EFFECTS OF THINK PAIR SHARE TEACHING STRATEGY ON ACADEMIC ACHIEVEMENT IN BIOLOGY AMONG SECONDARY SCHOOLS STUDENTS IN MINNA METROPOLIS OF NIGER STATE.

BY

JIYA DEBORAH
2014/1/51110BE

DEPARTMENT OF SCIENCE EDUCATION,
SCHOOL OF SCIENCE AND TECHNOLOGY EDUCATION,
FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA, NIGER STATE.

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A RESEARCH PROJECT SUBMITTED TO THE DEPARTMENT OF SCIENCE EDUCATION, SCHOOL OF SCIENCE AND TECHNOLOGY EDUCATION FEDERAL UNIVERSITY OF TECHNOLOGY MINNA, NIGER STATE IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF BACHELOR DEGREE OF FEDERAL UNIVERSITY OF TECHNOLOGY (B.TECH.ED) IN SCIENCE EDUCATION WITH OPTION IN BIOLOGY

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ABSTRACT

The purpose of the study is to investigate the effect of think-pair share teaching strategy on academic achievement in Biology, among Senior Secondary School in Minna, Metropolis of Niger State. In order to obtain the pertinent information required two research questions and two null hypothesis was set to guide the study. The study adopted a quasi-experimental research design approach with two groups, control group and experimental group which are those taught with conventional method and those taught with Think-Pair Share approach. The population of the study consist of 3,387 SSIII Biology students in 2019/2020 academic session. The sample size comprises of ninety five (95) SS III students .The instrument used to generate data for the study was Inheritance Concept Achievement Test (ICAT). The findings on the achievement test score shows that experimental group (think pair share) did better than the control group (conventional method), also male in the experimental group did not give better gap than their female counter part in the same group. Findings of the study revealed there is significant difference in the level of achievement in the performance of students taught biology using think pair share and those taught using conventional method therefore, null hypothesis was rejected. The findings of the study also revealed that there is no significant difference in the male and female gain scores in the performance of students taught Biology with exposure to think pair share, hence the null hypothesis two was accepted. The researcher there by recommended that the secondary school management should incorporate the teaching and learning Biology with aid of think pair share, ministry of education should also set the school curriculum to permit use think pair share to student and government should also fund think pair share for secondary school student to enhance their learning of science subject especially Biology.

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CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

The outcry of several science educators and the general public concerning the persistent low achievement of students in the sciences cannot be overemphasized. This under achievement becomes eminent when one considers the performance of students in public examinations. Over the years, various reports have brought to lime light the fluctuating under achievement of students in Biology in the West African Examination Council (WAEC) examinations conducted in Nigeria. This poor trend is particularly evident in the performance of biology students who over the years

(2010-2015), have never recorded an average of 50% credit pass in the examination. Available Information from the WAEC (2011) further reveal that biology has the highest students enrolment relative to other science subjects, it however records a very poor performance in senior school certificate examinations (Okoli, 2006).

The persistent under achievement in biology therefore needs to be addressed urgently by employing appropriate techniques in teaching among several other strategies. Determining the effect of think pair share on achievement in inheritance factors in Biology? And could be a step to address this issue of underachievement. The teaching styles used in delivering biology lessons should be selected carefully to enhance better achievement and stimulate the interest of the students. The selection of an appropriate teaching style or approach is important to the success of the teaching process (Howard, 2009). Howard further maintained that, to be successful, teachers must learn how to use a variety of teaching strategies by employing appropriate teaching styles that also suit the students learning styles. This is in agreement with Danmole and Femi-Adeoye (2004)

where they opined that no single method is best for the teaching of biology. The authors agreed that, teaching styles that would permit students' active participation such as field work, laboratory work (practical activities), group work, concept mapping and inquiry methods should always be used. These methods are most likely to ensure higher performance and promote students' interest in biology.

Dupin-Bryant (2004) defined teaching style as "instructional format". In teacher training, teachers may be exposed to more formal learning designs, pedagogical scenarios, lesson planning methodology etc. Teachers then have personality and beliefs are exposit to pre-service and in-service training. The combination of these (training, personality and beliefs) with experience (i.e. concrete exposure to classroom context and policies) will then lead to a given teaching style. A teacher's teaching style is based on their educational philosophy, their classrooms demographic, what subject area they teach and the school's mission statement. According to Grasha (2002)

teaching styles define, guide and direct instructional practices that impact students and their ability to learn.

Broadly, teaching style are categorized into teacher centered and students centered. The main focus behind the teacher-centered style is the idea that the teacher is the main authority figure. The students are simply there to learn through lectures and direct instruction, and the focus is mainly on passing tests and assessments. A teachers' role in this style is to pass on the knowledge and information needed to their students. Amad and Aziz (2009) posit that, teacher centered teaching is the traditional teaching method where teachers are at the center of class activities. In traditional or teacher centered classrooms, students have definite and fixed perceptions and ideas of their own roles and those of their

teachers. Based on these characteristics some teacher centered teaching styles include: direct instruction, formal authority, expert and personal model.

In think, pair, share teaching style, the teacher is still the authority figure, but the student plays an active role in what is learned. The idea is that the teacher will advise and guide the students down a learning path. Assessment involves informal and formal methods tests, group projects, portfolios, and class participation. The teacher continues to assess a student's learning even throughout the lesson. The students are learning the information the teacher is giving, and the teacher is learning how best to approach his students. Eken (2000) stated that in student centered classrooms, the teacher serves as a facilitator and students are seen as being able to assume active roles and participate throughout the lesson. These activities stated are most likely to promote students' interest in the task especially when the activities are specially fashioned to suit the interest of the students. Teachers facilitate student's discussion and activities and interject only when and where necessary. This gives the students a guided learning environment and helps students to discover facts by themselves (Eken, 2000). When students are allowed to lead discussions and activities, their achievement level is facilitated and their interest towards the subject and task is promoted

(Ahmad & Aziz, 2009).

Think, pair, share teaching styles includes facilitator, delegator, and collaborator, cooperative and personal teaching style. Ngonga (2002) observed that secondary school students continue to perform poorly due to poor teaching styles as majority of teachers are still over-dependent on teacher-centered styles. To Young and Collin (2003) traditional or conventional teaching style has failed to bring about the desired outcome of producing sound and creative students. Howard (2009) asserted that, students who are

taught creatively, analytically and practically perform better than students who are taught merely orally or by just telling. Quinonex (2014) confirms that a teacher's teaching style is based on his/her educational philosophy, the school's mission and vision statements. Understanding the diverse contexts of how teachers teach and the corresponding ways in which students learn has penetrated the field of education for some time, yet further studies that would likely unveil some salient facts are encouraged (Pollucks, 2009).

Rennie, Dieking and Falk (2013) were emphatic that, students' active participation in the learning process will enhance achievement since participation encourages and provides students with the opportunities to utilize the knowledge of science in different situations and not just at examination. Sarvey and Duffy (2003) as cited in Odoh (2013) posit that, a science teacher needs to teach students how to learn and not just to give the students what to be learnt. The advent of the paradigm shift from teacher to learner centeredness as examined by Igboko and Ibeneme

(2006) was targeted at enhancing students' achievement. Similarly, other approaches such as cooperative instructional strategy, problem-based learning and creating knowledge inquiry strategy were teaching methods and styles meant to engage student participation in the learning process and to arouse their interest in science. Many students who develop dislike for particular subjects have their reasons for doing so (Achor & Orji, 2009). They continued that, it could be that they were put off after a lesson, a week, a month or even the entire subject. Some of these students if not all eventually drop the subject along the way. This is to say that, teachers need to adopt teaching styles and techniques that will attract and not repel the students. The teacher student rapport in the class, use of words, the manner of presentation of the lesson and above all, the display of the knowledge of subject matter could have influence to make the student like or dislike the subject. Achor and Orji (2009) reported that interest as used in psychological and educational

measurement is a motivational construct. It therefore follows that interest in an event is aroused as a result of effort to satisfy a felt need. The individuals need arouses interest and motivates one to take action or to participate in activities that would lead to the satisfaction of that need. Substantiating this view, Njoku (2002) adds that interest is congruent with motivation and both constructs are action based or oriented and directly or indirectly are connected to teaching styles. Schneider (2004), Damole and Adeoye (2004) were of the common opinion that, teaching strategies, methods and tactics that would permit students active participation in the class be encouraged. When appropriately applied in classroom situations, Galton (2009) was optimistic that teaching styles can improve slow learners' level of achievement and promote their interest in the task at hand. Lassa (2005) noted that, teachers are the main determinant of the quality of education in Nigeria. The provision of this qualitative education cannot be achieved without the application of appropriate teaching styles. Adejoh narrated further that, when the appropriate methodology is applied, the teachers will be able to stimulate and sustain the interest of pupils and students throughout the lesson.

Howard (2009) maintained that matching the teachers' teaching styles with the learning styles of the students suggests that educators and science teachers in particular needs to become aware of how students learn. With this, they may be able to create an environment that is conducive for optimal learning. Todays' teaching style needs to be different from approaches that have been traditionally used. It is time for the schools to start focusing on the innate abilities that children possess rather than on the traditional education formula that is not totally consistent with the developmental learning or cognition (Creswell, 2009). Pintrich and Marx (2011) suggested that, a teacher's teaching style therefore should be such that would harmonize both the external and internal environment of the students to bring out their best sequel to their interest.

Interest in science is very important as it motivates students to learn (Bae, 2007). It is however worrisome that, recent studies show a decline in interest of students especially in science as the children grows (Bae 2007).

Bae (2007) pointed out clearly that, it is boring for a student to study science topics and difficult to appreciate its value without interest. These perceived problems and lack of interest on the part of the student is caused by in-appropriate use of teaching styles by the science teachers (Igboko & Ibeneme, 2006). Also, Adejoh and Idachaba (2010) stressed that biology teachers need to replace conventional methods of teaching with teaching approaches that are both student and interest centered. Igboko and Ibeneme (2006) opined that, teachers of science and technology should move with time and follow the paradigm shift in educational psychology from teacher to learner centeredness. It is therefore reasonable for teachers to initiate all the basics that students need to achieve using appropriate teaching styles to enhance their achievement and arouse their interest in biology.

Think-pair-share is a cooperative learning strategy that includes three components namely, time for thinking, time for sharing with a partner, and time to share among pairs to a larger group. The use of the strategy unites the cognitive and social aspects of learning, promoting the development of thinking and the construction of knowledge. Think-pair share strategy has many advantages over the traditional questioning structure. The "think time" incorporates the important concept of "wait time." It allows all students to develop answers, longer and more elaborate answers can be given, and answers will have reasons and justifications because they have been thought about and discussed. Students are more willing to take risks and suggest ideas because they have already "tested" them with their partner. Strategic steps of (Think – Pair – Share) posed some of

the questions to the class about what has been explained about the activity or an issue or a task and then ask the students to think for a minute about this question alone with the prevention of talk or walk around in the classroom at the time of thinking, then the teacher asks students to split up into pairs to discuss and think together about a question or posed activity for a period of five minutes, finally the teacher is required to participate by displaying what has been reached of solutions and ideas about the question or activity and it is characterized by giving the students an opportunity to reflect (with himself internally and externally with colleagues) and thinking and revision before answering (Zaitun, 2007).

1.2 Statement of the Problem

There is a clear signal that, in spite of the campaigns against poor performances and under achievement the trend still continues. Teachers need to adopt innovative teaching approaches to enhance student's achievement and reduce to the bearest, failure in external examination in secondary schools. The persistent failure of students in science oriented subjects at external examination bodies such as WAEC and NECO is a threat to the attainment of the educational goals and science education in particular. This failure is a signal of a process problem at the secondary school level. Over the years Samba and Eriba (2012) have revealed the poor performance of students in science subjects in general and biology in particular. In fact, students' over dependence on examination malpractice as an option for success at examinations is worrisome. Besides the West African Examination Council (WAEC), other examination bodies such as NECO, NABTEB among others are always in the campaign with the government against examination malpractice. Yet, this ugly trend still persists in schools. In the field of science and science teaching in particular, it is true that many research have been carried out on teaching styles

and students' achievement, yet not much has been achieved. The limited academic achievement of students in science in spite of innovative teaching strategies has no doubt been a problem.

Programmes to improve students' achievement in science often have mixed results hence this study intends to further investigate. The effect of think pair share on achievement in inheritance factors in Biology?

1.3 Aims and Objectives of the Study

The purpose of this study is to investigate the effect of Think-Pair Share on academic achievement in inheritance factors in Biology among secondary school students in Minna Metropolis of Niger State - as follows;

i. To determine the effect of Think- Pair share on academic achievement in biology.
ii. To determine whether there will be a difference in academic achievement of male and female students taught using the Think-Pair share approach.

1.4 Research questions

The following research questions have been raised to guide the study.

i. Will there be any difference in the Mean ($\overline{x}$) achievement scores of students taught inheritance factors in biology using the Think-Pair Share approach and those taught without?
ii. What are the Mean ($\overline{x}$) achievement scores of male and female students taught inheritance factors in Biology using the Think-Pair Share approach?

1.5 Hypotheses

The following hypotheses were formulated and tested at 0. 05 significance level.

i. HO_1: There is no significant difference in the mean achievement scores of students taught inheritance factor in Biology using Think-Pair Share approach and those taught without.

ii. HO_2: There is no significant difference between the achievement scores of male and female students taught inheritance factor in Biology using Think -Pair Share approach.

1.6 Significance of Study

The significance of (Think – Pair – Share) strategy helps the students in process information, develop communication skills and refine their thinking, it can be applied in any number of students, it is also characterized by undemanding, can give students time to think alone, give him a chance to think out loud with one of his colleagues, increase the sense of participation in the learning process, and include the participation of the largest number of students in the classroom to develop the academic achievement and accept colleagues. This strategy works to overcome some of the problems: The acquisition of a limited number of students to participate and short time for students to think.

1.7 Scope of Study.

This study determines the effect of Think-Pair Share teaching strategy on student academic achievement in Biology in Minna Metropolis of Niger state. An in-depth research of all the secondary schools in the state cannot be conducted due to constraints of time and material resources; instead it was confined to SS3 Biology students in two (2) public schools in Minna Metropolis, where Biology students responded to the test instrument. The topic taught was inheritance factor (Hereditary factor) which lasted for four weeks of classroom teaching experiment.

1.8 Operational Definition of Terms

Demographic: Demography (from prefix *demo-* from Ancient greek δῆμος *dēmos* meaning "the people", and *-graphy* from γράφω *graphō*, implies "writing, description or measurement"[1]) is the statistical study of populations, especially human beingsThink-Pair Share:,

Instructional format: An instruction format defines the layout of the bits of an instruction, in terms of its constituent's part

Think-pair-share (TPS): is a collaborative learning strategy where students work together to solve a problem or answer a question about an assigned reading. This strategy requires students to (1) think individually about a topic or answer to a question; and (2) share ideas with classmates. Discussing with a partner maximizes participation focuses attention and engages students in comprehending the reading material.

CHAPTER TWO

2.0 REVIEW OF RELATED LITERATURE

Related literature was reviewed under the following sub-headings:

2.1 Conceptual Framework

2.1.1 Concept of cooperative learning

2.1.2 Concept of Instructional Strategies

2.1.3 Think Pair Share (TPS) Instructional Strategy

2.1.4 Senior Secondary School Biology curriculum

2.1.5 Concept of achievement

2.1.6 Concept of gender

2.2 Theoretical Framework

2.2.1 Cognitive learning theory (Jean Piaget, 1973)

2.2.2 Social learning theory (Lee Semyonovich Vygotsky, 1962)

2.3 Review of Empirical Studies

2.4 Summary of literature review

2.1 Conceptual Framework

2.1.1 Concept of Cooperative Learning

Cooperative learning has American roots. It originated from the philosophical work of John Dewey emphasizing the social nature of learning and the work of Kurt Lewin advocating group dynamics (Panitz, 2011). The underlying premise of cooperative learning is based on constructivist theory, where students construct, discover, transform, apply and reconstruct their knowledge and experience. It involves two parties (teacher and students) working together to accomplish a common goal. It is a student-centered

strategy, that adopts active class, where teaching and learning involve shared experiences that trigger and ginger students' ability, reflecting their thought processes through sharing ideas in small groups (National University of Singapore (NUS), (2008).

Cooperative learning employs syndicate groups, to develop interdependence, accountability and participatory spirit in the students, while the teacher acts as a facilitator, a coach or a guide. The syndicate or team members are not only rewarded based on the success of the entire group but are also individually accountable for their own work. The task is structured in a way that requires the participation of every student in the syndicate. The teacher maintains control of the social interaction structures, designs teaching and learning activities, structures the groups' tasks, and does not empower the study groups (Li & Lam, 2013).

In cooperative learning, students work together as a team, not only to jointly complete a task but also help each other to succeed. This encourages the learning of several life skills by students (Kelly, 2015). It applies study teams, to develop tolerance for diversity, higher-order thinking and interpersonal skills in students. VanWyk (2011) wrote that cooperative learning as an instructional strategy provides opportunities for students to build skills in group interactions. Students also learn how to socialize, solve problems together and handle conflict. Assessment in cooperative learning instructional strategies is done by both teacher and students, while evaluation remains the exclusive responsibility of the teacher.

Types of Cooperative Learning

Types of cooperative learning include among others: Folded Value Line (FVL), Teams-Games Tournament (TGT), Jigsaw, Learning Together, Group investigation, Peer-Assisted Learning Strategies (PALS),

Folded Value Line (FVL) cooperative learning

Folded Value Line is a cooperative learning strategy which verifies learners' opinions in a quick, visual and practical way by asking them to line up on the basis of how they strongly agree or strongly disagree with a statement, proposition, topic or question (Mills, n.d.). Teachers show the students a five point Likert Scale (SA -1, A -2, U -3, D -4, SD - 5), they then ask learners to choose the number that best shows their position on the question. The learners should be told to write down their number before the next step. The learners that have choosen strongly agree -1 will stand at a designated location along the wall of the class, the learners who have choosen agree -2 follow them, and so on, until all learners are lined up. After the learners have formed a continuous line according to their opinions, they then ignore the initial number they chose as the basis for their location in the line and number themselves afresh sequentially. The team or group may be formed in two ways: the first is that teachers will divide the line into two, and start selecting the groups of four learners by taking one learner from each extreme of the line, and two learners from the midpoint, making the first group of four learners. For example, in a class of forty learners, teachers would pick numbers 1, 40 (extreme/ ends of the line), 15 and 14 (mid - point). For the next group/ team, teachers would pick numbers 2, 39, 13 and 16. Teachers proceed to form the groups/ teams with this process until all learners have been assigned to a team and have found their designated location in the class. The second way is that instead of selecting four learners from the ends and mid – point to form a quad, they break the line at the mid - point and the two lines formed face each other.

Teams-Games-Tournament (TGT) cooperative learning

Teams-Games-Tournament (TGT) was developed by David De Vries and Keith Edwards at the Johns Hopkins University as a cooperative learning method (DeVries, Mescon &

Shackman, 1975). TGT uses the same teacher's presentations and team work as in Student Teams Achievement Divisions (STAD), but replaces the quizzes with tournaments, in which students play academic games at tournament tables with members of other study groups with similar past academic records. It consists of four steps, namely: 1. Teacher's presentation 2. Group discussion

3. Tournament 4. Group recognition (Li & Lam, 2013; Slavin, 2010).

i. Teacher's Presentation

The presentation of the subject-matter is systematically done by the teacher with the aid of teaching and learning materials coupled with questioning technique. The materials are presented to the students at the end of the lesson.

ii. Group Discussion

Teachers divide students into heterogeneous teams based on their academic performance level, sex, socio-economic status, ethnicity, religion and other differences, to study the learning materials and do the assigned tasks. The members of the study groups make their contributions to their various teams, bearing in mind that they are accountable for their individual performance and group performance.

iii. Tournament

At this stage, two tournament groups exist within one study group, while students with equal academic ability are made to compete with one another across the tournament groups, inform of inter-competition. The arrangement here implies that each study group is made up of two tournament groups. While the first tournament group consists of students with low academic performance, the second tournament group consists of students with high academic performance, Low academic achievers and high academic

achievers respectively. Members are awarded based on their performance in the competition. The aggregate scores of members (both low achievers and high achievers) equal the scores of their tournament groups. The cumulative average of the two tournament groups will form the aggregate score of their study group.

iv. Group recognition

Scores are awarded based on the individual and group performance. The individual scores reveal the contribution of each member to his or her group. The students with low scores show they have not made an effective contribution to their study groups and have also not performed very well in their tournament groups while those with high scores show they have made an effective contribution to their study groups and have also performed very well in their tournament groups.

The study groups with the highest aggregate score is given certificate of recognition.

Jigsaw I and II Cooperative Learning

According Slavin (2011) Jigsaw is divided into six stages, namely:

1. Presentation of learning materials
2. Jigsaw groups or home groups
3. Experts groups
4. Home group reporting
5. Testing
6. Group recognition

The teacher divides the class into jigsaw groups, also called home groups. Learning materials and tasks are shared among the home groups. Each member of the jigsaw group is assigned to study one part of the materials. Thereafter, members in different jigsaw groups that have same learning tasks leave their home groups and come together to form

another group which is called expert group. Members of expert groups work together, discuss together and brainstorm to become experts/ specialists in that particular learning tasks (Slavin, 2008; Li & Lam, 2013). Thereafter, they again return to their home groups or jigsaw groups to share their expertise with the members of home groups. Finally, the students are tested in their home groups, and are awarded scores and recognition based on their individual performance, while jigsaw groups are scored based on the cumulative average scores of members, and the best group is awarded certificate of recognition. The different between Jigsaw I and Jigsaw II is that in the former, learning tasks or learning material is divided into different sections while in the latter, students work on the same learning task, the same subject matter, the same concept, the same content or the same book chapter.

However, each student also receives an aspect of the task on which to become an expert (Slavin,

2010).

2.1.2 Concept of Instructional Strategies

The purpose of every teaching and learning activities is the achievement of certain desirable goals in the students. The efficacious tool at the disposal of every Economics teacher for the attainment and accomplishment of instructional objectives is effective innovative methodology. Thus, in absence of robust and grounded knowledge of a good number of instructional strategies, teaching would become a trial and error task, the outcome of which cannot be predicted (Uwalaka, 2013). However, there is no single best strategy for teaching Economics. The focus of every economics teacher should be to develop in the students various socio-economic skills, critical thinking and ability to take rational decisions in solving daily life problems. To achieve the above objectives, it is for every Economics teacher to identify which strategy would be suitable for teaching a

particular topic. Since the ingredients of teaching and learning situation are seen as motivation towards achieving the behavioural objectives (Adedoyin & Adegbija, 2006). The concept of instructional strategies is geared towards achieving instructional goals. The only way this realization and notion can become real is for teaching to be carried out effectively by the teacher. Akubue (2008) asserted that effective teaching demands the application of innovative instructional strategies in the classroom. The reason for adopting these innovative instructional strategies is not just because they are novel, but that the contemporary social issues have required the nurturing of students who can think intuitively, critically, logically, prudently, and imaginatively, while creatively constructing their own knowledge and experiences, and skilfully disseminating their views and ideas. In view of the above assertion, the achievement of effective teaching demands that an innovative teacher makes use of instructional strategy that is relevant to the concept being taught.

Types of Instructional Strategies

Several literature have identified the following types of instructional strategies, namely individualistic, competitive, cooperative and collaborative instructional strategies (Van Wyk, 2011; Malek, Hall & Hodges, n.d.; Panitz, n.d.; Panitz, 2011).

i. **Individualistic instructional strategies:** An individual method of teaching is where students are given individual tasks to perform and are individually rewarded.

ii. **Competitive instructional strategies:** A competitive method of teaching is where students succeed at the expense of others.

iii. **Cooperative instructional strategies:** A cooperative method of teaching is where small groups of students work together to perform a task and receive rewards both on individual performance and on their groups' performance.

iv. **Collaborative instructional strategies:** In collaborative learning, students do not receive much instructions from their teacher and the teacher transfers all authority to the groups once the task or problem is given out. However, the groups still meet the teacher for consultation, conflict resolution and progress report.

2.1.3 Think Pair Share (TPS) Cooperative Learning Instructional Strategy

Think Pair Share was developed by Frank Lyman of the University of Maryland in 1981 (Lyman, 1981). Success for all Foundation (2008) affirmed that Think Pair Share is a questioning technique that is used to keep all the students actively involved in class discussions and provides an opportunity for everyone to share an idea and answer to every question posed by the teacher. Think Pair Share is a cooperative learning strategy that aims at promoting reading comprehension skills (Carss, 2007); (Bromley & Modlo, 1997). Allen (2014) ascertained that the Think-Pair-Share strategy is designed to differentiate instruction by providing students time and structure for thinking on a given topic, question or problem, helping them to construct individual ideas and share these ideas with at least one other student. The operational definition of Think-Pair-Share is thus a co-operative teaching strategy that includes four components: time for teacher to pose a question, time for students to think, time for sharing in pairs and time for each pair to share back to the whole class.

Procedure for using Think Pair Share (TPS) in Classroom Setting

In using TPS, Teacher Vision (2008) affirmed that teacher should give clear guidelines to every student and ensures that roles are clearly defined before the activity begins. First,

teachers ask the class a question about a concept, issue or a problem. Then the Think Pair Share strategy follows three procedures:

i. Time for thinking: After the teacher asks the class a question, the teacher pauses for about one minute (depending on the complexity or technicality of the question) to allow students to think about their answers individually and independently.

ii. Time for sharing with a partner: Students are divided into pairs. Then students share their ideas about the answer with their partner for about four minutes.

iii. Time for each pair to share back to the whole class: The teacher gathers the students back together as a class. Then one person may be randomly selected from each pair to share the pair's answer with the class or few students may be randomly selected if the class size is large. Another way is to have all pairs stand, and after each representative shares with the whole class, the representative would sit down alongside any student with similar ideas and answers. This continues until everyone is seated.

Of course, some of the representatives may get the answer, some may not get it correctly; some may not be able to adequately and competently present what they have already discussed with their pairs, while some pairs will only come out with a tentative answer. This is why in cooperative learning, the teacher is called a coach or a facilitator, to harmonize the various answers given by the representatives. The teachers will not say a particular answer is right or wrong but they would use their wealth of knowledge and skills, creativity, initiative and resourcefulness to sieve out the chaff from the wheat. Think Pair Share (TPS) is suitable for assessment for learning in Economics classroom.

Advantages of Think Pair Share (TPS)

It can be used to teach every concept in Economics and other Social Science subjects. Its advantages include the followings:

i. Research works have shown that students' learning is enhanced when they have many opportunities to elaborate on ideas through talk (Teacher Vision, 2014). While interacting and sharing ideas, students take ownership of their learning and negotiate meanings rather than relying fully on their teachers. Consequently, the learning and knowledge acquired become part of them for easy application to real life. And the Chinese Proverb is fulfilled that says "Learning is a treasure that will follow its owner everywhere".

ii. Think Pair Share lends itself to developing attention skills, reading skills, metacognition skills, articulation skills, problem solving skills, interpersonal skills, communication/conversational skills and listening skills. It unites the cognitive and social aspects of learning, promoting the development of thinking and the construction of knowledge (Carss, 2007).

iii. Cross fertilization of ideas amongst students: When a question is posed by a teacher, students think and rethink their answer, share it with their partners, fine-tune their thinking, elaborate on their answers and think of new ideas. That is, students construct their own ideas and brainstorm before sharing their answers with the whole class.

iv. Flexibility of application: It can be used at the commencement of the lesson, at the middle of the lesson, at the end of the lesson or as the lesson progresses.

v. Success for all Foundation (2008) attested that Think Pair Share takes fear out of class discussion by allowing students to think carefully about their answers and talk about them with a partner before they are randomly called on to present to the

whole class. It offers a lot of help for shy students who are introverts, who do not volunteer to answer questions in the class (Carss, 2007); (Bromley & Modlo, 1997).

vi. Think-Pair-Share helps students develop conceptual understanding of a problem, topic, concept or an issue, develop in the students the ability and skill to filter information and draw conclusions, and also develop the ability to consider other points of view (Allen, 2014).

Disadvantages of Think Pair Share (TPS)

i. Classroom management becomes difficult and complex.

ii. If the teacher is not good in classroom management, the whole process will be noisy.

iii. There is nothing in Think Pair Share to make sharing/ verbalization time equal within the pairs or during the class sharing time, unlike Timed Pair Share that is designed to equalize discussion time. In the application of Think Pair Share some students always doing most or even all of the talking, while other students doing little or nothing (Kagan, 1999).

iv. Weaker or low-level students may be at disadvantaged, while the clever partner would dominate the discussion.

v. Various activities that are involved in its application make it to be time consuming.

vi. Distinction is not created between the posing of, thinking on and sharing of ideas and answers on simple and complex questions.

vii. It cannot be applied in basic schools like kindergarten and primary schools.

2.1.4 Senior Secondary School Biology Curriculum

Biology is one of the elective subjects in the Key Learning Area (KLA) of Science Education. The Biology Curriculum serves as a continuation of the Science (SS1-3) Curriculum and builds on the strength of current Biology curricula. It will provide a range of balanced learning experiences through which students develop the necessary scientific knowledge and understanding, skills and processes, values and attitudes embedded in the 'Life and Living' strand and other strands of science education for personal development and for contributing towards a scientific and technological world. The curriculum will

prepare students for entering tertiary courses, vocation-related courses or the workforce in various fields of life science.

The emergence of a highly competitive and integrated economy, rapid scientific and technological innovation, and a growing knowledge base will continue to have a profound impact on our lives. In order to meet these challenges, the Biology Curriculum, like other science electives, will provide a platform for developing scientific literacy and building up essential scientific knowledge and skills for life-long learning in science and technology. Through the learning of biology, students will acquire relevant procedural and conceptual knowledge to help them to understand many of today's contemporary issues, and they will become aware of the interconnections between science, technology and society. In addition, students will develop a respect for the living world, an attitude of responsible citizenship and a commitment to promote personal and community health. Biology is a rapidly advancing science with huge amounts of information about living organisms. It is always confused as a subject of memorizing numerous unrelated facts. In this curriculum, it is hoped that students will acquire a limited body of facts and at the same time develop a broad, general understanding of biology principles and concepts. In order to make the study of biology exciting and relevant, it is suggested to introduce the learning of biology in real life contexts. The adoption of diverse learning and teaching strategies, and assessment practices is intended to stimulate interest and create motivation for learning among students with a range of abilities and aspirations.

Curriculum Aim

The overarching aim of the Biology Curriculum is to provide biology-related learning experiences for students to develop scientific literacy, so that they can participate actively

in our rapidly changing knowledge-based society, prepare for further studies or careers in the fields related to life science, and become life-long learners in science and technology. The broad aims of the curriculum are to enable students to:

i. Develop and maintain an interest in biology, a sense of wonder and curiosity towards the living world, and a respect for all living things and the environment.
ii. Construct and apply knowledge of biology, understand the nature of science in biology related contexts, and appreciate the relationship between biological science and other disciplines.
iii. Develop the abilities to make scientific inquiries; think scientifically, critically and creatively; and solve problems individually and collaboratively in biology-related contexts.
iv. Understand the language of science and communicate ideas and views on biology-related issues.
v. Be aware of the social, ethical, economic, environmental and technological implications of biology, and be able to make informed decisions and judgements on biology-related issues; and
vi. Develop an attitude of responsible citizenship, and a commitment to promote personal and community health.

2.1.5 Concept of Achievement

Anekwe (2006) described achievement as something which has been accomplished successfully by means of exertion, skills, practice and perseverance. Uwalaka (2013) conceptualized achievement as something very good but difficult, which is carried out successfully. Achievement is the ability to function efficiently, respond quickly or

perfectly to a given task. Thus to achieve is to accomplish a task successfully with a skill. Achievement describes the level of success in relation to a task that is carried out. Academic achievement is an output of an instructional process.

It measures the extent to which students have attained their educational stated objectives (Igbo, Okafor, & Eze, 2014).

The results of achievement test provide information on the extent to which a student has attained the criterion performance. It also enables the tester to compare a student's performance with respect to other students' performance, which is norm reference achievement (Uwalaka, 2013). Okoro (2011) opined that achievement could be enhanced when students have a chance to interact and partner with one another on a given task. Operationally defined, achievement is any task which is of significance and value to a particular program, but averagely difficult, which is undertaken successfully through knowledge, skills and experiences.

Ajayi, Lawani, and Adeyanju (2011) identified two classifications for predictors of achievement, namely: the cognitive domain and non-cognitive domain. While the cognitive domain include aptitude, intelligence, memory perception and reasoning, the non-cognitive domain include socioeconomic status, students' attitude, personality determinants, peer group influence, gender influence, students' environment or location, students' interest, self-concept, anxiety amongst others. Malek et al. (n.d.) wrote that various students learn Economics in various ways. This therefore suggests that Economics educators should utilize various alternative teaching methods in teaching and learning of Economics, so as to maximize students' achievement rate. However, these alternative teaching methods such as cooperative learning instructional strategies, class discussion, simulations, group activities, future wheel, concept mapping, and teaching

through multimedia sources are not being used by Economics teachers. Nevertheless, research works and recent contemporary phenomena changes in the society have made Economics scholars to deemphasized chalk and talk teaching method (Hall, Lawson, Mateer, & Rice, 2008; Hall & Lawson,

2008; Lawson, Hall, & Mateer, 2008; Mixon, 2010; Mateer & Stephenson, 2011; Hall, 2012; Crisp & Mixon, 2012).

McKeachie & Svinicki (2014) wrote on the following types of students that teachers may see in their classroom: the attention-seeking student, discussion-dominating student; the inattentive student; the unprepared student and the uncivil and disrespectful student. They opined that these categories of students could be managed by drawing them into participation, interaction, discussion and group activities, which are the characteristic features of these alternative teaching methods. New Zealand Ministry of Education (2012) in addition pointed out that there is no silver bullet approach to pedagogy that works in every learning situation as teaching methods work differently in different contexts for different learners. Economics teachers should therefore adopt a range of methods to support student learning, and achievement.

2.1.6 Concept of Gender

Gender is one of the factors that influences and affects learning. This study also aims at finding a lively and effective learning strategy that could help to eliminate gender bias in classroom interaction. Gender is a social concept that is set to differentiate between the two sexes, male and female; with respect to their roles (Eze, 2008). Idyorough (2005) defined gender as a social differentiation and cultural uniqueness between males and females, and the attribution of certain roles on the basis of that differentiation. Nnamani and Audi (2005) pointed out that gender refers to the numerous socially and culturally

constructed characteristics, values, behaviours, and roles which different societies ascribe to males and females. These constructed characteristics are not inbuilt but learned. Gender and sex are not synonymous to one another and cannot be used interchangeably. Sex is an inborn physiological condition that makes individuals to be either males or females, while gender is a learned, socially and culturally constructed characteristics assigned to males and females (Uwalaka, 2013). Operationally defined, gender is a social variation, social exclusivity and cultural uniqueness between males and females, and the assignment of certain responsibilities on the basis of that uniqueness.

Gender is a broad and general analytical concept which distinguishes women's roles in relation to those of men in every society. It is a variable that plays a sensitive and an important role in the learning process. Ezeudu and Obi (2013) pointed out that gender is a major determinant factor which influences career choice and subject interest of students. Uwalaka (2013) asserted that gender is a range of characteristics which differentiate male and female especially in the case of men and women, and the masculine and feminine qualities ascribed to them. While Egbukwu (2013) asserted that sex is a biological uniqueness in appearance that is, morphology and function, that is physiology, as well as reproductive contribution of men and women. Operationally sex is defined as the biological characteristics which manifest in body structure and its functioning, which is morphology and physiology respectively, including the reproductive functioning of men and women. This implies that sex connotes biological functioning and responsibilities of male and female while gender connotes social and cultural functioning and responsibilities of male and female.

2.2 Theoretical Framework

The theories related to the rationale of this study are: Jean Piaget's (1973) constructive cognitive learning theory and Lee Semyonovich Vygotsky's (1962) constructivist social learning theory. .

2.2.1 Jean Piaget's (1973) cognitive learning theory

Piaget (1973) was a genetic epistemologist constructivist. Piaget observed and studied his own three children through each stage of their cognitive development.

There are three elements to Piaget's theory:

1. Schema
2. The four processes that enable the transition from one stage to another
3. The four stages of cognitive development

1. Schema

A schema is the basic building block of intelligent behaviour, a way of organizing knowledge that children use to interpret the things they see, hear, smell, or touch. A schema can be thought of as a unit of knowledge, relating to one aspect of the world including objects, actions, and abstract (theoretical) concepts. A schema can be defined as a set of linked mental representations of the world, which we use both to understand and to respond to situations. The assumption is that we store these mental representations and apply them when needed. It is a structured cluster of concepts, it can be used to represent objects, scenarios or sequences of events or relations. A schema (pl. schemata) is the mental framework that is created as children interact with their physical and social environments. For example, many 3-year-olds insist that the sun is alive because it comes up in the morning and goes down at night. Children are born with a very basic mental structure (genetically inherited and evolved) on which all subsequent learning and

knowledge is based. These children are operating based on a simple cognitive schema that things that move are alive. At any age, children rely on their current cognitive structures to understand the world around them. Moreover, younger and older children may often interpret and respond to the same objects and events in very different ways because cognitive structures take different forms at different ages.

Schemata are:

i. Critically important building block of conceptual development
ii. Constantly in the process of being modified or changed
iii. Modified by on-going experiences
iv. A generalized idea, usually based on experience or prior knowledge.

2. The Four Processes that Enable the Transition from One Stage to Another

The four processes that enable the transition from one cognitive stage to another are assimilation; accommodation, disequilibrium, and equilibration. Together, assimilation and accommodation are processes of adjustment to changes in the environment and are defined as adaptation, the continuous process of using the environment to learn. Assimilation and accommodation are the two sides of adaptation, Piaget's term for what most of us would call learning. Assimilation is when a child responds to a new event in a way that is consistent with an existing schema. Accommodation is when a child either modifies an existing schema or forms an entirely new schema to deal with a new object or event. For example, a child develops a schema for a dog by assimilating information about the dog. The child then sees a cat; using accommodation compares existing knowledge of a dog to form a schema of a cat. Piaget believed that all children try to strike a balance between assimilation and accommodation, which is achieved through a mechanism Piaget called equilibration. As children progress through the stages of

cognitive development, it is important to maintain a balance between applying previous knowledge (assimilation) and changing behavior to account for new knowledge (accommodation). Equilibration helps explain how children are able to move from one stage of thought into the next. When a child's existing schemas are capable of explaining what it can perceive around it, it is said to be in a state of equilibrium, i.e. a state of cognitive (i.e. mental) balance. However, an unpleasant state of disequilibrium occurs when new information cannot be fitted into existing schemas (assimilation). Equilibration is the force which drives the learning process as we do not like to be frustrated and will seek to restore balance by mastering the new challenge (accommodation).

3. The four stages of cognitive development

I. sensory-motor (birth to two years)

II. preoperational (two to seven years)

III. concrete operations (seven to eleven years)

IV. formal operations (eleven to sixteen years)

I. Sensory-Motor Stage: Birth through two years (Infancy)

The Sensory-Motor Stage extends from birth until approximately the age of two. During this stage, senses, reflexes, and motor abilities develop rapidly. Intelligence is first displayed when reflex movements become more refined, such as when an infant will reach for a preferred toy, and will suck on a nipple and not a pacifier/dummy when hungry. Understanding of the world involves only perceptions and objects with which the infant has directly experienced. Actions discovered first by accident are repeated and applied to new situations to obtain the same results. Toward the end of the sensory-motor stage, the ability to form primitive mental images develops as the infant acquires object

permanence. Until then, an infant doesn't realize that objects can exist apart from him or herself.

II. Preoperational Stage: Two through seven years (Pre-school)

The child in the preoperational stage is not yet able to think logically. With the acquisition of language, the child is able to represent the world through mental images and symbols, but in this stage, these symbols depend on his own perception and his intuition. The preoperational child is completely egocentric. Although he is beginning to take greater interest in objects and people around him, he sees them from only one point of view: his own. This stage may be the age of curiosity; preschoolers are always questioning and investigating new things. It is also a speech stage. It is during the preoperational stage that children's thought differs the most from adult thoughts.

III. Stage of Concrete Operations: Seven through eleven years (Childhood)

The stage of concrete operations begins when the child is able to perform mental operations. Mental operations permit the child to think about physical actions that he or she previously performed. The preoperational child could count from one to ten, but the actual understanding that one stands for one object only appears in the stage of concrete operations. The primary characteristic of concrete operational thought is its reversibility. The child can mentally reverse the direction of his or her thought. A child knows that something that he can add, he can also subtract. He or she can trace her route to school and then follow it back home, or picture where she has left a toy without a haphazard exploration of the entire house. A child at this stage is able to do simple mathematical operations. Operations are labeled concrete because they apply only to those objects that are physically present. Conservation is the major acquisition of the concrete operational stage. Conservation is the ability to see that objects or quantities remain the same despite

a change in their physical appearance. Children learn to conserve such quantities as number, substance (mass), area, weight, and volume; though they may not achieve all concepts at the same time. The child in the concrete operational stage deals with the present, the here and now.

IV. Stage of Formal Operations: Eleven through sixteen years (Adolescence)

The child who can use formal operational thought can think about the future, the abstract, the hypothetical. Piaget's final stage coincides with the beginning of adolescence, and marks the start of abstract thought and deductive reasoning. Thought is more flexible, rational, and systematic. The individuals can now conceive all the possible ways they can solve a problem, and can approach a problem from several points of view. The adolescents can think about thoughts and operate on operations, not just concrete objects. They can think about such abstract concepts as space and time. The adolescents develop an inner value system and a sense of moral judgment. They now have the necessary mental tools for living their life. They begin to think more about moral, philosophical, ethical, social, and political issues that require theoretical and abstract reasoning. Adolescents begin to use deductive logic, or reasoning from a general principle to specific information.

The theory is related to the present study because it encourages student-centered learning, while the teacher serves as a facilitator. The researcher studied the effects of Think Pair Share (TPS) and

Student Teams-Achievement Division (STAD) on students' achievement and interest in Economics by allowing the students to construct their own knowledge and play active role in the course of teaching and learning activities. Think Pair Share (TPS) and Student Teams Achievement Division (STAD) will help the students to engage in the process of

discovering meaning from their teacher's presentation based on their prior knowledge. The students will also be able to merge their pre-existing knowledge with the new knowledge

Significance of Jean Piaget's (1973) Cognitive Learning Theory to the Present Study

Learning is a step by step, from simple to complex and from known to unknown. It is student centered, accomplished through active learning. Children develop best in a classroom with interaction and activities. The role of the teacher is to facilitate learning, rather than direct tuition. The idea that students learn best through doing and actively exploring the environment should be encouraged. Instructional activities and materials should be planned to fit into the level of mental ability and age of the students. Teachers should use active methods that require rediscovering or reconstructing ideas, knowledge, and experiences. Teachers should focus majorly on the process of learning, rather than the end product. They should therefore employ cooperative and collaborative learning instructional strategies.

2.2.2 Lee Semyonovich Vygotsky's (1962) Social Learning Theory

Vygotsky's theory is deeply rooted in the constructivist theory which believes in students' discovery and constructing their own ideas, knowledge and experiences. The theory affirmed that learning and cognitive development take place through interaction of learners with their peers and adults. The fundamental and crucial role of social interaction in the development of cognition is thus emphasized. Vygotsky theorized that infants are born with basic abilities for cognitive development, which were called basic mental functions. These basic mental functions include attention, sensation, perception and memory. They are developed into higher mental functions through interaction within the sociocultural environment. It is on this note that Vygotsky sees cognitive functions as

being largely influenced by the beliefs, values and tools of cognitive adaptation of the culture in which a child develops and that it is socio-culturally determined.

Vygotsky theorized that children are inquisitive, curious and actively involved in their own learning and the development of new schemata. Children discovered their world through the assistance of family members, peers and teachers. This assistance is referred to as scaffolding. Scaffolds are structures erected by builders for support while the height of the building is going higher. The concept of scaffolding refers to a process whereby a teacher or more advanced peer helps to arrange or structure a puzzle/ jigsaw so that a novice can work on it successfully. The environment in which the children find themselves will influence how they think and what they think about. Cognitive development stems from an internalization of language, emphasized is thus placed on the role of language.

The underlying premise of Vygotsky's theory is founded on two principles, namely: the Zone of Proximal Development (ZPD) and the More Knowledgeable Other (MKO). All good learning was in advance of development and involved in the acquisition of skills just beyond the students' grasp.

Such learning occurred through interaction within the students' Zone of Proximal Development (ZPD). The range of knowledge and skills that can be developed with the guidance of adult or peer cooperation exceeds what can be attained single handedly. Zone of Proximal Development (ZPD) refers to the discrepancy between the students' actual level of development and their potential level of achievement. Actual level of development refers to the level of independent achievement while potential level of achievement refers to the level of achievement with the help of a more competent partner. Vygotsky stated that cognitive development stems from social interactions and guided

discovery learning within the Zone of Proximal Development, as children and their peers jointly construct their ideas, knowledge and experiences. The More Knowledgeable Other (MKO) refers to someone who has a higher ability than the student in terms of skills, knowledge and experience.

This person could be the student's parent, peers or teacher.

The theory is related to the present study because it encourages students' interaction in study groups, while the teacher serves as a coach. The researcher studied the effects of Think Pair Share

(TPS) and Student Teams-Achievement Division (STAD) on students' achievement and interest in Economics by dividing the students into different study groups where they would teach one another and construct their own knowledge. Think Pair Share (TPS) and Student Teams Achievement Division (STAD) will help the students to share their individual ideas with one another in study groups and link their own knowledge with their teachers' presentation.

2.3 Empirical Studies

Dheeraj and Kumari (2013) studied the effect of co-operative learning on achievement in Environmental Science of school student. The study is an experimental study based on randomized two group posttest. It was conducted on a sample size of sixty students from Gaya district of Bihar. Out of which thirty students were in experimental group and another thirty students in controlled group. Two self-developed tools were used in the form of Instructional Tool unit with teaching aids and Measuring Tools in the form of a teacher made test and a three point scale to study the impact of the method used. Experimental group was taught co-operative learning method while controlled group was taught through traditional method. Findings of the study reflected that mean achievement

of the students exposed to co-operative method differs significantly from the mean achievement of the students taught through traditional method.

Anidu and Idoko (2012) worked on the comparative study of the effect of concept mapping and cooperative learning instructional strategies on secondary school student' interest in Biology, using two randomly sampled boys' schools and girls' schools each from Enugu Education Zone, Enugu State. A quasi-experimental design was adopted, and intact classes were used for the study.

Data on students' interest was collected using the Biology interest inventory. The research question that guided the study was answered using mean interest score. The hypothesis was tested using ANCOVA. Results showed that the cooperative learning group had higher mean interest score than the concept mapping group. ANCOVA results however revealed that the difference in interest is not significant, both instructional strategies were therefore recommended for training and retraining programs of Biology teachers.

Jensen and Owen (2010) did a research in New York on pedagogy, gender, and interest in Economics. They used a large multi-school sample to examine how the characteristics and attitudes of students interact with pedagogy and attributes of the instructor to influence students' decisions to study Biology beyond the first semester. The result of their investigation revealed that students who have a predisposition to major in Biology, who find Biology relevant, who believe they understand Biology as well as their classmates, and who expect higher grades in Economics relative to their other classes are more likely to study Biology beyond the first semester. Their investigation also showed that some, but not all, of these techniques are particularly successful in influencing the decisions of female students. Van Wyk (2011) studied the effects of the cooperative learning technique of Teams-Games-Tournaments (TGT) on the achievement, retention,

and attitudes of Economics Education students in Bloemfontein, South Africa. A pretest-posttest, quasi-experimental design was used. Data collection instruments were an achievement test (Test of Economic Literacy), attitude instrument towards Teams-Games-Tournaments (TGT) and a retention test. Results indicated that the achievement test score for the Teams-Games-Tournaments (TGT) group was 52. 99, whereas the lecture control group was 50 13. This implies that the Teams Games-Tournaments (TGT) group performed better in the achievement test compare to the control group. The retention tests for both groups were very similar. The treatment group indicated positive attitude towards Teams-Games-Tournaments (TGT) as a teaching strategy for Economics Education.

However, Daniel (2012) studied gender differences in Nigerian junior secondary school students' achievement in Basic Science using cooperative learning instructional strategy. The total number of one hundred and twenty students obtained from the intact classes of the three junior secondary schools in the three selected Local Government Areas of Ogun State, Nigeria, participated in the study. The study employed a quasi-experimental design. Lesson note based on the Jig Saw II cooperative learning instructional strategy and Achievement Test for Basic Science Students (ATBSS) were the instruments used to collect relevant data. The data collected were analyzed using descriptive and independent samples t-test statistical methods. Findings of this study revealed that there was no significant difference in academic achievement of male and female students at the pre-test, post-test and delayed post-test levels respectively.

Adeosun (2008) also investigated gender differences in the achievement and retention of Nigerian students exposed to concepts in Social Studies through multi-media packages. The purpose was to investigate which of the sexes would achieve or retain better than the

other having been exposed to Social Studies through multi-media packages. The study was a quasi-experimental design using one hundred and sixty junior secondary school two (JSS 2) students randomly selected into three experimental and control groups. A thirty (30)-item achievement test designed by the researcher and some professionals were used to gather data which were analyzed using ANCOVA and multiple classifications analysis. Two hypotheses were formulated and tested, and the findings showed that none of the sexes achieved significantly better than the other, but that the female students retained significantly more than the male students.

Olajide (2010) in consonance with Onuka and Durowoju (2010) reported that gender did not play any significant role in students' achievement in essay writing and business studies respectively. Sullivan, Joshi and Leonard (2010) worked on the longitudinal analysis of the effects of singlesex schooling on academic outcomes in Britain, and reported that girls at single-sex schools were substantially more likely, other things being equal (which might include students' interest), than their co-educated peers to achieve a high level of examination success at age sixteen, while males were neither significantly advantaged or disadvantaged in terms of overall examination attainment by attending single-sex schools. This study was done in Britain while the present study is done in Nigeria. In another research conducted by Onuka and Durowoju (2011), to investigate the relationship between motivation and academic achievement of male and female students in secondary school Economics in Ibadan North Local Government Area of Oyo State. Two-stage sampling was employed to randomly select four schools from forty senior secondary schools (SSS) in the area and an intact arm of SSS II from each of the sampled schools. Data were analyzed using correlation and t-test. The results revealed that gender has no significant effect on students' achievement in Economics. Trent (2013) did a study

to determine if the peer instruction technique of Think-Pair-Share improved students' performance in high school Chemistry. The study was done in Louisiana. Pretest and posttest quasi-experimental design was used. A paired t-test was used in the data analysis. Findings showed that there was no difference in the learning gains between the control and experimental groups. Factors such as small class size, absenteeism, quality of pre- and post-test questions may have contributed to these results. The reviewed study was done in Louisiana while the present study is done in Nigeria.

Siburian (2013) employed Think Pair Share to solve the problem of low students' achievement in writing descriptive text. Action research was conducted and qualitative and quantitative technique were applied in the study. The subject of the research was grade VIII in Junior High School, Rantau Parapat, North Sumatera in Indonesia. In the first test, the students got the mean of mark 66, 4375. It dramatically increased on the second test, which was 78, 125. Additionally, on the third test the mean of students' mark reached a pick on 87, 5625. Observation result showed that the students gave their good attitudes and responses during teaching and learning process by applying the application of Think Pair Share (TPS) method. Questionnaire and interview report showed that students agreed that the application of Think Pair Share (TPS) method had helped them in writing descriptive text.

Mahmoud (2013) investigated the change in critical thinking (CT) skills of baccalaureate nursing students who were educated using a Think-Pair-Share (TPS) or an equivalent Non-Think-Pair Share (Non-TPS) teaching method. Ninety one students participated in the study. The study used a quasi-experimental design. The independent sample t-test and Mann-Whitney test were used to analyze the data. Findings revealed a significant increase in critical thinking (CT) over time, with the use of Think-Pair-Share (TPS) teaching/

learning strategy. The results suggest that Think-Pair Share is an effective strategy to foster critical thinking of nursing students and could be used by educators to foster learners' critical thinking in their courses.

Kitaoka (2013) examined the effect of a combination of two teaching methods, namely: cooperative learning with a Think-Pair Share technique and a context rich problem on students' learning. Findings indicate that these teaching methods help students to stand at and walk on the right path to become effective problem solvers, which will enhance their motivation to study and engage in learning. Kothiyal, Majumdar, Murthy, and Iyer (2013) did a study that investigated the quantity and quality of student engagement in a large CS1 class during the implementation of

Think Pair Share activities. The study was done in Bombay, India. They determined patterns of student engagement in three phases using a real-time classroom observation protocol that was developed and validated. Findings showed that 62% of students were highly engaged during Think phase and 70% during Pair phase.

Sampsel (2013) studied the effect of Think-Pair Share cooperative learning technique on students' confidence in their abilities to do Mathematics and their willingness to participate in class discussion. The study found that students' participation increased, the number of long explanations given by students increased, and students comfort and confidence when contributing to class discussion also increased. Utama, Marhaeni, and Putra (2013) investigated the effect of Think Pair

Share teaching strategy on students' self-confidence and speaking competency. The study was conducted on students of the second grade in SMPN 6 Singaraja, in Indonesia, during the academic year 2012/2013. There were 121 students selected as sample put in experimental and control groups. The study used a post-test only control group design.

The analysis was made by using Manova facilitated by SPSS version 16.0 for windows. The results indicated that: (1) there was a significant effect of Think Pair Share on students' self-confidence (F = 754.104 and sig = 0.000; $p<0.05$). (2) There was a significant effect of Think Pair Share on students' speaking competency (F = 60.325 and sig = 0.000; $p<0.05$). (3) Simultaneously, there was significant effect of Think Pair Share on students' self-confidence and students' speaking competency.

2.4 Summary of literature review

The literature reviewed in this study is presented under the following major headings: conceptual framework, theoretical framework, empirical framework and summary of literature review. The concept of cooperative learning, concept of instructional strategies, Think Pair Share (TPS) cooperative learning instructional strategy, Senior Secondary School Biology curriculum, concept of achievement, and concept of gender were examined under the conceptual framework. The conceptual framework affirmed the need for application of innovative instructional strategies in teaching and learning process. The need to employ cooperative learning instructional strategies for stemming the incidence of low achievement and lack of interest in Biology was also highlighted. The review also looked into the theoretical basis of this study which include Jean Piaget cognitive learning theory and Lee Semyonovich Vygotsky social learning theory. Piaget affirmed that children's development must necessarily precede their learning. Vygotsky argued that social interaction and learning must precede development while consciousness and cognition are the end product of socialization and social behaviour. Vygotsky argued that cognitive development varies across cultures while Piaget stated that cognitive development is mostly universal across cultures. Vygotsky stated that cognitive development stems from social interactions and guided learning, through the process of

scaffolding. Piaget in contrast stated that cognitive development starts from independent explorations of the environment, in which children construct their own ideas, knowledge and experiences.

The review of empirical studies focused on the effects of Think Pair Share (TPS) and Cooperative learning.

The contributions of eminent authors such as Utama, Marhaeni, and Putra (2013); Teemuangsai and Tiantong (2013); Trent (2013); Siburian (2013); Mahmoud (2013); Kitaoka (2013); Kothiyal et al. (2013); Sampsel (2013); Van Wyk (2013); Anidu and Idoko (2012) amongst others are noteworthy. These scholars showed that achievement, interest and gender are variables that need to be given a serious attention in every teaching and learning process.

Empirical evidence from literature revealed an inconclusive debate on the effects of Think-Pair Share (TPS) instructional strategies on students' achievement. Also there were conflicting findings on gender studies. The various contradictory, divergent, conflicting and opposing results highlighted, have necessitated a study on the effects of Think-Pair Share (TPS) and Student Teams- Achievement Divisions (STAD) instructional strategies on students' achievement and interest. More so, there seems also to be little work for now on cooperative learning instructional strategies using Think-Pair Share (TPS) and Student Teams-Achievement Divisions (STAD) teaching strategies in Economics Education to the best of this researcher's knowledge. This study thus aims at filling this gap. Also from the available studies that were reviewed, none or few investigated the effect of Think-Pair Share (TPS) instructional strategies on students' achievement and interest in senior secondary school Biology. This study sought to look at the effect of think pair share on academic achievement in Biology in Minna Metropolis of Niger State.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents research method under the following sub-headings: research design, population of the study, sample and sampling techniques, instruments for data collection, validation of the instrument, reliability of the instruments, method of data collection, and method of data analysis.

3.2 Research Design

The pre-test, posttest quasi-experimental design was employed for the study (Adesoji & Ibraheem, 2009). This research design was adopted because it is not possible to have complete randomization of subjects without disrupting the school organization (streaming classes) of the existing schools that were involved in the study. Consequently, intact (pre-existing) classes were randomly assigned to the control and experimental groups. This is illustrated symbolically below:

GROUPS	PRE-TEST	TREATMENT	POST-TEST
Experimental	O_1	X_1	O_3
Control	O_2	X_0	O_4

Where:

O_1 O_2 = Pre-test for the experimental and control group

O_3 O_4 = Post-test for the experimental and control group

X_1 = Treatment (experimental group)

X_0 = No treatment (control group)

3.3 Population of the study

The population of the study consists of all the SS3 Biology students from all the secondary schools in Minna Metropolis of Niger State. The total number of student population during 2019/2020 academic session is 3,387. The targeted secondary school are co-educational because of the population characteristics (gender – male, female) considered in the study. They also have the same environmental condition such as teachers, syllabus, remuneration and class size.

3.4 Sample and Sampling Techniques

The sample size of this study consist of 95 students selected from two classes in the selected public co- educational schools in Minna Metropolis of Niger State. Two co – educational schools were randomly selected by balloting and categorized into experimental and control groups. The experimental group was taught using the think pair share approach and the control group was taught using conventional method. Simple random sampling techniques was used to select the schools and also randomly categorized into experimental and control group respectively.

3.5 Research Instruments

The instrument used for data collection in this study is Inheritance Concept Achievement Test (ICAT). The instrument for data collection was divided into two parts, the pre-test, and the posttest. This achievement test consists of two sections, A and B. Section A seeks personal information on the students with respect to gender while the section B consists of the achievement test made up of twenty (20) items. Each of the test items is followed

by option A – D. The respondent is expected to pick an answer by ticking the correspondent alphabet.

3.6 Validity of Research Instrument

The instrument was validated by the researcher's supervisor and two senior lecturers from Science Education Department. The questions were also validated using the following criteria: (i) subject matter coverage (ii) adequacy of language (iii) stemming of the questions. Corrections, suggestion given by experts were used to modify the content of ICAT.

3.7 Reliability of the Instrument

The achievement test question was trial – tested in Bosso Secondary School, which is not selected for the main study. The data collected in two administrations was analyzed using Pearson Product Moment Correlation formula and reliability coefficient of 0.83 was obtained, showing that the items are reliable according to thumb print of (Frankel and Wallen, 2014).

3.8 Method of Data Collection

A letter of request for permission was written to the school principals seeking for permission to use the school, Biology Teachers and Students for the study. The researcher also established interactions in other to enlighten them on the purpose of the visit.

The instrument containing 20 item was administered on two (2) senior secondary school (SS 3) students offering Biology in Minna Metropolis of Niger State. At the time of administering the instrument, the researcher ensures that the students read the instruction before answering the questions on the Inheritance Concept Achievement Test (ICAT).

They were also guided by a lesson plan prepared by the researcher based on the topic Inheritance factor for assessment. Conventional teaching method was used for teaching the control group and think pair share method for experimental group. Pretest was given to all the biology students in the two schools using ICAT before treatment. After the pretest, students (control group) in their classes were taught the Biology/inheritance factor using teaching method. Student in the other school were taught the same topics using the think pair share approach and this group will serve as the experimental group. The treatment lasted for four weeks of two periods per week. ICAT was administered to the experimental and control groups as pretest, posttest after it had been reshuffled in order to present a fair test.

Think-Pair-Share: The experimental group Think-Pair -Share were in pairs forming fifteen (15) group. The researcher poses an open-ended question on the topic and ask the students to think analytically on the question for some minutes to think about their answer. Then the researcher pairs the students in groups of four (4) to discuss their answer and share ideas among themselves. Finally the researcher call randomly on few students to share their response with the whole class.

3.9 Method of Data Analysis

Data were analyzed by using mean, Standard deviation to answer research questions while t-test statistic was used to analyze the hypotheses at 0.05 level of significance. The Statistical Package for the Social Science (SPSS) version 25.0 was used.

CHAPTER FOUR

RESULT AND DISCUSSION

4.1 Analysis of Research Questions

1. Will there be any difference in the Mean achievement score of students taught inheritance factor in biology using Think-Pair-Share approach and those taught without?

Table 4.1: Mean and standard deviations on academic achievement in Biology for experimental and control groups.

Group	N	Pretest		Posttest	
		$\bar{x}$	SD	$\bar{x}$	SD
Experimental group	60	9.27	2.43	11.95	2.24
Control	35	7.29	2.90	10.03	2.26

Table 4.1 shows the mean achievement scores of students taught biology using think pair share method and those taught using conventional method. From the result, the students taught biology using think pair share method had mean score of 11.95 and standard deviation of 2.24 while those taught biology using conventional teaching method had a men score of 10.03 and standard deviation of 2.90. The result indicated a higher mean score for the students taught biology using think pair share method than those taught using conventional teaching method. Thus the experimental group had a better performance than the control group.

Researches question Two:

What are the Mean ($\bar{x}$) achievement scores of male and female students taught inheritance Factors in Biology using the Think-Pair Share?

Table 4.2: Mean and standard deviation scores of male and female students taught inheritance factors using Think-Pair-Share

Gender	**N**	Pretest		Posttest		Mean
		$\bar{x}$	SD	$\bar{x}$	SD	**gain**
Male	**30**	**8.08**	**2.56**	**12.03**	**2.65**	**3.95**
Female	**30**	**6.82**	**3.03**	**11.87**	**2.73**	**5.05**

Table 4.2 shows the mean achievement scores of male and female students taught biology using think pair share method. From the result, the male students taught biology using think pair share method had mean score of 12.03 and standard deviation of 2.65 while female students had a mean score of 11.87 and standard deviation of 2.73. The result indicated that both male and female students performed significantly better when taught biology using think pair share method.

4.2 Null Hypothesis

HO_1: There is no significant difference in the achievement scores of students taught inheritance factor in Biology using Think-Pair Share approach and those taught without.

Table 4.3: t-test comparison of the academic achievement of SS3 students who were taught biology with Think-pair- share and those taught without

Group	Mean	SD	df	t-cal	p-value
Experimental group	11.95	2.24			
			93	3.58	0.005
Control	10.03	2.26			

Table 4.3 shows the t-test comparison between the experimental and control groups taught Biology using the Think pair share teaching strategy and those taught without. The result indicates the mean score of 11.95 for experimental group and 10.03 for the control group with $t = 3.58$, $df(93)$, and $p<0.05$. Therefore, the null hypothesis that states, there is no significant difference in the achievement scores of students taught biology using think pair share strategy and those taught using conventional method is rejected. This means there is actually a significant difference between the two groups.

Hypothesis Two

HO_2: There is no significant difference in mean achievement scores of male and female students taught inheritance factors in Biology using Think-Pair-Share approach.

Table 4.4: t-test comparison of mean achievement scores of male and female students taught biology using Think – Pair- approach.

	Mean	**S. D.**	df	tcal	**p-value**
Male	12.03	2.65			
			58	0.24	0.81
Female	11.87	2.73			

Table 4.4 shows the t-test comparison between the male and female students taught biology using Think pair share teaching strategy. The result indicates the male mean score of 12.03 and the female mean score of 11.87 with t = 0.24, df(58) and $p>0.05$. Therefore, the HO_2 was not rejected (i.e. retained). There is a significant difference between the mean achievement score of male and female students taught biology using think pair share teaching strategy.

4.3 Discussion of Result

The analysis of research hypothesis revealed that experimental group (think pair share) did better than the control group (conventional method), also male in the experimental group did not give better gap than their female counter part in the same group.

Findings of the study revealed the significant difference in the level of achievement in the performance of students taught biology using think pair share and those taught using conventional method. The outcome of the result shows that the mean score of those expose to think pair share is 11.95 and the SD=2.43, df = 93, while the mean scores of those taught with conventional method only is 10.03, SD = 2.26, therefore hypothesis one was rejected. Hence, there is statistical significant different between the mean score of students exposed to think pair share than those exposed to conventional method. This implies that exposure to think pair share teaching strategies has a positive impact on the performance of student learning Biology. This assertion is also supported by the findings of (Uwalaka, 2013), he lamented on the significant effect of think pair share on student performance especially in science subject.

The outcome of the result also revealed the significant difference in the male and female mean scores in the performance of students taught Biology with exposure to think pair share. The outcome of the result shows the male mean score of those expose to think pair share is 12.03 and the SD=2.65, df = 58, also the female means score is 11.87 with SD=2.73. Shows that there is no statistical significance difference between male and female performance, taught Biology using think pair share teaching strategies. The findings of the study is in line with that of (Ajayi *et al.,* 2011), which is clearly stated that there is no difference of effect of think pair share on male and female performance.

CHAPTER FIVE

5.0 CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

Based on the findings of the study on the effect Of Think - Pair-Share on academic achievement among senior secondary schools in Minna Metropolis of Niger State, has given insight on significance of think pair share in teaching and learning.

From the findings of the study it could be concluded that there is a significant effect of think pair share in the teaching and learning of Biology. Also the findings made it clear that there is no gender difference in the performance of student taught Biology with think pair share.

Finally, it could be concluded that teaching and learning of think pair share is appropriate for teaching Biology.

5.2 Recommendation

In view of the findings of the study the following recommendations are made:

1. The secondary school management should incorporate the teaching and learning Biology with aid of think pair share
2. The Ministry of education should also set the school curriculum to permit use Think- Pair- Share to student.
3. The government should also fund Think- Pair- Share for secondary school student to enhance their learning of science subject especially Biology.

5.3 Suggestion for Further Studies

The following are suggestions further studies

1. Attitude of Teacher toward the teaching of Biology using Think- Pair -Share instructional strategies in secondary schools in Minna Metropolis of Niger State.
2. Investigative study into the factors affecting the implementation of Think- Pair - Share into teaching and learning of Biology in school in Minna Metropolis of Niger State.

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APPENDIX 'I'

INHERITANCE CONCEPT ACHIEVEMENT TEST (ICAT)

Dear student;

The purpose of this test is for a research study only and not to be used for any other intention. You are kindly requested to answer the questions below by ticking one out of the options (A, B, C or D)

SECTION A: Bio Data

Instruction: Tick the box provided below

Gender: Male ☐ Female ☐

SECTION B: Objective Test Items

1. Inherited characters are determined by
A. genes
B. allele
C. chromosome
D. traits

2. Which of this is not a hereditary variation
A. infant paralysis
B. blood group
C. color of skin
D. Shape of face and nose.

3. Hereditary variations is best described as
A. character transmitted from generation to generation
B. traits acquired from diseases
C. characters that show up due to social condition
D. Traits acquired from habits and environmental condition.

4. Which of the following statement about hereditary is not true? In heredity the traits are carried
A. by genes
B. contained in the ovum and sperm
C. always transmitted by one parent

D. transmitted from parents to offspring

5. The gene of an organism inherits during fertilization is called?

A. phenotype
B. genotype
C. character
D. chromosomes

6. Which of the following is the carrier of hereditary materials?

A. centriole
B. cytoplasm
C. nucleolus
D. chromosome

7. The physical appearance of an organism is called

A. genotype
B. phenotype
C. traits
D. gene

8. During sexual reproduction the gametes of a male and female individual or parent fuse to form? A. offspring

B. zygote
C. genes
D. baby

9. A diploid organism has two sets of chromosomes referred to as

A. homozygous
B. homozygote
C. heterozygous
D. haploid

10. The differences between individuals of the same species is called

A. heredity
B. variation
C. characters
D. genetics

11. Organisms with the same genotype may possess different phenotypes if

A. live in the same environment
B. live in different environment
C. all of the above
D. none of the above

12. Diploid organisms produce gametes by

A. mitosis
B. meiosis
C. segregation

D. none

13. An example of transmittable character in human being include

A. body shape

B. ability to move the ear lobe

C. ability to roll the eye

D. none

14. Acquired characters are

A. received by parents

B. passed to offspring

C. caused by the environment

D. Caused by mutation.

15. Which of the following is the precise location of gene?

A. chromosome

B. centrosome

C. centriole

D. ribosome

16. How many chromosome are found in the human ovum?

A .46

B. 23

C. 33

D. 13

17. The transmission and expression of characters or traits in organisms from parents to the offspring is known as

A. variation

B. heredity

C. genetics

D. traits

18. The male gamete is called

A. ovum

B. sperm

C. egg

D. ovules

19. Haploid organism has how many set of chromosomes

A. one

B. two

C. three

D. none

20. Genes are?

A. thread-like bodies

B. chromosome

C. heredity unit of inheritance
D. single cell formed during sexual reproduction

ANSWERS

1. A
2. A
3. A
4. C
5. B
6. D
7. B
8. B
9. A
10. B
11. B
12. B
13. A
14. C
15. A
16. B
17. B
18. B
19. A
20. C