels of students (Dineen et al., 1977; Harris & Sherman, 1973; Olmscheid, 1999; Topping, 2005). Peer tutoring may involve students of similar or differing academic capabilities working together. In cases where one student is performing academically higher than their peer, not only the tutee, but “the tutor also receives benefits through peer tutoring” (Olmscheid, 1999, p. 3). Webb (1988) gives examples of some of the benefits the tutor receives as a result of peer tutoring. These examples include reinforcement of the tutor’s own knowledge and skills, building self-confidence and self-esteem, and development of a sense of responsibility. Fitz-Gibbon (1988) agrees as she discusses gifted and talented students’ needs to be assigned significant, thought-provoking, and open-ended tasks such as tutoring. According to Topping (2005), both tutees and tutors can yield significant academic gains through peer tutoring. Harris and Sherman

(1973) agree in saying, “The student tutor also may acquire teaching skills and improve his own academic performance as a result of the tutorial experience” (p. 597). In a study conducted by Elbaum, Vaughn, Hughes, and Moody (1999), students with disabilities were found to make gains when acting as peer tutors as well.

According to Fitz-Gibbon (1988), Kourea et al. (2007), McGee, Almeida, Sulzer-Azaroff, and Feldman (1992), Pigott et al. (1986), Topping (2005), and Webb (1988), not only can peer tutoring help students to achieve higher in school related tasks, but it also gives them the opportunity to improve upon other social and behavioral skills such as communicating, sharing, and cooperating with their classmates; all important proficiencies. It has also been shown to improve students’ self-esteem (Miller, Topping, & Thurston, 2010; Olmscheid, 1999).

Peer tutoring can be beneficial for not only low achieving or struggling students, but higher achieving or gifted students as well (Dineen et al., 1977; Harris & Sherman, 1973; Olmscheid, 1999; Topping, 2005). Finally, as discussed by Topping (2005) and Webb (1988), peer tutoring has been found to increase students’ positive attitudes on school and learning in general. “The potential advantages of employing students as tutors in the classroom for education are numerous” (Harris & Sherman, 1973, p. 597).

Dineen et al. (1977) also discuss the benefits a tutor receives from peer tutoring. In a study which examined the effect of peer tutoring on spelling test scores, the results indicated that tutoring a peer increased the subjects’ spelling accuracy almost as much as being tutored by a peer.

Topping (2005) agrees that both tutor and tutee can gain significantly from peer tutoring. He also discusses the benefits of students of similar abilities working

together. Most recently, there has been a great deal more interest in deploying helpers whose capabilities are nearer to those of the helped, so that both members of the pair find some cognitive challenge in their joint activities. The helper is intended to be “learning by teaching” and also to be a more proximate and credible model. (p. 632)

As Topping (2005) supports, peer tutoring provides higher academic achievement gains for all members of the group.

### **Attitude on school and learning.**

Topping (2005) discusses the impact peer tutoring can have on improving students’ liking for a subject area in general as well. When discussing the effects of peer tutoring, he states, “Affective changes in attitude to school, the teacher, the subject, peers, and to the self might also be found” (Topping, 2005, p. 641). Webb (1988) agrees that students who engage in peer tutoring activities express improved attitudes towards school and academics.

## **2.3 PEER TUTORING & CONFIDENCE**

Parsons, Croft and Harrison (2009) discovered in research conducted at Harper Adams University College that college students confident in their ability in mathematics performed higher than those who were not confident. A student who is not confident will struggle to complete assigned work at a high level. Math teachers fight the stigma that follows mathematics on a daily basis. The phrase “Well, I was never very good at math” flows freely from the lips of parents and

other teachers. Over time, this can affect the students in a negative way. This is why it is important for educators to search for different methods of instruction that will increase the confidence level in their students.

One method that educators have used to increase student confidence is using peer tutoring. This approach consists of two students paired together to play both roles as the tutor and tutee. Rosewal et al. (1995) compared the changes of self-concept and the student's likelihood to drop out of school among students who participated in a peer tutoring program versus those students who did not participate in the program. The student participants came from one of two different classroom settings. Those settings were either a traditional class that used group learning activities or a traditional class setting that used individual learning activities.

Rosewal et al. discovered that students who participated in a peer tutoring program had a significant increase in self-concept and general attitude toward school over those that participated in more traditional settings.

Care needs to be taken in not only pairing students, but also in creating tasks that would be conducive to peer tutoring. Fernandez-Santander (2008) observed that by beginning each class by presenting the main information to the entire class and then assigning tasks to be done in cooperative learning groups of two or three, students took a greater ownership of their learning.

Data were collected over a four-year span in the form of student surveys, grades and attendance.

In the first two years the instructor used lecture only, and in the second two years, a combination of lecture and cooperative learning was used. Results showed that achievement and student satisfaction increased with the combination style. A great

deal of time was taken to create tasks with objectives of “reasoning, reading comprehension and ability to summarize, and oral and written communication skills” (Fernandez-Santander, 2008, p. 35) in this Optics and Optometry course.

Although Parsons et al. (2009) did not focus on peer tutoring; they discovered that increased student confidence will yield higher achievement. Walker (2007) and Fernandez-Santander (2008) found that if the students worked with a peer tutor or some form of cooperative learning, all student participants will have a higher self-concept and satisfaction. Thus, as students work with a peer tutor, their confidence will increase. When a student’s confidence increases, so will his or her achievement (Parsons et al., 2009).

## **2.4 PEER TUTORING & ACHIEVEMENT**

Peer tutoring can take many forms in the classroom setting. Spencer (2006) looked at 38 studies from 1972 to 2002 where some form of tutoring was used for students with emotional or behavioral disorders. She discovered that in “the 38 research studies indicate that peer tutoring has been demonstrated to be an effective instructional strategy” (p. 211). The most effective form of the peer tutoring was a reciprocal method where the students reverse roles of tutor and tutee regularly. When students are required to explain their thought process in such a way that the other students will understand, they get a deeper understanding of the concept themselves.

It is not enough to pair students, give them a set of problems, and expect them to succeed at a higher level. Walker (2007) had the principal and teachers of Lowell High School choose six high-achieving students to use as peer tutors in an after-

school tutoring program. She chose to use the knowledge of these students to help compensate for the lack of understanding of how urban students understand mathematics and to help create and deepen knowledge and interest in mathematics. Her research shows that the tutors and tutees benefitted from working together on concepts taught in their class.

Through an action research plan, Mesler (2009) paired a third-grade student who had been retained with a classmate. The retained student became a tutor for the struggling peer. He and his tutee had both seen significant gain in their test scores by the end of the study. Mesler found that this increased the retained student's confidence and that with the extra math practice he showed improvement.

Walker (2007), Mesler (2009), and Spencer (2006) observed different types of children.

Walker (2007) studied urban high-school students, Mesler (2009) studied a retained third-grade student, and Spencer (2006) looked at 38 studies of students with emotional and behavioral disorders. Although all three studied different types of children, they all discovered that pairing students in the form of peer tutors increased the achievement of both students.

## **2.5 ROLE OF THE TEACHER IN PEER TUTORING**

The role a teacher plays within the classroom is important. Davis and Weeden (2009) compare the role of a teacher to characters of stories. “However tempting the role of sage is, teachers should resist the temptation” (Davis & Weeden, 2009, p.76). Instead, teachers should embrace the role of a trickster. The trickster is a person who puts barriers in the way of the students in order to promote learning.

“To do so is to accept and illuminate the dual responsibility of the teacher as both supporter and challenger” (Davis & Weeden, 2009, p.70).

From the role of trickster, teachers facilitate the learning of their students.

Crow (2004) discusses the role of the teacher in college classrooms. “Facilitation in actual practice reduces teaching to a paper-shuffling event with little involvement of the teacher in the learning process” (Crow, 2004, p.67). Crow believes that student-centered learning is important and should be present in classrooms. However, it does not mean that the facilitation of the learning needs to exclude the participation of the teacher.

In the context of peer tutoring, the role of the teacher is to facilitate, observe, question, and guide the learning of their students. However, it is still necessary to include some whole group instruction so the students have a base of knowledge. “Maintaining short periods of lecturing in every session was very helpful in the development of the pupil’s trust in the new learning methodology and in the success of it” (Fernandez-Santander, 2008, p.38) After the content has been given, then the teacher can roam the room to listen to discussions that students are having about the material. This will help them begin to understand the thought processes that their students are following and may intervene if they feel it is necessary.

Davis and Weeden (2009), Crow (2004), and Fernandez-Santander (2008) all believe that the role of teacher is extremely important to the learning of their students.

Crow (2004) and Fernandez-Santander (2008) both feel that teachers should still play an active role in the learning by presenting the new information to the

students. However, Davis and Weeden (2009) see a teacher's role as a trickster that facilitates the learning.

## **2.6 SUMMARY AND CONCLUSION ON PEER TUTORING**

### **SUMMARY**

Peer tutoring has a lengthy history of success in classrooms (Olmscheid, 1999). Peer tutoring is an effective classroom strategy which is successful in improving student academic performance (Pigott et al., 1986). Additionally, according to Olmscheid (1999), peer tutoring gives teachers the opportunity to teach more effectively. "Time constraints in delivering instruction during the school day make it challenging for educators to account for significant gains in student learning" (Schisler et al., 2010, p. 135). As students work one-on-one with each other as they engage in peer tutoring activities, academic engagement for all students can be increased (Greenwood, 1991; Olmscheid, 1999). "One-on-one instructional procedures have been viewed as highly effective for students with diverse needs" (Brewer, Reid, & Rhine, 2003, p. 113). Peer tutoring can also yield significant gains in social and communication skills (Topping, 2005). Both tutees and tutors can gain academically and socially from this experience (Topping, 2005). Peer tutoring has been shown to be a useful strategy for both lower and higher academic levels of students (Dineen et al., 1977; Harris & Sherman, 1973; Olmscheid, 1999; Topping, 2005). Finally, students engaged in peer tutoring display more positive feelings towards school in general (Webb, 1988). Research has shown peer tutoring to have "the potential to be very successful for students of all ages and ability levels" (Olmscheid, 1999, p. 9).

## **CONCLUSION**

Fernandez-Santander (2008), Walker (2007), Mesler (2009), and Spencer (2006) agree that having peer tutors will increase student achievement in elementary, high school and college.

In the following action research, peer tutoring will be utilized as a method of instruction in a middle school setting. Rosewal et al. (1995) and Fernandez-Santander (2008) have shown that having a peer tutor can also increase student confidence in the subject area, and Parsons et al. (2009) showed that if a student has confidence he or she will achieve more. This research looked at whether having a peer tutor increases the student achievement and confidence of the participating students.

### **2.7 WHAT IS COOPERATIVE LEARNING?**

Cooperative learning involves students working together towards a common goal in a teaching-learning situation. The social context and active involvement make it more motivating to learn. Research has shown that cooperative learning increase confidence in students' abilities. It improves self-esteem as well as feelings of competence in specific subjects. Research has also documented positive effects of cooperative learning on improving social relations with students of different ethnicity and cultural backgrounds (Hartman, 1996).

It has been successfully used in the Netherlands since the early 1970's. Cooperative learning is a powerful instructional method for developing content knowledge and higher level thinking skills across the curriculum.

In the U.S.A, there is an increasing amount of ethnic and linguistic diversity in classroom. Cooperative learning has been demonstrated to be an especially effective method of teaching in settings characterized by such diversity.

Johnson and Johnson's (1986) work on cooperative learning has important implications for teaching especially for tutors working with teaching groups. In both cooperative learning and teaching groups, they submit that students help each other with academic work. The tutor has to make decisions, plan instructions, monitor students' performance, evaluate students' progress and provide feedback.

Nillsen (2004), Ball and Pelco (2006) mentioned that participation in team activities whereby through discussion of content, students may gain 'new ideas, insights, connections and interactions' which may aid better student engagement with the content and better recall of content (Farrell B.J & Farrell H.M, 2008)

## **2.8 REAL MATHS/MATHS FOR ALL (THE NETHERLANDS – NATIONAL CURRICULUM DEVELOPMENT FOUNDATION)**

This Curriculum for students' ages 12-16 is based on the theory of Van Hiele, an internationally known Dutch mathematics teacher and researcher.

The Dutch were pioneers in using cooperative learning in mathematics. Real-life settings are essential feature of all mathematics problems in this approach. The lesson design model for this curriculum consists of three stages:

1. Introduction: Working with the whole class, the teacher introduces the problem, explores aspects of it, and may give hints about the solution and place it in an everyday life context.

2. Group Work: Students work in groups as the teacher observes and manages their cooperative problem solving. When necessary, the teacher deals with individual problems.

3. Reflections and Evaluation: Students discuss several topics related to their group process and results. The discussion involves; identifying of all the different solutions and strategies groups used to solve the problem; teacher questioning to explore other possible solution strategies; reformulating and summarizing solutions; and generalizing about solutions.

Sample lesson involve using newspaper ads, deciding which video shop to become a member of, and selling badges as a small business enterprise. The Real Maths Curriculum has accompanying teacher manuals as resources for using real life situations for mathematical problems and for teaching with heterogenous, small groups. It also has student material and video tapes.

## **2.9 TEACHERS ROLE IN COOPERATION**

There are three basic forms of student cooperation in learning. They are: tutoring (peer or cross age), in which one student teaches another; pairs who work and learn with each other; and small groups of students teaching and learning together (Cooperative learning).

Johnson, Johnson & Holubee's (1986) "The Teacher's Role in Cooperation" follows for useful suggestion for managing teaching. They characterize the information below as some of the Essential Elements of Cooperative Learning.

1. Planning: making decisions by specifying academic and collaborative objectives, deciding on a group size, assigning students to groups, arranging the room, planning materials and assigning role.

Their planning further includes setting the lesson through explaining the academic task, structuring positive interdependence, structuring individual accountability, structuring intergroup cooperation, explaining the criteria for success, specifying expected behaviour, and teaching of collaborative skills.

2. Monitor and Intervene: by arranging face-to-face interactions, monitoring students' behaviour, providing task assistance, intervening to teach collaborative skills.

3. Evaluate and Process: evaluating the student learning, processing group functioning, and providing closure.

## **2.10 COMPARISON BETWEEN THE TWO MODELS**

The main idea which underlies both Peer Tutoring and Cooperative Learning is the conviction that the assumption of roles in a group or a couple makes the pupils responsible for their own learning process, significantly favoring it at the same time. The goal of an educator; not only of the teacher, is that of succeeding in making the other assume the responsibility of a task.

On the basis of our studies on experience accomplished in secondary schools, it seem that as mathematical task is concerned, Cooperative Learning Model is more adequate when the subject to work about is new and open to different part of inquiry, for instance, when a new (i.e not yet presented by a teacher) demonstration

of a theorem is required. (Baldrighi, Fattori, Pesci, 2004) or when a complex problem situation has to be explored (Euler's formula for faces, corners and vertices of a polyhedral, Angelini et. Al., 2007)

Also Baldrighi, Bellinzona, 2004; Baldrighi, Bellinzona, Pesci, 2007 prefers complementary learning model when the task is quite difficult and the cognitive resources of the whole group of students are necessary; for example when the problem is not familiar to students and a good expertise of the contents involved is required.

Peer Tutoring Model however seems more appropriate, when a specific mathematical content has to be recovered. An inquiry activity based on pairs' reflection on their own errors (wrong, strategies or misconceptions) is very relevant for this model; in this case, mates' cognitive resources and peers' language could be fruitfully exploited. Experience makes it clear that not only students in difficulties are more likely able to recover (Toresani, 2008) but also that tutor pupils strengthen their competence in mathematics, their language abilities and their skills in interpersonal communication.

In conclusion, it seems relevant to recognize the peculiarities of these two teaching-learning models, together with their analogies and differences, at least for two main reasons: Firstly, if a teacher has this awareness, his/her competence in planning didactical interventions, could be more suitable and fruitful for improving students' education, both in mathematics and in interpersonal relationships. In addition, I believe that the same awareness could suggest to researcher in mathematics education deeper analysis of these two models and other points of view for further explorations.

## **CHAPTER THREE**

### **3.0 METHODOLOGY**

#### **3.1 RESEARCH DESIGN**

The purpose of this action research was to help students all contributing factor to their poor mathematical performance through the use of the mathematical teaching-learning strategies Peer Tutoring and Cooperative learning and to help them build up their confidence levels when working with math. Thus, this study discussed on the observation of the sample and comparison of the assessment of the control group that benefitted from Cooperative learning and Per Tutoring strategies and the other group which engaged in individualistic study.

#### **3.2 RESEARCH POPULATION**

The population intended for this study is all students of the secondary schools in Ibadan North Local Government Area of Oyo State. It is believed that findings or generalization from the work is applicable to all students.

#### **3.3 SAMPLE OF THE STUDY**

The subjects of this research are the students of five different secondary schools in Ibadan North local Government area. 40 students are selected from the SS1 Class and grouped into two of 20 students per group. One of the groups is taken to be a control group and Peer tutoring and Cooperative learning was further used to facilitate their understanding after the normal teaching while the students

making up the other group were asked to revise individually and ask teachers questions.

The students were firstly intimated of the purpose of the research and confidential treatment of its outcome so as to create rapport with the pupils. They were then further interviewed in order to fish out the uninterested and incompatible sample (e.g. students from other classes different from the SS1 target).

### **3.4 SAMPLING TECHNIQUE**

At random, two hundred students (200) were selected using simple random technique from the selected school. Forty students (40) are selected from each school.

The schools involved are:

- i. St. Gabriel's Commercial Secondary School.
- ii. All Saint College.
- iii. Onireke Girls Grammar School.
- iv. Army Barracks Grammar School.
- v. St. Brigid's Grammar School.

Onireke Girls Grammar School is a girls-only school included to understudy the general performance of girls in mathematics and how the teaching methodologies described can help improve them. All Saints College is a Private

school also included to observe the disparity in education standard services offered in Private schools compared to Government public schools.

### **3.5 RESEARCH INSTRUMENT**

Since this is an action research to measure the effect of peer tutoring and cooperative learning on students' mathematical performance, the researcher discussed a mathematics concept (Fraction) with the students, allowed a division of the group (control group of 20 students) study it in pairs and then cooperatively in group. He then assess the performance of the students that benefitted from the two teaching strategies when he gave them ten sums (5 multiple choice and 5 theory questions) to solve and compared it with the score of those that revised individually before taking the test.

In conducting the research, the researcher sought the assistance of teachers of the schools visited and some other friends (as research assistants) for smooth and effective monitoring and control of the entire procedure.

### **3.6 VALIDITY OF THE INSTRUMENT**

The instrument used was able to reflect the disparity in the performance of students that undergo peer tutoring and cooperative learning compared with their counterpart who studied individually.

Fraction is a very good concept to test students' mathematics ability. It is a very common aspect of mathematics that requires performance of all the algebraic operations (addition, subtraction, multiplication and division) and sound mental

reasoning. Students have also been well acquainted with fractions right from lower grade levels (i.e Nursery and primary classes).

### **3.7 RELIABILITY OF THE INSTRUMENT**

The topic chosen (fraction) was designed in an attempt to measure students performance after passing through peer tutoring and cooperative learning or individual study.

Any other topic would have also been good but fraction is seen as a very common and easily understandable tool to test students' display of the mathematic lesson. Philip LaFleur also used fractions in his research, a good pointer to the prospect and effectiveness of the topic to measure the impact of peer tutoring and cooperative learning on students' mathematics performance.

In addition to this, the consent of the Supervisor and some other mathematics lecturer in education were also sought and they all attest to the relevance of the concept.

### **3.8 METHOD OF DATA COLLECTION**

The main data necessary for the research were obtained through observation and the students' performance with respect to the marks obtained in the test taken after undergoing all the procedure.

The marks of the students in the control group (who took part in the peer tutoring and cooperative learning session) were noted and kept separately to be

compared with what is obtained by those studied individually to see if there is an improvement in the score and therefore a correlation.

### **3.9 DATA ANALYSIS**

The marks obtained in the ten sums form the basis of the data that was analyzed. Frequency tables and charts showing student scores for each of the school and for all the students in general were presented separately for the students involved in the two mathematics teaching strategies (Control grouped denoted by ‘Grouped’ or ‘Grp.’) and those who attempted the questions only after doing private or personal revision of the concept examined i.e fraction (denoted by ‘Non-grouped’ or ‘NGrp.’)

The Product moment correlation was used to test the hypothesis while the T-test was obtained to verify and confirm the outcome of the correlation method adopted.

### **3.10 TESTING OF HYPOTHESIS INTERPRETATION**

To arrive at a reasonable conclusion on this research work, the researcher employed the use of Correlation method.

The T-test for hypothesis testing was used to confirm that the difference between the two samples means (the Control Group and Non Group mean score) whether or not the two samples were drawn from the same population. If the difference is not statistically significant, then the two samples were drawn from the same population. The T-test is

$$\frac{x_1 + x_2 - \mu_1 - \mu_2}{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$$

which has a t-distribution with the number of degree of freedom equal to

$$df = \frac{\left(\frac{s_1^2}{n_1}\right)^2}{n_1} + \frac{\left(\frac{s_2^2}{n_2}\right)^2}{n_2}$$

or

t-calculated is

$$t = \frac{x_1 + x_2 - \mu_1 - \mu_2}{\sqrt{S_p \left(\frac{1}{n_1} + \frac{1}{n_2}\right)}} = \frac{x_1 + x_2 - \mu_2 - \frac{1}{2}}{\sqrt{S_p \left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

where

$$S_p = \frac{s_1^2(n_1 - 1) + s_2^2(n_2 - 1)}{n_1 + n_2 - 2}$$

$H_0$  is the null hypothesis

$H_1$  is the alternative hypothesis

$\alpha$  is the level of significance

df is the degree of freedom

n is the number of samples or observations

$S^2$  is the standard deviation

S is the variance

$\bar{x}/\mu$  is the sample mean.

Correlation coefficients  $r$ , however gives the degree of association between the two variables i.e scores obtained by students involved in individual studies and scores obtained by the cooperative learning and peer tutoring student group. The value of  $r$  lies between -1 and +1. If  $r$  is negative (-ve), there is an inverse linear relationship. If  $r$  is zero, there is no relationship between the two variables. Finally, if  $r$  is positive (+ve), a direct linear relationship exists.

The nearer  $r$  is to -1 or +1, the stronger the inverse or direct relationship. The nearer it is to zero, the weaker the association between the two variables.

### **3.11 PROCEDURES**

The research involved the selection of 40 students from each of the five secondary schools. The following procedure was adopted during the course of the study.

1. Introduction: The intention of the research was firstly introduced to the 40 students selected and students were allowed to decide whether to participate in the research or opt out. Those that showed interest were retained while the non-interested ones were excused or replaced.
2. Selection and Sorting: The 40 students were then divided into 2 groups each comprising of 20 students. One of the groups was made the control group upon which the effect or impact of the teaching strategies i.e Peer Tutoring and Cooperative learning was tested. Students comprising the other group were allowed to study individually and consult with the teacher only incase of any problem or difficulty. The students in the Control Group were further paired during

the Peer Tutoring session and regrouped into 4 sub groups comprising of 5 students each during the Cooperative learning session.

3. Teaching: The teacher (researcher) chooses a topic (Fraction) from the grade level current curriculum and explains it for fifteen minutes. The researcher worked some examples and take questions from the students. He ensures that they all understands and are able to solve problems individually on the topic. He emphatically asks “Do you understand?”, “Can you solve problems on this topic when given?” He makes sure he satisfies any student’s curiosity.

After the teaching session, ten (10) standard problems or questions are presented to the students to assess them. The question comprises of 5 objective tests and 5 theory questions.

4. Peer tutoring session: The participants in the control group are grouped in pairs to study the lesson together before taking the questions for ten minutes. The concept and definition of tutoring were first discussed and examples of how the tutors help their friends will be provided. The tutors who are selected need to play the following roles: the tutor had to give suggestions and provide explanations on the mathematics concept discussed. During the tutoring session, the teacher must always be available to assist the tutors when they have the problems and also supervise the whole tutoring session. Then the teacher as the researcher facilitated and moderated the tutoring session, creating a good relationship between the pairs of the focus group.

5. Cooperative Learning session: The teacher finally regroup the students into five (5) groups of 4 students per group and allowed them to discuss the mathematics concept taught (lesson) among themselves. They are then asked to complete the task after ten minutes of discussion.

In the cooperative learning model, the students assume roles which are different at the social level. The good student oriented to the task among the group becomes the speaker whereas the other students be the observer, contributor and checked the result of the task. However, they were involved in the same way in facing the problem posed.

6. Testing session: The students are finally allowed to take the test without assistance from any angle. The students that participated in the peer tutoring and cooperative learning experience are expected to score higher than those that studied individually after the lesson. Their results are then compared. The test taken is presented in Appendix I.

## CHAPTER FOUR

### 4.0 RESULT AND DISCUSSION

This chapter presents the data collected and their analysis. It discuss the findings of each hypothesis tested using the T-test and Pearson's product moment correlation coefficient.

### 4.1 COMPOSITION OF THE RESPONDENTS

Table 1 below shows the distribution (in sex) of the 200 students selected from the five secondary schools.

**Table 1;**

<b>SEX COMPOSITION OF THE RESPONDENTS</b>		
	<b>MALE</b>	<b>FEMALE</b>
<b>ST. GABRIEL's</b>	20	20
<b>ALL SAINT</b>	18	22
<b>ONIREKE GIRLS</b>	0	40
<b>ARMY BARRACKS</b>	17	23
<b>ST. BRIGID's</b>	22	18
	<b>77</b>	<b>123</b>
	<b>38.5%</b>	<b>61.5%</b>

The low percentage of boys (38.5%) in the research was mainly due to the inclusion of a girls-only school (Onireke Girls High School) in the research. Otherwise, the composition would have given a fair and balanced representation of boys and girls.

The age range of the students was between 11 and 15 years giving an average age of 13 years. Another very important data that pointed to the low level of achievement in mathematics in students was the time frame it took them to complete the test. The students were able to complete ten sums under fractions

between 45 minutes to 1½ hours. This justifies the reason why students fail in external examinations like WASSCE as a result of complaints about inadequate timing and inability to finish all the questions.

## 4.2 STUDENTS PERFORMANCE IN EACH SCHOOL

Table 2 and 3 is a representation of the score obtained by the students who participated in the Peer tutoring and Cooperative learning and those that studied individually in each school. While table 2 shows the mean score of the students, table 3 gives a more detailed account of the number of students that scored each respective marks from 0 to 9 out of a total of 10 in each of the school.

**Table 2;**

MEAN SCORE AND STANDARD DEV. OF THE DISTRIBUTION				
SCHOOL	MEAN SCORE		STANDARD DEVIATION	
	GRP.	N. GRP.	GRP.	N. GRP.
ST. GABRIEL'S	1.55	1.85	1.23	1.04
ALL SAINT	6.65	4.95	1.66	1.39
ONIREKE GIRLS	3.35	2.25	1.42	2.25
ARMY BARRACKS	3.8	3.05	1.36	1.36
ST. BRIGID'S	2.75	4	1.62	2.05

It is obvious from Table 2 that the mean scores of the grouped students from 3 schools; All Saint College, Onireke Girls High School and Army Barracks Grammar school were more than that of St. Gabriel and St. Brigid's. This information is represented in figure 1 and 2 for purpose of clarity. This has partly shown the effect Peer tutoring and cooperative learning can have on students' mathematics performance. One could also conclude from this that there is a positive correlation since the introduction of the strategies has improved the students performance.

In order to avoid hasty generalization and conclusion, it is necessary to look at the rate at which they perform. Table 3 gives the 10 possible marks obtained by the students (0 – 9 out of a mark obtainable of 10) and frequency of students that obtained them. This information will be processed to test the research hypothesis.

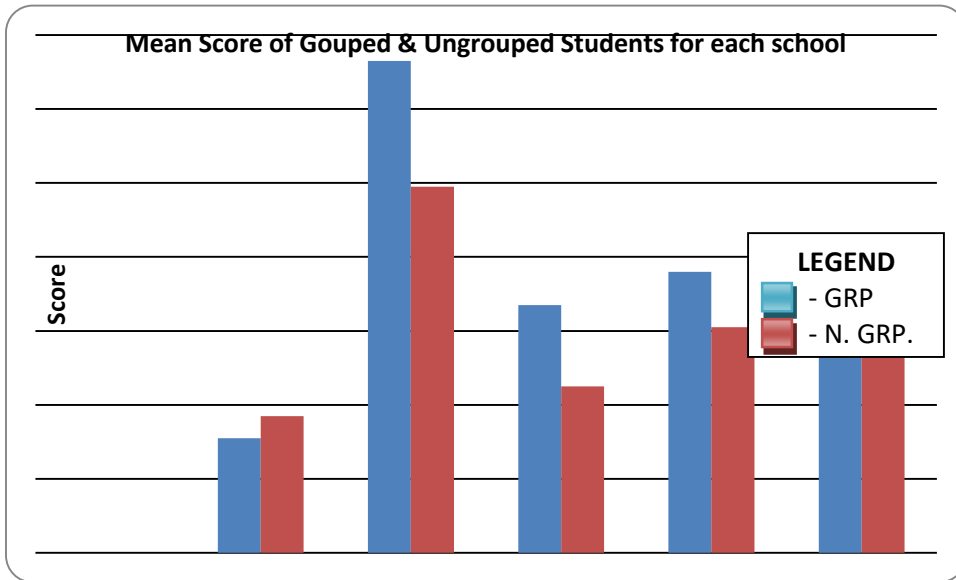


Figure 1a

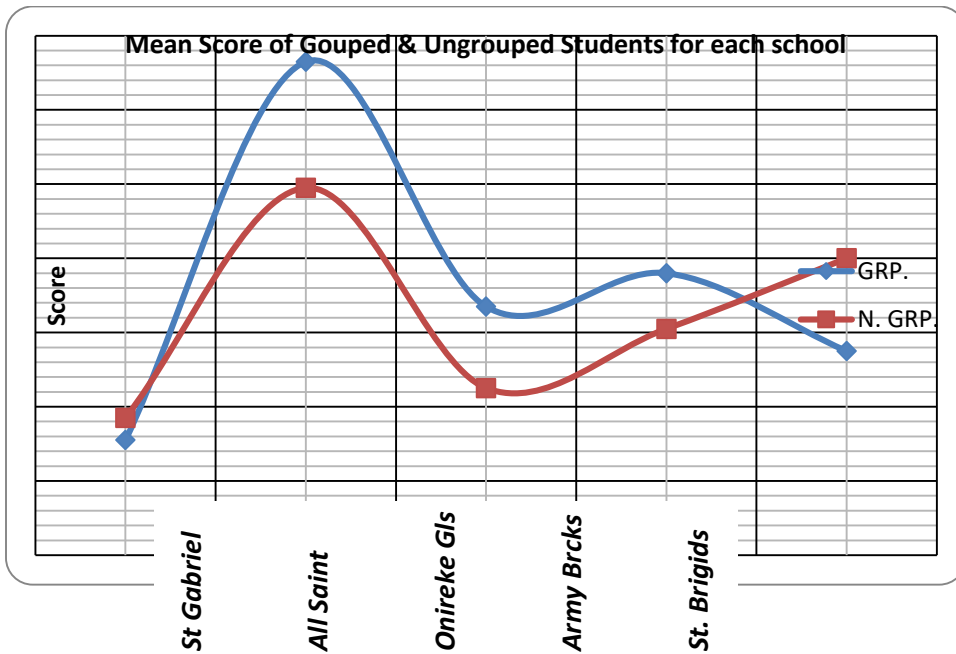


Figure 1b

**Table 3;**

MARK SCORED										
SCORE	ST. GABRIEL		ST. BRIGID'S		ALL SAINT		ARMY BARRACK		ONIREKE GIRLS	
	GRP	N. GRP.	GRP	N. GRP.	GRP.	N. GRP.	GRP.	N. GRP.	GRP.	N. GRP.
0	1	0	1	0	0	0	0	0	0	0
1	4	1	4	1	0	0	1	3	2	3
2	4	4	4	4	0	0	2	4	5	10
3	4	5	4	5	0	3	5	5	2	6
4	6	4	6	4	3	5	7	6	7	1
5	0	0	0	0	2	6	2	1	3	0
6	0	4	0	4	4	3	3	1	1	0
7	1	1	1	1	4	2	0	0	0	0
8	0	0	0	0	4	1	0	0	0	0
9	0	1	0	1	3	0	0	0	0	0
	<b>20</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>20</b>

### **Percentage of students that scored 40% and 50% pass mark**

Table 4 below is a summary of table 3 i.e the number of students that obtained the score of 0 to 9 from a total of 10. 0 to 39% however, is results below average especially in mathematics and therefore it will be better if we consider the frequency of students that scored 40% or 50% and above.

Figure 2a and 2b further gives a clearer picture of the students' performance. From the two figures, it was clearer that the number of students that obtained 40% and 50% was more among the grouped students who participated in the peer tutoring and cooperative learning session than those that studied individually.

Table 4;

SCORE Mark Obtainable (10)	NO.OF STUDENTS	
	GRP	N. GRP.
0	2	0
1	11	8
2	15	22
3	15	24
4	29	20
5	7	7
6	8	12
7	6	4
8	4	1
9	3	2
	<b>100</b>	<b>100</b>

**Table 5: No. and Percentage of Students that scored 40% in the test.**

SCORE(4+)	NO. OF STUDENTS	PERCENTAGE
GRP	57	57%
N. GRP.	46	46%

**Table 6: No. and Percentage of Students that scored 50% in the test.**

SCORE(5+)	NO. OF STUDENTS	PERCENTAGE
GRP	28	28%
N. GRP.	26	26%

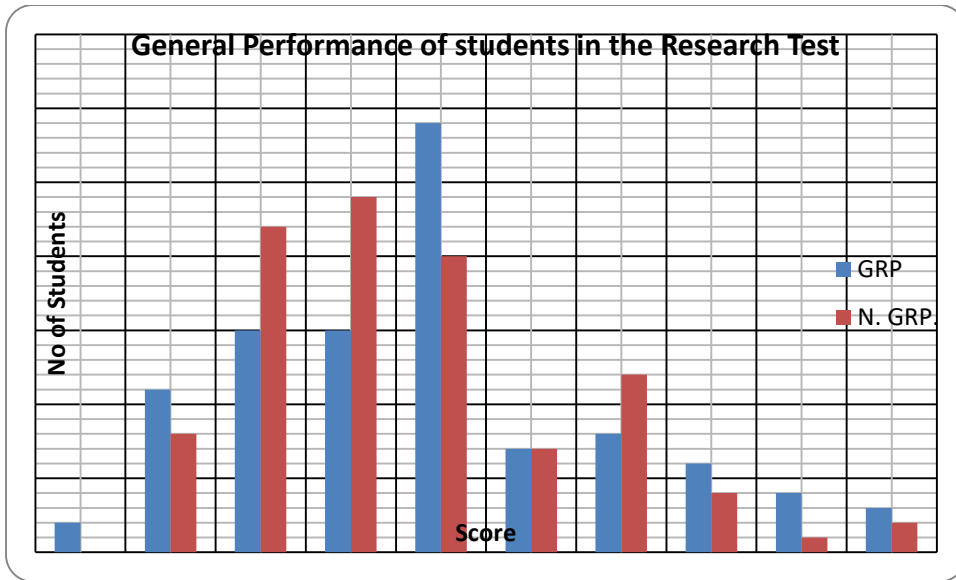


Figure 2a.

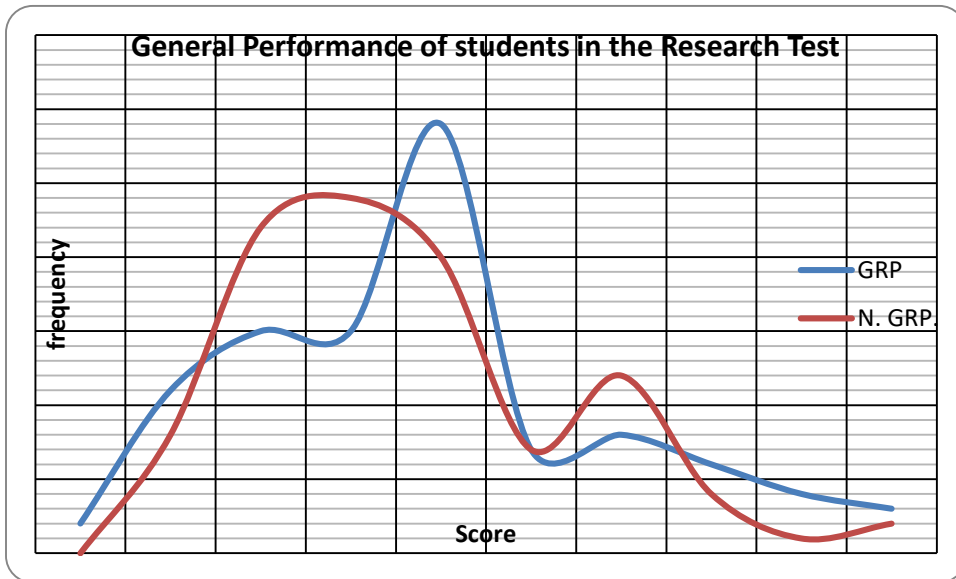


Figure 2b.

Table 5 and 6 (above) finally present an unambiguous result of the students' performance. As presented in table 5, 57% of the grouped students scored 40% and above while only 46% of the total ungrouped students could attain that score.

Equally in table 6, 28% was recorded as the total number of the grouped students from the entire 5 schools that could score 50% and above while 26% of the ungrouped students was obtained for the score range. Though very close, the performance of the grouped students can still be said to be higher than the ungrouped students.

Considering the mean score, table 2, figure 1a and 1b above have already been used to depict a higher mean score from three schools in the grouped students than the ungrouped students.

Finally using the t-test, three schools were obtained to fall conveniently outside the acceptable region while the remaining two fall within the region for a one tail, unequal variances test. The mean score of the five schools was then used to compute the t-test and the result was found to fall within the acceptable region. The null hypothesis is rejected and therefore the mean score of the students that participated in Peer tutoring and cooperative learning is higher than that of those that studied individually. The t-Statistics for each of the school is calculated and presented in table 8 below while the values obtained using Microsoft Excel in-built Data Analysis Tool is presented in Appendix III. The values are very close.

$$T - test = \frac{X - Y}{\sqrt{\left(\frac{N_1 S_1^2 + N_2 S_2^2}{N_1 + N_2 - 2}\right) \left[\frac{1}{N_1} + \frac{1}{N_2}\right]}}$$

$$T - test = \frac{3.62 - 3.22}{\sqrt{\left(\frac{(5 \times 1.892^2) + (5 \times 1.269^2)}{5 + 5 - 2}\right) \left[\frac{1}{5} + \frac{1}{5}\right]}}$$

$$= \underline{\underline{0.35116}}$$

$$df = \frac{\frac{S_1^2}{n_1} - \frac{S_2^2}{n_2}}{\frac{(S_1^2/n_1)^2}{n_1} + \frac{(S_2^2/n_2)^2}{n_2}}$$

$$df = \frac{\frac{1.892^2}{5} - \frac{1.269^2}{5}}{\frac{(1.892^2/5)^2}{5} + \frac{(1.269^2/5)^2}{5}}$$

$= \underline{\underline{9.62 \approx 10}}$

At 0.05 level of significant, the table observed value at 10 degree of freedom is 1.812 while t-calculated value is approximately 0.35.

Table 7;

Correlation coeff., r & t-stat. using the Mean Score of each school				
NG	G			
X	Y	XY	(X <sup>2</sup> )	(Y <sup>2</sup> )
1.85	1.55	2.8675	3.4225	2.4025
4.95	6.65	32.9175	24.5025	44.2225
2.25	3.35	7.5375	5.0625	11.2225
3.05	3.8	11.59	9.3025	14.44
4	2.75	11	16	7.5625
<b>16.1</b>	<b>18.1</b>	<b>65.9125</b>	<b>58.29</b>	<b>79.85</b>
Mean G =	3.62	Mean NG =	3.22	
S.D G =	1.892	S.D NG =	1.269	
r =	<u><b>0.793867</b></u>	tcal =	<b>0.35116</b>	
		df =	<b>9.626082</b>	

### 4.3 TESTING OF HYPOTHESES

**H<sub>0</sub>:** There is no significant relationship between the performance of students taught with peer tutoring and cooperative learning and students taught in normal classroom setting.

The Pearson's product moment correlation was used to check if a correlation exists between the students' performance. A positive correlation was obtained for three schools (two of which was not too strong) while a negative correlation exists for the remaining two (Table 8). The correlation values obtained were the same as the values gotten when the Ms. Excel inbuilt Data Analysis Tool was used to compute them (Appendix IV).

The mean score of each of the school (taken together) was also used to confirm this and a strong positive correlation was found to exist in the performance of students that studied individually and those that benefitted from Peer tutoring and Cooperative below. The correlation values are presented in table 8 below and Appendix IV. The correlation coefficient for the mean score values (table 7) is obtained as follows:

Table 8; Correlation Studies Using the mean scores of each school.

Correlation coeff., r, t <sub>cal</sub> & t <sub>obs</sub> for each school @α = 0.05%					α = 5%	α = 1%
	R	t cal.	t obs.	Df	t observed	t observed
ST. GABRIEL's	-0.34234	-0.8103	3.551	40	1.684	1.303
ALL SAINT	-0.32566	3.414	3.551	40	1.684	1.303
ONIREKE GIRLS	0.528	2.947	3.5795	37	1.689	1.306
ARMY BARRACKS	0.2622	1.702	3.551	40	1.684	1.303
ST. BRIGID's	0.174	-2.08	3.55	39	1.6855	1.304
MEAN SCORE	0.793	0.35116	4.587	10	1.812	1.372

Note: The critical value from t-distribution table for alpha = 0.05, one tailed test and 95 degree of freedom is **1.6634**.

$$r = \frac{N \sum XY - \sum X \sum Y}{\sqrt{[N \sum X^2 - (\sum X)^2][N \sum Y^2 - (\sum Y)^2]}}$$

$$= \frac{(5 \times 65.91) - (16.1 \times 18.1)}{\sqrt{[(5 \times 16.1^2) - (58.21)^2][(5 \times 18.1^2) - (79.85)^2]}} = \underline{\underline{0.793}} \approx \underline{\underline{0.8}}$$

However, when the correlation was done for the scores of all the students from the five (5) schools computed together, similar result was obtained.

$$\sum X = 362; \quad (\sum X)^2 = 131044; \quad \sum Y = 322; \quad (\sum Y)^2 = 103684$$

$$\sum XY = 1327; \quad \sum X^2 = 1802; \quad \sum Y^2 = 1350$$

$$r = \frac{N \sum XY - \sum X \sum Y}{\sqrt{[N \sum X^2 - (\sum X)^2][N \sum Y^2 - (\sum Y)^2]}}$$

$$= \frac{(200 \times 1327) - (362 \times 322)}{\sqrt{[(200 \times 1802) - 131044] \times [(200 \times 1350) - 103684]}}$$

$$= \frac{148836}{195308.9158} = 0.762054 \approx \underline{0.8}$$

#### 4.4 DISCUSSION

The discussion of results was done based on the students' performance and the research hypothesis which guided the study.

From table 8, a positive correlation coefficient of 0.52, 0.26 and 0.17 were obtained for 3 schools (Onireke Girls, Army Barracks and St. Brigid's respectively) while St. Gabriel and All Saint College have a negative correlation of -0.34 and -0.32 respectively.

Also, from the table 8 above again, it could be seen that the t calculated value for 3 schools is greater than the tabulated value. The t calculated for All Saint College is 3.414, Onireke Girls 2.947 and Army Barracks 2.08 while the t (from t distribution table) at 0.05 level of significance and 95 degree of freedom is 1.6634.

Using these outcomes to test the Hypothesis, since a positive correlation coefficient and a greater t-cal than the t-tabulated value (critical region value) is obtained in greater number of school, the implication of this is that the null hypothesis should be rejected. The hypothesis that there is no significant relationship between the performance of students taught with peer tutoring and cooperative learning and students taught in normal classroom setting is therefore rejected.

When the five schools are taken together, the correlation coefficient for the pairs of scores (i.e scores obtained by students that took part in cooperative learning and peer tutoring and those that studied individually) is 0.8. This indicates a strong positive correlation and the implication of this is that the null hypothesis should be rejected. Therefore, the hypothesis that there is no significant relationship between the performance of students taught with peer tutoring and cooperative learning and students taught in normal classroom setting is rejected.

The t calculated however, for the five schools taken together (using the mean value of each school) which is 0.35116 is less than the tabulated value suggesting the acceptance of the null hypothesis. This disagrees with the conclusion earlier made.

This disparity is likely as a result of the peculiar feature of each method which makes them suitable for specific data.

## **CHAPTER FIVE**

### **5.0 CONCLUSION AND RECOMMENDATION**

#### **5.1 CONCLUSION**

The purpose of this study was to examine the research question, “Does one-on-one peer tutoring or group cooperative learning have an effect on student academic achievement; specifically, mathematics performance among secondary school students?” The results showed students who participated in peer tutoring to have slightly higher average scores in the test taken after taking a few minutes lesson on fractions than students who worked individually and did not engage in peer tutoring. These results indicate the positive impact peer tutoring and cooperative learning have on student academic achievement, and supporting numerous research which has also shown peer tutoring to increase student academic achievement (Dineen, Clark, & Risley, 1977; Greenwood, 1997; Harris & Sherman, 1973; Kamps, Barbeta, Leonard, & Delquadri, 1994; Kourea, Cartledge, & Musti-Rao, 2007; Olmscheid, 1999; Pigott, Fantuzzo, & Clement, 1986; Simmons, Fuchs, Hodge, & Mathes, 1994; Topping, 2005). Students involved in peer tutoring also demonstrated improved cooperation skills with peers and an increased motivation to engage in more mathematics tasks.

My findings further illustrate a great potential in peer tutoring and cooperative learning. Both the tutor and the tutee or all members of the group (Control group) gained during the course of the Peer tutoring or Cooperative learning. This collaboration is very useful as it is able to reduce stress and tension in mathematics learning. All pupils participated in the construction and exploration of knowledge through these learning activities. The pupils therefore have high self-esteem and

confidence in achievement of mathematics learning since their anxiety have been overcome and this reduces the chances of failure. Like Walker (2007), I have shown that it is possible to use the excellence from your own students to guide others in need toward higher achievement. While that higher achieving student is explaining, rewording and then re-explaining, they too are benefitting from the peer tutoring. Not only are they practicing the problems, but they are gaining a deeper understanding of what they already know and are gaining confidence in mathematics (Walker, 2007).

The teachers play very important role as the facilitator and coordinator for the tutoring and cooperative discussing learning activities. It is necessary for the teacher to be aware of the choices of suitable mathematics tasks for the peer tutoring and group discussion. It is more fruitful to prepare a task to be accomplished in peer tutoring and cooperative learning rather than asking directly to the pupils work in individually. When a teacher is able to intertwine both activities (peer tutoring and cooperative learning) in the educational process, all the pupils can have the better positive attitude towards mathematics and improve their interpersonal relationships. The teacher must therefore be aware of this and his actions to a large extent can make or mar the whole process.

However, while Rosewal (1995) found that peer tutoring increased students' self-concept, my study did not strongly justify this finding. My data was limited due to the random sampling which could have led to wrong pairing or grouping. For success in utilizing these strategies the strong and the weak students must be identified and paired or grouped together. The pairing or grouping of weak students would rather poorer result than individual study because what you don't have you cannot give. This may also be because my data instruments were not

properly created to produce data that would clearly define whether peer tutoring had an impact on student confidence.

## **5.2 RECOMMENDATION**

Given these results, it is recommended that classroom teachers implement peer tutoring and/or cooperative learning into their daily classroom instruction as much as possible.

A better approach would be to allow the students themselves to choose their own peer tutors. Students openly complained about their being partnered with someone they did not like. This should however be properly scrutinized so that they don't go ahead to pick a friend as weak as they are.

Further step will also be to create lessons that are more conducive to having a partner. This is because result will not be achieved when lessons and tasks are not designed to give room for partnership.

It is therefore recommended to teach peer tutoring and cooperative learning instructional methods to pre-service mathematics teachers in order to foster highly effective instructional strategies. Kourea et al. (2007) also gives support for integrating peer tutoring into teachers' pre-service training in stating, "Guiding pre-service teachers in structuring peer tutoring, providing appropriate training, and monitoring and evaluating their progress will ultimately increase the likelihood of their continued use of such strategies throughout their teaching career" (p. 106).

## REFERENCE

Agnes Gardner, Agnes Tiwari, Howard Davies & Margaret O' Donoghue. (n.d)  
Peer tutoring. Learning and Teaching Resource Center. Retrieve from  
[http://ltrc.edc.polyu.edu.hk/student02\\_1.html](http://ltrc.edc.polyu.edu.hk/student02_1.html)

American Psychological Association (2010). *Publication manual of the American Psychological Association (6th edition)*. American Psychological Association: Washington, D.C.

Arendale, David R. (2007). Postsecondary Peer Cooperative Learning Programs: Annotated Bibliography. College of Education and Human Development. University of Minnesota Minneapolis, MN. Retrieve from  
[http://www.utas.edu.au/\\_\\_data/assets/pdf\\_file/0005/129371/Postsecondary-Peer-Cooperative-Learning.pdf](http://www.utas.edu.au/__data/assets/pdf_file/0005/129371/Postsecondary-Peer-Cooperative-Learning.pdf)

Brewer, R. D., Reid, M. S. , & Rhine, B. G. (2003). Peer coaching: Students teaching to learn. *Intervention in School and Clinic*, 39(2), 113-120.

Crow, L. (2004). Facilitator versus teacher. *Journal of College Science Teaching*, 34(3), 66-67.

Davis, K. W., & Weeden, S. R. (2009). Teacher as Trickster on the Learner's Journey. *Journal of the Scholarship of Teaching and Learning*. 9(2), 70-81.

Dineen, J. P., Clark, H. B., & Risley, T. R. (1977). Peer tutoring among elementary students: Educational benefits to the tutor. *Journal of Applied Behavior Analysis*, 10, 231-238.

- Elbaum, B., Vaughn, S., Hughes, M., & Moody, S. W. (1999). Grouping practices and reading outcomes for students with disabilities. *Exceptional Children*, 65, 399-415.
- Enright, S. M., & Axelrod, S. (1995). Peer tutoring: Applied analysis working in the classroom. *School Psychology Quarterly*, 10(1), 29-40.
- Farrell, B. J. & Farrell, H. M. (2008). Student satisfaction with cooperative learning in an Accounting curriculum, *Journal of University Teaching & Learning Practice*, 5, 2. Retrieve from <http://ro.uow.edu.au/jutlp/vol5/iss2/4>
- Fernandez-Santander, A. (2008). Cooperative learning combined with short periods of lecturing: a good alternative in teaching biochemistry. *Biochemistry and Molecular Biology Education*, 36(1), 34-38.
- Fitz-Gibbon, C. T. (1988). Peer tutoring as a teaching strategy. *Educational Management and Administration*, 16, 217-229.
- Greenwood, C. R. (1991). Longitudinal analysis of time, engagement, and achievement of at risk versus non risk students. *Exceptional Children*, 57(6), 521-535.
- Greenwood, C. R. (1997). Classwide peer tutoring. *Behavior and Social Issues*, 7(1), 53-57.
- Harris, V. W., & Sherman, J. A. (1973). Effects of peer tutoring and consequences on the math performance of elementary classroom students. *Journal of Applied Behavior Analysis*, 6, 587-597.
- Kamps, D. M., Barbetta, P. M., Leonard, B. R., & Delquadri, J. (1994). Classwide peer tutoring: An integration strategy to improve reading skills and promote

- peer interactions among students with autism and general education peers. *Journal of Applied Behavior Analysis*, 27, 49-61.
- Kourea, L., Cartledge, G., & Musti-Rao, S. (2007). Improving the reading skills of urban elementary students through total class peer tutoring. *Remedial and Special Education*, 28(2), 95-107.
- Leslie, L., & Caldwell, J.S. (2011). *Qualitative Reading Inventory – 5* (5th ed.). Boston: Pearson.
- Levine, H. M., Glass, G. V., & Meister, G. R. (1987). A cost-effectiveness analysis of computer assisted instruction. *Evaluation Review*, 11, 50-72.
- Maheady, L., & Harper, G. F. (1987). A class-wide peer tutoring program to improve the spelling test performance of low-income, third- and fourth-grade students. *Education and Treatment of Children*, 10(2), 120-133.
- McCarty, T., Griffin, S., Apollini, T., & Shores, R. E. (1977) Increased peer-teaching with group-oriented contingencies for arithmetic performance in behavior-disoriented adolescents. *Journal of Applied Behavior Analysis*, 10, 313.
- McGee, G. G., Almeida, M. C., Sulzer-Azaroff, B., & Feldman, R. S. (1992). Promoting reciprocal interactions via peer incidental teaching. *Journal of Applied Behavior Analysis*, 25(1), 117-126.
- Mesler, L. (2009). Making retention count: The power of becoming a peer tutor. *Teachers College Record*, 111(8), 1894-1915.

- Miller, D., Topping, K., & Thurston, A. (2010). Peer tutoring in reading: The effects of role and organization on two dimensions of self-esteem. *British Journal of Educational Psychology*, 80, 417-433.
- Miller, L. J., & Kohler, F. W. (1993). Winning with peer tutoring. *Preventing School Failure*, 37(3), 14-19.
- Olmscheid, C. (1999). *The effectiveness of peer tutoring in the elementary grades*. Retrieved from ERIC database. (ED430959)
- Oluremi, O.O., Rasaki A.A., & Joseph O.A (2009). Research methods in Economics for Undergraduates. Oyo. Masters Printers International.
- Parsons, S., Croft, T., & Harrison, M. (2009). Does Students' confidence in their ability in mathematics matter? *Teaching Mathematics and Its Applications*, 28(2), 53-68.
- Pigott, H. E., Fantuzzo, J. W., & Clement, P. W. (1986). The effects of reciprocal peer tutoring and group contingencies on the academic performance of elementary school children. *Journal of Applied Behavior Analysis*, 19, 93-98.
- Rosewal, G. M., Mims, A. A., Evans, M. D., Smith, B., Young, M., Burch, M., Croce, R., Horvat, M. A., & Block, M. (1995). Effects of collaborative peer tutoring on urban seventh graders. *The Journal of Educational Research*, 88(5), 275-279.
- Saeed Daneshamooz & Hassan Alamolhodaie (2012). Cooperative learning and academic hardiness on students' mathematical performance with different

- levels of mathematics anxiety. *International Research Journal*, 3, 3, 270 – 276. Thirteen Ed.
- Schisler, R., Joseph, L. M., Konrad, M., & Alber-Morgan, S. (2010). Comparison of the effectiveness and efficiency of oral and written retellings and passage review as strategies for comprehending text. *Psychology in the Schools*, 47(2), 135-152.
- Simmons, D. C., Fuchs, D., Fuchs, I. S., Hodge, J. P., & Mathes, P. G. (1994). Importance of instructional complexity and role reciprocity to classwide peer tutoring. *Learning Disabilities Research and Practice*, 9, 203-212.
- Spencer, V. G. (2006). Peer tutoring and students with emotional or behavioral disorders: A review of the literature. *Behavioral Disorders*, 31(2), 204-222.
- Taw Mei Yoke and Wong Wang Yuen (2011). SME 6044- Contemporary Issue in Mathematics Education. Cooperative Learning and Peer Tutoring in Overcoming Mathematics Anxiety.
- Topping, K. J. (2005). Trends in peer learning. *Educational Psychology*, 25(6), 631-645.
- Walker, E. N. (2007). The Structure and culture of developing a mathematics tutoring collaborative in an urban high school. *The High School Journal*, 91(1), 57-67.
- Webb, M. (1988). Peer helping relationships in urban schools. *Equity and Choice*, 4(3), 35-38.

Wikipedia, The Free Encyclopedia. (2012). Action research. Retrieved from 2012,  
[http://en.wikipedia.org/w/index.php?title=Action\\_research&oldid=4873142](http://en.wikipedia.org/w/index.php?title=Action_research&oldid=4873142)  
69

Wikipedia, The Free Encyclopedia. (2012). Cooperative learning. Retrieved from  
[http://en.wikipedia.org/w/index.php?title=Cooperative\\_learning&oldid=485273531](http://en.wikipedia.org/w/index.php?title=Cooperative_learning&oldid=485273531)

**APPENDIX I**  
**TEST QUESTIONS OF AN ACTION RESEARCH TO EVALUATE “THE EFFECT OF COOPERATIVE LEARNING AND PEER TUTORING ON SECONDARY SCHOOL STUDENTS’ MATHEMATICS PERFORMANCE”**

**STUDENT NAME:**..... **CLASS:**.....

**SCHOOL:** .....

.....

**FRACTIONS**

*Answer all the Questions*

**PART A**

1.  $\frac{4\frac{4}{5}-\frac{3}{5}+1}{3+4\frac{4}{5}}$  (a)  $\frac{2}{3}$  (b)  $\frac{1}{3}$  (c)  $\frac{4}{5}$  (d)  $\frac{1}{8}$
2. Simplify:  $\frac{2}{3} - \frac{3}{5}$  (a)  $\frac{1}{2}$  (b)  $\frac{1}{6}$  (c)  $\frac{4}{5}$  (d)  $\frac{1}{15}$
3. A boy has #800. He spends #160. What fraction of his original money does he have left? (a)  $\frac{1}{3}$  (b)  $\frac{4}{5}$  (c)  $\frac{1}{5}$  (d)  $\frac{7}{8}$
4. A flagpole 6.3m long is driven 1.4m into the ground. What fraction of the pole is above the ground? (a)  $\frac{1}{3}$  (b)  $\frac{2}{5}$  (c)  $\frac{7}{9}$  (d)  $\frac{9}{7}$
5. Simplify:  $9\frac{1}{3} - 5\frac{3}{4} + 6\frac{1}{2}$  (a)  $8\frac{1}{2}$  (b)  $9\frac{3}{4}$  (c)  $\frac{7}{8}$  (d)  $\frac{1}{3}$

**PART B**

*Please show your workings.*

6. Simplify:  $2\frac{1}{4} \times 3\frac{1}{2} \div 4\frac{3}{8}$
7. Which is greatest of :  $\frac{7}{9}, \frac{3}{4}, \frac{10}{13}$
8. There are 572 students in a mixed school.  $\frac{5}{11}$  of them are boys. How many girls are there?
9. How much less than 6 is the sum of  $2\frac{3}{4}$  and  $2\frac{4}{5}$ .
10. A notebook has 128 pages and 88 of them have been used. What fraction of the notebook remains?

**Researcher: Aliu Hussein Omeiza**

## APPENDIX II: SCORES OF THE GROUPED & NON GROUPED STUDENTS

A. St. Gabriel Commercial Secondary School.

		GROUP							NON GROUP						
		Objective Questions Attempted	Score (i.e No. of Obj. Ques. Answered correctly)	Theory Questions Attempted	Score (i.e No. of Theory Ques. Answered correctly)	Total no. of Questions Attempted	Score	Sex	Objective Questions Attempted	Score (i.e No. of Obj. Ques. Answered correctly)	Theory Questions Attempted	Score (i.e No. of Theory Ques. Answered correctly)	Total no. of Questions Attempted	Score	Sex
		5	5	5	5	10	10		5	5	5	5	10	10	
1	I	5	1	3	-	8	1	M	5	-	1	1	6	1	F
2	II	5	-	5	-	10	-	M	5	2	5	2	10	4	M
3	III	5	2	1	-	6	2	M	5	3	4	-	9	3	M
4	IV	4	3	2	1	6	4	F	5	2	4	-	9	2	F
5	V	5	1	2	-	7	1	M	5	2	2	-	7	2	M
6	VI	5	2	1	-	6	2	M	5	2	2	-	7	2	M
7	VII	5	1	3	1	8	2	F	5	1	-	-	5	1	F
8	VIII	5	-	4	-	9	0	F	5	3	1	-	6	3	F
9	IX	5	1	3	-	8	1	M	5	1	5	-	10	1	M
10	X	5	2	2	-	7	2	M	5	1	-	-	5	1	F
11	XI	5	-	3	-	8	-	M	5	1	1	-	6	1	F
12	XII	5	-	1	-	6	-	F	5	2	5	2	10	4	M
13	XIII	5	2	2	-	7	2	M	-	-	5	-	5	-	M
14	XIV	5	1	1	-	6	1	M	4	1	5	-	9	1	M
15	XV	5	2	1	-	7	2	F	5	1	1	1	6	2	F
16	XVI	5	-	5	-	10	-	F	4	1	2	1	6	2	F
17	XVII	4	1	4	1	8	2	F	4	1	3	1	7	2	F
18	XVIII	5	1	4	1	9	2	F	5	1	4	1	9	2	M
19	XIX	4	2	5	1	9	3	F	5	2	-	-	5	2	F
20	XX	5	3	5	1	10	4	F	-	-	1	1	1	1	M
<b>Mean Score</b>		<b>1.55</b>							<b>1.85</b>						

B. ONIREKE GIRLS GRAMMAR SCHOOL

		GROUP							NON GROUP						
		Objective Questions Attempted	Score (i.e No. of Obj. Ques. Answered correctly)	Theory Questions Attempted	Score (i.e No. of Theory Ques. Answered correctly)	Total no. of Questions Attempted	Score	Sex	Objective Questions Attempted	Score (i.e No. of Obj. Ques. Answered correctly)	Theory Questions Attempted	Score (i.e No. of Theory Ques. Answered correctly)	Total no. of Questions Attempted	Score	Sex
		5	5	5	5	10	10		5	5	5	5	10	10	
1	I	5	3	1	1	6	4	F	5	2	2	1	7	3	F
2	II	4	2	1	1	5	4	F	5	2	1	1	6	3	F
3	III	3	2	2	2	5	4	F	4	3	1	-	5	3	F
4	IV	4	1	2	1	6	2	F	5	1	-	-	5	1	F
5	V	5	3	3	2	8	5	F	4	2	1	-	5	2	F
6	VI	5	4	2	2	7	6	F	5	3	-	-	5	3	F
7	VII	4	4	1	1	5	5	F	4	4	-	-	4	4	F
8	VIII	3	3	1	1	4	4	F	4	1	2	1	6	2	F
9	IX	5	2	2	1	7	3	F	5	2	-	-	5	2	F
10	X	5	3	3	2	8	5	F	5	2	-	-	5	2	F
11	XI	5	1	2	1	7	2	F	5	3	-	-	5	3	F
12	XII	2	1	1	1	3	2	F	4	1	2	1	6	2	F
13	XIII	4	3	1	-	5	3	F	5	3	1	-	6	3	F
14	XIV	5	2	3	2	8	4	F	4	1	1	1	5	2	F
15	XV	5	1	1	-	6	1	F	4	-	2	1	6	1	F
16	XVI	3	1	2	-	5	1	F	4	-	3	2	7	2	F
17	XVII	2	2	2	-	4	2	F	4	1	2	-	6	1	F
18	XVIII	5	3	3	1	8	4	F	4	2	2	-	6	2	F
19	XIX	5	3	4	1	9	4	F	5	1	1	1	6	2	F
20	XX	4	2	2	-	6	2	F	5	1	1	1	6	2	F
<b>Mean Score</b>		<b>3.35</b>							<b>2.25</b>						

C. ALL SAINT COLLEGE

		GROUP							NON GROUP						
		Objective Questions Attempted	Score (i.e No. of Obj. Ques. Answered correctly)	Theory Questions Attempted	Score (i.e No. of Theory Ques. Answered correctly)	Total no. of Questions Attempted	Score	Sex	Objective Questions Attempted	Score (i.e No. of Obj. Ques. Answered correctly)	Theory Questions Attempted	Score (i.e No. of Theory Ques. Answered correctly)	Total no. of Questions Attempted	Score	Sex
		5	5	5	5	10	<b>10</b>		5	5	5	5	10	<b>10</b>	
<b>1</b>	<b>I</b>	5	3	5	2	10	<b>5</b>	M	5	4	3	3	8	<b>7</b>	F
<b>2</b>	<b>II</b>	5	4	5	3	10	<b>7</b>	M	5	4	4	2	9	<b>6</b>	F
<b>3</b>	<b>III</b>	5	5	5	4	10	<b>9</b>	F	5	3	2	1	7	<b>4</b>	M
<b>4</b>	<b>IV</b>	5	3	5	1	10	<b>4</b>	F	5	2	4	2	9	<b>4</b>	M
<b>5</b>	<b>V</b>	5	2	4	2	9	<b>4</b>	M	5	1	5	2	10	<b>3</b>	M
<b>6</b>	<b>VI</b>	5	3	4	3	9	<b>6</b>	F	5	2	5	3	10	<b>5</b>	M
<b>7</b>	<b>VII</b>	5	5	5	3	10	<b>8</b>	F	5	3	5	2	10	<b>5</b>	F
<b>8</b>	<b>VIII</b>	5	4	5	4	10	<b>9</b>	F	5	2	5	1	10	<b>3</b>	F
<b>9</b>	<b>IX</b>	5	4	5	1	10	<b>5</b>	F	5	2	4	2	9	<b>4</b>	F
<b>10</b>	<b>X</b>	5	5	5	2	10	<b>7</b>	M	5	3	5	3	10	<b>6</b>	F
<b>11</b>	<b>XI</b>	5	3	5	3	10	<b>6</b>	M	5	2	5	3	10	<b>5</b>	M
<b>12</b>	<b>XII</b>	5	5	5	4	10	<b>9</b>	F	5	1	3	2	8	<b>3</b>	F
<b>13</b>	<b>XIII</b>	5	2	5	4	10	<b>6</b>	F	5	2	5	3	10	<b>5</b>	M
<b>14</b>	<b>XIV</b>	5	4	4	3	9	<b>7</b>	F	5	3	5	4	10	<b>7</b>	F
<b>15</b>	<b>XV</b>	5	5	4	3	9	<b>8</b>	M	5	3	5	2	10	<b>5</b>	M
<b>16</b>	<b>XVI</b>	5	4	5	4	10	<b>8</b>	M	5	3	5	1	10	<b>4</b>	F
<b>17</b>	<b>XVII</b>	5	4	5	4	10	<b>8</b>	M	5	3	3	2	8	<b>5</b>	F
<b>18</b>	<b>XVIII</b>	5	4	5	2	10	<b>6</b>	F	5	4	4	2	9	<b>6</b>	F
<b>19</b>	<b>XIX</b>	5	3	5	1	10	<b>4</b>	F	5	5	5	3	10	<b>8</b>	M
<b>20</b>	<b>XX</b>	5	4	5	3	10	<b>7</b>	M	5	2	2	2	7	<b>4</b>	M
<b>Mean Score</b>		<b>6.65</b>							<b>4.95</b>						

D. ARMY BARRACK'S GRAMMAR SCHOOL

		GROUP							NON GROUP						
		Objective Questions Attempted	Score (i.e No. of Obj. Ques. Answered correctly)	Theory Questions Attempted	Score (i.e No. of Theory Ques. Answered correctly)	Total no. of Questions Attempted	Score	Sex	Objective Questions Attempted	Score (i.e No. of Obj. Ques. Answered correctly)	Theory Questions Attempted	Score (i.e No. of Theory Ques. Answered correctly)	Total no. of Questions Attempted	Score	Sex
		5	5	5	5	10	10		5	5	5	5	10	10	
1	I	5	5	5	1	10	6	M	5	4	3	2	8	6	M
2	II	5	4	5	2	10	6	M	5	3	5	1	10	4	M
3	III	5	3	5	1	10	4	F	5	1	1	-	6	1	F
4	IV	5	2	5	2	10	4	F	5	2	5	-	10	2	F
5	V	5	2	4	2	9	4	F	5	2	4	2	9	4	F
6	VI	5	2	4	3	9	5	F	5	3	5	1	10	4	M
7	VII	5	1	5	2	10	3	M	5	2	2	2	7	4	M
8	VIII	5	2	5	2	10	4	F	5	3	5	-	10	3	F
9	IX	4	2	5	1	9	3	F	5	3	3	2	8	5	M
10	X	5	1	5	2	10	3	F	5	3	-	-	5	3	M
11	XI	5	1	5	2	10	3	M	5	2	2	-	7	2	F
12	XII	5	-	5	1	10	1	M	5	1	5	2	10	3	F
13	XIII	4	4	4	-	8	4	M	5	-	1	1	6	1	F
14	XIV	5	3	3	1	8	4	M	5	2	2	1	7	3	F
15	XV	5	3	4	3	9	6	F	5	2	3	2	8	4	F
16	XVI	5	2	3	-	8	2	F	5	-	5	2	10	2	F
17	XVII	4	1	3	2	7	3	F	4	4	2	-	6	4	F
18	XVIII	4	2	3	-	7	2	M	5	-	5	3	10	3	M
19	XIX	5	3	4	2	9	5	F	5	2	-	-	5	2	M
20	XX	5	2	2	2	7	4	M	5	1	-	-	5	1	F
<b>Mean Score</b>		<b>3.8</b>							<b>3.05</b>						

E. ST. BEIGIG'S HIGH SCHOOL

		GROUP							NON GROUP						
		Objective Questions Attempted	Score (i.e No. of Obj. Ques. Answered correctly)	Theory Questions Attempted	Score (i.e No. of Theory Ques. Answered correctly)	Total no. of Questions Attempted	Score	Sex	Objective Questions Attempted	Score (i.e No. of Obj. Ques. Answered correctly)	Theory Questions Attempted	Score (i.e No. of Theory Ques. Answered correctly)	Total no. of Questions Attempted	Score	Sex
		5	5	5	5	10	<b>10</b>		5	5	5	5	10	<b>10</b>	
<b>1</b>	<b>I</b>	5	2	4	1	9	<b>3</b>	F	5	3	5	1	10	<b>4</b>	M
<b>2</b>	<b>II</b>	5	2	5	1	10	<b>3</b>	F	5	3	5	1	10	<b>4</b>	M
<b>3</b>	<b>III</b>	5	3	5	1	10	<b>4</b>	F	5	3	5	3	10	<b>6</b>	M
<b>4</b>	<b>IV</b>	5	3	5	1	10	<b>4</b>	F	5	2	4	0	9	<b>2</b>	M
<b>5</b>	<b>V</b>	5	4	5	0	10	<b>4</b>	M	5	5	5	4	10	<b>9</b>	M
<b>6</b>	<b>VI</b>	5	3	4	1	9	<b>4</b>	M	5	3	5	3	10	<b>6</b>	M
<b>7</b>	<b>VII</b>	5	2	4	0	9	<b>2</b>	M	5	1	4	0	9	<b>1</b>	F
<b>8</b>	<b>VIII</b>	5	2	5	2	10	<b>4</b>	F	5	2	3	1	8	<b>3</b>	F
<b>9</b>	<b>IX</b>	5	2	5	0	10	<b>2</b>	F	5	2	5	0	10	<b>2</b>	M
<b>10</b>	<b>X</b>	4	1	4	0	8	<b>1</b>	M	5	2	5	0	10	<b>2</b>	M
<b>11</b>	<b>XI</b>	5	2	3	0	8	<b>2</b>	M	5	2	4	2	9	<b>4</b>	F
<b>12</b>	<b>XII</b>	5	2	5	1	10	<b>3</b>	F	5	4	5	3	10	<b>7</b>	M
<b>13</b>	<b>XIII</b>	5	1	4	0	9	<b>1</b>	M	5	2	3	0	8	<b>2</b>	F
<b>14</b>	<b>XIV</b>	5	0	5	0	10	<b>0</b>	M	5	3	5	3	10	<b>6</b>	F
<b>15</b>	<b>XV</b>	5	1	5	0	10	<b>1</b>	M	5	4	5	2	10	<b>6</b>	M
<b>16</b>	<b>XVI</b>	5	1	5	0	10	<b>1</b>	M	5	3	3	0	8	<b>3</b>	F
<b>17</b>	<b>XVII</b>	5	3	3	0	8	<b>3</b>	M	5	2	5	1	10	<b>3</b>	F
<b>18</b>	<b>XVIII</b>	5	2	2	0	7	<b>2</b>	M	5	3	5	0	10	<b>3</b>	M
<b>19</b>	<b>XIX</b>	5	5	5	2	10	<b>7</b>	F	5	2	5	2	10	<b>4</b>	F
<b>20</b>	<b>XX</b>	5	2	5	2	10	<b>4</b>	F	5	2	3	1	8	<b>3</b>	F
<b>Mean Score</b>		<b>2.75</b>							<b>4</b>						

### APPENDIX III: CORRELATION COEFFICIENT FOR EACH SCHOOL

A

ALL SAINT COLLEGE				
NGRP	GRP			
X	Y	XY	(X <sup>2</sup> )	(Y <sup>2</sup> )
7	5	35	49	25
6	7	42	36	49
4	9	36	16	81
4	4	16	16	16
3	4	12	9	16
5	6	30	25	36
5	8	40	25	64
3	9	27	9	81
4	5	20	16	25
6	7	42	36	49
5	6	30	25	36
3	9	27	9	81
5	6	30	25	36
7	7	49	49	49
5	8	40	25	64
4	8	32	16	64
5	8	40	25	64
6	6	36	36	36
8	4	32	64	16
4	7	28	16	49
<b>99</b>	<b>133</b>	<b>644</b>	<b>527</b>	<b>937</b>
Mean G =	6.65	Mean NG =	4.95	
S.D G =	1.663	S.D NG =	1.394	
r =	<b>-0.32566</b>	tcal =	<b>3.41484</b>	
		df =	<b>39.69266</b>	

SAINT GABRIEL'S				
NGRP	GRP			
X	Y	XY	(X <sup>2</sup> )	(Y <sup>2</sup> )
1	1	1	1	1
4	0	0	16	0
3	2	6	9	4
2	4	8	4	16
2	1	2	4	1
2	2	4	4	4
1	2	2	1	4
3	0	0	9	0
1	1	1	1	1
1	2	2	1	4
1	0	0	1	0
4	0	0	16	0
0	2	0	0	4
1	1	1	1	1
2	2	4	4	4
2	0	0	4	0
2	2	4	4	4
2	2	4	4	4
2	3	6	4	9
1	4	4	1	16
<b>37</b>	<b>31</b>	<b>49</b>	<b>89</b>	<b>77</b>
Mean G =	1.55	Mean NG =	1.85	
S.D G =	1.234	S.D NG =	1.0399	
r =	<b>-0.34234</b>	tcal =	<b>-0.81034</b>	
		df =	<b>39.71066</b>	

ARMY BARRACK'S				
NG	G			
X	Y	XY	(X <sup>2</sup> )	(Y <sup>2</sup> )
6	6	36	36	36
4	6	24	16	36
1	4	4	1	16
2	4	8	4	16
4	4	16	16	16
4	5	20	16	25
4	3	12	16	9
3	4	12	9	16
5	3	15	25	9
3	3	9	9	9
2	3	6	4	9
3	1	3	9	1
1	4	4	1	16
3	4	12	9	16
4	6	24	16	36
2	2	4	4	4
4	3	12	16	9
3	2	6	9	4
2	5	10	4	25
1	4	4	1	16
<b>61</b>	<b>76</b>	<b>241</b>	<b>221</b>	<b>324</b>
Mean G =	3.8	Mean NG =	3.05	
S.D G =	1.36	S.D NG =	1.356	
r =	<b>0.262297</b>	tcal =	<b>1.702248</b>	
		df =	<b>39.99991</b>	

ST. BRIGID'S				
NG	G			
X	Y	XY	(X <sup>2</sup> )	(Y <sup>2</sup> )
4	3	12	16	9
4	3	12	16	9
6	4	24	36	16
2	4	8	4	16
9	4	36	81	16
6	4	24	36	16
1	2	2	1	4
3	4	12	9	16
2	2	4	4	4
2	1	2	4	1
4	2	8	16	4
7	3	21	49	9
2	1	2	4	1
6	0	0	36	0
6	1	6	36	1
3	1	3	9	1
3	3	9	9	9
3	2	6	9	4
4	7	28	16	49
3	4	12	9	16
<b>80</b>	<b>55</b>	<b>231</b>	<b>400</b>	<b>201</b>
Mean G =	2.75	Mean NG =	4	
S.D G =	1.618	S.D NG =	2.051	
r =	<b>0.174362</b>	tcal =	<b>-2.08569</b>	
		df =	<b>39.45054</b>	

## APPENDIX IV

NO. OF STUDENTS (FREQUENCY)															
SCORE	ST. GABRIEL		ST. BRIGID'S		ALL SAINT		ARMY BARRACK		ONIREKE GIRLS		TOTAL		PERCENTAGE		
	GR P	N. GRP.	GR P	N. GRP.	GR P.	N. GRP.	GR P.	N. GRP.	GR P.	N. GRP.	GR P	N. GRP.	GRP	N. GRP.	
4	7	10	7	10	20	17	12	8	11	1	57	46	57%	46%	
5	1	6	1	6	17	12	5	2	4	0	28	26	28%	26%	

RESULTS OBTAINED USING IN-BUILT Ms EXCEL DATA ANALYSIS TOOL												
	ST. GABRIEL's		ALL SAINT		ONIREKE GIRLS		ARMY BARRACKS		ST. BRIGID's		MEAN VALUE	
	Variable 1	Variable 2	Var. 1	Var. 2	Var. 1	Var. 2	Var. 1	Var. 2	Var. 1	Var. 2	Var. 1	Var. 2
Mean	1.55	1.85	6.65	4.95	3.35	2.25	3.80	3.05	2.75	4.00	3.62	3.22
Variance	1.52	1.08	2.77	1.94	2.03	0.62	1.85	1.84	2.62	4.21	3.58	1.61
Observations	20.00	20.00	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	5.0	5.0
Hypothesized Mean Difference	0.00		0.00		0.00		0.00		0.00		0.0	
df	<b>37.00</b>		<b>37.0</b>		<b>30.0</b>		<b>38.0</b>		<b>36.0</b>		<b>7.0</b>	
t Stat	<b>-0.83</b>		<b>3.50</b>		<b>3.02</b>		<b>1.75</b>		<b>-2.14</b>		<b>0.39</b>	
P(T<=t) one-tail	0.21		0.00		0.00		0.04		0.02		0.35	
t Critical one-tail	1.69		1.69		1.70		1.69		1.69		1.89	
P(T<=t) two-tail	0.41		0.00		0.01		0.09		0.04		0.71	
t Critical two-tail	2.03		2.03		2.04		2.02		2.03		2.36	

SUMMARY:RESULTS OBTAINED USING IN-BUILT Ms EXCEL DATA ANALYSIS TOOL			
SCHOOL	r	t-Stat.	df
ST. GABRIEL's	-0.34234	-0.8312	37
ALL SAINT	-0.32566	3.502	37
ONIREKE GIRLS	0.528593	3.023	30
ARMY BARRACKS	0.262297	1.745	38
ST. BRIGID's	0.174362	-2.618	36
*MEAN VALUE	0.793867	0.392	7

LEGEND	
Variable 1	Group
Variable 2	Ungroup

## APPENDIX V

**Computation of the Correlation coefficient, r using Product moment method.**

GRP (X)	N GRP (Y)	XY	X <sup>2</sup>	Y <sup>2</sup>		GRP (X)	N GRP (Y)	XY	X <sup>2</sup>	Y <sup>2</sup>
5	7	35	25	49		3	2	6	9	4
7	6	42	49	36		1	3	3	1	9
9	4	36	81	16		4	1	4	16	1
4	4	16	16	16		4	3	12	16	9
4	3	12	16	9		6	4	24	36	16
6	5	30	36	25		2	2	4	4	4
8	5	40	64	25		3	4	12	9	16
9	3	27	81	9		2	3	6	4	9
5	4	20	25	16		5	2	10	25	4
7	6	42	49	36		4	1	4	16	1
6	5	30	36	25		4	3	12	16	9
9	3	27	81	9		4	3	12	16	9
6	5	30	36	25		4	3	12	16	9
7	7	49	49	49		2	1	2	4	1
8	5	40	64	25		5	2	10	25	4
8	4	32	64	16		6	3	18	36	9
8	5	40	64	25		5	4	20	25	16
6	6	36	36	36		4	2	8	16	4
4	8	32	16	64		3	2	6	9	4
7	4	28	49	16		5	2	10	25	4
1	1	1	1	1		2	3	6	4	9
0	4	0	0	16		2	2	4	4	4
2	3	6	4	9		3	3	9	9	9
4	2	8	16	4		4	2	8	16	4
1	2	2	1	4		1	1	1	1	1
2	2	4	4	4		1	2	2	1	4
2	1	2	4	1		2	1	2	4	1
0	3	0	0	9		4	2	8	16	4
1	1	1	1	1		4	2	8	16	4
2	1	2	4	1		2	2	4	4	4
0	1	0	0	1		3	4	12	9	16
0	4	0	0	16		3	4	12	9	16
2	0	0	4	0		4	6	24	16	36
1	1	1	1	1		4	2	8	16	4
2	2	4	4	4		4	9	36	16	81

0	2	0	0	4		4	6	24	16	36
2	2	4	4	4		2	1	2	4	1
2	2	4	4	4		4	3	12	16	9
3	2	6	9	4		2	2	4	4	4
4	1	4	16	1		1	2	2	1	4
6	6	36	36	36		2	4	8	4	16
6	4	24	36	16		3	7	21	9	49
4	1	4	16	1		1	2	2	1	4
4	2	8	16	4		0	6	0	0	36
4	4	16	16	16		1	6	6	1	36
5	4	20	25	16		1	3	3	1	9
3	4	12	9	16		3	3	9	9	9
4	3	12	16	9		2	3	6	4	9
3	5	15	9	25		7	4	28	49	16
3	3	9	9	9		4	3	12	16	9
206	172	849	1202	764		156	150	478	600	586

$$\Sigma X = 362; \quad (\Sigma X)^2 = 131044; \quad \Sigma Y = 322; \quad (\Sigma Y)^2 = 103684$$

$$\Sigma XY = 1327; \quad \Sigma X^2 = 1802; \quad \Sigma Y^2 = 1350$$

$$r = \frac{N \Sigma XY - \Sigma X \Sigma Y}{\sqrt{[N \Sigma X^2 - (\Sigma X)^2][N \Sigma Y^2 - (\Sigma Y)^2]}}$$

$$= \frac{(200 \times 1327) - (362 \times 322)}{\sqrt{[(200 \times 1802) - 131044] \times [(200 \times 1350) - 103684]}}$$

$$= \frac{148836}{195308.9158} = 0.762054 \approx \underline{0.8}$$