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Effects of Student-Team -Achievement-Division Instructional Strategy On Upper Basic School Convergent And Divergent Students' Interest In Basic Science In Benue State

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Abstract. This study examined the effects of Students-Team-Achievement-Division Instructional Strategy on upper basic Convergent and Divergent students' interest, in Basic Science in Benue state. The study was guided by two (2) objectives, two (2) research questions and two (2) hypotheses. Quasi-experimental pre-test, post-test control group research design was used for the study. The sample of this study constituted of one hundred and sixty (160) upper basic eight (8) students from four (4) co-educational upper basic schools in Makurdi Local Government Area Benue State. Multi-stage sampling techniques were used in drawing the respondents. One instrument titled: Basic Science Interest Questionnaire (BSIQ) was used for the study. In analyzing the data obtained from the respondents, mean, Mann Whitney Test and Kruskal –Wallis test were employed. The findings of the study revealed that: there was significant difference between the mean interest scores of Convergent and Divergent students taught Basic Science using STAD and those taught using Conventional method. There was no significant difference between the mean interest scores of male and female Convergent and Divergent students taught Basic Science using STAD. Based on the findings of the study, it was recommended that, since STAD was found to be effective in enhancing students' interest it should be adopted by teachers as a teaching strategy in basic science.

Key words: Student-Team -Achievement-Division Instructional Strategy, Convergent and Divergent and Interest

Introduction

Globally, nations including Nigeria are striving towards scientific and technological development in all of life. Science and Technology hold the key to the progress and development of nations and any nation that is considered developed and civilized had to achieve the status through purposeful scientific education for her citizens. A scientifically unsophisticated society means an underdeveloped nation in all sectors. Such a nation would never be able to sustain the lives of its citizens and may have to solely depend on other nations for the basic requirements.

According to Sani and Dajal (2022), a country that aspires to address the problems of under-development; science and technology have to be at the fore front of every educational programme. It is through science that nations of the world such as America, United Kingdom and Germany among others are considered as developed. Science has been and would continue to be of tremendous importance to man and the society as a whole. Science and technology education is utilized to ensure economic, scientific and technological advancement. Thus, science and technology bring about advancement in the immediate basic essentials of life such as access to water, food and shelter. Also important issues that affect all humanity such as management of agricultural production, water resources, health, energy resources, biodiversity, environment, transport and communication (Enemarie, 2016).

For science education to become a reality, students must be able to think and solve problems using different approaches. This flourishes in interactive environments because science is a practical and natural course of study with many unknown ideas, knowledge and skills waiting to be discovered by students who are curious about the natural world. Such students hold promising future in science and technology. Science education therefore, is the knowledge gained through understanding of scientific concepts and processes required for personal decision making, participating in civic cultural affairs and economic productivity for survival in a changing world (Kpiranyam, Agbidye and Ukor 2022). There is therefore, the need for students to be effectively taught the subjects comprising science and technology education in Nigeria if it is to become a developed country, (Dajal and Musa, 2022).

In cognizance of the relationship between national development and level of science education, the Federal Government of Nigeria introduce a programme known as the Basic Education programme for Primary and Junior Secondary Schools in September 1999 in Sokoto State. The Universal Basic Education (UBE) programme bill was passed into law in 2004. The Nigerian Educational Research and Development Council (NERDC) restructured and re-aligned all extant Primary and Junior Secondary School (JSS) curricula into 9-Year Basic Education Curriculum for implementation in Nigerian schools with effect from September, 2008.According to Oludipe and Oludipe (2018), the scientific, vocational and technological aspects of education were not effectively implemented in the Nigeria school system therefore, it became necessary for the existing curriculum for the upper basic level to be reviewed, restructured and realigned to fit into the 9-year Basic Education programme. With this, the National Council on Education (NCE) in her meeting in 2005 directed the NERDC to ensure the review which also approved the new curriculum. It was during this restructuring and review of curricular that integrated science became Basic Science (Sani and Dajal 2022).

Basic Science formerly known as Integrated Science is the first form of science a child comes in contact with at the secondary school level. Basic Science is a core subject in the National Curriculum of the upper basic level (Yaduvanshi and Singh 2018). All students from upper basic I-III classes must offer and study the subject. Basic Science is considered the bedrock of all Science subjects at the Senior Secondary School (SSS) level. The subject prepares students at the upper basic level for the study of core Science subjects (Biology, Chemistry and Physics) at the senior secondary school level. For a student to be able to study science subjects at the senior secondary level successfully; such a student has to be well grounded in Basic Science at the upper basic level. Based on this, it is generally taught as a single science subject, until at the SSS level, and then split into specialized Science subjects (Biology, Chemistry and Physics). It is expected that those students who achieve well in Basic Science should be given the opportunity to study the separate science subjects at the SSS level (Danebeth 2015).

While selecting the contents, major issues shaping contemporary growth and development of nations, and influencing knowledge driven societies were identified and infused into the curriculum content at every level, from primary one through to junior secondary classes; with a progression in infusion of concepts as class advances. These includes: a. Environmental Education, b. Climate Change, c. Drug Abuse Education, d. Foods and Drugs Safety Education, e. Disaster/ Risk Reduction Education, f. Consumer Education, g. Safety and Security, h. Entrepreneurship, i. Human Immune Virus/Acquire Immune Deficiency Syndrome (HIV/AIDS).

According to Dajal and Musa (2022), the topics in each theme are spirally sequenced, from simple to complex across the nine (9) years of schooling in order to sustain the interest of learners and promote meaningful learning and skills development. The revised Basic Science and Technology Curriculum of 2012 provides the contents and further learning experiences that will engender the acquisition of functional skills for job creation and wealth generation that will lead to the reduction of poverty within the communities and the nation, at large. The activities are both learner-centered and problem solving-centered, and encourage student-teacher, student-student interaction, working in groups or pairs and student interaction with resource materials (FRN, 2013).

Thus, one of the instructional approaches that could actively engage students; thereby making them learn and resulting in great realization of the objectives of basic science and technology curriculum is Students Team Achievement Division (STAD). Students- Team -Achievement - Division (STAD) is one of Slavin's cooperative Instructional strategies. In STAD strategy, students are assigned to a heterogeneous group that consists of members that are mixed in achievement level and genders. Students take a group quiz during which they reach consensus in decision-making. They also take individual quizzes on the material without helping one another. Students' scores are then summed up to form team scores. Teams that meet certain criteria earn certificates or other rewards (Slavin, 2010).

This STAD strategy has the following basic steps:

i. form groups of four or five students;

ii. identify the objectives and focus on outcomes of course expected,

iii. explain the process, and present new information to students;

iv. give students sufficient time to understanding the materials;

v. give worksheets to students so that students may help one another learn materials through quizzing and group discussions;

vi. test students' understanding in both the individual student and group levels through quizzes to see the expected outcomes;

vii. score the quizzes and give each individual student in each group an improvement score, and

viii. add the individual improvement score to give a group score.

STAD can be applied to a wide range of situations, the major principle behind this technique is that learners cooperate to learn and are held accountable with respect to their teammates and their own achievements. This technique was chosen because amongst other cooperative learning techniques, STAD is easy for teachers to apply and can be used to teach a variety of subjects from primary to university level (Gambari and Yusuf, 2017).

Conventional method on the other hand is one among the several traditional teaching methods used by teachers to impart knowledge to the students. According to Dajal, Apochi and Paul-Fiase (2022), a Conventional method is convenient and usually makes the most sense especially with the larger class room sizes. Conventional method allows the teacher to address a larger group of students at once in the most general manner while still conveying information that he/she feels is most important according to the lesson plan.

Interest plays a substantial role among students studying science. This is the case because interest implies a favorable or unfavorable evaluative reaction towards something. It has been observed that most learners perform below average due to lack of interest; they are neither interested to learn nor do they do what they are expected to do (Atoo and Zam (2021).

Interest is considered to be the feeling of an individual towards a particular object or an activity. It means that a child will develop an interest in an object or activity that is found to be attractive or stimulating. Therefore, in a classroom situation, the learner will be attentive during a lesson only if the instruction is appealing to the learner (Danjuma, 2015). According to Danjuma (2015), students whose interests have not been developed, do not attend class regularly. Such students do not listen to the lesson carefully neither do they do their homework. For the learner to be interested in class activities, appropriate learning strategies should be used because such type of learning strategies have the tendency of developing students' interest to learn thereby enhancing achievement. In the same vein, Atoo and Zam (2021) observed that the uninspiring teaching methods adopted by science teachers have led to lack of interest and under-achievement of students in the sciences and basic science in particular.

The learning of basic science in schools could also be influenced by students' gender. Gender refers to cultural and social construct which describes or analyzes the roles, expectations, behaviours, characteristics and attributes of male and female based on their biological sex (Oriakhi and Igbudu, 2015). The disparity in the performance of males and females in the sciences has been studied over the years (Ajai and Imoko, 2015). Some of the studies show that girls perform poorly when compared to boys at all levels of science education in Nigeria (Ajai and Imoko, 2015, Adigun, Onihunwa, Irunokhai, Yusuf & Olubunmi (2015). Gender has been identified as a major factor that affects students' achievement in Basic Science examinations (Omiko, 2015). Dajal, Apochi and Paul-Fiase (2022) reported that gender had no effect on academic performance of students in science. These contradictory findings have prompted the inclusion of gender as one of the variables for this study.

According to Yakubu, Ezenwa, Wushishi and Jonathan (2019), convergent and divergent students can be identified easily by their areas of interest. Convergent students rely heavily on reading and experiment to process information while divergent students rely heavily on listening and watching to process information. Babatunde and Seyi (2019), stated that convergent and divergent students are very different in their learning styles but they can both benefit greatly from working with one another. Nwagbo and Aham (2015) observed that the population of students in most cases is made up of students of varying intellectuals, learning styles and attitudes which has

to a large extent affected students' academic performance. Ariyo., Bonire, and DhulKifl, (2017) reported that individuals differ in their characteristic ways of dealing with problems of different sorts, thereby resulting in individual differences in approach to problems-solving otherwise known as cognitive styles or learning styles. It is expected therefore, that the teacher should be familiar with the students learning abilities and be able to device the appropriate instructional strategy that can address such individual differences in the students. Since the methods used in a basic science classroom can go a long way in solving or at least ameliorating the poor interest and poor -retention of students in basic science; and the teachers being the architect of enhancement of achievement in the classroom, there is a need to examine the effect of some of these teaching methods on interest students. This study therefore examined the effects of Students –Team- Achievement- Division on upper basic Convergent and Divergent students' interest in Basic Science in Benue state.

Statement of the Problem

The National Policy on Education (FME, 2013) stated in its objectives that students be helped to become effective teachers with good mastery of content and strategy for effective teaching of science in Secondary Schools and Colleges of Education. Despite the objectives of Basic Science in developing students' interest in Science and Technology, providing students with scientific and technological knowledge and skills to meet contemporary societal needs, take advantage of the numerous career opportunities provided by science and become prepared for further studies in science resulting to national development, it was observed that, students have been performing poorly in Basic Science in Benue. According to the result computation portal of Benue State Education Board (BSEB, 2020), students have been performing poorly in Basic Science in the Basic Education Certificate Examination in Benue State. The abysmal performance of students in Basic Science at the upper basic level of the Universal Basic Education (UBE) closes many candidates' chances of studying science-based courses at the senior secondary school level as well as at the university level. Such students end up switching to arts and social sciences leading to low enrolment and turnover in the sciences, thus creating a gap in national development in the area of science.

Findings from related studies Ronald and Rema (2015); Abdul, Ansari, Ahmar and Rusli (2016); Joel and Samuel (2018) among others revealed that most of the failures recorded in students' performance in Basic Science have been attributed to lack of interest.

Purpose of the Study

The main purpose of this study was to examine the effects of Students –Team- Achievement-Division Instructional Strategy on upper basic Convergent and Divergent students' interest in Basic Science in Benue state. The specific objectives were to;

i.examine the difference in the mean interest scores of convergent and divergent students taught Basic science using Students Team Achievement Division and those taught using conventional method; and

ii. find out the difference in the mean interest scores of male and female convergent and divergent students taught Basic science using Students Team Achievement Division

Research Questions

1. What is the difference in the mean interest scores of convergent and divergent students taught Basic Science using Students Team Achievement Division and those taught using conventional method?

2. What is the difference in the mean interest scores of male and female convergent and divergent students taught Basic Science using Students Team Achievement Division?

Hypotheses

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

Ho1: There is no significant difference between the mean interest scores of Convergent and Divergent Students taught Basic Science using STAD and those taught using conventional method.

Ho2: There is no significant difference between the mean interest scores of male and female Convergent and Divergent students taught Basic Science using STAD.

Methods. The study adopted a quasi-experimental pre-test, post-test research design. The population of the study comprised upper basic eight students from 26 government owned co-educational upper basic schools in Makurdi Local Government Area of Benue State. The population of upper basic eight students was 3,113. Using Multi-stage sampling techniques, 160 upper basic eight students from four co-educational upper basic secondary schools in Makurdi Local Government Area were sampled and used for the study. The instrument used for collection of data in this study was tagged: Basic Science Interest Questionnaire (BSIQ). The instrument comprised two sections (A and B). Section A elicited information on demographic data of respondents such as gender and name of school. Section B consisted of Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD) and was assigned value points of 4, 3, 2, and 1 respectively for positive statements and in reverse order for negative statements. The instrument was structured based on adapted and modified four points Likert rating scale which consisted of 30 items on four rating scale responses. Hypotheses formulated for the study were tested using mean, Mann Whitney and Kruskal-Wallis.

Results.

The data collected from the study were analyzed and presented in the tables as follows:

Ho1: There is no significant difference between the mean interest scores of Convergent and Divergent Students taught Basic Science using STAD and those taught using conventional method.

Table 1: Summary of Mann Whitney Results of Interest scores of Students (Convergent and Divergent) Taught Basic Science using STAD and Those Taught Using Conventional Method

Group	N	Mean Rank	Sum of Ranks	Mann Whitney U	Z	P	Remark
STAD	84	116.19	9760.00	194.00	10.252	0.000	Significant
Conventional	76	41.05	3120.00				

Analyses on table 1 results of the Mann Whitney nonparametric mean rank test showed that the calculated p value of 0.000 is below the P≤ 0.05 level of significant and the computed Mann Whitney U value of 194.00 is higher than the 10.252 Z scores. The computed mean interest rank scores are 116.19 and 41.05 by STAD and Conventional groups respectively. The computed sum of ranks scores were 9760.00 and 3120.00 by STAD and Conventional groups respectively. These mean ranks were quite wide apart. This showed that the mean interest development of STAD and Conventional groups was significantly different when both groups were taught Basic Science. Consequently, hypothesis one which states that there is no significant difference between the mean interest scores of Convergent and Divergent Students taught Basic Science using STAD and those taught using conventional method, was rejected.

Ho_2: There is no significant difference between the mean interest scores of male and female Convergent and Divergent students taught Basic Science using STAD.

Table 2: Summary of Kruskal-Wallis Results of Interest scores of Male and Female Convergent and Divergent Students taught Basic Science Using STAD

Group	Gender	Cognitive Level	N	Mean Rank	H Value	Sum of Ranks	P Value	Remark
STAD	Male	Convergent	15	21.00		315.00		
	Female	Convergent	26	21.00		546.00		
					0.0056		0.943	Significant
	Male	Divergent	21	22.33		469.00		
	Female	Divergent	22	21.68		477.00		

Analyses on table 2 results of the Kruskal-Wallis test on gender showed that the computed p value of 0.943 was above the P ≤0.05 level of significant and the computed mean ranks were 22.33, 21.68, 21.00 and 21.00 by male divergent, female divergent, male convergent and female convergent respectively. This shows that the difference in interest development between male and female divergent and convergent students taught Basic Science using STAD Strategy was not significant. Hence, hypothesis two which states that there is no significant difference between the mean interest scores of male and female convergent and divergent students taught Basic Science using STAD was accepted.

Discussion. Hypothesis one addressed Mean interest scores of Basic Science Convergent and Divergent students taught using STAD and those taught using Conventional method. The Mann Whitney nonparametric mean rank test shows that the calculated p value of 0.000 is below the P≤ 0.05 level of significant and the computed Mann Whitney U value of 194.00 was higher than the 10.252 Z scores. The computed mean interest rank scores were 116.19 and 41.05 by STAD and Conventional groups respectively. The computed sum of ranks scores were 9760.00 and 3120.00 by STAD and Conventional groups respectively. These mean ranks were quite wide apart. This implies that the mean interest development of STAD and Conventional groups was significantly different when both groups were taught Basic Science. Consequently, hypothesis one which states that there is no significant difference between the mean interest scores of Convergent and Divergent Students taught Basic Science using STAD and those taught using conventional method, was rejected. The finding was consistent with that of Ronald and Rema (2015), Gambari, Yusuf and Thomas (2015) and Joel and Samuel, (2018) this may be because they also worked on variables that are similar to the researcher's work.

Hypothesis two addressed the Mean interest scores of Male and Female Convergent and Divergent students taught Basic Science using STAD.

The results from Kruskal-Wallis test on gender showed that the computed p value of 0.943 was above the P ≤0.05 level of significant and the computed mean ranks were 22.33, 21.68, 21.00 and 21.00 by male divergent, female divergent, male convergent and female convergent respectively. This implies that the difference in interest development between male and female divergent and convergent students taught Basic Science using STAD Strategy was not significant. Hence, hypothesis two which states that there is no significant difference between the mean interest scores of male and female convergent and divergent students taught Basic Science using STAD was accepted. This is in line with the works of Ariyo, Bonire, and DhulKifl, (2017) and Abdul, Ansari, Ahmar and Rusli (2016).

Conclusion

Based on the study findings the study concluded that; there is significant difference between the mean interest scores of Convergent and Divergent students taught Basic Science using STAD and those taught using Conventional method. There is also no significant difference between the mean interest scores of male and female Convergent and Divergent students taught Basic Science using STAD.

Recommendations

Based on the findings, the following recommendations are made.

i.Training of science teachers to get acquainted with the use of STAD should be encouraged in the teaching and learning of basic science in Nigeria schools.

ii. Teachers in implementing the STAD instructional strategy should motivate and encourage both male and female students ensuring that, all sexes are treated equally in the group.

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