

**EFFECT OF RECIPROCAL PEER-TUTORING ON INTEREST AND
PERFORMANCE IN GENETICS AMONG SECONDARY SCHOOL
STUDENTS IN ZARIA EDUCATION ZONE, KADUNA, NIGERIA**

BY

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**DEPARTMENT OF SCIENCE EDUCATION,
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AHMADU BELLO UNIVERSITY,
ZARIA**

FEBRUARY, 2021

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**A THESIS SUBMITTED TO THE SCHOOL OF POSTGRADUATE,
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THE REQUIREMENTS FOR THE AWARD OF MASTER DEGREE IN
SCIENCE EDUCATION**

**DEPARTMENT OF SCIENCE EDUCATION,
FACULTY OF EDUCATION,
AHMADU BELLO UNIVERSITY,
ZARIA**

FEBRUARY, 2021

DECLARATION

I hereby declare that this dissertation entitled “**Effect of Reciprocal Peer-tutoring on interest and Performance in Genetics among Secondary School students in Zaria Education Zone, Kaduna, Nigeria**” has been written by me, under the supervision of Prof. I. A. Usman and Prof. T. E. Lawal in the Department of Science Education. It is a record of my own work and it has not been presented in any previous application for a higher degree. All quotations and sources of information are fully acknowledged by means of references.

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(Date)

CERTIFICATION

This Dissertation entitled **“Effect of Reciprocal Peer-tutoring on interest and Performance in Genetics among Secondary School students in Zaria Education Zone, Kaduna, Nigeria”** by Zailani Safiya SHEHU (MRS)(P14EDSC8019) meets the regulation governing the award of masters degree in Science Education of the Ahmadu Bello University Zaria, Nigeria and is approved for its contribution to knowledge and literacy presentation.

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DEDICATION

This dissertation is dedicated to the memory of my husband Alhaji Mustapha Yusuf, my children Abdulkarim, Khadija and Yusuf Mustapha for their love and concern.

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OPERATIONAL DEFINITION OF TERMS

The following terms have been used to suit this study:

- **Reciprocal Peer-tutoring:** Is a teaching strategy in which students are partnered together to review information or practice skills.
- **Interest:** It is an individual desire, power and tendency to act in a particular way.
- **Academic Performance:** It is the exhibition of knowledge attained or skills developed by students in a subject designed by test scores assigned by teachers.

TABLE OF CONTENTS

Contents:	Page:
Title Page	i
Declaration	ii
Certification	iii
Dedication	iv
Acknowledgement	v
Operational Definition of Terms	vi
Table of Contents	vii
List of Figures	x
List of Tables	xi
List of Appendices	xii
List of Abbreviations	xiii
Abstract	xiv

CHAPTER ONE: THE PROBLEM

Contents:	Page:
1.1 Introduction	1
1.1.1 Theoretical Framework	6
1.2 Statement of the Problem	8
1.3 Objectives of the Study	10
1.4 Research Questions	10
1.5 Null Hypotheses	10
1.6 Significance of the Study	11
1.7 Scope of the Study	12
1.8 Basic Assumptions	12

CHAPTER TWO: LITERATURE REVIEW

2.1	Introduction	13
2.2	Teaching of Biology in Secondary Schools	13
2.2.1	Concept of Genetics in Biology	15
2.3	Science Teaching Methods	16
2.3.1	Different types of Cooperative Learning Strategies	18
2.4	Peer – Tutoring Strategy and Reciprocal Peer-Tutoring Strategy	19
2.4.1	Reciprocal Peer – Tutoring and Performance in Biology	25
2.5	Interest of Students towards Biology	27
2.6	Academic Performance of Students in Biology	31
2.7	Gender and Academic Performance in Science	31
2.8	Overview of Similar Studies	33
2.9	Implication of the Literature Reviewed for the Present Study.	42

CHAPTER THREE: METHODOLOGY

3.1	Introduction	44
3.2	Research Design	44
3.3	Population of the Study	46
3.4	Sample and Sampling Techniques	47
3.5	Instrumentation	48
3.5.1	Validation of Instruments	49
3.6	Pilot Testing	50
3.6.1	Reliability of Instruments	50
3.6.2	Item Analysis	51
3.7	Administration of Treatment	52
3.8	Data Collection Procedure	56
3.9	Procedure for Data Analysis	56

CHAPTER FOUR: DATA PRESENTATION, ANALYSIS AND DISCUSSION OF RESULTS.

4.1	Introduction	58
4.2	Data Presentation and Analysis of Result	58
4.2.1	Answering Research Questions	58
4.3	Hypotheses Testing	60
4.4	Summary of Major Findings	63
4.5	Discussion of Results	63

CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1	Introduction	67
5.2	Summary	67
5.2.1	Summary of Major Findings	69
5.3	Conclusions	69
5.4	Contribution to Knowledge	70
5.5	Recommendations	70
5.6	Limitation of the Study	71
5.7	Suggestions for Further Studies	71
	References	73
	Appendices	79

LIST OF FIGURES

Figure		Page
2.1	Flowchart for Reciprocal Peer-Tutoring Strategy	25
3.1	Research Design	45
3.2	Flow chart for Teaching Genetic Concept using Reciprocal Peer-Tutoring Strategy	55

LIST OF TABLES

Table		Page
1.1	Students' performance in Biology in Kaduna State WAEC May/June 2011– 2017	9
3.1	The Population of the Study	46
3.2	Sample for the study	48
3.3	Table of Specification foe GCPT Instrument	49
4.1	Posttest Mean and Standard Deviation of Academic Performance Scores of the Students in Experimental and Control Groups.	58
4.2	Mean and Standard Deviation of Academic Performance of Male and Female Students in Experimental Group Only.	59
4.3	Mean Rank Analysis of Interest of Students in Experimental and Control Groups.	59
4.4	Mean Rank Analysis of Interest of Male and Female Students in Experimental Group	60
4.5	Independent t-test Analysis of Mean Academic Performance Scores of Student in Experimental and Control Groups	60
4.6	Independent t-test Analysis of Mean Academic Performance Scores of Male and Female Students in Experimental Group Only	61
4.7	Kruskal Wallis Analysis on the Interest shown in Genetic by Students in Experimental and Control Groups	62
4.8	Kruskal Wallis Analysis on the Interest Shown in Genetics by Male and Female Students in the Experimental Group	62

LIST OF APPENDICES

Appendix:	Page:
A: Genetic Concept Performance Test (GCPT)	79
B: Marking Scheme of Genetic Concept Performance Test (GCPT)	84
C: Genetic Concept Interest Questionnaire (GCIQ)	85
D: Interaction with Validators	88
E: Lessons Plan for Experimental Group	92
F: Lessons Plan for Control Group	111
G: Reliability of Genetic Concept Performance Test (GCPT)	119
H: Analysis of Variance and Scheffe's Test for Study Sample	120
I: Perception of respondents on the level of their Interest after Taught Genetic Concepts using Reciprocal Peer-Tutoring Strategy	121

LIST OF ABBREVIATIONS

FME	-	Federal Ministry of Education
WAEC	-	West African Examination Council
NECO	-	National Examination Council
PT	-	Peer – Tutoring
RPT	-	Reciprocal Peer – Tutoring
STAN	-	Science Teachers Association of Nigeria
NPE	-	National Policy on Education
NCSSS	-	National Curriculum for Senior Secondary Schools
SSCE	-	Secondary School Certificate Examination
NERDC	-	Nigerian Education Research and Development Centre
GCPT	-	Genetic Concept Performance Test
SGCIQ	-	Students Genetic Concept Interest Questionnaire.

ABSTRACT

The study investigated the Effect of Reciprocal Peer-Tutoring on Interest and Performance in Genetics among Secondary School Students in Zaria Education Zone, Kaduna State, Nigeria. Four objectives, Research questions and Null Hypotheses were formulated to guide the research. A sample of one hundred and sixteen (116) SS II students was drawn using random sampling technique from a population of four thousand, one hundred and twenty five (4125) senior secondary school students in the study area. The study employed quasi-experimental design. The experimental group was taught Genetic Concept using Reciprocal Peer-Tutoring Strategy while Control group was taught using lecture method. Two instruments namely Genetic Concept Performance Test (GCIQ) and Genetic Concept Interest Questionnaire (GCIQ) were employed for data collection. The instruments were duly validated by experts. The reliability coefficient of the instruments were 0.92 and 0.82 respectively. Research questions raised were answered using Mean and Standard deviation and Mean Rank Statistics while null hypotheses were tested using t-test and Kruskal Wallis Statistics at $P \leq 0.05$ level of significance. The result revealed that there was significant difference in students academic Performance and interest between biology students taught genetic concepts using Reciprocal peer-tutoring strategy and those taught the same concept using lecture method, there is significant difference in the interest shown in genetic concepts by male and female students taught using Reciprocal Peer-tutoring and those taught using lecture method. Based on the findings, the following recommendations were made. The use of Reciprocal Peer-tutoring strategy should be encouraged and also Biology teachers should be sponsored to attend regular courses, workshops, and seminars on the use of Reciprocal Peer-tutoring Strategy.

CHAPTER ONE

THE PROBLEM

1.1 Introduction

Biology is one of the science subjects taught in Nigeria senior secondary schools and a compulsory science subject of choice among the students. The word biology is of Greek origin, coined from bios meaning ‘*life*’ and ‘*logos*’ meaning the study of life. Biology is conceptualized as a unique life subject, which deals with animate and inanimate objects, including their structure, function growth, origin, evolution and distribution. According to Ahmed and Abimbola (2011), biology is designed ultimately to educate individuals who may or may not pursue biological related careers, but could at least acquire the knowledge as pre-requisite for pursuing careers in science related disciplines. This includes medicine, nursing, pharmacy, agriculture, genetic engineering among others. According to Aliyu (2014), the popular nature of biology among the science subjects is attributed to it being softer and relatively easier to learn than chemistry or physics.

The objectives of biology curriculum as provided in the National Policy on Education (FRN 2014) are to prepare students to acquire; adequate laboratory and field skills in biology, meaningful and relevant knowledge in biology and also reasonable and functional scientific attitudes among others. According to James, in Danjuma (2017) the objectives of the National Policy on Education will not be achieved as desired, if appropriate teaching techniques and the principle of individual differences which exist among others are not closely monitored. In line with these objectives, the three major science subjects that are taught in senior secondary schools level in Nigeria are Biology, Chemistry and Physics. Therefore, this study will determine whether Reciprocal Peer -

Tutoring strategy will have any positive effect on students' interest and performance in Genetic Concepts in Biology.

Academic performance defined by Oludipe and Oludipe (2010) as the exhibition of knowledge attained or skills developed by students in a subject designed by test scores assigned by teachers. Poor performance in Biology has been the major concern of teachers, parents and the entire general public. Studies have shown that students perform poorly in biology. This is because the biology classes are usually too large and heterogeneous in term of ability level. According to Atadoga and Lakpini (2013), the persistent low academic performance in science education is attributed to teacher instructional strategies, attitude, learning style preferred among others. Thus, instructional, strategies used by teacher in teaching-learning process have significant influence on students' academic performance. Okebukola (2009) also attributed the poor achievement in Biology to the use of ineffective teaching and learning environment under which Biology teaching takes place. Abdulkarim (2010), opined that apart from the obsolete and inadequacy of equipment and laboratories for teaching biology, some teachers lacked in-depth knowledge of the subject matter and application of inappropriate teaching methods. Therefore, this study hopes to determine whether Reciprocal Peer - Tutoring will have any positive effect on students' performance and interest in genetic concept of Biology.

Genetics, as a branch of biology that studies heredity and variation and also the function and behavior of genes influences many aspects of our daily life from the food we eat, to identification of criminal, treatment of diseases among others. The study of genetics today is so important that from primary to tertiary institutions it is considered as crucial to the scientific and technological development of the society. According to Aliyu (2014) the understanding of the concepts of genetics and their mode of operation appears to be more

difficult than any other topic in biology this evident is shown in the WAEC and NECO Chief Examiners Reports (2012 – 2017).

The nature of science itself and its teaching methods are among the reasons for difficulties in learning science. Against this background, this study focuses on the effects of Reciprocal Peer-Tutoring on students' academic performance and interest among senior secondary school biology students.

Most teachers adopted conventional method popularly called lecture method which is an oral presentation of ideas, concepts and principles to the students. Usually in teaching with lecture method, the teacher stands in front of the classroom and dictates information relevant to the course content. Lecture Method is less tedious, saves time and provides fascinating and aesthetically stimulating experience especially for new students on topics of interest,Obeka (2009). Similarly, Nworgu (2009) considered lecture method as a one way flow of communication from teacher to the students. It is teacher centered approach because most of the talking is carried out by the teacher while students remain passive listeners often taking notes. Considering the above scenario lecture method is concerned with how much ground is covered by the teacher before examination. Therefore, most science classrooms today are characterized by lecture method due to the fact that it leads generally to adequate coverage of the syllabus.

According to Nworgu (2009) Lecture method does not take care of individual differences in the students and does not actually involve the students in the active learning process. Hence, it becomes necessary for science teachers to try out other strategies that can allow students to participate actively during lessons. The act of giving help improves learning, and in explaining to other students have the opportunities to engage in knowledge building. Most students do not exhibit these positive helping behaviors and it appears that

they must be assisted in order to give and receive beneficial help. Students' interaction can be supported through the use of active strategies which are regarded as students centered strategies that provide students with ample opportunity to become actively engaged and help each other to learn.

Peer – Tutoring (PT) is acquisition of knowledge and skill through active helping and supporting among status equals or matched companion (Topping, 2005). Romano and Walker (2010), described peer – tutoring as an instructional strategy where peers act as

“Instructional agents for their fellow students.” In the same view, Adekoya and Olatoye (2011), defined peer – tutoring as an instructional strategy that consists of student partnerships, linking high achieving with low – achieving students or those with comparable achievement for structured reading and study sessions. Also Nguyen (2013) views peer-tutoring as an instructional method that involves pairing of higher – performing students to tutor lower performing students in a class – wide setting or in a common venue outside the school under the supervision of teacher. Therefore, Peer-tutoring can be defined as the teaching of low – performing students by high – performing students in the class.

Maheady and Gard (2010) reported that peer-tutoring has been commonly implemented in many educational settings across a wide range of ages in a variety of content areas. They added that the strategy does not only have significant improvement on students' academic performance but also reduced destructive behavior thereby enhances interpersonal interaction among the students. The use of interest or reward system in biology will encourage students' participation and task behaviour. During the peer-tutoring sessions, the teacher is expected to supervise all activities and pass out raffle tickets to students exhibiting good tutoring. This can be done to overcome challenges to student's

motivation, teachers also emphasize confidentiality, positive interest and adequate response time when asking questions in peer-tutoring class and this will have significant influence on students' academic performance because it encourages students to learn.

Therefore, Reciprocal Peer - Tutoring strategy is the process by which students with guidance from a teacher helps one or more students at the same grade level to learn a skill or concept. It involves students from similar social groups helping each other to learn and learning themselves by so doing (Topping, 2005). Reciprocal Peer - Tutoring can also be defined as a flexible, peer – mediated strategy that involves students serving as academic tutors and tutees; typically, a higher performing student is paired with a lower performing student to review critical academic or behavioural aspects. In the same vein Reciprocal Peer - Tutoring is a teaching intervention strategy in which students alternate between the role of a tutor and a tutee. Students get to be the teacher and the learner. In this method, two or more students are grouped together, and it can be used for any subject or age group. Reciprocal Peer - Tutoring allows each student the chance to teach a review lesson, monitor other students in the group and evaluate each other's work through observations or work samples, in this strategy students are huge part of the process. The students can prepare instructional materials as well as receive immediate feedback from their peers. Most Reciprocal Peer - Tutoring Strategy incorporates some kind of rewards for students. Rewards can be given for progress as well as abiding by group rules and procedures (which are enforcing appropriate social skills) for students to feel successful in the groups, they need to be rewarded for more than just academic success. This study will therefore, investigate whether Reciprocal Peer - Tutoring would enhance interest and performance in genetics among secondary school students.

A part from poor teaching strategy, another factor of concern that led to poor performance is lack of interest in science subjects (Biology inclusive) as observed by (Nweke, 2010).

As a psychological variable, interest has a history. Walter and Heart (2009) define interest as an individual's desire, power and tendency to act in particular way. The development of interest has been the focus of conceptualizations (Hidi & Renninger (2006) & Krapp 2002 & 2007). described interest as being a psychological state and predisposition to reengage particular disciplinary content over time that develops through the interaction of the person and his or her environment.

Krapp (2007) opined that once interest is maintained, repeated engagement can be either self-initiated or promoted by the environment, leading to the development of first an emerging and then a well-developed interest. Interest could also be seen as “a psychological state of engagement, experience in the moment and also a predisposition to engage repeatedly in particular ideas, event or object overtime” (Paul 2014). Interest simultaneously diversifies one's experienced and focuses his experience, leading him to pay attention to only certain things and not to some other things that tends to stimulate the persons attention. Renninger (2006); Danjuma (2017) added that if interest of a student could be generated during learning process, academic performance is certain to be enhanced. In senior secondary school, students select a major field of study (Biology, physics and chemistry are the science subjects that can be chosen). Therefore, the researcher seeks to investigate whether Reciprocal Peer - Tutoring will enhance interest and performance in genetics among secondary school students in Zaria Education Zone.

1.1.1 Theoretical Framework

This study is hinged on Social Constructivism by Vygotsky (1929) and cooperative learning theory by Johnson and Johnson (1996). According to Vygotsky (1929) knowledge is first constructed in a social context and is then appropriated by individuals. He added that “human development is a socio-genetic process by which students gain mastery over cultural tools and signs in the course of interacting with others in their

environments". The method of communication between the tutee and tutor in a more knowledgeable order is said to "effect development if the interaction occurs within the child's zone of proximal development". Within this zone of proximal development Vygotsky hypothesized that "higher mental functioning in an individual has its origins in social activity". He further added that zone of proximal development "is the distance between the actual developmental levels as determined by independent problem solving and the level of potential development as determined, through problem solving under adult guidance or in collaboration with more capable peers". The partnership with more capable peers impacts knowledge through different ways. Some of these ways include "demonstration, leading questions, and by introducing the initial elements of the task's solution". Vygotsky clearly stressed the individual's active role in development. In collaboration his research shows that the "student can always do more than he can do independently". This shows that, the process of sharing individual perspectives called peer learning results in students constructing understanding together that will never be possible alone. Social constructivism viewed learning as an active process where students should learn to discover principles, concepts and facts for themselves, hence social constructivist emphasized that individuals make meanings through the interactions with each other and with the environment they live in.

Similarly, social constructivists are of the view that instructors have to adapt to the role of facilitators and not teachers. Whereas a teacher gives a didactic lecture that covers the subject matter and gives answers according to a set curriculum, a facilitator helps the students to get to their own understanding of the content and provides guidelines and creates the environment for the students to arrive at their own conclusions; in the former scenario the students plays a passive role and in the latter scenario the student plays an active role in the learning process. The emphasis thus turns away from the instructor and

but to contents and towards the students. This dramatic change of role implies that a facilitator needs to display a totally different set of skills than that of a teacher. By implication social constructivist theory utilizes peer interaction to developed desirable behavior, interest and sense of belonging in students.

1.2 Statement of the Problem

Despite the importance of Biology and its impact on the scientific and Technological development of the society, the performance of students in some biology concepts is still not encouraging, for example genetics is one of the important biology concepts taught at secondary schools. The concept enables students to understand and appreciate some of the natural processes of life such as the food we eat, to identification of criminal, treatment of diseases among others (Aliyu, 2014). However, research conducted by Nsofor and Ala (2013) attributed the deterioration in students performance in genetics to ineffective strategy in teaching biology. Similarly, WAEC Chief Examiners Report (2011 – 2017) also attributed this poor performance in Biology to low performance in Genetic concepts and the situation still persist. Lawal (2009) state that part of the problems leading to this failure rate in genetics could include poor method of instruction.

This poor performance of students in biology has continued to be a major cause of concern to all particularly those in the mainstream of biology education in Nigeria. Among other factors that have been identified to be responsible for poor performance in biology are difficulty in the nature of science subjects, (Olorukooba & Muoneme, 2014); Poor Method of Teaching and Improper use of materials (Usman, 2010a) and Students' lack of interest (Nweke, 2010). The needs to find solutions to Students' Poor Academic Performance in Science subjects and biology is therefore an obvious factor. This situation has created the need for more effective teaching method that will enable the students engage in a peer-interaction that will help them know the areas of strength and weakness to be able to perform very well and have more

interest in biology. Shiri (2005) worked on effects of Peer-Tutoring on the Performance of Sixth grade students during volleyball practice and game play in Ohio indicated that Peer-Tutoring is an acceptable strategy to use in Physical Education classes. In southern Part of Nigeria research on Peer-Tutoring Strategy in the aspect of Agricultural Science was conducted by Adekoya and Olatoye, (2011) and the result shows that Peer-Tutoring Strategies of Teaching are potents in raising students performance. In similar vain Ezenwosu and Nworgy, (2013) conducted a research on the efficacy of Peer-Tutoring and Gender on students' achievement in Biology. It was found to enhance interest and academic performance. Relatively few studies were conducted in biology specifically on genetic concepts using Reciprocal Peer-Tutoring Strategy and in Northern Nigeria particularly Kaduna State. Hence, the present study was out to investigate the Effect of Reciprocal Peer-Tutoring Strategy on Interest and Performance in genetic concepts among Secondary School Students in Zaria Education Zone, Kaduna State, Nigeria. The performance of students can be seen from the statistical table of Biology results in May/June West African Examination S.S.C.E.

Table 1.1 Kaduna State WAEC Examination Results of Biology Students from 2011-2017

Year	Total Sat	No. With A1 – C6	% with A1 – C6	No. With D7 – F9	% with D7 – F9
2011	126,821	59657	47.04	67161	52.96
2012	134,852	56570	41.95	78282	58.05
2013	130,653	56155	42.98	74498	57.02
2014	150,925	72204	47.85	78722	52.17
2015	143,936	62008	43.08	81928	56.92
2016	149,162	61028	40.90	88134	59.10
2017	136,916	58284	42.60	78632	57.40

Source: West African Examinations Council, Kaduna Office (2018).

1.3 Objectives of the Study

This study has the following objectives which are to:

1. Investigate the Effect of Reciprocal Peer - Tutoring Strategy on the academic performance of senior secondary school students in genetic concepts.
2. Examine gender related Effect of Reciprocal Peer - Tutoring Strategy on the academic performance of senior secondary school students in genetics.
3. Find out the Effect of Reciprocal Peer - Tutoring Strategy on the interest of students in genetic concepts.
4. Determine the gender related Effect of Reciprocal Peer - Tutoring Strategy on the interest shown in genetic concepts by students.

1.4 Research Questions

The following research questions were formulated to guide the study:

1. What is the difference between mean academic performance scores of biology students taught genetic concepts using Reciprocal Peer - Tutoring strategy and those taught using lecture method?
2. What is the difference in the mean academic performance scores of male and female students taught genetic concepts using Reciprocal Peer – Tutoring Strategy?
3. Is there any difference in the interest shown in genetic concept by students taught using Reciprocal Peer - Tutoring strategy and those taught using lecture method?
4. What is the difference in the interest shown for genetics by male and female students taught using Reciprocal Peer - Tutoring strategy?

1.5 Null Hypotheses

Based on the research questions, the following null hypotheses were tested at 0.05 level of significant.

Ho₁: There is no significant difference in the mean academic performance scores of students taught Genetic Concepts using Reciprocal Peer - Tutoring strategy and those taught using lecture method.

Ho₂: There is no significant difference in the mean academic performance scores of male and female students taught genetic concepts using Reciprocal Peer - Tutoring strategy.

Ho₃: There is no significant difference in the interest shown in genetics by students taught using Reciprocal Peer - Tutoring strategy and those taught using lecture method.

Ho₄: There is no significant difference in the interest shown in genetics by male and female students taught using Reciprocal Peer - Tutoring strategy.

1.6 Significance of the Study

The findings of this study would hopefully benefit the following:

Biology Students- Enable students to learn meaningfully, the students will receive individualized instruction and will respond better to their peers than to their teachers. The students will also attain companionship from the students that tutored them and they will exercise their skills practically. With the use of RPT students could bring in the spirit of team work and doing it yourself at classroom level.

Biology Teachers- Provide a teaching strategy for teaching biology in order to inculcate in students the skills of diligent search and enhance positive performance in biology students.

Curriculum Planners: Useful to curriculum planners of senior secondary schools to emphasize the use of the Reciprocal Peer - Tutoring. This may help to enhance the performance in biology, thus reducing the rate of failure in the subject.

Government Agencies; Government agencies at various levels, more especially those concerned with the business of science and technological education would find this work useful as it will provide information of the ways of giving it citizen quality science education.

Professional Bodies: Like Science Teachers Association of Nigeria (STAN) will benefit from this study by organizing workshops and seminars for teachers

Other Researchers: may develop interest to investigate the Effect of Reciprocal Peer – Tutoring strategy on student academic performance and interest in other concepts of Biology and science subjects in general. It will also serve as source of literature review in related field.

1.7 Scope of the Study

The study investigated the Effect of Reciprocal Peer-Tutoring on students' performance and interest in genetic concepts. It was delimited to public senior secondary school two (SSII) students in Zaria Education Zone, Kaduna State, Nigeria. It lasted for a period of six weeks. The concepts chosen under genetics includes: Definition of genetics, Genetic Terminologies, Chromosomes: the basis of heredity and Mutation. These concepts have been identified as difficult by WAEC and NECO Chief Examiners' Reports (2010 – 2017). And much work has not been done on the area of genetics. Teaching genetics as a concept using Reciprocal Peer-Tutoring strategy allow the learners to actively participate through interacting with their peers, and this enhances student academic performance and interest in the subject matter. Therefore, in this study the researcher investigated the Effect of Reciprocal Peer - Tutoring Strategy on interest and Performance in Genetic Concepts among Secondary School II Biology students in Zaria Education Zone, Kaduna State Nigeria.

1.8 Basic Assumptions

The study is based on the assumption that:

1. Effect of Reciprocal Peer-Tutoring strategy is measurable
2. The curriculum used is the same for all Biology Senior Secondary Schools in Zaria Education Zone.
3. The Biology students are taught by qualified and experienced teachers as recommended in the National Policy on Education.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1 Introduction

This study investigated the Effect of Reciprocal Peer - Tutoring on students' academic performance and interest in genetic concepts. This chapter reviewed related literature under the following sub-headings:

2.2 Teaching of Biology in Secondary Schools

2.2.1 Concept of Genetics in Biology

2.3 Science Teaching Methods

2.3.1 Different types of Cooperative Learning Strategies

2.4 Peer – Tutoring Strategy and Reciprocal Peer-Tutoring Strategy

2.4.1 Reciprocal Peer - Tutoring Strategy and Performance in Biology

2.5 Interest of Students towards Biology

2.6 Academic Performance of Students in Biology

2.7 Gender and Academic Performance in Science

2.8 Overview of Similar Studies

2.9 Implication of the Literature Reviewed for the Present Study.

2.2 Teaching of Biology in Secondary School

In Nigeria, the sciences are taught in school subjects such as Biology, Chemistry and physics. The National Policy on Education (NPE) in the National Curriculum for Senior Secondary Schools (NCSS), stated specific objectives to be achieved by each science subject curriculum. The curriculum stated the cardinal objectives for Biology teaching/learning in Nigeria should include adequate laboratory and field skills in Biology, meaningful and relevant knowledge in Biology, ability to apply scientific knowledge to everyday life in matters of personal and comm. unity health, agriculture and formation of reasonable and functional scientific attitudes.

Teaching and learning of biology in secondary schools in Nigeria is predominantly by the traditional method of teaching and learning adopted for most subjects in secondary schools (Jaja, 2013). In traditional method of teaching and learning, teachers present information to the whole class at once (Jaja, 2013). With this method, the teacher is the center of instruction and students are passive. Student competitiveness and individuality are rewarded in traditional method of teaching and learning as students strive to attain the highest grade and gain the reputation being the smartest student. Students in traditional classrooms work against each other to attain the goal of best student or best grade, a goal only one or at most only a few students can achieve. An alternative to the traditional method is a student centered learning strategy known as peer- tutoring learning strategy. Biology as a subject in secondary school level is used to investigate the structure and functions of living beings. Teachers bring animals or plants into the classroom in order to teach about their structures and functions. In ideal situation, it is necessary that the students perform the classroom experiments on real objects (animals or plants); thus experimentally learning as close to the “real” world as possible. This requires active participation of the students of different cognitive styles. Biology is a natural science subject consisting of contents from microscopic organisms to the biosphere in general encompassing the earth’s surface and all living things. Considering its fundamental characteristic and importance, biology is today a standard subject at secondary school certificate examination (SSCE), whose study is very relevant to man’s successful living.

Biology is one of the science subject students like to study both at secondary and tertiary levels of education. The fact that this subject is particularly required for professional course like medicine, pharmacy, biochemistry, agriculture, environmental studies and others in the university, stimulates learning of the subject at the secondary school level students are expected to sit for Biology as one of the science subjects at senior secondary

certificate examination (SSCE); the examination is made up of a theory, multiple choice questions and practical examinations (Kareem, 2003; Aminu, 2012). This study therefore, investigated Effect of Reciprocal Peer- Tutoring on Interest and Performance in genetics among secondary school students.

2.2.1 Concept of Genetics in Biology

Genetics, a branch of biology that studies the function and behavior of genes and how they influence many aspects of our daily life, the food we eat, to how we identify animals and treat diseases. In agriculture, genetic advances enable scientist to alter a plant or animal to make it more useful, for instance, some food crops such as oranges, potatoes, wheat, soya beans and rice have been genetically altered to withstand insects pest and harsh weather conditions. Tomatoes and apples have been modified to resist discoloration or bruising on their way to market, thus enhancing their appeal on super market shelves. Soya beans pods have been modified to prevent them from breaking open and scattering the seeds away when they are not harvested in good time on the farm. The study of genetics today is so important that, from primary levels of academic institution, it is considered as crucial to the scientific and technological development of the society.

The study of genetics today is so important that from primary to tertiary institutions it is considered as crucial to the scientific and technological development of the society. According to Aliyu (2014) the understanding of the concepts of genetics and their mode of operation appears to be more difficult than any other topic in biology this evidence is shown in the WAEC and NECO (2010 – 2015) chief examiners report. Lawal (2009) stated part of the problems leading to this failure rate in genetics to include poor method of instruction. Nsofor and Ala (2013) also attributed the deterioration in students' performance in genetics to ineffective strategy in teaching biology. In line with persistent

poor performance which may be due to ineffective use of teaching method and lack of interest among others. Although efforts had been made by authorities and agencies in the field of education such as Nigeria Federal and State Ministries of Education, Nigerian Education Research and Development Centre (NERDC) and Science Teachers Association of Nigeria (STAN) and West African Examination Council (WAEC) among others to device ways of influencing students' academic performance in Nigerian Secondary Schools. Thus, the presents study determined the Effect of Reciprocal Peer – Tutoring Strategy on interest and performance in Genetics among secondary schools' students in Zaria, Kaduna State Nigeria.

2.3 Science Teaching Methods

Teaching method is a technique of transmitting knowledge and skills to students. Scholars like: (Joshi, 2008, Olorukooba, Lawal & Jiya, 2012) opined that there have been a variety of methods and techniques for teaching the sciences. Most of these are in use and each of them provides something useful and worthwhile to a capable and enthusiastic teacher. None of the method is error proof; each of the is associated with a number of advantages and disadvantages. These methods include: Lecture method, demonstration method, inquiry method, laboratory technique among others.

Lecture method is a teaching method that involves oral or verbal presentation of ideas, concepts and principles to the students, usually in teaching with lecture method, the teacher stands in the front of the classroom and dictates information relevant to the course content. Similarly, Nworgu (2009) considered lecture method as a one way flow of communication from teacher to the students. It is teacher centered approach because most of the talking is carried out by the teacher while students remain passive listeners often taking notes. Considering the above scenario lecture method is concerned with how such

grounds is covered by the teacher before examination. The obvious advantages of coverage of both the syllabus and accommodating a large number of students, lecture method can only be successful if it is blended with students participation particularly at the developmental stage; and this can only be achieved by allowing students to ask questions and participate in answering the questions during the lecture period. Lecture method has some advantages and disadvantages which are as follows:

- It is convenient and easy and a teacher is free to adopt his own style of teaching.
- It is quick, and a lot of knowledge can be imparted in quite a lesser time.
- It could be delivered through radio, thus minimizing the cost of employing teachers.
- Using of this method excludes the use of any equipment or laboratory

Some of the disadvantages of lecture method include:

- Student's previous knowledge or entry behaviors are usually not taken into consideration.
- Teacher needs a lot of prior knowledge to prepare lecture
- Developing scientific skills are neglected.
- **Demonstration Method:** It is another method of teaching science. The method allows the students to see the teacher actively engaged as a model rather than merely telling the information. Students learn mental or physical skills by performing those skills under supervision. Demonstration is therefore an instructional strategy in which the teacher did a lot of "*showing and doing*" activities while the students listen and observe the teacher. After the teacher has finished the performance of a particular activity, the students might be required to perform same activity in order to test their understanding. If the teacher showed a particular process, act of skills or technique with no explanation accompanying it, this is known as "*pure demonstration*" Demonstration with commentary occurs if

demonstration was accompanied with verbal explanation in participative form of demonstration, students participate in the demonstration given by the teacher.

- **Inquiry Method:** This is also called problem – solving involves seeking or asking for information about something, inquiry based teaching approach provide useful platform for engaging students in practice, hand on science investigation that can bring them in interaction with living and non-living aspect of the environment (Hubber& Moore, 2011). This method as argued by the authors could be a very potent instructional strategy for science teachers in teaching science subjects particularly where the real answer to the problem is not known. Inquiry method is students centered and agrees with early psychologist like Bruner (1966) who said that learning involves processing of information that is organized and constructed in a unique way by each individual. The processing will lead into exploration and discovery.

Therefore, within this study lecture method was used to teach the control group the genetic concepts of biology in secondary school level.

2.3.1 Different Types of Cooperative Learning Strategies.

Cooperative learning strategy is a strategy that emphasize the use of small group of two to five students who work together cooperatively to accomplish shared goals. There are three main types of cooperative learning:

1. **Informal Learning Groups:** These groups are short term and not very structure. They typically involve activities where classmates turn to a neighbour to discuss a problem or concept for a few minutes. Informal groups are generally small, usually two but not more than three people. It's most convenient to use informal learning groups for quick activities such as checking for understanding, brainstorming, quick problem solving, summarising

or review. These groups are a great way to change up a lecture format by giving students a few minutes to discuss a concept with a peer.

2. Formal Learning Groups: Formal learning groups are assigned a task or project and stay together until it is complete. There is a clear structure to these groups set by the teacher that includes task and behaviour expectations. Formal learning groups can be heterogeneous or homogenous depending on the assignment. Most groups perform well with three to four people any more than five become unproductive. Doing a project, solving a series of problems reviewing for a test or writing a report are all examples of how formal learning groups can be used in a classroom.

3. Cooperative Base Groups: These groups are different from the previous two in this they are long term supporting groups. Base groups should last for a minimum of a semester or term but can be anywhere up to several years. Since they are long term commitment, typically these groups become more than just academic problem solving groups. Members in base groups often become a personal support system for each other, building relationship and trust during the duration of their cooperative base groups is that the members develop peer accountability and support each other while learning together. Eg: Peer-Tutoring Teaching Strategy.

2.4 Peer – Tutoring Strategy and Reciprocal Peer-Tutoring Strategy

Romano and Walker (2010), describe peer – tutoring as an instructional strategy where peers act as an “Instructional agents for their fellow students” in the same view, Adekoya and Olatoye (2011), defined peer – tutoring as an instructional strategy that consists of student partnerships, linking high achieving students with low – achieving students or those with comparable achievement for structured reading and study sessions. Also Nguyen (2013) viewed peer- tutoring as an instructional method that involves pairing of

high – performing students to tutor lower performing students in a class – wide setting or in a common venue outside the school under the supervision of teacher. (Paul Lisa and Venesa, 2006) opines that peer -tutoring consist of two or more students working together, teaching and learning from each other.

Peer – Tutoring (PT) is also called peer teaching or reciprocal teaching (Menelese 2012). Peer – tutoring enhances motivation, improved cognition and social out comes in learning, increased sense of responsibility for one’s own learning and improved meta – cognitive skills.

Peer tutoring has some characteristics which were outline by (Spencer, 2006):

- It promotes academic and social development for both the tutor and tutee.
- It is a widely researched practice across ages, grade levels and subject areas.
- The intervention allows students to receive one – to – one assistance.
- Peer – tutoring strategy increase interest and performance of students.
- Students have increased opportunities in respond in smaller groups.
- Student engagement and time on task increases.

Peer tutoring strategy has five sequential steps to be followed, (Miller & Thurston, 2010) provide a practical guide to the steps involved in carrying out a successful peer tutoring program; from choosing the tutoring format and training the tutors through testing for effectiveness. The five steps are:

Step 1: Select a Tutoring format

Step 2: Train the tutors

Step 3: Arrange the environment

Step 4: Run the programme

Step 5: Test for effectiveness

Goddard, Heron and Welsh (2003) and Tracy 2008, identified five format of Peer – Tutoring Strategy these includes:

Cross – Age Tutoring: This is reviewed by Heron et al (2003) as tutor – tutee dyads which composed of pairs of students of unequal ages or from different grades. The older student delivers instructions to the younger one (Miller et. al., 1994; Thurston, 2010). Configuration of the dyads might include older children within the same school or from a different school or students from general education paired with children with special needs (Heron, 2003).

Home – based Tutoring: Heron et al. (2003) identified home based tutoring as a system which includes parents (or siblings) serving as tutors initial skill training includes the “model – lead – test” format; tutoring procedures are modeled to parents and they are led through it and after that parents complete the procedures independently with feedback from the trainer (Heron et al. 2003)

Small – Group Tutoring: Small- group tutoring format, tasks are clearly assigned, students are working together in a group small enough so that everyone can participate on the tasks (Siedentop et al. (2003) found in their review three variation of small – group tutoring:

- a) A small group of tutor – tutee dyads, convenes to practice individualized skills during independent seat works.
- b) The teacher instructs one group while the rest of the class is engaged in a tutoring session or in a daily seat work and;
- c) Several tutors who rotate for one students needing assistance.

One – to – one Tutoring: This format of tutoring occurs in the general or special education classroom and only selected tutor – tutee dyads participate within it. Students needing directive and remedial assistance (Heron et al. 2003). Bloom (1984) mentioned one – on one tutoring enables constant feedback and corrective process between the tutor and the tutee. Reinforcement and encouragement are

integrated in the tutoring situation in addition to the tutee active participation in the learning.

Reciprocal Peer – Tutoring: This form of peer- tutoring was developed from the observation that much of teacher – designed instruction fails to engage the academic behavior of students of different abilities. Teacher designed instruction did not have the ecological arrangements necessary to support students’ academic responding and engagement, whereas RPT was an instructional arrangement designed specifically to accelerate all students’ levels of academic responding and engagement and to provide feedback, immediate error correction, high mastering level and content coverage (Adekoya&Olatoye, 2011). Shirri (2005), viewed Reciprocal Peer – tutoring as an interdependent group contingency where students are held accountable for their performance, roles are reciprocated and students assess their peer and provide feedback. Similarly, (Maheady&Gard 2010) added that RPT is different from other strategies to instruction that use students to instruct other students because RPT is a tutoring system with several distinct phases: training, practice and evaluation. Students are trained to conduct each phase of the system and are reinforced for emitting correct tutoring behavior during and after training.

Students in reciprocal peer – tutoring are opportune to get one – on – one help and enough time to practice and learn. The teacher writes lesson that one student uses to teach or tutor one another. During the tutoring one student explains the work to another student, asks the students whether his or her answer are correct (Miller & Thurston, 2010) Tutors are trained and supervised by the classroom teacher. Barbara (2010) observed that the success of RPT program lies on its seven (7) basic operational components. These components are:

- i) Reciprocal and distributed practice – each student has the opportunity to be both tutor and tutee.
- ii) Involves active engagement and repeated practice for all the students
- iii) Uses distributed practice – the content is divided among the group members
- iv) Multi – modality format, uses multiple modalities including hearing, seeing and writing which allows students to take advantage of their strongest learning method.
- v) Built-in interest the tutor provides verbal interest and the teacher can acknowledge positive tutoring behaviours with bonus marks and praise. Winning teams receives extrinsic motivation. Additional motivators such as classroom goal or team goal can help students to feel good about themselves and their learning.
- vi) Outcomes are measurable through the use of pre and post assessments of each new unit of academic material. Daily outcomes are evident through the points earned and each student’s notes from the tutoring sessions providing evidence and monitoring of student learning and academic improvement.
- vii) Encourage a higher level of academic mastery and content can easily be differentiated to meet the learning needs of individuals or groups

The major problem teacher’s encounter in teaching is being able to provide feedback to all students. Teachers cannot be everywhere at all times and because of this feedback is often directed to the group rather than to the individual. The most appropriate strategy that can be used to mediate feedback to students is Reciprocal Peer - Tutoring. (Thurston 2010). Reciprocal Peer - Tutoring strategy is the process by which students with guidance from a teacher helps one or more students at the same grade level to learn a skill or concept. It involves students from similar social groups helping each other to learn and learning themselves by so doing (Topping 2005). Reciprocal Peer - Tutoring can also be defined as a flexible, peer – mediated strategy that involves students serving as academic tutors and

tutees; typically, a higher performing student is paired with a lower performing student to review critical academic or behavioural aspects. In the same vein Reciprocal Peer - Tutoring is a teaching intervention strategy in which students alternate between the role of a tutor and a tutee. Students get to be the teacher and the learner. In this method, two or more students are grouped together, and it can be used for any subject or age group. Reciprocal Peer - Tutoring allows each student the chance to teach a review lesson, monitor other students in the group and evaluate each other's work through observations or work samples, in this strategy students are huge part of the process. The students can prepare instructional materials as well as receive immediate feedback from their peers.

Research has shown that reciprocal peer – tutoring has a positive impact on academic performance in Agricultural science (Adekoya&Olatoye, 2011), Biology (Ezenwosu and Nworgu, 2013). Ayuba (2011), opines that reciprocal peer – tutoring has impact on the academic performance of junior secondary school students in basic sciences. On the same vein, (Shiri 2005) indicated that reciprocal peer – tutoring improved academic performance, self-efficiency and test anxiety of students in sciences.

In the present study Reciprocal Peer-Tutoring format was employed as an instructional Strategy for teaching the concepts of Genetics to the students in the experimental group and observed its influence on academic performance and interest of biology students. This is because Reciprocal Peer-Tutoring is different from other Peer-Tutoring formats that use students to instruct other students as reviewed in the literature. Reciprocal Peer-Tutoring also increases academic performance while simultaneously decreasing disruptive behavior in students. The researcher also employed the use of Reciprocal Peer-Tutoring strategy because it requires both the tutor and tutee to explain concepts to one another. However, during the practice phase of Reciprocal Peer-Tutoring, students are taught how to present materials to their partners, praise correct responses, and provide error correction for

incorrect responses. The primary goal of Reciprocal Peer-Tutoring is to facilitate students' achievement and mastery of any classroom content.

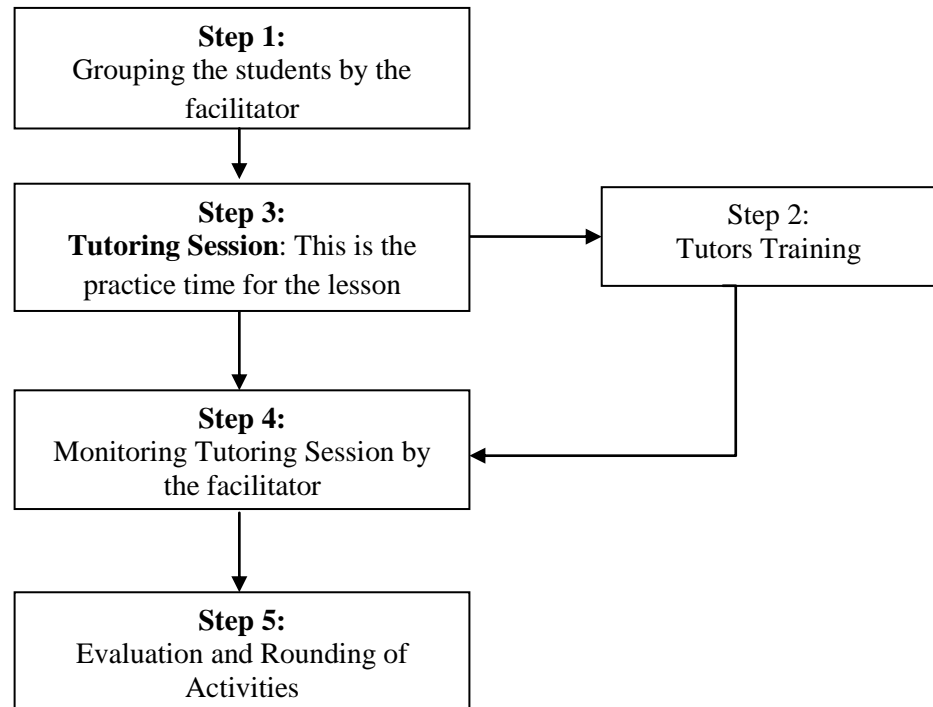


Figure 2.1: Flowchart for Reciprocal Peer-Tutoring Strategy
Source: Adapted from Johnson and Johnson (1975)

2.4.1 Reciprocal Peer – Tutoring and Performance in Biology:

Reciprocal Peer – Tutoring give student time in class to pair up in an in-class tutor/tutee relationship taking turns between being the tutor and the tutee. They will benefit in two ways:

- a) From explaining their own personal understanding of the material to another and
- b) From hearing the other explains from their understanding or view point, the same material. In this model, student spend time summarizing information, assessing the

work or ideas of a peer and explaining rationales and all meaningful activities that promotes critical thinking and long – term retention of information.

This type of peer instruction is associated with the promotion of critical thinking skills as well as understanding of complex scientific concept (Goto & Schneider, 2010). Reciprocal peer – tutoring is also an intervention in which student provides instruction or academic assistance to another student.

Reciprocal Peer – Tutoring is a form of cooperative technique for increasing students' academic performance (Goto&Scheneider, 2010) Conceptually Reciprocal Peer- Tutoring similar to many activities ranging from the informal encounter of play to the most complex activities of cooperation in which people help one another and learn by doing so. This process transforms learning from a private to a social activity by making students to be responsible for their learning and that of others. In this process students function reciprocally as both tutors and tutees. This role is beneficial because it enables students to gain from both the preparation and instruction in which tutors are engaged and from the instruction that tutees received.

Recent studies such as Lawal (2011) pointed out that the Performance of Science Students in Nigeria schools still leaves much to be desired right from the primary school through the secondary school to the tertiary level of education. A general review of Nigerian students' performances in the three science subjects (Biology, Chemistry and Physics) in the West African Examination Council (WAEC) and National Examination Council (NECO) from 2010 to 2015 revealed fluctuations and down-ward trends in students' performance. Reciprocal Peer - Tutoring has a comparative advantage over the conventional lecture method in facilitating students' academic performance in biology. This evidence is shown in research conducted by (Ezenwosu & Nworgu 2013). In the

present study Reciprocal Peer – Tutoring format was employed as an instructional strategy for teaching the concept of genetics to the students in the experimental group and determined the influence on interest and academic performance of biology students.

2.5 Interest of Students towards Biology

The role of interest is usually not included in empirical applications as a consequence of the information availability. Interest could positively affect educational attainment by at least two different channels. On one hand, greater motivation/interest is directly related to students' effort, attendance, discipline, time devoted to homework, among others (Bishop et. al., 2003; Danjuma 2017). On the other hand, interest could increase the perceived utility of learning. All normally functioning persons have the neurological predisposition to seek information and develop interest (Hidi, 2006). Even if they initially have low self-efficacy, lack academic goals for learning and or are not able to self regulate their interest can develop (Palmer, 2009; Renninger, 2010). Hidi (2006) declared, “One of our greatest defects is our lack of consistent or adequate theory of interest.

It is only recently that psychologist started to investigate interest and the results are impressive as stated by Paul (2014) that in recent years researchers have begun to build a science of interest, investigating what interest is, how interest develops, what makes things interesting and how we can cultivate interest in ourselves and in others. There are finds that interest can help us think more clearly, understand deeply and remember more accurately. Interest has the power to transform struggling performance and lift high achievers to a new plane. In early study, Paul (2013) found that interest cognitively engages students and statistically fosters learning. Interest could be seen as a

“psychological state of engagement, experienced in the moment and also a predisposition to engage repeatedly in particular ideas, events or objects overtime” (Paul, 2014).

Interest simultaneously diversifies ones experience and focuses his experience, leading him to pay attention to only certain things and not some other things that tends to stimulate the person’s attention. Interest serve as drive towards the new, the edgy, and the exotic. Both the urge to approach or engage in certain events and the urge to avoid some events lie in the realm of interest.

Interest in an activity, such as academic performance could most probably be a very powerful affective psychological trait and a very strong knowledge emotion as well as an overwhelming magnetic positive feeling, a sense of being captivated enthralled, invigorated and energized to cognitively process information much faster and more accurately in addition to most effective application of psychomotor traits like self-regulatory skills, self-discipline, working harder and smarter with optimum persistence (Kpolovie 2007; 2010a; 2010). Persistence for instance is defined by Kpolovie (2010; 2012) as the indomitable power, unshakable determination, irrepressible commitment, absolute dedication, relentless pursuit, continuous and ever-increasing confidence and resolute action in the direction of one’s goal until it is satisfactorily achieved. Self discipline is define as “the ability to and the actual commitment to make one self do what one should do, exactly how and when he/she should do it, irrespective of whether he/she feels like it or not” (Kpolovie 2010). It is little wonder then that when an individual is keenly interested in the information that he is learning, he tend to pay closer attention, process the information more effectively; employ the most effective learning strategies, engage in critical thinking, rehearse deeply and very frequently make connections between the new information and old knowledge acquired (Kpolovie, 2007; 2010; 2012).

Growing knowledge leads to growing interest as new information increases the likelihood of conflict (i.e conflict of coming across a factor or idea that does not fit into what the individual has already learnt) (Silvia, 2006; Paul 2014). The more a person knows or learns about a domain, the more interesting the domain becomes to him. This is most probably because of the phenomenon of more learning leading to more questions, which in turn increases learning. The information that is novel, complex and comprehensible tends to arouse students interest because it increases curiosity (Kpolovie, 2012) understandability of the learning material is crucial in capturing of the students interest. New and complex things are interesting provided the student feels able to comprehend them and master the challenges that they pose (Silvia, 2006; Paul 2013; Paul 2014).

Student, have an interest in their own performance when they weigh this objective against others such as the amount of leisure time or increasing social networks through studying less or more. The role of motivating students' interest and effort has not received the same attention in the economic literature as other aspects, due to the information availability of variables that reflect that conditions. Interest through self motivation and effort can be induced by parent and teachers, parents affect children's performance through many channels. First they provided a set of resources available to them (books, computers, educative software and complementary classes, among others) parent's educative background help to assist their homework and it could foster their learning. Children also have a clear interest in schooling resources being used efficiently when they assume that education in an investment and or a consumption activity.

Chiu and Xinhua (2008) pointed out that students with more education resource available at home could have more opportunities to learn and to have more intrinsic motivations which consequently arouse interest. Learning is an activity that requires, among other things, time and active engagement of students. And this arouses the interest of the

researcher to investigate the effect of Reciprocal Peer - Tutoring on interest and performance in genetics among secondary school students.

Academic Assets available at home such as textbooks, computer among others may have a positive impact on school performance through the increase in the productivity of other resources used during the educational process (such as teachers and school's resources). Students with access to internet at home are more likely to complement the lessons received at school, therefore are more likely to perform better. It is expected that the role of academic assets will be a complement and not a substitute of other 'inputs' such as parent's time or school resources.

The effect of interest and effort on the quality of education could be from different perspective:

1. When interest is aroused in students, it helps the student to see in learning an activity with a higher utility than leisure;
2. Interest increases in the number of questions the student may ask and this includes him/her further to look for answers.
3. Interest generates positive externality for students to evaluate the subjects they are studying;
4. The existence of central examinations changes the students incentives (Bishop, 2006)
5. When the student only has his course as a reference point, his performance could be limited to the course level.

In specific areas such as math and sciences, the role of interest and effort is especially important as a consequence of the 'special pleasure for learning' because in these areas discipline and perseverance are associated with success. In many cases, effort is measured by the number of minutes or the amount of time dedicated to study. Both in mathematics and in science, homework frequency is negatively related to student performance, while homework length is actually positively related to students' performance. In any event,

there is clearly no direct positive relationship between minutes per week a student spends on homework and test score performance. Students' interest motivation is crucial for better academic results when it completed with basic resources or assets. The study investigated the Effect of Reciprocal Peer - Tutoring on Interest and Performance in genetics among secondary school students.

2.6 Academic Performance of Students in Biology

Academic performance, according to Oludipe and Oludipe, (2010) is an exhibition of knowledge attained or skills developed by students in a subject designed by test scores assigned by teacher. One way by which this can be determined is with the use of performance test. Performance test can give students an indication of his progress and acts as reward for his effort or as a spur against underachievement. It also indicates to the students the importance placed by the teacher on the various things that are taught. Biology enjoys much better patronage among senior secondary school students compared to other science subjects. The Science Teachers Association of Nigeria STAN (2013) identified gross under funding, large class size, shortage of qualified science teachers and poor teaching strategies, among others contribute to student under performance in science subjects including biology. The nature of science itself and its teaching methods are among the reasons for difficulties in learning science. According to Atadoga and Lakpini (2013) they found that the persistent low academic performance in science education is attributed to teacher instructional strategies, attitude, learning style, preferred among others. Thus instructional, strategies used by teachers in teaching and learning process have significant influence in students' academic performance. Okebukola (2009) also attributed that poor performance in Biology to the use of in effective teaching and learning environment under which Biology teaching takes place. Thus, the present study

determined the Effect of Reciprocal Peer - Tutoring strategy on interest and performance in genetics among secondary school biology students.

2.7 Gender and Academic Performance in Science

Academic Performance in students learning has been a matter of concern in the present day research. Busari in Ogundukun and Adeyemo (2010) defined academic performance as the display of knowledge attained or skills developed by student in the school subject. It was the level of performance in the subject as exhibited by an individual. The concept of gender in teaching and learning processes has attracted the attention of many psychologists, biologists and researchers as a result of which a lot of literatures exist on different aspects of the concepts.

Several researchers conducted by scholars on the effect of academic performance on gender in science education shows significant differences between boys and girls (Mari, 1994, Bichi 2002, Usman, 2007, Obeka, 2009) while others opined no difference between genders academic performance (Usman, 2010). Alpha, (2007) in his research on gender disparity on performance in mathematics of senior secondary school, opines that performance of boys was higher than that of girls in support of this, Usman, (2007) in his work “Relationship between students performance and their academic achievement in Biology using XISTEP mode of teaching revealed that senior secondary male biology students perform well in any rigorous work than their female counterpart.

The largest differences between boys and girls performance lied on the effective domain that is attitude. Mari and Bichi, (2008) supported that boys performed well in any rigorous work while girls showed to settle for less rigorous work. Nuruddeen, (2013) findings from research studies which have demonstrated differences due to gender in various academic performance, have become popular and generally accepted by scholars. Females tend to

score higher on verbal test and always do better on coding test, which call for short memory, speed and draftiness. The males on the other hand, invariably achieved higher on arithmetic although, there was no enough evidence that males and females differ in average intelligence, the constitutions of intelligence, in the two sexes were far from similar. Therefore, this study determined that gender sensitivity did not exist among students when exposed to Reciprocal Peer - Tutoring.

2.8 Overview of Similar Studies

This study titled Effect of Reciprocal Peer-Tutoring on Interest and Performance in Genetics Among Secondary School Students in Zaria Education Zone, Kaduna State, Nigeria. Various empirical studies and researches have been conducted in this country such as that of Michele (2015), Abiodun (2010), Adekoya and Olatoye (2011) among others or elsewhere in the world such as that of Korir and Kipkemboi (2014) which are either directly or indirectly related to this study. The researcher looks at these studies one after the other.

Michele, (2005) examined the effects of Class-Wide Peer Tutoring (CWPT) on the acquisition, maintenance and generalization of science vocabulary words and definitions. Participants were 14 seventh grade students at risk for failure in a general education science course in urban school located in central Ohio. The researcher adopted a multiple probe across word sets design for the study. The data collected was analyzed using t-test statistics. The result of the study indicated a functional relationship between CWPT and acquisition of science vocabulary. All students were able to acquire words and definitions. Results for maintenance and generalization varied. When acquisition criterion was change maintenance and generalization varied. When acquisition criterion was changed, maintenance and generalization scores increased for some students, while other students

remained consistently high. The investigation was done on generalization of science vocabulary and definitions and the research design adopted was multiple probes across word set design while this study was carried out on genetic concepts and quasi experimental research design was adopted in this study.

Abiodun, (2010) study Peer – Led Guided Inquiry and Class – Wide Peer Tutoring Instructional Strategies as determinants of senior secondary School Students Performance on practical problem solving in Chemistry. A population of 250 SSII students in 3 Local Government areas in Ibadan metropolis was used. A pre – test, post – test control group quasi experimental design using 3 x 3 x 2 factorial matrix was adopted for the study. Data obtained was analyzed using inferential statistics of Analysis covariance (ANCOVA) of the post test scores with Pre-test as covariates and Scheffe post – hoc analysis. Result of the study showed that there is significant main effect of treatment on students' achievement in practical chemistry. However, students performed significantly at different levels in the three groups. There is no significant interaction effect of treatment and gender on students' achievement in practical chemistry. The study under review was in chemistry while the present study is in Biology, and t-test and Kruskal Wallis statistics were used to analyzed the result which differ from the formal.

Adekoya and Olatoye (2011) in the study, effect of three teaching strategies, demonstration peer – tutoring and lecture strategies of teaching on students achievement in pasture and forage crops which is an aspect of agricultural science in Ijebu – ode Local Government Area of Ogun State. Lecture strategy served both as a teaching strategy as well as control since it is assumed to be a convectional strategy of teaching. A 3 x 2 x 2 pre – test, post – test experimental design with a control group was used. The population for the study comprised of all senior secondary school – two (SS II) agricultural science students in Ijebu – Ode Local Government Area of Ogun State. A total of onehundred and

fifty senior secondary school two (SSS II) students purposively selected from the three schools constituted the sample for the study. The data was analyzed using ANCOVA and Scheffe's Post – Hoc Analysis at $P \leq 0.05$. Result of the study showed that there is significant main effect of treatment on student achievement in an aspect of agricultural science that is pasture and forage crops ($F_{2, 137} = 7.072$; $P < 0.05$). Also, students performed significantly at different levels in the three groups. There is no significant interaction effect of treatment and gender on students' achievement in pasture and forage crops ($F_{2, 137} = 0.561$; $P > 0.05$). Hence this present study used SS11 Biology students to investigate effects of Reciprocal Peer - Tutoring on interest and performance in genetics among senior secondary students in Zaria Education Zone, Kaduna State, Nigeria. Descriptive, Independent T-test and Kruskal Wallis statistical tool were used to analyze the results which differ from the formal.

Ezenwosu and Nworgu (2013) also examined the efficacy of Peer-Tutoring and gender on students' achievement in Biology in Aguata Education Zone of Anambra State, Nigeria. The study adopted Quasi experimental design. Specifically, the design is a pretest – posttest nonequivalent control group design. The instrument used is Biology Achievement Test (BAT). The population of the study comprised 1731 SS II students from two co-educational Secondary Schools in the Zone. Mean and Standard Deviation were used to analyze the research question while the hypotheses were tested at 0.05 levels of significance using Analysis of covariance (ANCOVA). The result among others shown that students taught Biology using peer tutoring performed significantly higher in BAT than those taught Biology using the conventional lecture method. The result further revealed that male students slightly performed better than female students. The similarities between the previous study and the present study are; both were carried out in Nigeria, on Biology, and they both used Secondary School Students as the sample for the

studies. The study under review did not look at interest in relation to academic performance of students; hence this study has filled in the gap.

Okoye (2013) examined the effect of Peer-Tutoring Instructional Strategy on the academic achievement in Home Economics among Secondary school students in Dunukofia Local Government Area of Anambara State. Quasi – experimental design was used. All the senior secondary school students in the local government area constituted the population of the study. Four Secondary schools out of eight secondary school were randomly selected and all the 145 SS I students offering Home Economics in these four schools were selected and assigned to experimental and control groups. Data on students' achievements was collected using Home Economics Achievement Test (HAT). The research question and hypotheses use were answered using mean t-test statistics at $P \leq 0.05$. The results indicated that students taught Home Economics using peer – tutoring instructional method achieved higher than those taught using lecture method. The study under review is similar to this present study in many areas; it was carried out on secondary school students and peer-tutoring was used to promote their learning. The previous study did not investigate the effect of Reciprocal Peer - Tutoring on students' interest and performance while the present study did.

Adamu (2012) investigated effects of Enrich Instructional Materials and inquiry academic achievement and interest among senior secondary schools physics students' of varied ability. The research design for the study was quasi – experimental, non – equivalent control group design. A total of 49 students of SS II classes from four randomly sampled schools were randomly assigned into treatment groups, two experimental and one control groups. All the groups were pre-tested using the researchers developed instruments namely the Physics Achievement Test (PAT) and Physics Interest Inventory (PII). The subjects were subjected to treatments with Experiments 1, Experiments 2 and control

groups. This involved five contact period of lessons made up of forty-five (45) minutes each covering the units of study namely: equation of motion, projectiles, law of flotation, moment and heat. The experimental groups E1 and E2 were taught using enriched instructional materials and inquiry method respectively. While the control group were taught using lecture method. At the end of the treatment, subjects were post-tested using the same instruments and data were collected and analyzed. Research questions were answered using Mean and Standard Deviation. Analysis of Variance (ANOVA) was used in testing the hypotheses at 0.05 level significance. The study revealed that enriched instructional materials appear to the greatest influence on students interest in the content areas covered than other teaching methods. The previous study is similar with the present study in location both were carried out in Nigeria, research design quasi experimental and interest which is one of the variable in the study was considered. They differ in the sense that the previous study was on physics while the present study is on Biology. Reciprocal Peer-Tutoring was not considered this has created a gap in which this presents study has filled.

Agbiti (2012) examined Effects of Inquiry and lecture methods on students' academic achievement and interest on some radiation concepts of Senior Secondary School (SSS) Physics. Population of students was 465 out of which 100 students in an intact class of two selected secondary schools in Sabo – Tasha Education Zone, Kaduna State, Nigeria were involved. Quasi experimental control pre-test post test was designed for the study. The data were collected using Physics achievement test (PAT) and interest-scale in Radiation Questionnaires (ISRQ). Data collected were analyzed using t-test to find if there was any significant difference in the interest scores of students who were taught radiation concept using inquiry method and those taught using lecture method. From the findings, inquiry method of teaching and learning has significant effects on students'

interest in radiation concepts. Hence the present study used SS II Biology students to investigate Effects of Reciprocal Peer – Tutoring on interest and academic performance in genetics among senior secondary school students in Zaria Education Zone, Kaduna State Nigeria, t-test and Kruskal Wallis statistical tools were used to analyzed the results which differ from the formal.

Muoneme (2012) Examined Effect of Computer – Based/Multimedia Enriched – Lecture Approach (CBMLA) instruction on the academic achievements and interest of S II Biology students in Evolution concept in Niger State, Nigeria. The study describes of findings an experimental research project that deals with the interest of students' Computer – Based/Multimedia enriched lecture approach in learning and teaching of Biology to improve students' learning outcomes and interest. The study was based on pretest, post test Quasi Experimental and control group design. Population of student comprised of 498 students, out of which 80 students were sampled and used for the study. The learning outcomes were compared in terms of students' academic achievement and motivation through the results from the students Computer – Based/Multimedia Enrich – Lecture Approach through Interest Questionnaire (SCBMLAIQ) and Evolution Achievements Test (EAT). Data collected were analyzed using t-test and PPMC statistics. The result of the study revealed increased in the statistics. The result of the study revealed increased in the interest of students by the use of the method. Hence this present study used SS II Biology Students to investigate Effects of Reciprocal Peer – Tutoring on interest and academic performance in Genetics among Senior Secondary Students in Zaria, Kaduna State, Nigeria, t-test and Kruskal Wallis Statistical tools were used to analyzed the result which differ from the formal.

Agogo, and Naakaa (2014) investigated on how the 5Es Constructivist Instructional Strategy would improve students' interest in Senior Secondary School Genetics in Gwer

L.G.A of Benue State, Nigeria. The design of the study was Quasi experimental specifically, the pretest, post-test non-equivalent control group design. A sample of 147 students from four schools, out of a population of 2,183 SS II Biology students were selected. A validated 30 items Genetics Interest Inventory (GII) was the instrument for data collection. A reliability co-efficient of 0.85 was established for GII using Cronbach Alpha method. Out of the four schools two schools were assigned to the experimental group while the other two to the control group. The experimental group were taught genetics using the 5Es (Engagement, Exploration, Explanation, Elaboration and Evaluation) constructivist instructional Strategy while the control group were taught using the conventional (lecture) method. Mean and Standard Deviation were used to answer the two research questions and Analysis of Covariance (ANCOVA) was used to test the two hypotheses at $P \leq 0.05$ levels of significance. The result revealed that the 5Es constructivist instructional strategy was more effective in facilitating students' interest in genetics in both urban and rural schools. Agogo *et al* studies is similar with the present study in the location both are carried out in Nigeria, concept used for the study is genetics, instrument for data collection GIQ, research design quasi experimental and interest which is one of the variable of this presents study was considered. The previous studies used the 5Es Constructivist, inquiry based, computer simulation, instructional strategies to determine performance of students, peer-tutoring was not considered, this has created a gap in which this present researcher has filled.

Danjuma (2017) investigated effects of Inquiry – Based Instruction in Acquisition of Process – Skills, interest and performance in Ecology among secondary school students in Lere Education Zone, Kaduna State, Nigeria. The design of the study was Quasi Experimental design. A sample of 118 students out of a population of 1908 were randomly selected from two coeducational secondary schools. The experimental group

was taught Ecology concepts using Inquiry – Based Instruction while the control group was exposed to lecture method. Three validated instruments called Student Process Skills Acquisition Test (SPSAT) with $r = 0.74$, Ecology performance Test (EPT) with 0.76 and Students Ecology Concept Interest Questionnaire (SECIQ) with 0.84 were used to gather data. Data collected were analyzed using t-test and Kruskal Wallis Statistics. The result of the study revealed that differences exist in the interest shown by students when they are exposed to inquiry and lecture method in favour of the experimental group. The previous study is similar with the present study in the location both are carried out in Nigeria, research design quasi experimental and interest which is one of the variable of this present study was considered. The previous study was on Ecology while the present study is on Genetics, and also the former used inquiry – Based Instruction in Acquisition of process – skills to determine performance of students, Reciprocal Peer – Tutoring was not considered, this has created a gap in which this present researcher has filled.

Zitzman (2005) investigate the relationship between children’s peer relationship and academic performance using 585 participants involving children, parents and teachers of these kindergarten children. The author used interview and questionnaire to generate data for the study from the children and their teachers respectively. Multiple correlation Analysis was employed. The correlations or the results provided positive association between pair relationships and academic performance. The previous study used peer relationship to investigate the academic performance of kindergarten children while this present study used Reciprocal Peer-Tutoring to investigate the academic performance of SS II students in genetic concepts, this has created a gap in which this present researcher has filled.

Sajjad H, Riasat A., Amir Z., Abdul G., Aamir, S. A, Minhas M., (2013) investigated the impact of peer group on academic performance. The authors used 300 secondary school

students. Questionnaire was the instrument used for data collection. Simple percentage correlation analysis and linear regression were the statistical tools used to analyzed data. The result revealed that peer groups have significant effect on academic performance. The result showed that female students perform better than male students. This study attempted to find out whether reciprocal peer-tutoring strategy will enhance students academic performance in genetics. Korir and Kipkemboi (2014) examined the impact of school environment and peer group influence on the students academic performance. Two hundred and ten (210) students from Sabatia District of Vihiga county, Kenya, were used as the sample for the study. Questionnaires were used as the research instruments for data collection. Multiple regression statistical tool was used to analyze the data. The result indicated that school environment and peer group influence made significant contribution to students' academic performance. This present study used Reciprocal Peer-Tutoring to investigate the academic performance of SS II students in genetic concepts in Zaria Education Zone, Kaduna State Nigeria which differ from the formal.

Goulaa (2014) examined the relationship between self efficacy and academic performance in adult learners. The sample size used was 63 students of both genders selected from the first years of under graduate studies. Questionnaire was used to measure self-efficacy and the overall students' academic performance was measured by their total grade from two different types of evaluation. That is, one from one final face to face exams (100%) and another from two criteria two online works (e-folio, 40%) during the semester and final face to face exam (P-folio, 60%) as the researcher calls them Pearson Correlation and t-test were used to analyze the data. The results showed that students' level of self-efficacy is high and that a significant relationship exists between self efficacy and academic performance. The previous study used self-efficacy to examined the academic performance of adult learners while this present study used reciprocal peer-tutoring to

investigate the academic performance of SS II students in genetic concepts. In the former Reciprocal Peer-Tutoring was not considered, this has created a gap in which this present researcher has filled.

Falokun and Omenesa (2015) investigated the effects of prior knowledge and classroom interactions on students academic performance in Chemistry using 93 Senior Secondary (SS II) students in Dutsin-ma Katsina State, Nigeria. Pretest and Posttest quasi experimental design was adopted. Chemistry Achievement Test (CAT) and Prior Knowledge Questionnaire (PKQ) were the instruments used to collect the data for the study. The data were analyzed using Analysis of Variance (ANOVA) and Analysis of Covariance (ANCOVA). The results of the study suggested that those students taught using teacher students interactions tend to perform significantly higher than those taught using demonstration method. Fatokun and Omenesa studies is similar with the present study in location both are carried in Nigeria, SS II students were used for the studies. The previous studies used prior knowledge and classroom interaction to determine the academic performance of students while the present study investigated the Effect of Reciprocal Peer-Tutoring on interest and performance among secondary school students in Zaria Education Zone, Kaduna State.

2.9 Implications of the Literature Reviewed for the Present Study

The literature reviewed has some implication on the present study. It revealed major areas where Reciprocal Peer – Tutoring has been used. For instance, Obiunu (2008), Okoye (2013), Ezenwosu and Nworgu (2013) used Peer – Tutoring in Biology, Home economics and enhancement of career decision making process. There is relatively little research on Reciprocal Peer-Tutoring in Biology. Most of the variables dealt with in the previous studies were attitude, retention, motivation and performance of students. Hence the

present study examined the Effect of Reciprocal Peer – Tutoring strategy on interest and performance of students in biology; this makes it unique from the other research. The review also revealed that most of the studies reviewed on Peer – Tutoring do not involve all the students in the class, instead only few students are used to test the effectiveness of Peer – Tutoring Strategy. But this study involves all students using Reciprocal Peer – Tutoring Strategy to teach genetic concepts. The effects of variant methods of teaching sciences on academic performance and interest were identified in this study with the view of remediating their observed limitations in this study. For example, as a result of limitation of the use of various peer – tutoring format in teaching sciences in schools as observed by Adekoya and Olataye (2011) and Adamson (2013). The researcher decided to utilize reciprocal peer – tutoring strategy to remediate their observed limitations.

The literature also revealed that, the used of indirect instructional strategies such as Peer – Tutoring have been found to contribute significantly to the growth and development of science education. Teacher centered instructional methods (Example, lecture method) was found to be less effective in improving students' academic performance in science. This has implication on exploring effective strategy for teaching science. A good number of instructional strategies have been developed by scholars to improve academic performance of students in science. The implication of this is that, it gives the researcher an insight to use lecture method to control group.

The reviewed literature has pointed out some research design adopted by previous studies such as single subject alternative treatment design (Adamson, 2013), crossover design (Simpkins, P.M., Mastropier M. A. & Scruggs T. E 2009), but this study used pretest – posttest matched group quasi experimental design. This literature also guided the researcher in selecting sampling procedure, developing instruments for data collection and lesson guide for teaching genetic concepts using Reciprocal Peer – Tutoring Strategy.

There is slight similarity between this study and that of Ezenwosu and Nworgu (2013), they studied the efficacy of Peer-Tutoring and gender on students' academic achievement in Biology in Aguata Local Government Area in Anambara State, but they differ in the sense that this study focuses on genetic concepts of biology among SS 2 biology students in Zaria Education Zone Kaduna State, Nigeria. The present study investigated the Effect of Reciprocal Peer – Tutoring Strategy and lecture method to ascertain which strategy can improve students' interest and academic performance in genetic concepts among Secondary Schools students in Zaria, Kaduna State Nigeria.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This study investigated the Effect of Reciprocal Peer - Tutoring on students' academic performance and interest in genetics concept. This chapter therefore present the methodology of the study under the following sub-headings:

3.2 Research Design

3.3 Population of the Study

3.4 Sample and Sampling Techniques

3.5 Instrumentation

3.5.1 Validity of Instrument

3.6 Pilot Testing

3.6.1 Reliability of Instrument

3.6.2 Item Analysis

3.7 Administration of Treatment

3.8 Data Collection Procedure

3.9 Procedure for Data Analysis

3.2 Research Design

This study was quasi-experimental design which adopted the pretest, posttest Experimental and Control Groups designs. Two sets of students namely-Experimental Group (EG) and Control Group (CG) were used for the study. Experimental group (EG) were exposed to experimental treatment (X_1) Reciprocal Peer – Tutoring Strategy. While control group (CG) were taught using lecture method (X_0). Two intact classes were used for the study. Both experimental and control groups were pretested (O_1) to ensure comparative ability in the sample. The two groups were taught Genetics concept for a period of six weeks. Posttest (O_2) was administered to determine the Effect of

ReciprocalPeer-Tutoring on studentsacademic performance and interest. This design have been prescribed by Kerlinger (1973) and used by Bichi (2002) and Aliyu, (2014). This research design has numerous advantages such as:

- It revealed whether or not a particular instructional strategy is superior over the other
- It can be used to identify differences in the groups at the beginning of the study
- It is an indicator for gaining mastery of the concept selected. Kerlinger (1973) and Sambo (2008).

The research design of the study is illustrated in Figure 3.1:

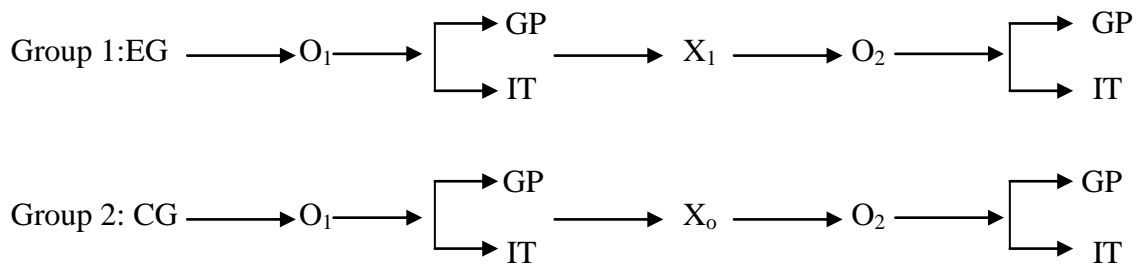


Fig.3.1:ResearchDesign

Keys:

EG= Experimental Group

CG = Control Group

X₁ = Treatment (Teaching using Reciprocal Peer - Tutoring Strategy)

X₀= No treatment (Teaching using Lecture Method only)

O₁ = Pretest administration

O₂ = Posttest administration

GP = Genetic Performance

IT = Interest

3.3 Population of the Study.

The population for the study consists of all senior secondary year two (SSII) students studying Biology in selected Secondary Schools in Zaria Education Zone, Kaduna State. According to Zaria Education Zone, the total population of SSII students in the 16 secondary schools is 4125. The reason for choosing SSII students was that, they are more stable in the school and their performance in Genetics is generally poor. Summary of the population is presented in Table 3.1.

Table 3.1 Population of the Study

S/N	School	Male	Female	Total
1	G.S.S.S Kaura	361	186	547
2	I.A.S.S.S Karau – Karau(B)	110	115	225
3	G.S.S TudunJukun	205	180	385
4	G.S.S. Gyallesu	288	139	427
5	G.S.S. K/Kuyanbana	346	60	406
6	G.S.S. Dakaci	119	56	175
7	G.S.S. Kugu	30	25	55
8	G.S.S. Bogari	12	00	12
9	G.S.S. Magajiya (Snr.)	38	23	61
10	G.S.S.S Zaria (WTC)	00	250	250
11.	S.S.S. Kofena	128	00	128
12	G.S.S. Zaria (Snr.)	174	00	174
13	Barewa College Zaria	386	00	386
14	G.G.S.S Pada (Snr.)	00	235	235
15	Alhuda Huda College	360	00	360
16	G.G.S.S K/Gayan	00	299	299
	Total	2557	1568	4125

Source: Zaria Education Zone (2017)

3.4 Sample and Sampling Technique

The sample of the study constituted a total of one hundred and sixteen (116) SS II biology students from two public senior secondary schools in the study area, as follows: The sixteen (16) schools in the study population were selected through stratified sampling technique, it was divided into four stratum and one (1) school was randomly selected from each stratum. A pretest on Genetic Concept Performance Test was administered to (SS II) students in each of four schools selected to determine their equivalence in terms of academic performance. This was achieved by subjecting the students' test scores for the four schools to ANOVA and Scheffe's Test. The following schools GSS Kugu (school A) and GSS Magajiya (School B) were found to be relatively similar statistically. The status of the schools was determined using simple random sampling techniques involving balloting. The names of the two schools were written on a piece of paper, folded and placed in a container. The papers were picked without replacement and placed into two different containers labeled as experimental and control groups. As a result of the exercise GSS Kugu was assigned the experimental group while GSS Magajiya the control group respectively. The sample subjects for each school was intact classes of fifty five (55), for experimental and sixty one (61) for control groups respectively. The choice of the one hundred and sixteen (116) students as a sample size was in line with central limit theorem recommendation, which suggested that a minimum of thirty (30) participants can be used to establish a relationship between groups in experimental research as noted by (Tuckman, 1975). The sample selected is present in Table 3.2.

Table 3.2 Sample for the Study

S/N	School	Group	M	F	Total
1	School A	Experimental	30	25	55
2	School B	Control	38	23	61
Total			68	48	116

3.5 Instrumentation

Two research instruments were developed by researcher and used for this study. These are:

1. Genetic Concepts Performance Test (GCPT)
2. Genetic Concepts Interest Questionnaire (GCIQ)

1. Genetic Concepts Performance Test (GCPT)

This is an instrument developed by the researcher using standardized WAEC and NECO past questions comprising of 40 items using contents based Genetic Concepts. The instrument was used to determine the academic performance of biology students before and after the treatment. Four Genetic Concepts were used in developing the instrument (as shown in Table 3.3), the concepts were distributed in Genetic Concepts Performance Test (GCPT) item consisting 40 objective test items, each question has four options (A, B, C and D). The instrument was developed based on the six blooms taxonomy of educational objectives. The distribution of the items based on the six taxonomies was knowledge has 12 questions, comprehension 7 questions, application 6 questions and five (5) questions each for analysis, synthesis and evaluation. The distribution of items is presented in Table 3.3.

Table 3.3: Items Specification of Genetics Based on Blooms Cognitive Taxonomy.

S/No	Content	Weight (%)	Kn (30)	CO. (21)	AP. (17)	An. (11)	Sy (11)	Ev. (10)	Total (100)
1	Definition of genetics	(15)	4	3	1	1	1	1	11
2	Genetic terminologies	(25)	4	1	3	1	1	2	12
3	Chromosomes: The basis of heredity	(25)	2	2	1	2	1	1	9
4	Mutation	(35)	2	1	1	1	2	1	8
	Total	100	12	7	6	5	5	5	40

KEY: Kn= knowledge; CO= Comprehension; Ap = Application, An = Analysis; Sy=Synthesis, Ev, = Evaluation.

Source: The researcher's field work (2018)

2. Genetic Concepts interest Questionnaire (GCIQ)

The Genetic Concepts interest Questionnaire was designed to find out the students interest in genetic concepts of biology as a result of exposure to Reciprocal Peer-Tutoring Strategy. It consists of 20 items adapted from Danjuma (2017) developed using a 5-point Likert Scale, ranging from strongly agree, agree, decided, undecided, dis-agree to strongly dis-agree. Detail of this was presented in appendix C.

3.5.1 Validation of Instruments.

The instruments namely Genetic Concept Performance Test (GCPT) and Genetic Concept Interest Questionnaire (GCIQ) were subject to both content and face validity. The content validity was accomplished by ensuring that the test reflected the test blue print. Face validity was established by evaluation of the test items by two lecturers with a minimum qualification of Ph.D in the Department of Science Education, one lecturer from Psychology Department Ahmadu Bello University Zaria and two Biology teachers at secondary school level with B.Sc. Ed qualification.

A copy of the developed items was submitted to each expert for validation and requested to:

- Certify if the question were considered to be testing the performance and interest of students.
- Certify if the items are appropriate for the level of the students under study.
- Check for possible errors in the instrument
- Suggest appropriate corrections on the possible errors observed in the instrument

3.6 Pilot Testing

Pilot study was conducted with a group of 20 students in government Senior Secondary School Gyallesu, one of the senior secondary schools that did not form the study sample, but part of the study population to determine the reliability of the instruments (GCPT and GCIQ). The school selected for this purpose was similar to those of the main study in term of location, ownership and status level. The purpose of pilot testing was to obtain the reliability coefficient of the instrument; determine the appropriateness of the items of the instruments; find out the characteristics of the instrument item analysis and determined the appropriateness of the length of time required to answer items in the test.

3.6.1 Reliability of the Instruments

Two reliability tests were conducted. The instruments include GCPT and GCIQ. A total of 20 students were used during the pilot testing to establish the reliabilities. The first test was given to the subjects of the school which is not part of the sample. After two weeks interval the second test was administered in line with Tunckman (1976), recommendation of two weeks interval for test-retest procedure.

The reliability coefficient of GCIQ was found to be 0.82 using split-half method. The statistical tool used was Spearman Rank Correlation Coefficient. On other hand, the

reliability of GCPT was calculated using Pearson Product Moment Correlation Coefficient (PPMC) after test-retest method applied, the reliability was found to be 0.92. Olayiwola, (2010) asserted that an instrument is considered reliable if it lies between 0 and 1 and that the closer calculated reliability coefficient is to zero, the less reliable is the instrument.

3.6.2 Item Analysis

For the purpose of standardization of instruments, facility index and discrimination were determined as follows:

Facility Index:

Item analysis was carried out from the pilot study score to determine the item difficulty index, and discrimination index, Sambo (2008) defined item difficulty index as a measure of percentage of people, candidate who get the item right over the total number of candidates that attempted the item. The facility index of an item indicates the percentage of candidates that got an item right. It is determine by using the formula:

$$P = R/T \times 100$$

P = Difficult index

Where: R = is the number of candidate who got the item right.

T = is the total number of candidate

Sambo (2008), further recommended that in the research literature, items with difficulty index between 40% to 60% are accepted. For the present study, items with difficulty index of 40% to 60% were retained. Items below 40% are considered being too easy and 60% being too difficult. These items were modified to suit the research.

The Discrimination Index: Discrimination index of the test is the ability of the test item to separate between high and low ranking students in the entire test. To compute discrimination index of test items, the researcher proposed the use of following relation:

$$D = \frac{RU - R1}{N}$$

Where: D = discrimination index of test items

RU = number of candidate that got the item correct in the upper 27% of the group

R1 = number of candidate that got the item correct in the lower 27% of the group

N = number of candidates in the 27% upper or lower part of the group.

Sambo (2008); posited that items of discrimination index of 0.40 and above are very good for the study, 0.30 – 0.70 are reasonably good, 0.20 – 0.29 are marginal items that need improvement, while items with discrimination index of 0.19 and below are poor items to be discarded. Thus, in this study item with range of 0.30 - 0.70 was accepted for final selecting of GCPT instrument based on Sambo's (2008) recommendation.

3.7 Administration of Treatment

The treatment for this study which was Reciprocal Peer - Tutoring Teaching Strategy was done as follows:

Treatment for Experimental Group

Students in the experimental group taught themselves under the guidance of the researcher using Reciprocal Peer-Tutoring Strategy. The RPT format involves dividing the entire class into groups of five students with deferring ability levels. The RPT format has the following steps:

- Content selection
- Tutors Training Programme
- Formation of Tutoring groups
- Tutoring Session
- Monitoring and rounding-up of activities

Step 1: Content Selection:

The following Genetic concepts were selected for tutoring the students in the experimental group.

1. Definition of genetics,
2. Genetic Terminologies, and
3. Chromosomes: the basis of heredity,
4. Mutation.

Step 2: Training Programme for Peer Tutors:

The students were subjected to training for a period of one week at 80 minutes training per day by the researcher. They were trained on how to conduct instructions in Genetics based on the general process of implementing Reciprocal Peer - Tutoring lesson. The training lasted for a period of one week as follows:

1. The researcher trained the peer tutors on the process of peer- tutoring and strategies for fulfilling their role as tutors in the following ways:
 - The peer tutors were trained on how to teach the Genetic concepts sequentially to the tutees following the lesson step by step.
 - The peer tutors were guided on how to use simple explanations to teach each genetic concept using the language level of the tutees for easy understanding.
 - They were guided on how to use questions and answers session and by so doing provide immediate feedback to the tutees.
2. Peer tutors reviewed their tutoring materials prepared by the researcher and follow the structured tutoring procedure, in which tutors present the structured genetic concepts to the tutees in a modeling session.

3. The Tutors were provided with the background rules to adhere to throughout the tutoring session this includes: sharing of responsibility, taking turns, using respectful language and accepting criticism in to peer tutoring groups quickly and quietly; peer tutoring practice modeled and students were asked to practice prior to the first peer session and finally students were train on how to provide feedback for correct and incorrect peer responses, such as praise.

Step 3: The Tutoring Groups Formation:

In this study the students were grouped into eleven (11) tutoring groups consisting of five (5) students making a total of Fifty Five (55) students to cover the study sample.

Step 4: The Tutoring Session:

This involves tutoring activities where tutors were paired to teach their peers according to the established procedures. Tutoring session was the practice time of each lesson, during which the students were involved in tutoring one another. This lasted for a period of 80 minutes for six weeks.

Step 5: Monitoring:

The researcher move around the classroom to facilitate and monitor students progress to ensure that established procedures are followed, students utilize interpersonal skills and content are covered.

Step 6: Round of Activities:

This was based on the outcomes of the assessment which involves remediating the observed problems. Similarly, student progress and procedures were consistently monitored during the tutoring by the facilitator to ensure that content are covered and the objectives are achieved.

This is presented in the flowchart as follows:

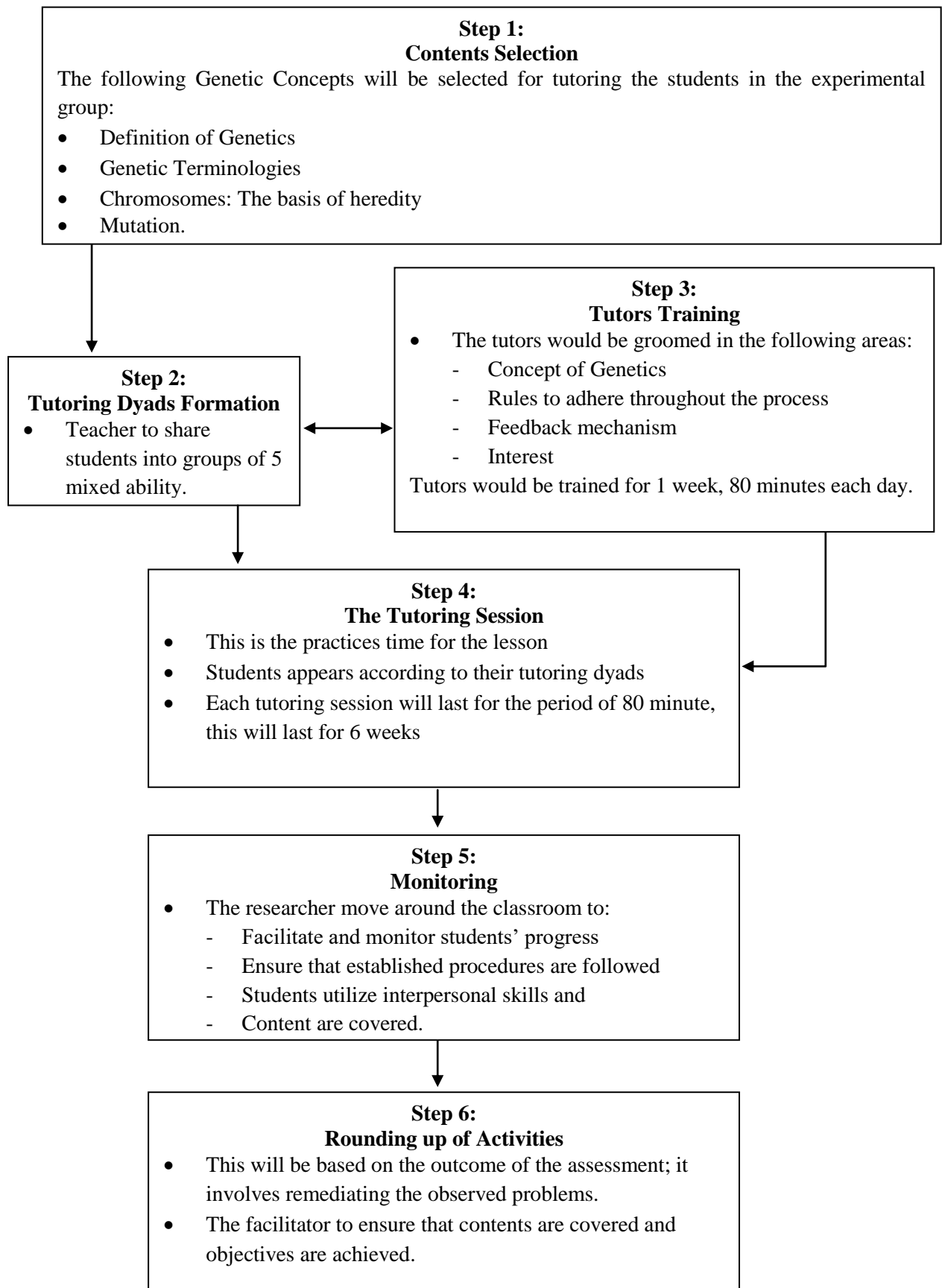


Figure 3.2: Reciprocal Peer – Tutoring Strategy Flowchart

Source: Adapted from Johnson and Johnson (1975).

Teaching the Control Group

The control groups were taught Genetics concepts by the use of conventional lecture method by the researcher.

3.8 Data Collection Procedure

The two instruments; the Genetics Concepts Performance Test (GCPT) and Genetic Concepts Interest Questionnaire (GCIQ) were administered as pretest to both the experimental and control groups before treatment. Posttest was administered after the teaching of genetics concepts for a period of six (6) weeks. The GCPT contained 40 items one (1) mark was allotted to each item to a total of 40 marks which was the highest mark to be scored. The 40 marks were converted to 100% by dividing each student's score over 40 multiply by 100. After scoring of the result, scores were collected and recorded based on the demand of research questions and hypotheses testing.

3.9 Procedure for Data Analysis

The research questions were answered using Mean and Standard Deviation. While the null hypotheses were re-stated with corresponding statistical tools for data analysis at $P \leq 0.05$ level of significance as follows:

Ho₁: There is no significant difference in the mean academic performance scores of students taught Genetic Concepts using Reciprocal Peer - Tutoring strategy and those taught using lecture method.

t-test Statistics was used to test this hypothesis. At $P \leq 0.05$ level of significance.

Ho₂: There is no significant difference in the mean academic performance scores of male and female students taught genetic concepts using reciprocal peer tutoring strategy.

t-test was used to test this hypothesis at $P \leq 0.05$ level of significance.

Ho₃: There is no significant difference in the interest shown in genetic concepts by students when exposed to Reciprocal Peer - Tutoring strategy.

This hypothesis was tested using Kruskal-Wallis test.

Ho₄: There is no significant difference in the interest shown in genetic concepts by male and female students when exposed to Reciprocal Peer - Tutoring.

This hypothesis was tested using Kruskal-Wallis test.

CHAPTER FOUR

DATA ANALYSIS: PRESENTATION AND DISCUSSION OF RESULTS

4.1 Introduction.

This study investigated Effect of Reciprocal Peer - Tutoring on interest and performance on Genetics Concept among secondary school students. In this chapter, result and discussion are presented in the following subheadings:

4.2 Data Analysis and Result Presentation

4.2.1 Answering Research Questions

4.3 Summary of Findings

4.4 Discussion of Findings

4.2.1 Answering Research Questions:

Question One: What is the difference between mean academic performance scores of biology students taught genetic concepts using Reciprocal Peer - Tutoring strategy and those taught using lecture method?

Table 4.1: Posttest Mean and Standard Deviation of Academic Performance Scores of the Students in Experimental and Control Groups.

Groups	N	Mean	Std. Deviation	Mean Difference
Experimental	55	33.18	0.62	12.07
Control	61	21.11	0.76	

Source: Researcher's Fieldwork, 2019.

In Table 4.1, the result of the analysis shows that there was difference in the mean academic performance scores of students taught Genetic using Reciprocal Peer - Tutoring Strategy and those taught using lecture method. Their mean Academic Performance Scores were 33.38 and 21.11 in posttest experimental and posttest control respectively. The computed mean difference was found to be 12.07 in favour of the experimental

group. The Mean Academic Performance Scores of Students in experimental group is higher than their counter parts.

Question Two: What is the difference in the mean academic performance scores of male and female students taught Genetic Concepts using Reciprocal Peer - Tutoring Strategy.

Table 4.2: Mean and Standard Deviation of Academic Performance of Male and Female Students in Experimental Group Only.

	N	Mean	Std. Deviation	Std. Error	Mean Difference
Male Posttest	30	28.00	8.01	.86	4.00
Female Posttest	25	24.00	7.92	1.42	

Source: Researcher’s Fieldwork, 2019.

Table 4.2 shows that the Mean Academic Performance scores of Male Students in experimental group was 28.00 and standard deviation of 8.01 was observed. Female students in the same group have a mean scores of 24.00 with standard deviation of 7.92. This indicates that the male students taught genetic concepts using Reciprocal Peer-Tutoring strategy have higher mean score than female students.

Question Three: Is there any difference in the interest shown in genetic concept by students taught using Reciprocal Peer - Tutoring strategy and those taught using lecture method?

Table 4.3: Mean Rank Analysis of Interest of Students in Experimental and Control Groups.

Groups	N	Mean Rank		Mean Rank Gain
		Pretest	Posttest	
Experimental	55	91.92	188.75	96.83
Control	61	96.50	93.52	2.98

Source: Researcher’s Fieldwork, 2019.

Table 4.3: shows that difference exists in the interest shown by student when they were exposed to Reciprocal Peer - Tutoring and lecture method in genetics. Their mean rankinterest were 91.92 and 96.92 pretest experimental and pretest control, 188.75 and 93.52 in posttest experimental and posttest control respectively. When the difference between their interest rate was computed it was found to be 96.82 for students in experimental group and 2.98 for students in control group. This shows that students in the experimental group shown more interest than their counter parts.

Question Four: What is the difference in the interest shown in genetics by male and female students taught using Reciprocal Peer - Tutoring strategy.

Table 4.4: Mean Rank Analysis of Interest of Male and Female Students in Experimental Group.

Gender	N	Mean Rank		Mean Rank Gain
		Pretest	Posttest	
Male	30	81.20	126.73	45.53
Female	25	65.33	102.52	37.19

Source: Researcher’s Fieldwork, 2019.

Table 4.4: shows that the mean rank of interest of male students in experimental group was 81.20 in pretest and 126.73 in posttest and mean rank gain of 45.53 was observed. Female students in the same group have a mean rank interest of 65.33 in pretest and 102.52 in posttest with mean rank gain of 37.19. This indicates that male students taught genetic concepts using Reciprocal Peer-Tutoring strategy shown more interest than female students.

4.3 Hypotheses Testing

Hypothesis One: There is no significant difference in the mean academic performance scores of students taught Genetic Concepts using Reciprocal Peer - Tutoring strategy and those taught using lecture method.

Table 4.5: Independent t-test Analysis of Mean Academic Performance Scores of Student in Experimental and Control Groups

Groups	N	Mean	Std. Deviation	Std. Error	Mean Diff.	Df	P	Remark
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Experimental	55	33.382	4.641	0.626				
Control	61	21.115	5.958	0.763	12.267	114	0.000	Significant

Source: Researcher's Fieldwork, 2019.

Significant at $P \leq 0.05$.

Table 4.5, shows that the P-Value of 0.000 was observed at $df = 114$. Since the p-value was less than the alpha value of 0.05. Therefore the difference in the mean Academic Performance Scores of students taught genetic concepts using Reciprocal Peer - Tutoring and those taught using Lecture Method is significant. The null hypothesis which stated that there is no significant difference in the Mean Academic Performance Scores of Students taught Genetic Concepts using Reciprocal Peer - Tutoring and the those taught using Lecture Method is hereby rejected.

Hypothesis Two: The null hypothesis state that there is no significant difference in the mean academic performance scores of male and female students taught genetic concepts using Reciprocal Peer - Tutoring strategy.

Table 4.6: Independent t-test Analysis of Mean Academic Performance Scores of Male and Female Students in Experimental Group Only

Gender	N	Mean	Std. Deviation	Std. Error	Mean Diff.	Df	P	Remark
Males	30	28.000	8.01	0.869				
					4.000	53	0.21	Not Significant
Females	25	24.000	7.92	1.423				

Source: Researcher's Fieldwork, 2019.

Significant at $P \leq 0.05$.

Table 4.6, indicates that the P-Value 0.21 was observed at $df = 53$ since the p-value was greater than the alpha value of 0.05. This shows that there is no significant difference. A no significant difference implies retaining of the hypothesis. Thus, null hypothesis which stated that there is no significant difference between the academic performance of male and female students taught genetic concepts using Reciprocal Peer-Tutoring was retained

Hypothesis Three: The null hypothesis state that there is no significant difference in the interest shown in genetic by students taught using Reciprocal Peer - Tutoring strategy and those taught using lecture method

Table 4.7: Kruskal Wallis Analysis on the Interest shown in Genetic by Students in Experimental and Control Groups.

Groups	N	Mean Rank		Mean Rank Diff.	Df	P	Remark
		Pretest	Posttest				
Experimental	55	91.92	188.75	96.83	1	0.01	Significant
Control	61	96.50	93.50	2.98			

Significant at $P \leq 0.05$

In Table 4.7, the P-Value of 0.01 was observed at $df = 1$ since the p-value is less than the alpha value of 0.05, it means that the difference in the interest shown by students when exposed to Reciprocal Peer - Tutoring and those exposed to lecture method was significant in favour of the Experimental Group. Therefore, the null hypothesis which stated that there is no significant difference in the interest shown in genetics by students taught using Reciprocal Peer - Tutoring Strategy and those taught using lecture method, is hereby rejected.

Hypothesis Four: The null hypothesis states that there is no significant difference in the interest shown in genetic by male and female students taught using Reciprocal Peer - Tutoring strategy.

Table 4.8: Kruskal Wallis Analysis on the Interest Shown in Genetics by Male and Female Students in the Experimental Group.

Gender	N	Mean Rank		Mean Rank Diff.	Df	P	Remark
		Pretest	Posttest				
Male	30	81.20	126.73	45.53	1	0.22	Not Significant
Female	25	77.33	120.52	43.19			

Significant at $P \leq 0.05$

Table 4.8, shows that the P-Value of 0.22 was observed at $df=1$, since the P-Value is greater than the alpha value of 0.05, it means that the difference in the interest shown by male and female students when exposed to Reciprocal Peer-Tutoring is not significant. Therefore the null hypothesis which stated that there is no significant difference in the interest shown in Genetics by male and female students taught using Reciprocal Peer - Tutoring Strategy is retained.

4.4 Summary of Major Findings

From findings of the study it was observed that:

1. Significant difference exist in the mean academic performance scores of students taught Genetic Concepts using Reciprocal Peer - Tutoring strategy and those taught using lecture method in favour of the experimental group.
2. Significant difference does not exists in the mean academic performance scores of male and female students taught genetic concepts using Reciprocal Peer - Tutoring strategy.
3. Significant difference exist in the interest shown in genetic concepts by students taught using Reciprocal Peer - Tutoring strategy and those taught using lecture method in favour of experimental group.
4. On the difference in the interest shown in genetic concepts by male and female students taught using Reciprocal Peer - Tutoring Strategy the result shows there is no significant difference.

4.5 Discussion of Findings

This research investigated the Effect of Reciprocal Peer - Tutoring on interest and performance in genetics among secondary school students. Four hypotheses were stated and tested based on the scores of the subjects obtained in Genetic Concepts Interest

Questionnaire (GCIQ). Analyses of the data obtained are presented in Tables 4.1 to 4.8 in accordance with the stated hypotheses. The findings are discussed below.

In Table 4.5 the result of the findings shows that there was significant difference when students were exposed to Reciprocal Peer - Tutoring and lecture method in favour of the experimental group. The reason for the difference was attributed to the ability of Reciprocal Peer - Tutoring Strategy to allow students to participate actively in the lesson and get assistance and feedback directly from their peers. This finding was in support of research findings of Shiri and Philip (2009), Simpkins, Mastropieri and Scruggs (2009), Abiodun (2010), Adekoya and Olatoye (2011). Abiodun (2010) findings revealed that peer-tutoring instructional strategies are more effective than conventional lecture method in terms of enhancing students' academic performance. In addition, Adekoya and Olatoye (2011) confirmed that students exposed to class-wide peer-tutoring strategy in pasture and forage crops concepts of agriculture performed significantly better than those exposed to conventional lecture method.

The better performance of students in Genetic Concepts taught Genetic Concepts using Reciprocal Peer - Tutoring strategy was as a result of the ability of the strategy to help students participate actively in the lesson and sense of belonging in students as it is always easy to learn from their peers. Also reinforcement and encouragement are interesting in the tutoring situation in addition to the students' active participation in learning.

From the findings in Table 4.6 result shows that there was no significant difference in the mean academic performance scores of male and female students when exposed to Reciprocal Peer-Tutoring in the concept of genetics. Thus the null hypothesis that states there is no significant difference between male and female students taught Genetic concepts using Reciprocal Peer-Tutoring is retained. This means that Reciprocal Peer-Tutoring is

gender friendly. The similarities in academic performance between male and female students in Genetics concepts taught using RPT, was because all students are working at their optional level during the same time. (Skinner, Fletcher and Henington, 1996).

The report agrees with earlier reports by Olatoye (2008) and Usman (2010). Olatoye (2008) confirmed that, there was no significant different between Male and Female achievement in science. The finding gain further support from the work of Adekoya and Olatoye (2011) who reported that there is no significant effect of gender on students achievement in an aspect of Agricultural Science due to exposure to Peer – Tutoring. While it disagree with the work of Ezenwuso and Nworgu (2013) who revealed that Male students performed better than female students in task involving Peer – Tutoring.

Table 4.7 tested for significant difference in the interest shown in genetic concepts by students taught using Reciprocal Peer - Tutoring and those taught using lecture method. The research question three was answered by testing the corresponding hypothesis which stated that there is no significant difference in the interest shown by SSS students when they are exposed to Reciprocal Peer - Tutoring strategy and lecture method. It was observed that students taught using Reciprocal Peer - Tutoring Strategy had more interest towards genetics than those taught genetics using lecture method. This indicated that the use of Reciprocal Peer - Tutoring strategy enhanced students interest towards learning of genetics, increased interest towards learning of genetics recorded could be due to use of Reciprocal Peer - Tutoring strategy and the general fun experienced during the lesson when Reciprocal Peer - Tutoring is used. Furthermore, other reasons that could be behind enhancement and boosting of students interest when taught using Reciprocal Peer - Tutoring strategy could be that students who learned with Reciprocal Peer - Tutoring strategy were actively in the classroom, interacted much more with their peers. This is in line with Silva (2006) who found out that, an individual's attention and/or engagement

with particular events and objects determine the direction of interest development. Therefore, with the empirical evidence in this study, it is shown that the use of Reciprocal Peer - Tutoring strategy is necessary for boosting students' interest towards learning of genetics.

From the result in Table 4.8, it shows that the interest level of male students was slightly higher than the female students interest in genetics when taught using Reciprocal Peer-Tutoring Strategy. Thus the null hypothesis that states that there is no significance difference in the interest shown in genetics by male and female students when taught using Reciprocal Peer-Tutoring is here by retained. This was because male and female students in the experimental group do not differ significantly in Genetic Concept due to exposure to Reciprocal Peer-Tutoring. This finding is in agreement with the work of Danjuma (2017) who found out that there is no significant difference in the interest of male and female students in biology while it disagree with the work of Nworgu (1990) in Obeka (2009) who reported that girls performed better academically in social sciences and science. It also disagreed with the work of Crookal, Saunders and Oxford (1987) in Obeka (2009) who reported that boys performed better in science and social sciences concept academically than girls, because they were involved in role/games activities while girls are more into domestic activities.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter summarises the investigation on the effect of Reciprocal Peer - Tutoring on interest and performance in Genetics among secondary school students in Zaria Education Zone, Kaduna, Nigeria.

The chapter is presented under the following sub-headings:

5.2 Summary

5.2.1 Summary of Findings

5.3 Conclusion

5.4 Contributions to Knowledge

5.5 Recommendations

5.6 Limitations of the Study

5.7 Suggestions for Further Studies

5.2 Summary

This study investigated the Effects of Reciprocal Peer - Tutoring on interest and performance in genetics among secondary school students in Zaria Education Zone, Kaduna, Nigeria. The research was presented in five chapters. Chapter one presented the problem of this study which was prompted by low interest and poor academic performance of secondary school Biology students. The study was guided by four research questions, null hypotheses corresponding to the research objectives were also stated. Other aspects of the chapter are significant of the study, scope of the study and basic assumptions. The study was delimited to only SS II students of public secondary school offering Biology in Zaria Education Zone of Kaduna State. Chapter two of the

study reviewed literature that were relevant in the areas such as, Teaching Biology in Secondary Schools, Science Teaching Method, Different types of cooperative learning strategies, Reciprocal Peer - Tutoring Strategy, Reciprocal Peer - Tutoring and Performance in Biology, Concept of Genetics, Academic Performance of Students in Biology, Interest and Academic Performance in Biology, Gender and Academic Performance in Science, Overview of Similar Studies, Implication of the Literature Review for the Present Study. The chapter three of this study presented the methodology employed in carrying out the study and this includes Research Design, Population of the Study, Sample and Sampling Techniques, Instrumentation, Validity of the Instruments, Pilot Test, Reliability of the Instruments, Administration of Treatment as well as Data Collection Procedure and Procedure for Data Analysis.

Chapter four of the study presented the results and discussions of the findings. Four hypotheses were tested along the research objectives and questions from the analysis of data and test of the study null hypotheses, the following major findings were outlined: There was significant difference in performance when students were exposed to Reciprocal Peer - Tutoring strategy and lecture method, there was significant difference in the mean academic performance scores of male and female students exposed to Reciprocal Peer - Tutoring strategy and lecture method, significant difference exist in the interest shown by SSS students when exposed to Reciprocal Peer - Tutoring and lecture method, there was no significant difference in the interest shown by male and female students taught Genetics with Reciprocal Peer - Tutoring. Chapter five summarizes the investigation on the effect of Reciprocal Peer - Tutoring on interest and performance in genetics among secondary school students in Zaria Education Zone, Kaduna, Nigeria. The chapter looked at the following sub-headings: Summary of major Findings, Conclusions,

Contributions to Knowledge, Recommendations, Limitations of the Study and Suggestions for further Studies.

5.2.1 Major Findings

1. Significant difference exist in the mean academic performance scores when students are exposed to Reciprocal Peer - Tutoring and lecture method. Students have significantly higher mean performance scores when exposed to Reciprocal Peer - Tutoring strategy.
2. Significant difference does not exist in the mean academic performance scores between male and female students when exposed to Reciprocal Peer - Tutoring Strategy. Male and female students have significantly higher academic performance scores when exposed to Reciprocal Peer - Tutoring Strategy.
3. Significant difference exists in the interest shown by SSS students when exposed to Reciprocal Peer - Tutoring and lecture method in Genetics. There was marked difference in interest between experimental group and control group in favour of the experimental group.
4. There is no significant difference in gender when students are exposed to Reciprocal Peer - Tutoring Strategy.

5.3 Conclusion

On the basis of the findings from this study the following general conclusion could be deduced:

1. Students have higher mean academic performance when exposed to Reciprocal Peer - Tutoring.

2. There was marked increased difference in interest between experimental group and control group in favour of the experimental group.
3. Reciprocal Peer - Tutoring enhanced the interest of male and female students.

5.4 Contributions to Knowledge

The concern of this study was to explore the effect of Reciprocal Peer - Tutoring on interest and performance in Genetics among Secondary School Students. The findings of the study have the following significant contributions to knowledge:

1. The study established that Reciprocal Peer-Tutoring Strategy enhances students academic performance and interest in learning genetic concepts of biology.
2. The Genetic Concept Performance Test (GCPT) was developed by the researcher which can be adopted or adapted by other researchers.
3. The researcher also established that the students taught using Reciprocal Peer - Tutoring show more interest in learning genetics than those taught using method.
4. The Genetic Concepts Interest Questionnaire (GCIQ) was adapted by the researcher to measure students' interest level in genetic concepts of Biology. Thus, served as contribution to knowledge.
5. The Reciprocal Peer - Tutoring Strategy steps developed by the researcher and used as treatment for the experimental group was found to be effective therefore contribute to knowledge.

5.5 Recommendations

The following recommendations are made:

1. The use of Reciprocal Peer - Tutoring Strategy in teaching Biology should be encouraged by stake holders in the education industries i.e both Federal and State Ministries of Education and other relevant agencies like STAN, NERDC among others. This can be achieved through periodic seminars and workshops to teachers on how to use Reciprocal Peer - Tutoring for teaching biology.
2. Curriculum planners should examine the efficacy of Reciprocal Peer - Tutoring Strategy and recommend it for use in translating the curriculum at the classroom level where appropriate.
3. Textbook publishers should produce textbooks in science subjects using the RPTS model.
4. Both male and female senior secondary school students should be taught Biology with Reciprocal Peer-Tutoring Strategy.

5.6 Limitations of the Study

The following are limitation of the study:

The students and research assistants were not too familiar with Reciprocal Peer-Tutoring Strategy. A lot of explanations were done on it before commencement of the exercise.

5.7 Suggestions for Further Studies

Based on the findings of this study the following suggestions may be found useful:

1. This study covered only Zaria Education Zone in Kaduna State. The study could be expanded to cover other zones and the whole of Kaduna State.
2. That the composition of schools changed to include both private and boarding secondary schools.
3. A similar study may also be conducted in Junior Secondary Schools (JSS) level to find out the effect of Reciprocal Peer - Tutoring strategy on interest and

performance of students in Basic Science, Mathematics and Physical and Health Education (P.H.E).

4. The result obtained in this study was for genetic concepts in Biology. The strategy can therefore be tried for other concepts in Biology and other science disciplines like chemistry, mathematics and physics.
5. More studies should be conducted on effect of Reciprocal Peer - Tutoring on academic performance, gender, attitude and confidence level in secondary schools and tertiary institutions in different part of the country.

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APPENDIX A:

GENETICS CONCEPT PERFORMANCE TEST (GCPT)

Instruction: This test contain 40 multiple choice questions you are required to tick the correct answer.

Duration: 40 Mins.

Class: SS II

1. (Kn) The branch of science which deals with resemblances, origin and expression of biological variation is called;
 - (a) embryology
 - (b) ecology
 - (c) entomology
 - (d) genetics
2. (An).Mutation lead to evolution in that it
 - (a) give rise to offspring which have the same characteristics as the parent
 - (b) kills all organisms where it has occurred
 - (c) giver rise to new individual which differ considerably from their parent.
 - (d) always confers to the offspring
3. (Ev) One of the major criticisms against Mendelian law is that they do not recognise that;
 - (a) one trait is often controlled by many pairs of genes
 - (b) single factor inheritance is never reality
 - (c) complete dominance is always possible
 - (d) incomplete dominance is not possible
4. (Ev) Identical twins inherit their genes from?
 - (a) the same ovum and different sperms
 - (b) the same sperm and different ova
 - (c) different sperms and many ova
 - (d) the same ovum and the same sperm
5. (Kn)The offspring produced when pure strains interbreed is described as;
 - (a) dominance
 - (b) phenotype
 - (c) allele
 - (d) genotype
- 6.(Kn) Which of the following diseases or disorders can be prevented by the application of the knowledge of heredity through marriage counselling?
 - (a) sickle cell anaemia
 - (b) Haemophilia
 - (c) diabetics mellitus
 - (d) colour blindness
- 7.(Sy) All the following are examples of gene mutation except
 - (a) Substitution
 - (b) diversion
 - (c) insertion
 - (d) inversion

- 8.(An). Which of the following statements best explains the meaning of homologous chromosome?
- (a) product of division of chromosome
 - (b) two identical chromosome from each parent
 - (c) chromosomes arranged on spindle fibre during cell division
 - (d) chromosomes arranged on the equatorial plate of the cell
- 9.(Kn). Which of the following is the unit of transmission of heredity traits in living organisms?
- (a) Nucleus
 - (b) Nucleous
 - (c) Gametes
 - (d) genes
- 10.(Kn) The genetic make-up of an organism is described as
- (a) phenotype
 - (b) genotype
 - (c) character
 - (d) chromosomes
- 11.(Kn) A pair of genes which controls a trait is described as?
- (a) dominant
 - (b) recessive
 - (c) allele
 - (d) chromosomes
- 12.(Co) How many chromosomes are found in the human ovum?
- (a) 46
 - (b) 23
 - (c) 30
 - (d) 13
- 13.(Kn) Which of the following pollutant can cause mutation?
- (a) Agricultural waste
 - (b) industrial waste
 - (c) Nuclear fallout
 - (d) chlorofluorocarbon
- 14.(Co) Which of the following determines a normal male offspring?
- (a) X
 - (b) Y
 - (c) XY
 - (d) YY
- 15.(Ap) The genotypic ratio of 1:2:1 in the offspring of a hybrid cross illustrates the law of?
- (a) use and disuse
 - (b) dominance
 - (c) segregation
 - (d) linkage
- 16.(Co) Which of the following traits may be considered in marriage counselling?
- (a) Height
 - (b) Fingerprints
 - (c) Rhesus factor
 - (d) colour of skin
- 17.(Co) Which of the following is the precise location of the gene?
- (a) chromosome
 - (b) centriole
 - (c) ribosome
 - (d) endoplasmic reticulum

- 33.(An) The inheritance of blood groups from the cross in figure 1.0, which of the following F₁ offspring does not belong to the father?
(a) AA (b) AO (c) OB (d) OO
- 34.(Ev) Continuous out breeding in a population leads to;
(a) increase in variation (b) decrease in variation
(c) increase in mutation rate (d) decrease in mutation rate
- 35.(Sy) In which of the following is the knowledge of genetics not applicable?
(a) Development of high yielding varieties (b) preservation of seeds
(c) Development of early maturing varieties (d) improvement in quality of yield
- 36.(An) The segregation of factors into different types during meiosis is called;
(a) Monohybrid (b) morphogenesis (c) random inheritance
(d) independent assortment
- 37.(Sy) The sudden change in a gene structure or chromosome number in an organism likely to cause an inheritable change in the phenotype is known as
(a) migration (b) mutation (c) mitosis (d) meiosis
- 38.(Sy) What does the chemical composition of the genetic material of all living organisms consist of?
(a) deoxyribonucleic acid (b) Adenosindiphosphate
(c) Adenosine triphosphate (d) follicle stimulating hormone
- 39.(Ap) If red is dominant to white and homozygous red pea plants are crossed with homozygous white pea-plants, the first filial generation will have;
(a) 2 red flowers, 2 white flowers (b) 4 red flowers
(c) 4 white flowers (d) 4 pink flowers
- 40.(Kn) Which of the following diseases is not hereditary?
(a) Albinism (b) scabies
(c) haemophilia (d) colour blindness

APPENDIX B:
GPT MARKING SCHEME

1. D	11. C	21.D	31.C
2. C	12. B	22.D	32. D
3. A	13. C	23.A	33. D
4. D	14. C	24.A	34. A
5. A	15. C	25.C	35.B
6. A	16. C	26.D	36.A
7. B	17. A	27.A	37. B
8. B	18. C	28.B	38. A
9. D	19. D	29.C	39. B
10. B	20. D	30.C	40. B

Total = 1mk x 40 = 40 Marks.

APPENDIX C:

GENETIC CONCEPT INTEREST QUESTIONNAIRE (GCIQ)

Dear Respondent,

This questionnaire is designed by a Post Graduate student to obtain information from you about students' Reinforcement on Genetics Concept. You are please requested to rate the items based on your opinion in order of priority from Strong Agreed (SA), Agreed (A), Undecided (U), Disagreed (D) to Strongly Disagreed (SD). Thank you.

SECTION 'A': PERSONAL DATA:

Sex: Male [] Female []

Class: SS II

SECTION 'B': QUESTIONS:

S/No	Questions	SA	A	U	D	SD
1	Studies are interesting when genetic concept is taught					
2	I am not focused when genetics concept of Biology is been taught					
3	I fear to read genetics because it involves cramming					
4	When I hear the word genetics I have feeling of dislike					
5	Only brilliant students can understand genetics concept of Biology					
6	I participate better in the lessons of genetics concepts					
7	I enjoy discussing genetics concept of Biology with my colleagues					
8	I do not like genetics concept of Biology because I don't need it for my future career					

S/No	Questions	SA	A	U	D	SD
9	The teacher involves me more in class discussions when genetics concept is taught					
10	To me attending genetic class of Biology is waste of time.					
11	I can learn many things when my teacher teaches genetics concept of Biology					
12	To me Genetics concept of Biology is better than any other science subject					
13	I am able to do my genetics concept of Biology home work					
14	Genetics concept of Biology to me is easily comprehended and understood when peer-tutoring is used					
15	I concentrate better in class when genetics concept of Biology is taught					
16	I feel like lesson on genetics concept of Biology should not end quickly					
17	I am able to solve problems in genetics without difficulty					
18	Genetics concept of Biology is connected to my life					
19	To me knowing too much of genetics can improve my knowledge					
20	I will like to study genetics as course when I go to the university					

Source: Adapted from Muoneme (2015).

APPENDIX D

GENETICS CONCEPT PERFORMANCE TEST (GCPT)

Instruction: This test contain 40 multiple choice questions you are required to choose the correct answer.

Duration: 40 Mins.

1. Kn. The branch of science which deals with resemblances, origin and expression of biological variation is called;
- (a) embryology (b) ecology (c) entomology
(d) genetics (e) taxonomy
2. An. Mutation lead to evolution in that it
- (a) give rise to offspring which have the same characteristics as the parent
(b) kills all organisms where it has occurred
(c) giver rise to new individual which differ considerably from their parent.
(d) always confers to the offspring
(e) does not confers to the offspring
3. Ev. One of the major criticisms against Mendelian law is that they do not recognise that,
- (a) one trait is often controlled by many pairs of genes
(b) single factor inheritance is never reality
(c) complete dominance is always possible
(d) incomplete dominance is not possible
(e) hybrid exist in living organism only
4. Ev. Identical twins inherit their genes from?
- (a) the same ovum and different sperms
(b) the same sperm and different ova
(c) different sperms and many ova
(d) the same ovum and the same sperm
(e) many ova and many sperms
5. Kn. The offspring produced when pure strains interbreed is described as;
- (a) dominance (b) phenotype (c) allele (d) genotype (e) hybrid
6. Kn. Which of the following diseases or disorders can be prevented by the application of the knowledge of heredity through marriage counselling?
- (a) sickle cell anaemia (b) Haemophilia (c) diabetics mellitus
(d) colour blindness (e) river blindness

- 7.Sy. Which of the following is a function of the chromosome?
- (a) Transmission of heredity traits (b) protein synthesis
(c) energy production (d) energy production
(e) Manufacture of enzyme
- 8.An. Which of the following statements best explains the meaning of homologous chromosome?
- (a) product of division of chromosome
(b) two identical chromosome from each parent
(c) chromosomes arranged on spindle fibre during cell division
(d) chromosomes arranged on the equatorial plate of the cell
(e) Daughter chromatids in the first mitotic division
- 9.Kn. Which of the following is the unit of transmission of heredity traits in living organisms?
- (a) Nucleus (b) Nucleous (c) Gametes
(d) genes (e) chromosomes
- 10.Kn. The genetic make-up of an organism is described as
- (a) phenotype (b) genotype (c) character
(d) chromosomes (e) allele
- 11.Kn. A pair of genes which controls a trait is described as?
- (a) dominant (b) recessive (c) character
(d) chromosomes (e) hybrid
- 12.Co. How many chromosomes are found in the human ovum?
- (a) 46 (b) 23 (c) 30 (d) 13 (e) 43
- 13.Kn. Which of the following pollutant can cause mutation?
- (a) Agricultural waste (b) industrial waste (c) Nuclear fallout
(d) chlorofluorocarbon (e) untreated swage
- 14.Co. Which of the following determines a normal male offspring?
- (a) X (b) Y (c) XY (d) YY (e) XX
- 15.Ap. The genotypic ratio of 1:2:1 in the offspring of a hybrid cross illustrates the law of?
- (a) use and disuse (b) dominance (c) segregation
(d) linkage

16.Co. Which of the following traits may not be important in marriage counselling?

- (a) sex-determination (b) sickle – cell factor
(c) Rhesus factor (d) colour of skin

17.Co. Which of the following is the precise location of the gene?

- (a) chromosome (b) centriole (c) ribosome
(d) endoplasmic reticulum

18.Ev. If a black guinea pig of a genotype BB is crossed with a white guinea pig of genotype bb, what will be the phenotype of F1 generation?

- (a) Half would be white, white half would be black
(b) All would be black (c) All would be grey
(d) $\frac{1}{3}$ would be black, $\frac{2}{3}$ would be white.

19.Kn. Heredity variation is best describe as;

- (a) characters transmitted from generation to generation
(b) traits acquired from disease
(c) characters that show up due to social conditions
(d) traits acquired from habits and environ condition
(e) characters that result from physical injuries

20.Ap. An individual with blood group AB can receive blood from those in blood group;

- (a) AB only (b) A and B (c) B only
(d) AB and O only (e) A,B, AB and O

21.Co. Which of the following is NOT a reason why an offspring looks different from its parents?

- (a) Random re-organization of chromosomes during genetic formation
(b) existing of multiple alleles in organism
(c) Formation of chiasmata in chromatids during meiosis

22.Kn. The pair of gene expressed in a heterozygous individual is described as;

- (a) Allele (b) chromatin (c) dominance gene
(d) centrosome (e) chromomere

23.Ap. Which of these allelic pairs represent a homozygous dominant trait?

- (a) TT (b) Tt (c) tt (d) Bb (e) bb

24.Ev. When both alleles in a heterozygous individual are fully expressed in the phenotype of the F1 generation this phenomenon is described as;

- (a) co-dominant (b) dominant (c) incomplete dominance
(d) mutation (e) recession

33.An. The inheritance of blood groups from the cross above, which of the offspring does not belong to the father?

- (a) AA (b) AO (c) OB (d) OO

34.Ev. Continuous out breeding in a population leads to;

- (a) increase in variation (b) decrease in variation
(c) increase in mutation rate (d) evolution of the population

35.Sy. The significance of the first meiotic division is to;

- (a) produce DNA (b) re-arrange gene
(c) reduce the number of chromosomes to haploid
(d) double the number of chromosomes

36.An. The segregation of factors into different types during meiosis is called

- (a) Monohybrid (b) morphogenesis (c) random
(d) independent assortment (e) incomplete dominance

37.Sy. The sudden change in a gene structure or chromosome number which cause an inheritable change in the phenotype is known as

- (a) migration (b) mutation (c) mitosis

38.Sy. What does the chemical composition of the genetic material consist of?

- (a) deoxyribonucleic acid (b) Adenosin diphosphate
(c) Adenosine triphosphate (d) follicle stimulating hormone

39.Ap. If red is dominant to white and homozygous red pea plants are crossed with white pea-plants, the first filial generation will have;

- (a) 2 red flowers, 2 white flowers (b) 4 red white flowers
(c) 4 white flowers (d) 4 pink flowers

40.Kn. Which of the following diseases is not hereditary?

33.An. The inheritance of blood groups from the cross above, which of the following F₁ offspring does not belong to the father?

- (a) AA (b) AO (c) OB (d) OO (e) AB

34.Ev. Continuous out breeding in a population leads to;

- (a) increase in variation (b) decrease in variation
(c) increase in mutation rate (d) evolution of the population

35.Sy. The significance of the first meiotic division is to;

- (a) produce DNA (b) re-arrange gene
(c) reduce the number of chromosomes to haploid
(d) double the number of chromosomes

36.An. The segregation of factors into different types during meiosis is called;

- (a) Monohybrid (b) morphogenesis (c) random inheritance
(d) independent assortment (e) incomplete dominance

37.Sy. The sudden change in a gene structure or chromosome number in an organism likely to cause an inheritable change in the phenotype is known as

- (a) migration (b) mutation (c) mitosis (d) meiosis

38.Sy. What does the chemical composition of the genetic material of all living organisms consist of?

- (a) deoxyribonucleic acid (b) Adenosin diphosphate
(c) Adenosine triphosphate (d) follicle stimulating hormone

39.Ap. If red is dominant to white and homozygous red pea plants are crossed with homozygous white pea-plants, the first filial generation will have;

- (a) 2 red flowers, 2 white flowers (b) 4 red white flowers
(c) 4 white flowers (d) 4 pink flowers

40.Kn. Which of the following diseases is not hereditary?

- (a) Albinism (b) scabies (c) haemophilia (d) colour blindness

APPENDIX E:
GPT MARKING SCHEME

1. D	11. C	21. C	31. D
2. C	12. B	22. E	32. D
3. A	13. C	23. C	33. D
4. D	14. C	24. C	34. A
5. A	15. C	25. B	35. A
6. A	16. A	26. D	36. C
7. D	17. A	27. E	37. B
8. B	18. A	28. A	38. A
9. D	19. B	29. C	39. B
10. A	20. A	30. C	40. B

Total = 1mk x 40 = 40 Marks.

Appendix: E

Lesson Plan for Experimental Group (Reciprocal Peer Tutoring) Week 1 Lesson One

Subject:	Biology
Topic:	Definition of Genetic
Class:	SS II
Average Age:	17 years
Gender:	Males and Females
Duration:	80mins.
Behavioural Objectives:	By the end of the lesson students should be able to: <ul style="list-style-type: none"> i – Define Genetics ii – List the pioneers in genetics iii – What makes <i>Drosophila melanogaster</i> to be the most suitable organism for genetic studies.
Previous Knowledge:	Students have previously learnt about variation.

	INSTRUCTIONAL PROCEDURES	TIME
Step I	<p>Teacher starts the class by presenting the day's agenda (Topic)</p> <p>Teacher talks about the topic. Example:</p> <ul style="list-style-type: none"> - Defines Genetics <p>Teacher divide students into groups of 5 – 6 student's and the group continue until the end of the class.</p> <p>Teacher list out some techniques and strategies to be use during the tutoring class. Example: explanation, demonstration, discussion and questioning.</p>	10mins.
	<p>Pre-Tutoring activity in a group:</p> <p>Teacher let students discuss on what they don't understand and take notes on paper (each member of a group will be a tutor to each other because one may be familiar with what another may not know).</p>	

Step II	<p>Teacher circulates around groups, listens and take part in the discussion.</p> <p>Each group present the techniques and strategies that they used.</p> <p>Teacher writes the techniques and strategies that each group presents on the board.</p> <p>Teacher adds some explanation about the strategies and compares them with the students own.</p>	10mins.
Step III	<p>Teacher gives out reading material on genetics and a chart.</p> <p>Teacher explains the chart.</p> <p>Students in groups read the reading materials and write down what they don't understand (members of a group share their thoughts about genetics).</p>	10mins.
	<p>Group Presentation:</p> <p>Teacher lets each group present what they understand about genetics reciprocally.</p> <p>Teacher writes the ideas from groups on the board.</p>	10mins.
	<p>Questioning Activity:</p> <p>Student in group comes up with questions.</p> <p>Teacher goes around groups and helps students to make questions</p> <p>Groups exchange the papers containing questions and compare them with their own (teacher says don't remove any question, just add some questions that you think are important to the sheet of other groups)</p>	10mins.
	<p>Teacher – guided learning for questioning:</p> <p>Groups get back their own papers.</p> <p>Teacher asks each group to read out their questions and writes some questions on the board. Example: What is Genetics?</p> <p>Teacher gives feedback on the questions to the class</p> <p>Teacher asks students if a question is right or not.</p>	10mins.

	Teacher encourages and guide students to make right questions.	
Step IV	<p>Clarifying Activity:</p> <p>Teacher lets students in groups to find out the answers of all the question</p> <p>Teacher goes around the group and encourages students to discuss and take part in the discussion.</p> <p>Each group gives a short presentation about what they finally understand and what they don't understand as well as what strategies they use for clarifying.</p> <p>Teacher clarifies what they don't understand.</p> <p>Teacher ensure that contents are covered.</p> <p>Teacher reinforce each group by praising and giving out prizes etc.</p>	10mins.
Step V	<p>Rounding of Activities: Evaluation and Conclusion</p> <p>Teacher evaluate the lesson by asking the student questions based on the specific objectives:</p> <p>i – Define Genetics</p> <p>ii – List the pioneers in genetics</p> <p>iii – What makes Drosophila melanogaster to be the most suitable organism for genetic studies?</p> <p>Teacher asks students to read on the next topic.</p>	10mins.

Week 2

Lesson Two

Subject:	Biology
Topic:	Genetic Terminologies
Class:	SS II
Average Age:	17 years
Gender:	Males and Females
Duration:	80mins.
Teaching Aids:	Charts of animals of same species that shows some variations.
Behavioural Objectives:	By the end of the lesson students should be able to: i – Define the following terms – genes, alleles, genotype, phenotype, homozygous, homozygous etc.
Previous Knowledge:	Students have been previously taught on the definition of genetics.

	INSTRUCTIONAL PROCEDURES	TIME
Step I	<p>Teacher starts the class by presenting the day's agenda (Topic)</p> <p>Teacher talks about the topic. Example:</p> <ul style="list-style-type: none"> - Defines and explain some Genetic terminologies. <p>Teacher divide students into groups of 5 – 6 student's and the group continue until the end of the class.</p> <p>Teacher list out some techniques and strategies to be use during the tutoring class. Example: explanation, demonstration, discussion and questioning.</p>	10mins.
	<p>Pre-Tutoring activity in a group:</p> <p>Teacher let students discuss on what they don't understand and take notes on paper (each member of a group will be a tutor to each other because one may be familiar with what another may not know).</p>	

Step II	<p>Teacher circulates around groups, listens and take part in the discussion.</p> <p>Each group present the techniques and strategies that they used.</p> <p>Teacher writes the techniques and strategies that each group presents on the board.</p> <p>Teacher adds some explanation about the strategies and compares them with the students own.</p>	10mins.
Step III	<p>Teacher gives out reading material on genetics terminologies and a chart.</p> <p>Teacher explains the chart.</p> <p>Students in groups read the reading materials and write down what they don't understand (members of a group share their thoughts about genetics terminologies).</p>	10mins.
	<p>Group Presentation:</p> <p>Teacher lets each group present what they understand about each genetics terminology reciprocally.</p> <p>Teacher writes the ideas from groups on the board.</p>	10mins.
	<p>Questioning Activity:</p> <p>Student in group comes up with questions.</p> <p>Teacher goes around groups and helps students to make questions</p> <p>Groups exchange the papers containing questions and compare them with their own (teacher says don't remove any question, just add some questions that you think are important to the sheet of other groups)</p>	10mins.
	<p>Teacher – guided learning for questioning:</p> <p>Groups get back their own papers.</p> <p>Teacher asks each group to read out their questions and writes some questions on the board. Example: What is a Gene?</p> <p>Teacher gives feedback on the questions to the class</p> <p>Teacher asks students if a question is right or not.</p> <p>Teacher encourages and guide students to make right questions.</p>	10mins.

Step IV	<p>Clarifying Activity:</p> <p>Teacher lets students in groups to find out the answers of all the questions.</p> <p>Teacher goes around the group and encourages students to discuss and take part in the discussion.</p> <p>Each group gives a short presentation about that they finally understand and what they don't understand as well as what strategies they use for clarifying.</p> <p>Teacher clarifies what they don't understand.</p> <p>Teacher ensure that contents are covered.</p> <p>Teacher reinforce each group by praising and giving out prizes etc.</p>	10mins.
Step V	<p>Rounding of Activities: Evaluation and Summary</p> <p>Teacher evaluates the lesson asking questions based on the stated objective:</p> <ul style="list-style-type: none"> - What is Gene? - What is an allele? - Differentiate between Homozygous and Hetrozygous <p>Conclusion: Teacher ask the students to read on the next topic i.e Chromosomes.</p>	10mins.

Week 3

Lesson Three

Subject:	Biology
Topic:	Chromosomes (Location and Structure).
Class:	SS II
Average Age:	17 years
Gender:	Males and Females
Duration:	80minutes
Teaching Aids:	Chart showing the structure of chromosomes.
Behavioural Objective:	By the end of the lesson, students should be able to: <ul style="list-style-type: none"> i) Explain the location of chromosomes ii) Explain the structure of chromosomes iii) Draw the structure of chromosomes
Previous Knowledge:	The students are familiar with the terms: ' <i>genes</i> ', ' <i>allele</i> ' etc. They are also familiar with traits like tall and short.

	INSTRUCTIONAL PROCEDURES	TIME
Step I	<p>Teacher starts the class by presenting the day's agenda (Topic)</p> <p>Teacher talks about the topic. Example:</p> <ul style="list-style-type: none"> - Teachers explain the location of chromosome in the cell. - Teacher explain the structure of chromosome <p>Teacher divide student's into groups of 5 – 6 student's and the group continue until the end the end of the class.</p> <p>Teacher list out some techniques and strategies to be use during the tutoring class. Example: explanation, demonstration and discussion and questioning.</p>	10mins.
	<p>Pre-Tutoring activity in a group:</p> <p>Teacher let students discuss on what they don't understand and take notes on paper (each member of a group will be a tutor to each other because one may be familiar with what another may not know).</p>	

Step II	<p>Teacher circulates around groups, listens and take part in the discussion.</p> <p>Each group present the techniques and strategies that they used.</p> <p>Teacher write the techniques and strategies that each group presents on the board.</p> <p>Teacher adds some explanation about the strategies and compares them with the students own.</p>	10mins.
	<p>Teacher gives out reading material on chromosomes and a chart containing the structure.</p> <p>Teacher explains the chart.</p> <p>Students in groups read the reading materials and write down what they don't understand (members of a group share their thoughts about the topic).</p>	10mins.
Step III	<p>Group Presentation:</p> <p>Teacher lets each group present what they understand about transmission and expression of characters reciprocally.</p> <p>Teacher writes the ideas from groups on the board.</p>	10mins.
	<p>Questioning Activity:</p> <p>Student in group comes up with questions.</p> <p>Teacher goes around groups and helps students to make questionsGroups exchange the papers containing questions and compare them with their own (teacher says don't remove any question, just add some questions that you think are important to the sheet of other groups)</p>	10mins.
	<p>Teacher – guided learning for questioning:</p> <p>Groups get back their own papers.</p> <p>Teacher asks each group to read out their questions and writes some questions on the board. Example: What is a chromosome?</p> <p>Teacher gives feedback on the questions to the class</p>	10mins.

	<p>Teacher asks students if a question is right or not.</p> <p>Teacher encourages and guide students to make right questions.</p>	
Step IV	<p>Clarifying Activity:</p> <p>Teacher lets students in groups to find out the answers of all the question</p> <p>Teacher goes around the group and encourages students to discuss and take part in the discussion.</p> <p>Each group gives a short presentation about that they finally understand and what they don't understand as well as what strategies they use for clarifying.</p> <p>Teacher clarifies what they don't understand.</p> <p>Teacher ensure that contents are covered.</p> <p>Teacher reinforce each group by praising and giving out prizes etc.</p>	10mins.
Step V	<p>Rounding of Activities: Evaluation and Summary</p> <p>Teacher evaluates the lesson asking questions based on the stated objective:</p> <ul style="list-style-type: none"> - Explain the location of chromosome - explain the structure of chromosome - Teacher ask each group to draw the structure of chromosome on a cardboard paper. <p>Conclusion: Teacher ask the students to study DNA Structure.</p>	10mins.

Week 4

Lesson Four

Subject:	Biology
Topic:	Chromosome (Chemical Nature of Chromosome)
Class:	SS II
Average Age:	17years
Gender:	Males and females
Duration:	80minutes
Teaching Aid:	A chart of DNA strand.
Behavioural Objectives:	By the end of the lesson, students should be able to: i) Explain DNA structure. ii) Explain the importance of the DNA. iii) Draw the DNA strand.
Previous Knowledge:	Students have been taught on location and structure of chromosome.

	INSTRUCTIONAL PROCEDURES	TIME
Step I	Teacher starts the class by presenting the day's agenda (Topic) Teacher talks about the topic. Example: - Explain the structure of DNA. - Importance of DNA strand Teacher divide student's into groups of 5 – 6 student's and the group continue until the end of the class. Teacher list out some techniques and strategies to be use during the tutoring class. Example: explanation, demonstration and discussion and questioning.	10mins.
	Pre-Tutoring activity in a group: Teacher let students discuss on what they don't understand and take notes on paper (each member of a group will be a	

Step II	<p>tutor to each other because one may be familiar with what another may not know).</p> <p>Teacher circulates around groups, listens and take part in the discussion.</p> <p>Each group presents the techniques and strategies that they used.</p> <p>Teacher writes the techniques and strategies that each group presents on the board.</p> <p>Teacher adds some explanation about the strategies and compares them with the students own.</p>	10mins.
Step III	<p>Teacher gives out reading material on the topic and a chart.</p> <p>Teacher explains the chart.</p> <p>Students in groups read the reading materials and write down what they don't understand (members of a group share their thoughts about the topic).</p>	10mins.
	<p>Group Presentation:</p> <p>Teacher lets each group present what they understand about the topic reciprocally.</p> <p>Teacher writes the ideas from groups on the board.</p>	10mins.
	<p>Questioning Activity:</p> <p>Student in group comes up with questions.</p> <p>Teacher goes around groups and helps students to make questions</p> <p>Groups exchange the papers containing questions and compare them with their own (teacher says don't remove any question, just add some questions that you think are important to the sheet of other groups)</p>	10mins.
	<p>Teacher – guided learning for questioning:</p> <p>Groups get back their own papers.</p> <p>Teacher asks each group to read out their questions and writes some questions on the board.</p>	10mins.

	<p>Teacher gives feedback on the questions to the class</p> <p>Teacher asks students if a question is right or not.</p> <p>Teacher encourages and guide students to make right questions.</p>	
Step IV	<p>Clarifying Activity:</p> <p>Teacher lets students in groups to find out the answers of all the question</p> <p>Teacher goes around the group and encourages students to discuss and take part in the discussion.</p> <p>Each group gives a short presentation about that they finally understand and what they don't understand as well as what strategies they use for clarifying.</p> <p>Teacher clarifies what they don't understand.</p> <p>Teacher ensure that contents are covered.</p> <p>Teacher reinforce each group by praising and giving out prizes etc.</p>	10mins.
Step V	<p>Rounding of Activities: Evaluation and Summary</p> <p>Teacher evaluates the lesson asking questions based on the stated objective:</p> <ul style="list-style-type: none"> - Explain the structure of DNA. - State the importance of DNA strand. - The teacher ask each group to draw the DNA strand on a cardboard paper. <p>Summary: Teacher summarises the important part of the lesson for more clarification and comprehension.</p> <p>Conclusion: Teacher ask the students to read on the next topic.</p>	10mins.

Week 5

Lesson Five

Subject:	Biology
Topic:	Mutation (Chromosome mutation)
Class:	SS II
Average Age:	17 years
Gender:	Males and Females
Duration:	80minutes
Teaching Aid:	Small plants, seeds, leaves
Behavioural Objectives:	By the end of the lesson, students should be able to: i) Define Mutation ii) List the causes of mutations iii) State the advantages of Mutations iv) Differentiate between gene and chromosome mutations.
Previous Knowledge:	Students have been seeing abnormalities in plants, animals and man.

	INSTRUCTIONAL PROCEDURES	TIME
Step I	Teacher starts the class by presenting the day's agenda (Topic) Teacher talks about the topic. Example: - Teacher defines mutation and list some causes of mutation. Teacher divide students into groups of 5 – 6 student's and the group continue until the end of the class. Teacher list out some techniques and strategies to be use during the tutoring class. Example: explanation, demonstration and discussion and questioning.	10mins.
Step II	Pre-Tutoring activity in a group: Teacher let students discuss on what they don't understand and take notes on paper (each member of a group will be a tutor to each other because one may be familiar with what another may not know).	

	<p>Teacher circulates around groups, listens and take part in the discussion.</p> <p>Each group present the techniques and strategies that they used.</p> <p>Teacher write the techniques and strategies that each group presents on the board.</p> <p>Teacher adds some explanation about the strategies and compares them with the students own.</p>	10mins.
	<p>Teacher gives out reading material on mutation and a chart.</p> <p>Teacher explains the chart.</p> <p>Students in groups read the reading materials and write down what they don't understand (members of a group share their thoughts about mutation).</p>	10mins.
Step III	<p>Group Presentation:</p> <p>Teacher lets each group present what they understand about mutation reciprocally.</p> <p>Teacher writes the ideas from groups on the board.</p>	10mins.
	<p>Questioning Activity:</p> <p>Student in group comes up with questions.</p> <p>Teacher goes around groups and helps students to make questions</p> <p>Groups exchange the papers containing questions and compare them with their own (teacher says don't remove any question, just add some questions that you think are important to the sheet of other groups)</p>	10mins.
	<p>Teacher – guided learning for questioning:</p> <p>Groups get back their own papers.</p> <p>Teacher asks each group to read out their questions and writes some questions on the board. Example:</p> <p>- What is Mutation?</p>	10mins.

	<p>- How many types of mutation do we have?</p> <p>Teacher gives feedback on the questions to the class</p> <p>Teacher asks students if a question is right or not.</p> <p>Teacher encourages and guide students to make right questions.</p>	
Step IV	<p>Clarifying Activity:</p> <p>Teacher lets students in groups to find out the answers of all the question</p> <p>Teacher goes around the group and encourages students to discuss and take part in the discussion.</p> <p>Each group gives a short presentation about that they finally understand and what they don't understand as well as what strategies they use for clarifying.</p> <p>Teacher clarifies what they don't understand.</p> <p>Teacher ensures that contents are covered.</p> <p>Teacher reinforce each group by praising and giving out prizes etc.</p>	10mins.
	<p>Rounding of Activities: Evaluation and Summary</p> <p>Teacher evaluates the lesson by asking the students questions based on the stated objectives:</p> <ul style="list-style-type: none"> - What is Mutation? - What are the causes of mutation? - What are the advantages of mutation? <p>Summary: Teacher summarises the lesson for more clarity and comprehension.</p> <p>Conclusion: Teacher ask the students to read on the next topic.</p>	10mins.

Week 6

Lesson Six

Subject:	Biology
Topic:	Gene Mutation
Class:	SS II
Average Age:	17 years
Gender:	Males and Females
Duration:	80minutes
Teaching Aid:	Diagrams and pictures of abnormalities in plants and animals.
Behavioural Objectives:	By the end of the lesson, students should be able to: <ul style="list-style-type: none">- Explain how gene mutation take place- List types of gene mutation- List types of gene mutation- Differentiate between gene and chromosomal mutation.
Previous Knowledge:	Students have been seen the various forms of abnormalities in plants and animals.

	INSTRUCTIONAL PROCEDURES	TIME
Step I	Teacher starts the class by presenting the day's agenda (Topic) Teacher talks about the topic. Example: - Teacher explain how gene mutation occurs Teacher divide students into groups of 5 – 6 student's and the group continue until the end of the class. Teacher list out some techniques and strategies to be use during the tutoring class. Example: Explanation, demonstration and discussion and questioning.	10mins.
	Pre-Tutoring activity in a group: Teacher let students discuss on what they don't understand	

Step II	<p>and take notes on paper (each member of a group will be a tutor to each other because one may be familiar with what another may not know).</p> <p>Teacher circulates around groups, listens and take part in the discussion.</p> <p>Each group presents the techniques and strategies that they used.</p> <p>Teacher writes the techniques and strategies that each group presents on the board.</p> <p>Teacher adds some explanation about the strategies and compares them with the students own.</p>	10mins.
	<p>Teacher gives out reading material on the topic and a chart.</p> <p>Teacher explains the chart.</p> <p>Students in groups read the reading materials and write down what they don't understand (members of a group share their thoughts about gene mutation).</p>	10mins.
Step III	<p>Group Presentation:</p> <p>Teacher lets each group present what they understand about gene mutation reciprocally.</p> <p>Teacher writes the ideas from groups on the board.</p>	10mins.
	<p>Questioning Activity:</p> <p>Student in group comes up with questions.</p> <p>Teacher goes around groups and helps students to make questions</p> <p>Groups exchange the papers containing questions and compare them with their own (teacher says don't remove any question, just add some questions that you think are important to the sheet of other groups).</p>	10mins.
	<p>Teacher – guided learning for questioning:</p> <p>Groups get back their own papers.</p>	

	<p>Teacher asks each group to read out their questions and writes some questions on the board. Example: How does gene mutation takes place?</p> <p>Teacher gives feedback on the questions to the class</p> <p>Teacher asks students if a question is right or not.</p> <p>Teacher encourages and guide students to make right questions.</p>	10mins.
Step IV	<p>Clarifying Activity:</p> <p>Teacher lets students in groups to find out the answers of all the question</p> <p>Teacher goes around the group and encourages students to discuss and take part in the discussion.</p> <p>Each group gives a short presentation about that they finally understand and what they don't understand as well as what strategies they use for clarifying.</p> <p>Teacher clarifies what they don't understand.</p> <p>Teacher ensures that contents are covered.</p> <p>Teacher reinforce each group by praising and giving out prizes etc.</p>	10mins.
	<p>Rounding of Activities: Evaluation and Summary</p> <p>Teacher evaluates the lesson by asking the students questions based on the stated objectives:</p> <ul style="list-style-type: none"> - Explain how gene mutation take place - How many types of gene mutation do we have? - Differentiate between gene and chromosomal mutation. <p>Summary: Teacher summarises the lesson for more clarity and comprehension.</p> <p>Conclusion: Teacher concludes the lesson by given the Students a group assignment.</p>	10mins.

APPENDIX F:

Lesson Plan for Control Group

Week 1

Lesson One

Subject:	Biology
Topic:	Definition of Genetic
Class:	SS II
Average Age:	17 years
Gender:	Males and Females
Duration:	40mins.
Methodology:	Lecture Method
Teaching Aids:	Chalk, chalkboard, chart
Behavioural Objectives:	By the end of the lesson students should be able to: i – Define Genetics ii – Name the scientist who worked on genetics
Previous Knowledge:	Students have a little knowledge of genetics (heredity).
Introduction:	The teacher introduces the lesson by asking the students a question. What is heredity?
Presentation:	The teacher presents the lesson through the steps:
Step I:	The teacher defines Genetics while the students listen.
Example:	Genetics is the study of heredity and variation. It principles account for the following. <ul style="list-style-type: none">- The diversity of organism- The driving force behind evolution- Adaptation of a species in its environment
Step II:	The teacher list the pioneers in genetics
Evaluation:	The teacher evaluates the lesson by asking questions such as: <ul style="list-style-type: none">- What is Genetics?- Who was the first scientist that worked on genetics?

Students' activities: Students responds by telling the answer

Conclusion: The teacher concludes the lesson by summarizing the main points of the lesson.

Lesson Two

Week 2

Subject: Biology

Topic: Genetics Terminologies

Class: SS II

Average Age: 17 years

Gender: Males and Females

Duration: 40mins.

Methodology: Lecture Method

Teaching Aids: Charts of animals of same species that show some variations.

Behavioural Objectives: By the end of the lesson, students should be able to define the following:

Gene, alleles, phenotype, genotype, homozygous, heterozygous etc.

Previous Knowledge: Students have been taught on definition of genetics.

Introduction: The teacher introduces the lesson by asking questions based on the previous topic.

Example: What is Genetics?

- Teacher asked the students to look around first among themselves and tell us the differences they can see.

Presentation: Teacher presents the lesson through the following steps:

Step I:	The teacher defines and explains the following terms: Genes, alleles, phenotype, genotype, homozygous etc.
Step II:	The teacher writes the definition of the terms on the board.
Evaluation:	<ul style="list-style-type: none"> - The teacher asks the students the definitions of each term and the examples. - What do you understand by the terms, genes, phenotype, genotype, homozygous, heterozygous etc.
Conclusion:	The teacher concluded the lesson by briefly giving the definitions of the basic terms once more.

Lesson Three

Week 3

Subject:	Biology
Topic:	Chromosome (Location and Structure)
Class:	SS II
Average Age:	17 years
Gender:	Males and Females
Duration:	40mins.
Methodology:	Lecture Method
Teaching Aids:	Charts showing the structure of chromosome
Behavioural Objectives:	By the end of the lesson, students should be able to: <ul style="list-style-type: none"> i) Explain the Location of chromosome ii) Explain the structure and functions of chromosome.
Previous Knowledge:	Students are familiar with some genetics terms e.g genes, alleles etc.

Introduction:	The teacher introduces the lesson by asking the students questions based on their previous knowledge e.g: i) What is a gene? ii) Differentiate between phenotype and Genotype
Presentation: steps:	Teacher presents the lesson through the following steps:
Step I:	Teacher explains what a chromosome is and its location in the cell.
Step II:	Teacher writes some notes on the board
Step III:	Teacher read and adds more explanation.
Evaluation:	Teacher evaluates the lesson by asking the students some questions: i) Explain the location of chromosomes ii) Explain the structure and function of a chromosome?
Conclusion:	The teacher concludes the lesson by briefly summarizing the major points of the lesson.

Lesson Four

Week 4

Subject:	Biology
Topic:	Chromosome (Chemical Nature of Chromosome)
Class:	SS II
Average Age:	17 years
Gender:	Males and Females
Duration:	40mins.
Methodology:	Lecture Method
Teaching Aids:	A chart of a DNA strand.
Behavioural Objectives:	By the end of the lesson, students should be able to:

- i) Explain the chemical nature of chromosome.
- ii) Explain the structure of DNA and its importance
- iii) Draw the DNA strand.

Previous Knowledge: Students have been taught on Chromosome location and structure.

Introduction: The teacher introduces the lesson by asking the students questions based on their previous knowledge.

Presentation: The teacher presents the lesson through the following steps:

Step I: Teacher explains the DNA structure using a chart

Step II: Teacher explains the chemical nature of the chromosome.

Step III: The teacher dictates some note to the students.

Evaluation: The teacher evaluates the lesson by asking the students some questions.

- i) Explain the chemical nature of a chromosome
- ii) Explain the DNA structure and its importance
- iii) Draw the DNA strand

Conclusion: The teacher concludes the lesson with a summary of the main points.

Lesson Five

Week 5

Subject:	Biology
Topic:	Chromosomal Mutation
Class:	SS II
Average Age:	17 years
Gender:	Males and Females
Duration:	40mins.
Methodology:	Lecture Method
Teaching Aids:	Chalk, chalkboard, small plants, seeds diagrams of animals with abnormalities.
Behavioural Objectives:	By the end of the lesson, students should be able to: i) Define mutation. ii) List the causes of mutation iii) Give examples of chromosomal mutation.
Previous Knowledge:	- Students have been seeing abnormalities in plants, animals and humans.
Introduction:	The teacher introduces the lesson by asking the students questions based on their previous knowledge. i) Name some of the abnormalities you see in plants and animals.
Presentation:	The teacher presents the lesson through the following steps:
Step I:	i) Teacher Define Chromosomal Mutation
Step II:	ii) Teacher explains how chromosomal mutation take place. - It involves a whole chromosome. - It takes various forms e.g: Duplication, non-disjunction.

Evaluation:	The teacher evaluates the lesson by asking the following questions: i) What is mutation? ii) What are the causes of mutation? iii) List three forms of chromosome mutation
Conclusion:	The teacher concludes by going through the main points once more.

Lesson Six

Week 6

Subject:	Biology
Topic:	Gene Mutation
Class:	SS II
Average Age:	17 years
Gender:	Males and Females
Duration:	40mins.
Methodology:	Lecture Method
Teaching Aids:	Pictures and diagrams of animals and human with abnormalities from gene mutations.
Behavioural Objectives:	By the end of the lesson, students should be able to: i) Explain how gene mutation takes place. ii) List types of gene mutations iii) List effects of gene mutations iv) Differentiate between gene and chromosomal mutation.
Previous Knowledge:	- Students have been seeing various abnormalities in plants and animals. - They are familiar with chromosome mutations.
Introduction:	The teacher introduces the lesson by asking the students questions based on their previous knowledge. E.g:

- What are the causes of abnormalities we see in plants, animals and humans?
- How many major groups of mutation do we have?
- Briefly explain how chromosome mutations takes place.

Presentation: The teacher presents the lesson through the following steps:

Step I: i) Teacher defines and explain how gene mutation takes place.

Step II: Teacher write some notes on the board.

- i) As a result of chemical imbalance in an individual gene.
- ii) An alteration in the sequence of nucleotide in the part of DNA molecule to a single gene will change the order of amino acid making up a protein.
- iii) This can have serious consequence on the development of an organism.
- iv) Can prevent proper functioning of the protein.
- v) If this result in death of the organism, the gene is described as lethal genes.

Step III: Types of gene mutation

The teacher explains the various types of gene mutations.

- i) Substitution
- ii) Insertion
- iii) Deletion
- iv) Inversion

Evaluation: Teacher evaluates the lesson by asking the students some questions:

- i) How does gene mutation takes place?
- ii) List the types of gene mutations that we have
- iii) What is the major difference between chromosomal mutation and gene mutation?

Conclusion: The teacher concludes the lesson by going through the main points once more.

APPENDIX G: Raw Score of the two sets of tests for determining the coefficient of reliability of the test instrument. Pre-test and Post Test Reliability using PPMC

N	X	y	x ²	y ²	xy
1	23	22	529	484	506
2	23	24	529	576	552
3	32	32	1024	1024	1024
4	23	23	529	529	529
5	21	21	441	441	441
6	23	23	529	529	529
7	28	25	784	625	700
8	19	21	361	441	399
9	23	23	529	529	529
10	21	21	441	441	441
11	23	23	529	529	529
12	23	24	529	576	552
13	30	28	900	784	840
14	20	22	400	484	440
15	31	34	961	1156	1054
16	26	23	676	529	598
17	32	31	1024	961	992
18	27	30	729	900	810
19	34	33	1156	1089	1122
20	23	25	529	625	575
N = 20	Σx = 505	Σy = 508	Σx² = 13129	Σy² = 13252	Σxy = 13162

Where: x is the first test scores and y is the second test scores for GCPT

$$PPMC = r = \frac{\Sigma(xy) - \frac{1}{N}\Sigma(x)\Sigma(y)}{\sqrt{[\Sigma(x^2) - \frac{1}{N}(\Sigma x)^2] [\Sigma(y^2) - \frac{1}{N}(\Sigma y)^2]}}$$

$$r = \frac{13162 - \frac{1}{20} \times 505 \times 508}{\sqrt{[(13129 - \frac{1}{20} (505)^2)] [(13252 - \frac{1}{20} (508)^2]}}$$

$$r = \frac{335}{362.987}$$

$$r = 0.92$$

APPENDIX H:

Analysis of Variance and Scheffe's Test for Study Sample

The ANOVA Descriptive Mean Table for Sample Schools

School	N	Mean	Std. Deviation	Std. Error
Pretest School A	55	34.001	0.665	0.0024
Pretest School B	61	34.920	0.590	0.0129
Pretest School C	50	20.990	2.410	0.013
Pretest School D	60	20.869	2.651	0.0018

Scheffe Subsets of the Pretest Scores

Mean Comparison		Subset for Alpha = 0.05 Level	
Schools	N	Subset 1	Subset 2
Pretest School D	60	20.869	
Pretest School C	61	20.990	
Pretest School A	55		34.001
Pretest School B	61		34.920

APPENDIX I: Perception of respondents on the level of their Interest after taught Genetic Concepts using Reciprocal Peer - Tutoring Strategy.

S/No	ITEMS	Categories of responses					MEAN
		SA	A	UD	D	SD	
1	Studies are interesting when genetic concept is taught	18	17	7	6	7	3.600
2	I am not focused when genetics concept of Biology is been taught	21	14	6	8	6	3.655
3	I fear to read genetics because it involves cramming	23	23	3	2	4	4.073
4	When I hear the word genetics I have feeling of dislike	27	7	6	8	7	3.709
5	Only brilliant students can understand genetics concept of Biology	30	14	2	5	4	4.109
6	I participate better in the lessons of genetics concepts	20	21	4	5	5	3.836
7	I enjoy discussing genetics concept of Biology with my colleagues	29	17	6	1	2	4.273
8	I do not like genetics concept of Biology because I don't need it for my future career	24	18	4	4	5	3.945
9	The teacher involves me more in class discussions when genetics concept is taught	31	11	6	5	2	4.164
10	To me attending genetic class of Biology is waste of time.	25	13	10	3	4	3.945
11	I can learn many things when my teacher teaches genetics concept of Biology	24	15	8	6	2	3.964
12	To me Genetics concept of Biology is better than any other science subject	33	13	3	2	4	4.255
13	I am able to do my genetics concept of Biology home work	22	13	8	7	5	3.727
14	Genetics concept of Biology to me is easily comprehended and understood when peer-tutoring is used	20	15	5	8	7	3.600

15	I concentrate better in class when genetics concept of Biology is taught	18	21	5	6	5	3.745
16	I feel like lesson on genetics concept of Biology should not end quickly	27	11	6	4	7	3.855
17	I am able to solve problems in genetics without difficulty	24	16	5	4	6	3.873
18	Genetics concept of Biology is connected to my life	21	21	5	5	3	3.945
19	To me knowing too much of genetics can improve my knowledge	23	13	7	5	7	3.727
20	I will like to study genetics as course when I go the university	26	18	3	2	6	4.018
	CUMULATIVE MEAN						3.901

Standard/Decision Mean = 3.000

The above table showed that the level of their interest after taught Genetic Concepts using Reciprocal Peer - Tutoring strategy was very high. This is because the cumulative mean interest level of 3.901 is higher than the standard/decision mean of 3.000.

Specifically, most of them consider genetic concept of biology as better than any other science subjects as this view attracted their highest mean opinion of 4.255 as details showed that while 33 were in strong agreement, 13 were in agreement as against 3 undecided while 2 disagreed and the rest 4 strongly disagree.

In the same vein as a result of the increased interest, they enjoy discussing genetics concepts of biology with their colleagues. Details showed that while a total of 29 were in disagreement, 17 were in agreement as against 6 that were undecided while 1 disagreed and the rest 2 strongly disagreed.

In summary, the level of their interest after taught Genetic Concepts using Reciprocal Peer - Tutoring strategy was very high, especially as majority now consider genetic concept of biology as better than any other science subjects and also enjoy discussing genetics concepts of biology with their colleagues.