EFFECT OF ADVANCE ORGANIZER ON ACADEMIC ACHIEVEMENT AND BASIC TECHNICAL SKILLS AMONG PRIMARY SCHOOL PUPILS ON BASIC SCIENCE AND TECHNOLOGY

Cynthia Ifeyinwa Asogwa
ifeyinwacasogwa@gmail.com

And

Andrew Midala Mshelia
Umar Suleiman College of Education
Gashua, Yobe State
andrewmidala@gmail.com

ABSTRACT
This study investigated the effect of advanced-organizer and gender differences on academic achievement and basic technical skills among primary school pupils in Basic Science and Technology in Demonstration Staff Primary School, Umar Suleiman College of Education, Gashua, Yobe State. A pre-test post experimental and control research design were adopted. The sample consisted of 71 pupils drawn from primary five (5) were randomly selected and categorized into experimental and control groups. The experimental group were exposed to treatment for four (4) weeks. The instrument for data collection was Basic Science and Technology Achievement Test (BSTAT). It was validated and pilot tested with reliability co-efficient of $r=0.76$. A pre-test using Basic Science and Technology Achievement Test (BSTAT). It was administered to the two groups to determine equivalence in their academic abilities before treatment, the same instrument was administered as post-test to the two groups to ascertain the effect of the treatment. Two hypotheses were tested at 0.05 alpha level of significance using t-test statistic. The result revealed that: there was significant difference in academic achievement of pupils taught using advanced organizer and those taught with lecture method alone in favour of those taught with direct teaching using advance organizer. It was recommended that primary school teachers should use advance organizer in teaching Basic Science and Technology. They should be sponsored to attend conferences and seminars on Advance organizer, so as to make learning more meaningful, activity-oriented and child centred for effective teaching and learning of Basic Science and Technology.

Keywords: Advance organizer, Basic science and technology, Academic achievement

INTRODUCTION
Science and Technology Education is the foundation for sustainable national development. With the advent of modern science, the world is in every second being transformed into a favourable living environment. The impact of science on the economic development, increased standard of living, improved communication and every aspect of life
has made it mandatory for every nation to ensure that her intellectually gifted citizens take to science related courses (Asogwa & Yakubu, 2015). According to Agbowuro, Saidu and Jimwan (2017), the role of education as the foundation of social, economic, political and cultural development is undisputed. All over the world, education is expected to be highly rated in national development plans. Education is an instrument for social change which can bring about a meaningful development through skills acquisition (Wakili & Gulee, 2014). These skills acquisition can be at any level of education; be it primary, secondary or tertiary level. The foundation of such skills development is the primary and secondary schools where young scientists are groomed. A skill according to Hornby (2015) is having enough ability to do something well usually gained through training or experience.

Skill is the basic ability by which man adjust to life. Adeyemo (2009) described skills as a quality of performance exhibited by an individual as a result of participating in activity. Therefore, basic technical skills are needed to succeed in business. It has been reported that science and mathematics instruction should always be activity-based oriented (FRN, 2013). This can be observed in the method of teaching employed by teachers which involves both materials and human resources. Adeyemo (2009) listed the following as the roles of activity-based method in skills development practice in basic science and technology teaching: enhancing of children’s understanding through interaction among related and useful experience; involvement of their senses and emotions; development of new concepts.

The development of needed skills in learners depends on the teacher’s ability to make appropriate selection of lesson topic. Achimugu and Adeyemo (2009), gave the following factors as the basic guiding principles when choosing a strategy for a lesson in science for skills acquisition such as – the experience and competency of the teaching; the maturity and ability of the students; the availability of instructional aid and equipment, availability of workshops/laboratories and the previous experience or knowledge. Awodun (2016), Cirfat and Zumyil (2007) also noted that many teachers employ methods that enable them cover their syllabus, in most cases, but fail to pay attention to the learner, especially in terms of the academic achievement. According to them, the predominant method used by teachers in Nigeria schools is the ‘talk and chalk’ method (lecture method) which does not allow active participation of the learner in lesson. This leads to memorization of facts and concepts by learners without the basic understanding of the concepts and meaningful learning not achieved. Thus, there is need to use advance organizer as an enrichment of lecture teaching techniques when students lack subsuming or prior knowledge.
On this basis, the researchers came up with this study to find out whether Advance Organizers could enhance higher academic achievement and facilitate the development of basic practical skills among primary school pupils in basic science and technology subject. Basic science and technology is a core subject in the 9 years basic curriculum taught at the primary and junior secondary school. It exposes the learner to some basic skills in science and technology (Agbowuro, Saidu & Jimwan, 2017; Ibrahim, Jibrin & Deba, 2015). This is expected to assist the learners to acquire skills and be self-reliance, hence making learning more meaningful.

Advance Organizer is a brief, general statement in form of text, map, graphics, visual, or hyper-media prepared and used by the teacher to help students link what they already know (prior knowledge) with the new lesson, before presenting the new materials or introducing the new lesson. Ausubel (1963) introduced the concept of subsumption model as a pedagogical device in which central and highly unifying ideas are stated in terms of what is already familiar to the learner to which he or she can relate new ideas by subsumptions. Subsuming concept enhances integration of new concepts. It also acts as prior knowledge and is quite good at organizing information, so that learners can easily understand the concept taught. Advance organizer provides principles and ideas to the student’s cognitive structures directly, and helps the learner to integrate new materials with what they already know. It prepares the learners for new information (Bency & Nagarajan, 2015). Thus, Basic technical skills need to be presented to the learner in a way that touches his or her sub consciousness. This can trigger quick recalling of the basic skills being taught or learnt, thereby enhancing academic achievement; but how gender compatible would it be.

Gender and its manifestation in various educational activities appear to be a strong predictor of human conduct and academic performances. The age-old stereotype that boys are better than girls in science and technology has long been a focus of science feminist critics. Nevertheless, many researchers and educationist feel that gender difference is one of the factors that affect academic performance (Hofer, 2010; Okeke, 2011; Bell, 2015). Shaibu (2014) stated that gender plays no significant role in academic performance of students in science, technology and mathematics. Researchers in Science Education have shown their concern on gender related issues with the view of improving science teaching (Ona & Ugwu, 2010; Okeke, 2011; Muoneme, 2014). The difference is characterized by under representation and poor performance in science by female students (Bell, 2015). Also some studies have shown that male students achieve significantly higher than female students, while some studies revealed that female achieved higher (Usman 2008). It is also reported that male students achieved better
than female in science learning situation where learners are involved in carrying out activities and manipulation of scientific skills (Technology) (Ona & Ugwu, 2010).

However, Bichi (2002) observed that there is no gender related difference in achievement among students taught in evolution concept using problem-solving teaching strategy. Studies have shown that pupils achieve poorly in basic science and skills acquisition (Hofer 2010; Asogwa, Mshelia & Eze 2018). The weakness in content knowledge and meaningful understanding of learners in basic science and skills acquisition in particular was attributed to the method of teaching adopted by the teachers which neglects the learner (pupils). Achimugu (2006), Adeyemo (2009), Cirfat and Zumyil (2007) and Adewomi and Azeakpono (2012) also noted that many teachers employ methods that enable them cover their syllabus, in most cases, but fail to pay attention to the learners, especially in terms of their interest, academic achievement and skill acquisition. According to the authors, the predominant method used by teachers in Nigerian schools is the lecture method (“chalk and talk method”) which does not allow active participation of the learner in the lessons and this leads to memorization of facts and concepts by the learner without the basic understanding of the concepts.

Advance organizers have been effective in a variety of learning tasks. Using advance organizer based on students’ daily experiences and interest can facilitate the learning process and skills. The effects of advance organizers on transfer of learning have been documented in a series of studies. Awodun (2016) investigated the effects of advance organizer teaching approach on students’ academic performance in physics in senior secondary school in Ekiti State Nigeria. The study showed that Advance organizer teaching approach significantly influenced student’s academic performance in physics in senior secondary schools. In a related study, Ogbeka and Agerno (2016) investigated the effect of study question as advance organizers on students’ achievement in Basic Science in Makurdi Local Government Area of Benue State. The study pointed out that experimental subjects significantly achieved more than the control subjects while there were no significant differences in achievement between male and female students. Okey and Avwiri (2014) investigated the effect of pictorial performance and retention of concepts of electromagnetism in Obio-Akpor Local Government Area of Rivers State. The study revealed that pictorial Advance organizers is most facilitating in enhancing the performance and retention of the concept electromagnetism. Similarly, Wachanya, Anthony and Mbugua (2013) in their study found significance effects of use of advance organizers in the performance of chemistry students in Kenya who were taught using it and those who were taught with conventional method only. Findings also indicated that gender has no effects on chemistry achievement test scores when advance organizers are used.
Another study by Legbara and Okafor (2006) showed that significant difference exists between the experimental group and control group when advance organiser is used. Based on this, the teaching of science and technology should be activity based which involves “Hands on and minds on”, exploration and experimentation through the use of varieties of resources and strategies so as to arouse pupils interest and performance (Asogwa, Mshelia & Eze, 2018; Wakili & Gulee, 2014; Eyetsemitan, 2000). It is in this line that Cirfat and Zumyil (2007) stressed that improving science education has to start at the grassroots, thus the saying “catch them young”.

**RESEARCH QUESTIONS**

1. What is the difference between the mean achievement scores of pupils taught Basic Science and Technology using direct teaching enriched with advance organizer and those taught using direct teaching method alone?

2. What is the mean academic achievement scores of male and female pupils in the area of basic technical skills when taught Basic Science and Technology using direct teaching method enriched with advance organizer?

**HYPOTHESES**

The following null hypothesis were formulated and tested at 0.05 alpha level:

\[ H_{01} \]: There is no significant difference in the mean academic performance scores of primary school pupils taught Basic Science and Technology using direct teaching enriched with advance organizer and those taught using direct teaching methods alone.

\[ H_{02} \]: There is no significant difference in the mean academic achievement scores of male and female pupils’ in Basic Science and Technology when taught using direct teaching method enriched with advance organizer.

**METHODOLOGY**

The research design employed in this study was pretest, post-test quasi experimental and control group design. The pre-test was given to ascertain the equivalent level of the respondents before treatment. The average age of the pupils was 11 years. The population comprised 622 boys and 668 girls. The sample for the study was made up of 71 primary five pupils drawn from Demonstration Staff Primary School, Umar Suleiman College of Education Gashua, Yobe State. The sample were randomly selected from the population and categorized into experimental (37 pupils) and control groups (34 pupils). The experimental group were exposed to treatment for four (4) weeks. The instrument used for data collection was Basic Science and Technology Achievement Test (BSTAT) constructed by the researchers. The items
were set based on the table of specification considering Bloom’s taxonomy of educational objectives.

The instrument was validated by experts from the Department of Science Education, Ahmadu Bello University, Zaria and Basic Science and Technology teachers at the primary school after which twenty-five items were selected. A reliability coefficient of r=0.76 was obtained using test re-test method. Basic Science teachers were used as research assistants. After the pre-tests, the pupils in experimental and control groups were taught for four (4) weeks with lesson plans developed by the researchers. The experimental group was taught using direct teaching enriched with advance organizer. They were taught Science apparatus, simple machine, heat energy, temperature acid, and Base simultaneously. Immediately after the treatment, Basic Science and Technology Achievement Test (BSTAT) were administered as post-test. This was done to determine the effect of the treatment. The mean academic achievement scores of the groups were computed statistically using t-test to test the null hypothesis at P ≤0.05 alpha level of significance. During the treatment, the researchers presented the advance organizer to the pupils to link their prior knowledge (what the learners already know) with the new task and then took the pupils to the places where some of the materials were constructed. This aroused a lot of questions and from the questions, the pupils were allowed to manipulate and create things with the knowledge gained from the teachings using the material (such as waste materials) in their surroundings environment.

RESULTS

The data obtained from the study was analysed using t-test statistics. The results obtained are presented in table 1 and 2

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>DF</th>
<th>T-cal</th>
<th>Sig (P)</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>Male</td>
<td>37</td>
<td>34.24</td>
<td>6.10</td>
<td>69</td>
<td>12.32</td>
<td>0.01</td>
</tr>
<tr>
<td>group</td>
<td>Female</td>
<td>34</td>
<td>20.42</td>
<td>8.23</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Significant at P≤0.05</td>
</tr>
</tbody>
</table>

The result in Table 1 shows a p-value of 0.01 at degree of freedom (DF) of 69 obtained at P≤0.05 level significance. Since the P-value calculated is less than the 0.05, it means that there was significant difference in the mean academic achievement scores of primary school pupils taught using lecture enriched with advance organizer. Therefore, the null hypothesis of no significant different is rejected.

The result indicated that the use of direct teaching enriched with advance organizer improved pupil’s academic achievement significantly in Basic Science and Technology than lecture method only.
Table 2: Result of t-test Analysis of the Mean Academic Achievement of Male and Female Pupils in Basic Science and Technology When Taught Using Direct Teaching Enriched with Advance Organizer

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>DF</th>
<th>t-cal</th>
<th>P-val</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>22</td>
<td>29.54</td>
<td>4.01</td>
<td>35</td>
<td>0.56</td>
<td>0.55</td>
<td>NS</td>
</tr>
<tr>
<td>Female</td>
<td>15</td>
<td>27.89</td>
<td>4.11</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The result in table 2 reveals a p-value of 0.55 at degree of freedom (DF) of 35 obtained at P≤0.05 level of significance. Since the p-value calculated is greater than the 0.05, it means that there was no significant difference in the mean academic achievement of male and female pupils taught using lecture enriched with Advance organizer. Therefore, the null hypothesis is accepted.

DISCUSSION

The result in table 1 showed that there was significant difference in the mean academic achievement scores of primary school pupils in Basic Science and Technology when exposed to direct teaching method enriched with advance organizer. This means that the direct teaching enriched with advance organizer is effective. This finding is supported by the study of Afroz, Kalantari and Nosrah (2006) and Wachangai, Anthony and Mbugua (2013) which revealed that advance organizer improves academic achievement of students, facilitates access to all human knowledge, anytime and anywhere in a friendly, efficient and effective way. It could also be that the use of Advance organizer stimulated change and created conducive learning environment and made learning more meaningful and responsive to specific need of the pupils.

The results of the analysis presented in Table 2 indicated that there is no significant difference in the mean academic achievement scores of male and female student taught using lecture enriched with Advance organizer. This implied that the use of advance organizer strategy is gender friendly. The finding conforms to that of Okey and Avwiri (2014) who observed in their study that both male and female pupils who were taught using advance organizer performed equally well in the mean academic achievement scores. This may be due to participatory approach and activity-base in the process of learning Basic Science and Technology using direct teaching enriched with advance organizer.

Similarly, Bency and Nagaraja (2015) revealed that the interactive nature and the entire “fun state” involved in using advance organizer in learning process, quickly bridges the gender gap in teaching and learning process. This is because advance organizer helps the learner to visualize the concept learned, leading to meaningful and deeper understanding of the topic taught.
CONCLUSION

The study revealed that the use of direct teaching method enriched with advance organizer enhanced the academic achievement of primary school pupils in Basic Science and Technology. The use of advance organizer in teaching motivated the pupils and enhanced the quality of instrument and understanding of scientific concepts, thus leading to meaningful and improved academic achievement among male and female pupils in Basic Science and Technology.

RECOMMENDATIONS

Based on the findings of the study, it was recommended that:

1. Basic Science teachers should use direct teaching method enriched with advance organizer in teaching Basic Science and Technology concepts because it enhances academic achievement of pupils and is gender friendly.

2. Teachers should always use the pupils’ immediate environment to source for science teaching materials as this will assist the pupils to understand Basic Science and Technology concepts better.

3. Pupils should be encouraged to be creative by taking part in basic practical skills activities.

4. Local education authority should organize workshops for primary science teachers on the use of direct teaching method enriched with advance organizer.

REFERENCES


