EFFECT OF JIGSAW AND TEAM PAIR-SOLO OF COOPERATIVE LEARNING STRATEGIES ON ACHIEVEMENT IN BASIC SCIENCE OF STUDENTS WITH VISUAL IMPAIRMENT

Nnamani, Ogechi (Ph.D)[1]; Onuigbo, Lizana N. (Ph.D)[1]; Adama, Grace N (Ph.D)[1] & Eze, Uchenna (Prof)[1]
Department of Educational Foundations, University of Nigeria, Nsukka
nnamani.ogechi@unn.edu.ng

Abstract
This study sought to investigate the effect of Jigsaw and Team pair-solo Cooperative learning strategies on achievement in Basic Science of junior secondary school students with visual impairment. Three research questions and three null hypotheses were generated to guide this study. The design of the study was quasi-experimental design. Specifically, the study employed the pre-test, post-test control group design involving two experimental groups and one control group. The population of the study consisted of all 35 visually impaired Junior Secondary School two (JSS II) students who were also used as the study sample. The instrument used for data collection was Basic Science Achievement Test (BSAT). Mean and Standard deviation were used to answer research questions while Analysis of Covariance (ANCOVA) was used to analyze the hypotheses. The results of the study revealed that students with visual impairment exposed to Jigsaw and Team pair-solo cooperative learning strategies achieved better than those exposed to conventional strategy in Basic Science. Gender had no significant effect on the achievement of students with visual impairment in Basic Science. Based on the findings, recommendations were made; which among others include that teachers should make teaching and learning studentscentred which will give learners, especially the students with visual impairment, the opportunity to participate effectively in teaching and learning activities in basic science in their various schools.

Keywords: Jigsaw, Team Cooperative learning, visual impairment, pair-solo, achievement, Basic science

Inroduction

In today's world it is almost impossible to live without science, since it is used in all aspects of human life. Information got through science is applicable to all areas of human endeavours and existence. This can be explained by the enormous scientific inventions which have been applied in communication, transportation, food production, computer, and construction of roads to mention but a few. Igboanugo (2013) posited that the nation's development has been enhanced rapidly in areas of agriculture, medicine, telecommunication, entertainment and power system due to the advancement in Science and Technology. Scientific role to individuals as well as its fundamental development in economic and technological growth of nations cannot be over emphasized. For a nation to experience economic growth there must be a strong stimulation of science and without this it becomes difficult for an individual or a society to survive and compete effectively in science and technology. Sciencehelps to equip an individual with basic qualities such as curiosity, objectivity, initiative and honesty required for survival and development of the society. As a result of this, students are encouraged early in life to study science irrespective of their life challenges.

Science is a systematic and logical approach to discovering how things in the universe work (Bradford and Hamer 2022).The authors also saw science as the body of knowledge accumulated through discoveries about all the things in the universe.To the researchers, Science is a systematic process of obtaining verifiable knowledge about the environment through careful observation and experimentation for the acquisition of desirable skills that will help individuals and nations to survive.Science is studied at primary school and junior secondary school (JS1-3) levels as Basic Science while at senior secondary school and tertiary institution levels; it is studied as biology, chemistry and physics.

Basic Science whichis the focus of this study isa subject of study that draws its content and concepts from all the major disciplines in Science such as life science (biology), physical sciences (chemistry and physics) and earth sciences (Geography and Agricultural science). Nigeria Educational Research and Development Council ([NERDC], 2007). The NERDC maintained that the general objective of Basic Science is to enable students observe and explore their environment using their senses. Basic Science formerly known as integrated science is the form of science a child encounters at the primary and secondary school level for the study of core science subjects at the senior secondary school level (Bukunola and Idowu 2012) Basic Science in the context of this study therefore, can be defined as a subject of learning that gives the fundamental knowledge and skills about the universe as a whole or in parts which drawn its content from Biology, Chemistry, Physics, Geography and Agricultural Science.

Basic Science represents the foundation stone for subsequent teaching and learning of science subjects. Ibe (2010) posits that Basic Science prepares students at junior secondary school level for the study of core science subjects (physics, chemistry and biology) at the senior secondary school level. Basic Science has been made one of the compulsory subjects for all students both at primary and junior secondary school levels. It is an attempt to ensure proper teaching of Basic science at these levels of education that the Federal Government of Nigeria in 2007 under the Millennium Development Goals Project organized training and re-training workshops for teachers in primary and Junior Secondary School levels to update their knowledge and skills in teaching of Basic Science (Mohammed, 2007). This is in compliance with the National Policy on Education (FRN, 2013) which has one of its aims as giving equal educational opportunities to all children, their physical, sensory, mental, psychological or emotional disabilities notwithstanding. It is based on this that learning of Basic Science by all students, including students with visual impairment became inevitable

Visual impairment also known as vision impairment is a medical definition primarily measured based on individual's better eye visual acuity in the absence of treatment such as corrective eyewear, assertive device and medical treatment.World Health Organization ([WHO], 2021) defines visual impairment as presenting acuity of less than 6/12 in the better eye. The term visual impairment involves mild, moderate and severe vision impairment. The term blindness is used for complete or nearly complete vision loss. World Health Organization (2021) classifies vision impairment into two: Distance and near presenting vision impairment. Mild- visual acuity worse than 6/12 to 6/18and Moderate- visual acuity worse than 6/18 to 6/60.Severe- visual acuity worse than 6/60 to 3/60

Researchers have shown that students being highly involved in teaching and learning of Basic Science have better achievement in school subjects including Basic Science thanstudents who were not involved due to vision challenge which invariably result in low achievement. (Afuwape&Olatoye, 2014).

Achievement is defined as something which has been carried out successfully especially by means of exertion, skill, practice or perseverance. Achievement represents performance outcomes that indicate the extent to which a person has accomplished specific goals that were the focus of activities in instructional environments specifically in schools, colleges and universities (Hattie, 2009). Achievement in the context of this study is referred to as the accomplishment of students in an academic or learning task. Achievement can be described as low or high depending on the level of performance of the learner in a given academic task. Achievement is termed low when in a given academic task, a student's performance is below an expected level of accomplishment and termed high when the student's performance is above the expected level of accomplishment. There are different ways to enhance students' achievement. Broussard and Garrison (2004) posited that one successful method to enhance achievement is to motivate and excite learning by changing the school culture. The authors affirm that this can be accomplished by encouraging teachers to use new improved learning approaches to teach, coupled with added commitment among teachers to empower all students in learning of school subjects including Basic Science, gender differences notwithstanding.

Consequently, there has been pronounced poor achievement of students with visual impairment in Basic Science in Junior Secondary Certificate Examination (JSSCE), and this has created a lot of concern in the minds of the parents, teachers and other stake holders in education sector. The poor result is evident in 2017, 2018 and 2019 Junior Secondary School Certificate Examination (JSSCE) results. The statistics from College of Immaculate Conception, Enugu and Girls Secondary School, Ngwo showed that in 2017, out of ten students with visual impairment who sat for examination in Basic Science none had distinctions or credit, ten (100%) had pass level. In 2018, thirteen students sat for the same examination and out of the thirteen none had distinction or credit, ten (77%) had pass level and three (23%) failed. In 2019, fifteen students sat for the examination and out

of the fifteen none had distinction or credit, ten (67%) had pass level and five (33%) failed (Result of the 2017, 2018& 2019. Junior Secondary School Certificate of students with visual impairment in Enugu State). The statistics also showed that though the students with visual impairment who sat for the examination in the above mentioned years could not get distinctions in other subjects they sat for but some of the students had credit level in some of these other subjects such as English, Igbo, Social studies and Religion to mention but a few.

Researchers have shown that it is not only vision that can be a hindrance to the study of Basic Science but also inappropriate teaching strategy(Fatokun and Inti 2007). These authors attributed students' poor result in Basic Science topoor instructional approaches, general lack of training in the use of Braille instruction, lack of Braille machines and their materials, slow in writing during learning instructions and during exams as well as problems of mobility in the school environment.Based on the interview, the researchers had with Basic Science teachers, the director of Education for the students with visual impairment as well as students with visual impairment themselves; it was evident that students with visual impairment who received instructions in Basic Science through conventional-lecture strategy encounter a lot of challenges. These challenges include not giving them room for active involvement during teaching and learning processes, not using activity-oriented strategy such that could give students with visual impairment opportunity to possess in-depth knowledge in Basic Science. The situation therefore, calls for a search for appropriate teaching and learning strategies that will give students with visual impairment room for active participation, exchange of ideas as well as opportunities to ask questions. All thesewere expected to encourage students with visual impairment to learn maximally. Based on this premise, the researchers were motivated to investigate on the effect of Jigsaw and Team pair-solo cooperative learning strategies as activity-oriented strategies on achievement of students with visual impairment in Basic Science.

Cooperative learning is an educational approach which aims to organize classroom activities, academic and social learning experiences (Sharan, 2010). To the researchers, cooperative learning is an organized and structured strategy that involves students working together in small groups of two-six people tackling a common learning task in order to achieve a set goal. Two cooperative learning strategies identified by Schul (2012) were used in this study. Theseinclude jigsaw and team-pair solo. Jigsaw strategy is a multifunctional structure of cooperative learning. Jigsaw can be used in different ways for a variety of goals, but it is primarily used for acquisition and presentation of new material, review or informed debate. There are steps involved in carrying out Jigsaw cooperative learning strategy. These steps include: Firstly, materials are divided into sections and each of the expert groups is assigned a section to learn, explore and then report to their home groups. Secondly, the class shares common learning experiences and the expert groups take different approaches in analyzing or responding to these experiences. For instance, presenting an experiment or other scientific activities in Basic Science, posing a problem and presenting a possible solution for home group discussion. Finally, all the students will come together as a class to share ideas in their various tasks which will be followed by assessment of students' performance in the learning tasks (Kagan 2001).

Team-pair solo is a learning strategy where students solve problems first as a team, then with a partner and finally on their own (individually). Team-pair solo is designed to motivate the students or learners to tackle and succeed in solving problems which initially were beyond their ability (Ogunleye 2011). The choice of these strategies was because the strategies are activity oriented, involving and increase higher level of reasoning; create new ideas and solutions in learning Basic Science tasks. Researchers have shown that when students are actively involved in teaching and learning process and necessary feedback received in their small groups, the students' achievement should be high. Trends in research and evidence from literature tend to suggest that cooperative learning strategies such as the above discussed strategies enhance and increasestudents' achievement (Ogunleye,2011).

Another controversial issue that has been of interest to the researchers is the issue of gender differences in achievement. World Health Organization (2023) defined gender as the characteristic of women, men, girls and boys that are socially constructed. This includes norms, behaviours and roles associated with being a woman, man, girl or boy as well as relationships with each other. It varies from society and can change over time. Gender refers to different roles, rights, and responsibilities of men and women and relations between them (Bazilli 2010). Operationally, gender refers to the roles, responsibilities or attributes attached to males and females in a society depending on the culture of such society. This implies that the roles and expectations of males and females are defined by societies and cultures.

Some studies have found significant differences in achievement of male and female students (Olupide 2004). Nonetheless, Onwu (2015) in his study found no significant difference in Basic

science achievement of male and female students. This difference in research reports indicates that the issue of achievement and gender of students in school subjects is still inconclusive. However, the above studies were conducted with students with normal vision. This situation therefore, motivated the researchers to carry out this study to investigate the effect of cooperative learning strategies on achievementof students with visual impairment in Basic Science using gender as one of the independent variables.

This low achievement in this subject was as a result of their peculiarities.It then becomes pertinent to investigate the effect of cooperative learning strategies specifically on achievement of students with visual impairment in Basic Science.

Purpose of the study

The main purpose of this study was to investigate the effect of Jigsaw and Team pair-solo cooperative learning strategies on Basic science achievement of students with visual impairment. Specifically, the purpose of the study was:

1. To investigate the effect of Jigsaw and Team pair-solo cooperative learning strategies on Basic science achievement of students with visual impairment,
2. To investigate Basic science achievement of male and female students with visual impairment.
3. To investigate the interaction effect of treatment and gender on Basic science achievement of students with visual impairment.

Research Questions

The following three research questions guided this study

1. What is the mean Basic science achievement scores of students with visual impairment exposed to jigsaw and team pair-solo cooperative learning strategies and those exposed to conventional lecture strategy?
2. What are the mean Basic science achievement scores of male and female students with visual impairment?
3. What are the interaction effect of treatment and gender on mean scores in Basic science achievement of students with visual impairment?

Hypotheses

The following null hypotheses were formulated and tested at 0.05 level of significance.

1. There is no significant difference in the mean Basic science achievement score of students with visual impairment exposed to Jigsaw and Team pair-solo cooperative learning strategies and those exposed to conventional lecture strategy as measured by Basic Science Achievement Test (BSAT)
2. There is no significant difference in the mean Basic science achievement scores of male and female students with visual impairment.
3. The interaction effect of treatment and gender on Basic science achievement of students with visual impairment is not significant.

Method

The study adopted quasi-experimental design. Quasi-experimental design according to Nworgu (2015) is an experiment where random assignment of subjects to experimental and control group is not possible. Specifically, it employed the pre-test post- test non-equivalentcontrol group design involving two experimental groups and one control group.

The study was carried out in Enugu State where students with visual impairment (blind) study together with the sighted students. The schools are College of Immaculate Conception, Enugu in Enugu South LGA and Girls Secondary School Ngwo in Udi LGA of Enugu State.The population of the study consisted of all 35 junior secondary school two (JSS II) of students with visual impairment (15 male and 20 females) who also were used as sample of the study. The instrument for the study was Basic Science Achievement Test (BSAT) It was based on the JSS2 Basic science syllabus of the schools. BSAT was developed by the researchers and four basic science teachers from the two schools who served as research assistants. The questions were in objective form made up of twenty questions from Basic science topics selected from the (JSS2) 3rd term learning content. The choice of 3rd term was to see that the learning content will not be taught then.The instrument was validated by experts,

two in Educational Psychology and one in Measurement and Evaluation all in the Faculty of Education in the University of Nigeria, Nsukka.

Experimental Procedure

The first stage was an initial visitation to the secondary schools where students with visual impairment study in large number with those with normal vision in Enugu State of Nigeria from January 2019 to March 2020 when the students will be free to some extent. During the visitation, the principals took us around the schools to see the students in their various classrooms. WHO's visual impairment classification was taken into consideration in choosing the students with visual impairment (blind).The researchers generated and used random sampling techniques with plastic container with (slips of paper) during the random assignments of the recruited participants into intervention group (n=18 participants) and no intervention (n =17 participants).

The participants were exposed to a container with slips of paper written A, 12slips, 12 slips written B and 11 slips written C. The papers were folded and properly mixed in the plastic container for the participants to pick. Those who picked 'As' were grouped into intervention treatment 1(jigsaw strategy) while those who picked Bs were grouped into intervention treatment group 2 (team-pair solo strategy) and those who picked Cs received no intervention, they were grouped as control group and received instruction on (conventional- lecture strategy). This was carried out in Enugu state of Nigeria. During the first meeting (session), the participants familiarized with the research assistants and the participants, rules and regulations, objectives of the study, name of each participant, challenges of the participants were presented. Participants were also encouraged to exchange pleasantries which will be followed by the assessment of the chosen plan. Before the commencement of the treatment, students in the control group and the experimental groups were given the pre-test. The first session focused on familiarization with participants, rules and regulation, establishment of rapport with the participant and plans for executing the learning strategies proper. Session 2-4 focused on pre-test to the participants to identify their level of achievement in Basic science. In each, intact streams received the appropriate instructional programme during the usual Basic Science periods in the regular school time table of classes which lasted for three weeks. Experimental group were taught using JCLS and TCLS approach while those in control group were taught using conventional-lecture strategy procedure. Thereafter, the researchers met the participants 3 months later for follow-up evaluation.

Measures

Basic Science Achievement Test (BSAT) served as pre-test-and post-test. It was developed by the researchers with the assistance of the four Basic Science teachers who were teaching in the two schools who equally served as research assistants. BSAT was developed based on the (JS2) Basic Science syllabus of the two schools used in this study. The questions were in two forms sub-objective and objective form. It was made up of twenty questions from the Basic Science topics selected from (JS2) 3rd term learning content. The choice of 3rd term was because it could not have been taught as at the time of the research. The measure assesses the achievement of students with visual impairment in Basic Science when studying with Jigsaw and Team pair-solo cooperative learning strategies. The reliability showed Cronbach's alpha co-efficient of high validity. In Basic Science Achievement Test Kuder-Richardson formula 20 was used to determine the internal consistency reliability of the items which yielded a reliability value of 0.80

The study also tested the reliability of BSAT in the Nigeria context and found its internal consistency of 0.80 indicating that BSAT is reliable instrument. BSAT has twenty items which was used to identify the achievement level of the students with visual impairment.

Questions no 2, 9, 10, 13and 19 were allotted 2 marks each or zero while all sub-objective questions 1,3, 4, 5, 6, 7, 8, 11, 12, 14, 15,16, 17, 18 and 20 were allotted 6marks each or zero

Research Assistants

In this study, four research assistants were used.Two male and two female Basic Science teachers. The age range of these research assistants wasbetween 35 to 45 years old. They were professionallylicensed teachers. These research assistants were briefed and guided on how to use jigsaw and team-pair solo cooperative learning strategies by the researchers. The briefing and guidance lasted for two weeks. Each meeting with the researchers and research assistants lasted for 45minutes each week until there wasevidence of mastery by the research assistants.

Treatment manuals

Jigsaw cooperative learning strategy(JCLS) program developed by the researchers were sets of lesson notes used to instruct the students with visual impairment in Basic Science to learn how to

work in team, grouping the students according to tasks using jigsaw strategy. These students were taught using JCLS. The groups were arranged to expertsto examine aspects of text or discussion topic.In addition, home group are the individual sub-group composed by the researchers and each group is assigned specific tasks by the researchers. The individual group performed their independent task within the time specified for such assignment.Information was combined to get the full picture of the problems, text, topic or tasks. Steps involved in carrying out JCLS: Firstly, materials are divided into sections and each of the expert group was assigned sections to learn, explore and then report to the home group.Secondly, the class shares a common learning experience and the expert groups take different approaches in analyzing or responding to the experiences eg. by experimentation or other activities in Basic Science.Finally, JCLS involves tests and assessment. The strategies were designed to last for three months.

Team-pair solo Cooperative Learning Strategy(TCLS)program developed by the researchers, is also a sets of lesson notes focused on starting to solve problem as a team, then with a partner and finally on their own (individually). The focus of this strategy is solely designed to motivate the students to tackle and succeed at problems that initially are beyond the students' ability (Mediated learning). In this treatment TCLS, it involved three steps: students were first arranged in teams of 5students each, up to three teams and 1team of 4 students, Second step was to pair the students in pairs to handle learning activities and lastly was to assign learning content to an individual to learn on his or her own.

The research questions were answered using mean, standard, deviation and Analysis of Covariance (ANCOVA) which was used to test hypotheses formulated for this study at $p< 0.05$ level of significance.

Results

Table 1: Mean and standard deviation of Basic Science achievement scores of students with visual impairment exposed to Jigsaw cooperative learning strategy, Team pair-solo cooperative learning strategy and those exposed to conventional-lecture strategy

Treatment		Pre-test		Post-test		
	N	Mean	SD	Mean	SD	Mean Gain
Jigsaw	14	47.71	13.21	77.71	9.37	30.00
Team pair-solo	14	4-9.00	12.34	74.51	8.53	25.51
Conventional-lecture Strategy	7	20.57	13.55	44.00	6.11	23.43

Table 1 shows that the students with visual impairment who were exposed to Jigsaw cooperative learning strategy had mean post-test Basic Science achievement score of 77.71 with a standard deviation of 9.37 against their pre-test Basic Science achievement score of 47.71 and standard deviation of 13.21 in Basic Science, students with visual impairment who were exposed to Team pair-solo cooperative learning strategy had mean post-test Basic Science achievement score of 74.51 with a standard deviation of 8.53 in Basic Science against their pre-test Basic Science achievement score of 49.00 and standard deviation of 12.34 in Basic Science while those who were exposed to conventional-lecture strategy had mean post-test Basic Science achievement score of 44.00 with a standard deviation of 6.11in Basic Science against their pre-test Basic Science achievement mean score of 20.57 and standard deviation of 13.55 in Basic Science. Mean gain scores of 30.00, 25.51 and 23.43 for the three groups respectively imply that the students with visual impairment who were exposed to Jigsaw cooperative learning strategy had higher mean post-test Basic Science achievement score than those exposed to Team pair-solo and conventional-lecture strategy followed by those exposed to Team pair-solo.

Table 2: Mean and standard deviation of Basic Science achievement scores of male and female students with visual impairment

Gender		Pre-test		Post-test		
	N	Mean	SD	Mean	SD	Mean Gain
Male	15	44.26	17.38	73.46	15.14	29.20
Female	20	41.70	16.86	66.97	15.53	25.27

Table 2 shows that male students with visual impairment had mean post-test Basic Science achievement score of 73.46 with a standard deviation of 15.14 against a pre-test achievement score of 44.26 with standard deviation of 17.38 while the female students with visual impairment had mean post-test achievement score of 66.97 with a standard deviation of 15.53 in Basic Science against their mean pre-test achievement score of 41.70 with a standard deviation of 16.97. Mean gain scores of 29.20 and 25.27 for the male and female students with visual impairment respectively imply that male students with visual impairment had higher mean post-test Basic Science achievement score than their female counterparts

Table 3: Mean and standard deviation of Basic Science achievement scores of students with visual impairment for the interaction effect of treatment and gender

Treatment	Gender		Pre-test		Post-test	
		n	Mean	SD	Mean	SD
Jigsaw	Male	6	46.66	14.78	84.33	1.50
	Female	8	48.50	12.90	72.75	9.79
Team pair-solo	Male	6	52.66	14.06	74.66	12.11
	Female	8	46.25	11.02	74.50	5.52
Conventional-lecture Strategy	Male	3	22.66	12.05	49.33	1.15
	Female	4	19.00	16.20	40.00	4.89

Table 3 reveals that male students with visual impairment who were exposed to Jigsaw cooperative learning strategy had mean post-test Basic Science achievement score of 84.33 with a standard deviation of 1.50. Male students with visual impairment who were exposed to Team pair-solo cooperative learning strategy had mean post-test Basic Science achievement score of 74.66 with a standard deviation of 12.11 while the male students with visual impairment who were exposed to conventional-lecture strategy had mean post-test Basic Science achievement score of 49.33 with a standard deviation of 1.15. Female students with visual impairment who were exposed to Jigsaw cooperative learning strategy had mean post-test Basic Science achievement score of 72.75 with a standard deviation of 9.79, female students with visual impairment who were exposed to Team pair-solo cooperative learning strategy had mean post-test Basic Science achievement score of 74.50 with a standard deviation of 5.52 while the female students with visual impairment who were exposed to conventional-lecture strategy had a mean post-test Basic Science achievement score of 40.00 with a standard deviation of 4.89. This by implication may have revealed that male and female students with visual impairment in the treatment groups had higher mean post-test Basic Science achievement scores than the male and female students with visual impairment who were in the conventional-lecture group.

Discussion

The findings of this study indicated that students with visual impairment exposed to jigsaw cooperative learning strategy had higher achievement in Basic Science than those exposed to team pair-solo and conventional lecture strategies. The result also revealed that those students exposed to team pair-solo cooperative learning strategy achieve better in Basic Science than those exposed conventional lecture strategy. This by implication shows that Jigsaw cooperative learning strategy enhances achievement more than team pair-solo cooperative learning strategy and conventional lecture strategies. The findings of this study also revealed a significant difference in achievement of students with visual impairment in Basic science in favour of those students exposed to the two cooperative learning strategies. This implies that cooperative learning strategies enhance greater achievement than conventional lecture strategy. The result of the study is in agreement with the work conducted by Ajaja and Eravwoke (2010) on effect of cooperative learning strategy on junior secondary students' achievement in integrated science which revealed thatthose in cooperative learning group achieved better than students exposed to traditional classroom. In the same vein a study conducted by Bukunola and Idowu(2012) on effectiveness of cooperative learning strategies on Nigerian junior secondary school students' academic achievement in Basic science revealed that students exposed to cooperative learning strategies (learning together and jigsaw 2) achieved better in Basic science than those exposed to the conventional lecture strategy.

The result of the study indicated that male students with visual impairment exposed to jigsaw and team pair-solo cooperative learning strategies had better achievement in Basic Science than their

female counterparts. The result further revealed a significant difference in Basic science achievement of male and female students with visual impairment in favour of male students.

Recommendations

Based on the findings, the following recommendations were made.

1. Teachers should make teaching and learning process student-centred thereby making it possible for the students especially the students with visual impairment to participate actively, share ideas, persist on learning tasks as well as take decision on their set goals.
2. There is also need for the students with visual impairment to posses' cordial relationship among themselves. The students should strive for mutual benefits, recognize that all group members share common fact (we all sink or swim together here), Feel proud and celebrate when a group member is recognized for achievement, Know that one's performance is mutually caused by oneself and one's team member. (we cannot do it without you).
3. Schools should be encouraged to adopt jigsaw and team pair-solo cooperative learning strategies for its efficacy. For these strategies are content oriented, make students self-reliant, participatory and decision makers. Help students with visual impairment as wellasother caliber of students to be in charge of their lifeactivities and their educational achievements.
4. The government and other stakeholders in Education sector as well as School Based Management Committee (SBMC) need to provide essential infrastructural facilities such as Braille, enabling environment as well as other important instructional aids to help students achieve maximally in Basic science.

References

Afuwape, M.O., &Olatoye, R.A. (2004). Students integrated science achievement as a predictor of later achievement in biology, chemistry, and physics. *Journal of Science Teachers Association of Nigeria (JSATN), 39(1,2):* 11-16

Aiken, L. R. (1979). Psychological testing and assessment by Allyn and Bacon, Inc., 470 AtlanticAvenue, Boston, Massachustetts 02210.

American psychological Association Ethical Principles of Psychologists and code of conduct. Washington DC, USA; APA;2013

Bazili, S. (2010). Mainstreaming gender in government of trans-boundary water resource guide: gender in water management. from www.gwaorg.

Bradford, A.& Harmer, A. (2022).Science and scientific method:, Definitions and examples. From https://www.livescience.com.

Bukunola, B.A.J& Idowu, O.D. (2012). Effectiveness of cooperative learning strategies on Nigerian senior secondary students' academic achievement in basic science. Oyo State. *British Journal of Education, Society & Behavioural Science 2(3):* 307-325.

Burcin, A. & Leman, T. (2007). Effect of cooperative learning strategies on students understanding of concepts in electro-chemistry. *International Journal of Science and Mathematics Education, 5(2)*: 349-373.

Fatokun, J. O. &Inti , B .(2007). *A guided discovery approach to teaching.* Seminar paper at school of Technology Education, ATBU, Bauchi.

Federal Ministry Education (2007). *Technology and science education,* Abuja: Nigeria.

Federal Republic of Nigeria (2013). *National policy on education* (4th Ed.)Yaba, Lagos: NERDC Press.

Ibe, E. (2010). Relevance of basic science curriculum in revamping economic crisis inNigeria: Implications for teacher preparation proceedings of the 51st annual conference of Science teachers association of Nigeria 204-211.

Keefer, A. (2011). *Characteristics of a visually impaired child*. *Family digest magazine.* Chicago: Chicago Parent and Women's Touch.

Kumar D, Ramasamy, R. &Stenfanich, G. (2001). Science for students with visual Impairments: Teaching suggestions and policy implications for secondary learners. *Electronic Journal of Science Education 5(3):* 1-9.

Lehman, S.S. (2012). Cortical visual impairment in children identification, evaluation and diagnosis. Current opinion in ophthalmology. *23(5):* 384-38

Mohammed, A. M.(2007). *Manual for the re-training of primary school teachers. Basicscience and technology.* A millennium development goals project (MDG) National Teachers' Institute, Kaduna/

NERDC (2007). 9-year Basic education curriculum. Basic science and technology for middle basic education, primaries 4-6.

Ngwoke, D. U. (2005). The role of family socialization processes in promoting discipline among primary school pupils*:* A paper presented at a workshop on "Innovative Primary School Management". The Participatory Approach. For SPEB Official by Alpha-touch Consult Asaba, Delta State.

Nworgu, B.G. (2015). *Educational Research: Issues and Methodology* (2nd ed.). Nsukka: University Trust.

Ogunleye, B.O. (2011). "Team pair solo". Cooperative learning and personality type as determinants of students' achievement and attitude to chemistry. *An international disciplinary Journal, Ethopia, 5*(6). from http://doi.org/10.4314/afrrer.v5i6.22.

Schul, J.E (2012). Revisiting an old friend. The practice and promise of cooperative learning for the twenty first century. *The social studies (102),* 88-93..

Sharan, Y. (2010). Cooperative learning for academic and social gains valued pedagogy, problematic practice. *European Journal of Education 45(2):* 300-313.

World Health Organization (WHO, 2021). Blindness and vision impairment, From www.who.int

World Health Organization (WHO, 2023). Gender and health. From https://.who.int