EFFECT OF STUDENTS' INTERACTION PATTERNS ON ACHIEVEMENT AND INTEREST IN CHEMISTRY AMONG SECONDARY SCHOOL STUDENTS IN AWGU EDUCATION ZONE

BY

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Abstract
This study determined the effect of students' interaction patterns on their achievement and interest in Senior Secondary School Chemistry. The general purpose of the study was to determine if subject interactions like co-operative, competitive and individualistic patterns enhance achievement and interest in secondary school chemistry. Three research questions and three null hypotheses guided the study at 0.05level of significance. The literature related to the study was reviewed under conceptual framework, theoretical framework and empirical studies. The design adopted for the study was three thousand and six hundred (3600) SS2 students. The sample was two hundred and forty (240) students drawn through stratified random sampling technique. They were drawn from two female and two male schools. The instruments for data collection were Chemistry Achievement Test (CAT) and Chemistry Interest Inventory (CII). They were face and content validated by three experts in Science Education from Department of Science and Computer Education Enugu State University of Science and Technology (ESUT) and the others from Faculty of Education Godfery Okoye University (GOU) and from the department of Measurement and Evaluation of Enugu State College of Education (Technical), Enugu. Three intact classes were assigned to co-operative, competitive and individualistic groups that were used for the study. Mean and standard deviations were used to answer the research questions while T-test analysis was used to test for the three null hypotheses at 0.05level of significance. The study revealed that the three interaction patterns, Co-operative, competitive and individualistic adopted for the study enhanced achievement and interest of students in chemistry. It also showed that the mean scores of the girls were consistently lower than that of the boys in the three groups. The three null hypotheses were significant indicating that T-calculated in each is greater than P-values. Recommendations were made based on the findings of the study.

Key words: Achievement, Interest, Interaction, Students and Chemistry.

Introduction

Teaching and learning of science have significant roles towards technological development in developing countries. Qualitative teaching methods enhance students learning process. There are different types of science teaching that is embedded in our life and society. Such teaching strategies are those that are in line with the Science Process Skills (Okeke, 2011). The performance of students in science based subjects like chemistry is closely related to the theoretical and practical knowledge of Chemistry (Akpan, 2010). Some teach science in isolation from the Science Process Skill of discovery or the conceptual applications. The six Science Process Skills are observing, classifying, measuring, communicating, inferring and predicting (Okeke, 2011). This however, depends solely on the subject at various classes and also on particular factors within and without the teaching and learning environment (Johnson and Johnson, 1987). The practical experience in chemistry also contributes to an integral part of Science Process Skill. The subject matter consists of teaching chemistry topics that can be verified experimentally with an objective to create an enabling environment to stimulate students' interest in groups arranged as cooperative, competitive and individualistic (Johnson and Johnson, 1987). This reduces chemistry reactions that are commonly presumed as abstract and boring (Okeke, 2015).

Ezeudu (1995) posited that availability of laboratory equipment's, chemicals and materials, laboratory personnel, working conditions in the laboratory and safety measures, substantial recommended textbooks and accurate periods allocated for the teaching of chemistry could enhance effective teaching of chemistry. She further stated that carefully controlled concept mapping strategy for effective teaching of chemistry could be achieved. In addition, inadequate funding has contributed to inadequate facilities and resources required for the successful implementation of school curriculum (FME, 2004). In the light of this, the aim of the present study was to explore strategies that promotes effective teaching of chemistry in secondary schools which in turn increase or enhance the performance of students in chemistry both in theory and practical

making students become self-reliant (Okeke, 2011).

A greater deal of work has been done in an effort to identify problem that are inherent in the teaching of chemistry in secondary schools. These factors influence the effective teaching of chemistry which in turn plays a vital role in the lives of the students as it affects their performance. These include: physical classroom and laboratory: instructional arrangement and school management (Johnson etal 1987). The physical classroom and laboratory represents the presence of good ventilation, availability of good white board marker and preparatory room, enough chairs and tables, charts and clean environment provides effective learning (Okeke,2011). The other factors include the presence of instructional materials in the laboratory such as apparatus and chemicals (Jegede and Brown, 1998).

To achieve the desired objective of teaching chemistry effectively in secondary schools, an effective science teaching strategy was proposed by the researcher. It is a gateway to attainment of scientific and technological greatness and this can be achieved via integrating theory with practical work (Okeke, 2007). Laboratory program is an integral part of chemistry teaching (Okeke, 20011). It is needed as a means of obtaining and learning scientific information which stimulates learners' interests as they are made to personally engage in useful scientific activities and experimentation (Okeke, 2011). It is also needed as means of verifying scientific principles, laws or/and theories that are already known to the students (Ezeudu, 1995). It can be easily engaged with text books and other learning materials. Knowledge obtained through laboratory work promotes long term memory (Okeke. 2011). Abdulahi (1982), stated that even though laboratory activities breed interest in students' attitude to science education, it does not warranty the realization of the whole. Interest could be defined as an activity one enjoys and devotes his/her time in doing or studying (Okeke, 2011).

Interest could also be seen as a feeling one has in the cause of wanting to know or learn more about something or somebody. Interest differs from one's personal attitude which refers to the manner of behaving towards somebody or something.

Cooperative Learning refers to a method of teaching and classroom management that emphasizes group work and a strong sense of community. This model fosters students' academic and social growth and includes teaching techniques such as "Think-Pair-Share" and reciprocal teaching. Cooperative learning falls under the student centered approach because learners are placed in responsibility of their leering and development. This method focuses on the belief that students learn best when working with and learning from their peers. In order to identify your personal teaching style, it is important to acknowledge your personal values toward education and how your students learn. Understanding your teaching style early enough will prove effective for both you and your students, creating and maintaining a balance between your teaching preferences and that of your students' learning preferences.

Inquiry-based learning is a teaching method that focuses on student investigation and hands on learning. In this method, the teacher's primary role is that of a facilitator, providing guidance and support for students through the learning process. Inquiry-based learning falls under the student-centered approach, in that students play an active and participatory role in their own learning process in small group and individuals. According to (Okeke 2011) an instruction is a description of performance you want the learners to exhibit before you consider them competent. An instructional objective is a description of intended learning results (Okeke, 2011).

The interaction patterns of interest to the researcher in this study includes cooperative, competitive and individualistic. Johnson and Johnson (1987), stated that cooperative social interaction is one in which the goal attainment of the group is more important than the goal attainment of the individual. Similarly Johnson and Johnson (1987), defined competitive interaction patterns as one in which the goal attainment of the individuals are more important than the goal attainment of the groups. Here, the teacher divides the members of the class into 7 or 8 groups of 5. Each group struggles to outperform the other. In individualistic interaction, the goal attainment of the individuals is for the individual (Johnson and Johnson, 1987). Each person is on his or her own rather than the groups as directed by the teacher. Ahaneku (1998), reported that the individual reward structure promotes higher achievement than group reward structure. Johnson and Johnson (1987), concluded in the opposite. Okeke (2016), believed that inter group competitions (competitive interactions) promotes high achievement. On the other hand (Johnson and Johnson 1987) maintained that inter group competition is not the only necessary condition for high achievement. Teaching and learning is an encounter which demands voluntary contribution from all parties involved to achieve the desired result in school system. Attitudes, like academic achievement, are significant aftermaths of science education in high schools as research has confirmed that attitudes are linked with academic achievement and that attitudes predict behaviors (Nworgu, 2006).

Stanwhort (1983) opined that teachers' attitudes toward science are a critical stimulus on their instruction and have a direct correlation to the instructional methods or strategy adopted. To bring conceptual change, it is equally important to promote students' awareness of the limitations of the instructional methods/models, as it is to provide the learners with accurate information. Adesoji (2008) have investigated the effect of teacher-directed and self-directed -problem-solving strategies on students' attitude toward chemistry and came to conclusion that if students were allowed to develop higher cognitive processes through problem solving strategies, either as teacher directed or self-directed, their attitudes toward chemistry might change positively. This will also lead to self-reliance in science education that the philosophy of education is all about. Similarly interest according to various theories is the key to success in any human endeavor. It is the desire of that person (human motivation); motivation may be rooted in the basic need to minimize physical pain and maximize pleasure, or it may include specific needs. This means that success or failure depends to a great extent on the interest or attitude of the learners involved in learning models (Jegede, 1996). The attitude of children in their school work is deeply affected by the degree of encouragement their parents give them and by their own level of emotional stability. The students often muddle their parent's attitude, where this happens, there is the tendency for them to exhibit positive or negative of encouragement by way of information or demonstration given or exhibited to them form the onset. It therefore, becomes imperative to estimate students/ learners' attitudes towards the Cooperative Learning (Nworgu, 2006).

Co-operative Learning refers to a method of teaching and classroom management that emphasizes group work and a strong sense of community (Nwagbo and Okoro 101.). This model fosters students' academic and social growth and includes teaching techniques such as "Think -Pair-Share" and reciprocal teaching (Staberg, 1985). Cooperative learning falls under the student-centered approach because learners are placed in responsibility of their learning and development. This method focuses on the belief that students learn best when working with and learning from their peers (Nwagbo and Okoro, 2012). In order to identify your personal teaching style, it is important to acknowledge your personal values toward education and how your students learn (Okeke, 2015). Understanding your teach style early on will prove effective for both you and your students, creating and maintaining a balance between your teaching preferences and your students' learning preferences. The interaction patterns of interest to the researcher in this study includes cooperative, competitive and Individualistic. Johnson and Johnson (1987) stated that cooperative social interaction is one in which the goal attainment of the group is more important than the goal attainment of the individual. Similarly Johnson and Johnson (1987) defined competitive interaction patterns as one in which the goal attainment of the individuals are more important than the goal attainment of the groups. Here, the teacher divides the members of the class into 7 or 8 groups of 5. Each group struggles to outperform the other. Individualistic interaction, the goal attainment of the individuals is for the individual (Johnson and Johnson, 1987). Each person is on his or her own rather than the groups as directed by the teacher. Ahaneku (1998) reported that the individual reward structure promotes higher achievement than group reward structure. Johnson et al (1987) concluded in the opposite. Okeke (2016) believes that inter group competitions (competitive interactions) promotes higher Achievement. On the other hand (Johnson and Johnson 1987) maintained that inter group competition is not the only necessary condition for high achievement Nwagbo and Okoro (2012). Should grouping students into small groups and make them compete enhance their learn ability and promote interest? This study should show that or otherwise when completed.

Purpose of the Study

The general purpose of the study is to determine students' interaction patterns on achievement and interest in Senior Secondary School Chemistry in Awgu Education Zone. Specifically the Study

i. determined the effect of subjects' interaction patterns on students' achievement in chemistry,
ii. determined the effect of subjects' interaction patterns on students' interest in chemistry,
iii. determined the difference in the interaction of male and female students in chemistry.

Research Questions

1. What is the effect of interaction patterns on the students' achievements in chemistry?
2. What is the effect of interaction patterns on the students' interest in chemistry?
3. What is the difference between interaction patterns on the male and female students exposed to different interaction patterns?

Hypotheses

Ho_1 Mean achievement scores of students exposed to the interactions are not significant.

Ho_2. Mean interest inventory scores of students exposed to the interactions are not significant.

Ho_3. There is no significant difference in the interaction of Male and Female students.

Research Method

Table one: Design of the Study

DESIGN	ACHIEVEMENT	INTEREST
EXPERIMENTAL	$O_1X_1O_2$	$O_1X_1O_2$
	$O_1X_2O_2$	$O_1X_2O_2$
	$O_1X_3O_2$	$O_1X_3O_2$
CONTROL	O_1 CO_2	O_1 CO_2

The three instructional groups were all assigned pretest in chemistry and the scores were collected and collated and kept. The three instructional interactions were employed. They are co-operative, competitive and individualistic interaction patterns. In cooperative interaction the teacher divides the intact classes into 5 to 7 or 8 groups and gave them chemistry task to perform. They were allowed and encouraged to communicate their ideas to each other. The 3 interactions have the same lesson plans except in instructional interaction activities. In competitive, the students were urged not to share ideas, skills during the course of instructions. In the individualistic interaction the students were made to work alone as a member of the intact class without grouping, cooperating and competing with one another. They were rewarded as an individual and not as a group. Pretest and Posttest of Chemistry Achievement Test (CAT) and determined the effect of subject's interaction patterns on students' interest in chemistry. Determined the difference in the interaction of male and female

Students in Chemistry

Chemistry Interest Inventory (CII) were administered by their regular teachers who received training by the researcher.

The design of the study is quasi experimental. Specifically, it is a pretest posttest, nonequivalent control group design according to Tuchman (1978). The design could be represented below $O_1X_1O_2$, $O_1X_2O_2$, $O_1X_2O_3$, O_1, CO_2 .O_1 stands for Pretest, O_2 stands for Posttest, X_1 stands for treatment or Experimental for Cooperative, X_2 stands for treatment or Experimental or Competitive and X_3 stands for Individualistic treatment or Experimental

Table Two: Mean and Standard Deviation of Experimental and Control Groups

GROUP	N	MEAN	STD.DEVIATION	STD. ERRO MEAN
EXPERIMENTAL	5	29.2000	8.899444	3.97995
PRETEST	5	6.40000	3.20936	1.43527
POSTTEST	5	33.0000	3.16228	1.41421
ACHIEVEMENT	5	26.2000	3.11448	1.39284

Table two shows that the mean achievement score of posttest is 26.20 and that of pretest is 6.40 and the gain mean score is 19.80

Table 3: Mean and SD of the Pretest and Posttest of Students

EXPERIMENTAL GROUPS	STATICALLY TOOL	PRETEST	POSTTEST	ACHIEVEMENT GAIN SCORE
CO-OPERATIVE	MEAN SD	29.20 8.98	29.20 3.20	3.00 5.5.78
COMPETITIVE	MEAN SD	6.40 3.21	33.0 3.16	27.60 0.15
INDIVIDUALISTIC	MEAN SD	22.20 1.11	26.40 3.20	4.20 1.09

EXPERIMENTAL	10	18.5000	4.9714	1.57233
PRETEST	10	3.8000	1.39841	0.44222
POSTEST	10	26.3000	7.55792	2.39003
INTEREST	10	19.2000	5.53373	1.74992

EXPERIMENTAL GROUP	ST TOOL	PRETEST	POSTEST	INTEREST
CO-OPERATIVE	MEAN SD	3.8 1.47	26.30 7.56	22.60 6.09
COMPETITIVE	MEAN SD	88.50 4.97	28.50 4.92	10.00 3.05
INDIVIDUALISTIC	MEAN SD	19.20 5.53	29.20 5.53	10.00 3.05

From table three the Achievement gain scores for cooperative, competitive and individualistic are 3.00, 27.00 and 4.00 respectively.

Table 4: Mean and SD of Students' Interest Interaction Pattern

GROUPS	N	MEAN	STD DEVIATION	STD ERROR MEAN
EXPERIMENTAL	10	18.5000	4.9714	1.57233
PRETEST	10	3.8000	1.39841	0.44222
POSTEST	10	26.3000	7.55792	2.39003
INTEREST	10	19.2000	5.53373	1.74992

Table 6: Pretest Mean, Posttest Mean and SD interactions by Gender

EXPERIMENTAL GROUPS	GENDER	PRETEST MEAN	POSTTEST MEAN	GAIN IN MEAN	NUMBER OF STUDENTS (N)
COOPERATIVE	BOYS GIRLS	6.40 29.20	26.20 7.56	18.50 4.97	30 50
COMPETITIVE	BOYS GIRLS	8.90 33.00	33.00 3.46	5.53 1.4	30 50
INDIVIDUALISTIC	BOYS GIRLS	6.40 26.20	29.20 7.56	1.40 4.97	30 50

Result from tables 2, 3, 4 and 6 show the students in cooperative group had significantly higher score than students in the competitive group. Also students in the competitive group had higher score than the individualistic students. Generally, the students in the three interactions showed higher achievement and interest.

Summary of the Findings

Result of mean achievement and interest showed increased from pre- test to post test. There were increase in mean achievement and interest. The three hypotheses were significant because their T calculated were greater than P values. They are significant.

Discussion of the Findings

From the result of the findings, it is shown that the this study is in support of Nwagbo and Okoro (2012) and also in support of Johnson and Johnson (1987)

Conclusion

Students in cooperative group had higher mean achievement and interest score than the competitive group. Similarly, The Mean achievement and mean interest of the girls were consistently lower than that of the boys.

Recommendations

1. State and federal ministry of education should organize seminar and workshop for teachers in chemistry for training with the three interaction patterns
2. Teachers who may learn the teaching of the strategies should in turn teach other teachers

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