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Enhancing the Comprehension of Basic Science Through Visual – Analogy

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Abstract
The study investigated the effects of visual-analogy and teacher expository instructional strategies on pupil's learning outcomes in Basic Science in Ondo State. It also examined the effect of visual-analogy and teacher expository instructional strategies on pupil's attitude towards Basic Science in the study area; and investigated the effect of visual-analogy and teacher expository instructional strategies on pupil's retention of Basic Science concept in the study area. These were with a view to determining a better way of improving the performance, attitude and retention ability of pupil's in Basic Science.The study adopted non-equivalent pre-test, posttest control group quasi-experimental research design. The study population comprised primary school pupils in Ondo State and the study sample comprised of 40 public primary III pupils in two intact classes from two schools in Ondo West Local Government area of Ondo State .One Local Government was selected from one of the 3 senatorial districts using random sampling technique based on availability of laboratory and library facilities. The sample was selected using multi-stage sampling technique. One experimental group and one control group were adopted for the study. The experimental group was taught using the visual-analogy strategy while the control group was taught using conventional method. Two instruments were used to elicit information from the respondents. Science Achievement Test (SAT) and Basic Science and Questionnaire on Pupils Attitude towards Basic Science (QPABS). The SAT was a 25-item test which tested the knowledge acquired by the pupils in basic science while the QPABS was a 25-item questionnaire which centered on pupils attitude towards basic science (QPABS). Three research hypotheses were formulated and tested. Data were analyzed using t-test analysis statistical tool.The results of the study showed that visual-analogy instructional strategy is more effective in improving pupil's academic performance in Basic Science compared to teacher expository instructional strategy ($t= 3.576$, $p < 0.05$). The results also showed that pupils' exposed to visual-analogy instructional strategy exhibited better attitude towards Basic Science than their counterparts exposed to teacher expository instructional strategy ($t= 3.123$, $p<0.05$) .The results further showed that visual analogy instructional strategy is more effective in enhancing retention ability of pupils' in Basic Science compare to teacher expository instructional strategy ($t= 3.312$, $p<0.05$).The study concluded that the visual-analogy instructional strategy positively improved the academic performance, attitude and retention abilities of pupils in Basic Science. Basic Science teachers should therefore use visual-analogy instructional strategy to teach Basic Science in primary schools.
Keywords: Comprehension Visual-Analogy, Basic Science, Teacher Expository method of teaching

1.1 Introduction

Education is the best legacy a country can give to her citizens. Education is a human right that should be accorded to all human beings solely by reason of being human. Science today represents, for many, the paradigm of the progress of human knowledge and achievement. The primary aim of science is to find out general explanation, understanding, prediction and control of natural events around us. Science education is the field concerned with sharing science content and process with individuals not traditionally considered part of the scientific community. One of the objectives of science education is to develop students' interest in science and technology. The learners may be pupils, students or adults within the general public. The field of science education includes work in science content, science process (The scientific method) and teaching pedagogy. Basic science education is a field of study which is concerned with producing a scientific literate society. Basic science and technology are known to be the bed rock of modern development. Basic science is just as important as learning other subjects like mathematics and history. Because the subject is so vast, learning the basics right from the early learning days will enable one to decide whether to pursue a higher education in the subject.

Research reports have revealed that graduates of Integrated or Basic Science leave much to be desired in terms of their achievement in Junior Secondary School Certificate Examinations (JSSCE) (Nwachukwu & Nwosu, 2007). For the past two decades, students' achievement in science subjects are consistently reported to be very poor (Akubuilo, 2004; Ahmed, 2007; Asuafor, 2008). Study shows that the results students' performance had been on the decline. This could be a reflection of the fact that the students have not demonstrated the necessary cognitive reasoning skills needed for good performance in their three years of junior secondary school. It could even be that the appropriate teaching strategy was not used or worse still that the students were probably not taught the required Basic Science concepts. Students learn science to gain factual knowledge and skills as well as passing subject knowledge examination.

Learning is a personal activity and each student has to construct his or her own knowledge. For learning to be personalized, it demands that learners should show commitment and interest, as well as actively participate in the learning process for meaningful understanding and assimilation of facts. This implies that learning could be meaningful and effective when students reflect on what is taught develop interest on the subject matter and construct new knowledge based on their understanding of the concepts. In view of this, science teaching ought to be proactive and student-centered for meaningful learning and understanding. Njoku (2004) had observed that science teaching in Nigeria is still done expository even when the method used by the teacher neither promotes students interest nor academic achievement; partly because of the teachers' inadequacies and partly because of their reluctance to adopt innovative teaching approaches which had been proved effective in enhancing learning outcomes.

Attitudes associated with science appear to affect students' participation in science as a subject and impact performance in science. It is generally believed that students' attitude towards a subject determines their success in that subject. In other words, favorable attitude result to good achievement in a subject. A student's constant failure in a subject can make him/her to believe that he/she can never do well on the subject thus accepting defeat. On the other hand, his/her successful experience can make him/her to develop a positive attitude towards learning the subject. To change attitudes, new attitudes must serve the same function as the old one. This suggests that student's attitude towards science subjects could be enhanced through effective teaching strategies.

As importance as basic science is, researches in science have shown that students have difficulties in understanding scientific concepts across all ages and levels and show negative attitude toward this subject and therefore perform poorly in it. To alleviate the poor performance in basic science at the lower primary school level, the use of a variety of visualization tools for teaching and learning science is necessary because students better understand scientific concepts when they see things for themselves most especially through experimentation. The visualization of science education is used in the widest sense, from physical models to a variety of images, multimedia and interactive animation.

An analogy is the comparison of two similar concepts "that are neither completely similar nor completely different". By definition, an analogy has two domains: a base domain and a target domain. The base domain (analog) is usually a familiar object such as a plant, and the target domain is usually an unfamiliar object such as a journal. Analogies allow new material, especially abstracts concepts, to be more easily assimilated with students' prior knowledge, enabling them to develop a more scientific understanding of the concept. Dagher (1995) reviewed several studies and comments on the role of analogies. She argues that although several studies claim that conceptual change occurred, analogies simply served as references for initial explanations or conjectures rather than bringing forth a conceptual change. Chiu (2000) argues that analogies are considered a way of assimilating new knowledge to an existing structure and, therefore, is not a conceptual change. Visual-analogy is a comparison of something unfamiliar with something familiar in order to explain a shared principle in a visual form. Visual- analogies are believed to help students learning by providing visualization of abstract concepts, by helping the students to compare similarities from the real world with the new concepts, and by increasing students' motivation.

Arnold and Millar (1996) said that analogies can support understanding by abstracting the important ideas from the mass of new information, making clear the system boundaries and introducing the appropriate language in which to frame a scientific explanation. The power of analogical relationships is said to be based in their potential to comprise an entire set of associative relationships between features of the concepts that are compared (Glynn, 1991).The key role that analogies can play has been analysed by Venville & Treagust (1996) using classroom evidence. According to their findings, analogy can act as:

- A sense maker to transfer the basic structure from a familiar domain to an unfamiliar one in order to establish intelligibility of the new science material being taught
- A memory aid to help students recall a concept which is difficult to remember
  A transformer which facilitates the change in the mind of the learner from 'matter' to 'processes'
- A motivator to enhance the self-efficacy of students and give them confidence in their ability to learn the science content

Despite the apparent benefits that analogies can provide as pedagogical tools, there are also warnings in the use of the strategy (Kircher, 1989; quoted in Duit, 1991). Uncritical use of analogies may generate misunderstanding, and this seems to be especially so when unshared attributes are treated as valid or when the learners are unfamiliar with the analogy (Harrison &Treagust, 1993). A careful examination of all the aspects of an analogy seems to be a pre-requisite to using it effectively. Harrison & Treagust (1993) have suggested that three elements are essential for the appropriate use of analogies: the need to consider the students' background so that the chosen analogy is familiar to as many students as possible, the shared attributes should be precisely identified by the teacher and the students, and where the analogy breaks down should be explicitly identified. Other authors, as a result of analysis and reflection about the way in which analogies are used in textbooks and classrooms have produced some models or teaching approaches for effective use of analogies in instruction. The

'bridging with analogies' approach of Clement et. al.(1989) and the TWA (Teaching with Analogies) model of Glynn (1991) are some examples. Glynn proposes an abstract representation of analogy; he calls the familiar concept the analogue and the unfamiliar one, the target, and considers that both can have a super ordinate concept. The TWA model arose from an analysis of science textbooks in which key operations performed by the authors were identified when using effective analogies from the standpoint of instructional design.

In spite of the potentials that analogies might have in promoting the learning of science, several authors have expressed their concern that students often misinterpret the analogies provided by them. In fact, Duit (1991) warned that learning with analogies can create learning difficulties and that students are capable of getting wrong impression from analogies. There is also the tendency that students may confuse analogies with reality except the teacher is capable of showing where the analogy breaks from reality. In other words, the teacher must be conscious of the limitations of the use of analogy; if the students are to gain from its potentials.

One problem often described by educators is that students do not retain information. Cooper, Nye, Charlton and Lindsay (1996) expressed this concern of teachers by relaying that students forget a large amount of material during summer breaks. Poor students' retention is widely acknowledged anecdotally. Most students have spent thousands of hours in the classroom learning, their result after examinations is often surprisingly disappointing, and forgetfulness believed to be the cause. Mazzeo and Dossey (1997) observed that the educational failure among students are partly explained by the fact that students after learning the information in the first place tend to forgets the learning concept. The truth is, the beauty of learning is lost when learnt material is forgotten, and this is particularly common for knowledge acquired in school. Since poor retention lowers the bar of students' performance, promoting better achievement in students becomes a challenge teachers face day to day, for instance, teachers have to spends extra time re-teaching concepts that has once been taught in previous lessons or previous year, this cycle of learning, forgetting and re-learning effects students' achievement and can contribute to students' frustration.

It is on the basis of this that this study intended to investigate how much visual analogy instructional strategy can help in improving academic performance of pupils in Basic Science, enhance retention of Basic Science concept and change in pupils' attitude towards Basic Science.

1.2 Statement of the Problem

Science is a process of acquiring desirable knowledge. As important as Science is, it has however been observed by previous studies that performance of pupils' in Basic Science at the lower primary schools is not encouraging due to inappropriate use of instructional strategy by teachers at this level of education. A number of methods have been devised to teach this subject, among which is the visual-analogy instructional strategy which is self-regulated. The efficacy of this strategy on the learning outcomes of pupils in lower primary school has enjoyed low report from literature; hence this study.

1.3 Purpose of the Study

The general purpose of this study is to find out the effects of visual-analogy instructional strategy on the learning outcomes of primary school pupils in Basic Science in Ondo West Local Government Area of Ondo State, Nigeria. The specific objectives of the study are to:

(a) compare the effects of visual-analogy and teacher expository instructional strategies on pupils' performance in Basic Science in Ondo West Local Government Area of Ondo State;
(b) examine the effects of visual-analogy and teacher expository instructional strategies on pupils' attitude towards Basic Science in the study area; and
(c) investigate the effects of these strategies on pupils' retention of Basic Science concepts in the study area.

1.4 Hypotheses

The following hypotheses were formulated and tested:

(i): There is no significant difference in the academic performance of pupils' exposed to visual-analogy and teacher expository instructional strategies in Basic Science.
(ii): There is no significant difference in the attitude of pupils' exposed to visual-analogy and teacher expository instructional strategies in Basic Science.
(iii): There is no significant difference in the retention ability of students' exposed to visual-analogy and expository instructional strategies in Basic Science.

1.5 Scope of the Study

The study covered public Primary III Pupils' in their intact classes selected from Ondo West Local Government Area of Ondo State. Two primary III intact classes were used for the study and were randomly assigned into groups A and B. The choice of primary III pupils is based on the fact that the study requires some level of

maturity. Two public primary schools was selected from the LGA using purposive sampling technique based on availability of facilities such as laboratory and library The Basic Science topics covered were taken from the primary III Syllabus which are energy, forms of energy (light energy), forms of energy (heat energy), and uses of light energy. The strategies considered are visual-analogy and teacher expository instructional learning strategies. Pupils variables covered are learning outcomes (academic performance, retention and attitude).

1.6. Methodology

This discussed the research design, population, sample and sampling technique, validity and reliability of the research instruments, procedure for data collection and method of data analysis.

1.7. Research Design

The study adopted non-equivalent pretest, posttest control group quasi-experimental research design to verify the effect of visual-analogy and teacher expository instructional Strategies on learning outcomes of pupils in Basic Science. The non-equivalent pretest, posttest, control group design is a type of quasi-experimental research design which is similar to experimental design except for the lack of randomization into groups. The non-equivalent pretest posttest design is used for this study because primary school exists in intact classes and the randomization of pupils into groups for experimental purpose is simply not allowed to avoid the disintegration of the classes, this is to ensure that the experiment has a strong level of internal validity. The pre-test and post-test implies that measurements are taken before and after the intervention. The pretest helps to ascertain the initial cognitive level before the treatment while the posttest helps to assess the differences between the two groups after treatment. The results of the two groups were then compared to establish baseline for the effect of the treatment and ensure the effectiveness of the design.

The design is represented as follows:

O_1 X_1 O_2 O_3 - Experimental group A
O_4 X_2 O_5 O_6 - Control group B

where O_1 and O_4 are the pre-test scores of the groups A and B; O_2 and O_5 are their respective post-test scores, while O_3 and O_6 are the retention scores for groups A and B.

X_1= Visual-analogy Instructional Strategy (VIS)

X_2= Teacher-expository Instructional Strategy (TIS)

The variables examined in this study are:

i. **Independent variable:** These are the teaching strategies used in this study . They are Visual analogy and Teacher expository method.

ii. a. **The dependent variable:** in this study is the pupils' is the Science Achievement Test (SAT) scores. Three tests were used to measure achievement. One of the tests measured pupils' entry behavior in the topics chosen for the study. The second test measured pupils' achievement at the conclusion of the study. The third measured the retention level of the pupils.

b. i. Questionnaire scores on Pupils' Attitude towards Basic Science (visual-analogy)

ii. Questionnaire scores on Pupils' Attitude towards Basic Science (teachers expository method)

1.6.2 Population of the Study

The population for the study comprised all primary school pupils in Ondo West Local Government area of Ondo State.

1.6.3 Sample and Sampling Techniques

The study sample comprised of 40 public primary III pupils in two intact classes from two schools in Ondo West Local Government area of Ondo State .One Local Government was selected from one of the 3 senatorial districts using random sampling technique based on availability of laboratory and library facilities. The sample was selected using multi-stage sampling technique. One experimental group and one control group were adopted for the study. The experimental group was taught using the visual-analogy strategy while the control group was taught using expository method.

1.6.4 Research Instruments

Two research instruments were used for data collection, they are: Science Achievement Test (SAT): this was used for pre-test, post-test and retention test and Questionnaire on Pupils' Attitude towards Basic Science (QPABS): this was used to assess the attitude of the pupils before and after the intervention. The SAT was a 25 items; 4-option structured multiple choice tests drawn from the concepts of Energy, Forms of energy (light energy), and Uses of light energy. The PBSAT was a 25 items rated on the 2 way closed-ended type scale of YES or NO developed for assessing students' attitude in Basic Science.

1.6.5 Validity of the Research Instrument

The two instruments SAT and QPABS was submitted to experience Basic Science Teachers in primary schools

and supervisor for face and content validation. The appropriateness of the items and content coverage considering the grade level and the objective of the study was checked. Comments and suggestion was noted.

1.6.6 Reliability of the Research Instrument

Pilot testing was carried out by administering the instrument on 20 primary school pupils' from an intact class of a co-educational primary school that was selected outside the study area but had same related characteristics as the sample schools. Test retest method was used to generate two set of scores for the pupils and Pearson Product Moment Correlation (PPMC) was used to calculate the reliability of the instruments, SAT was found to be 0.61.This shows that the instruments are reliable and were used for the study.

1.6.7 Procedure for Data Collection

The procedure for data collection was in three phases, the first phase (SAT) was administered as pretest to the pupils in the experimental group and the control group to find out the pupils' entry behaviours'. In the second phase, pupils in the experimental group were taught using visual-analogy instructional strategy and the control group was taught using teacher expository method. Topics taught in Basic Science were concepts of Energy, Forms of energy (light energy), and Uses of light energy and it lasted for six weeks. At the end, the (SAT) and QPABS was administered on the students as post-test. Two weeks after post-test, the (SAT) was reshuffled and ministered to the students to serve as a retention test. The whole exercise will last for eight weeks

(i) Pre-test Administration

The pre-test consisted of "Science Achievement Test" (SAT) and "Questionnaire on Pupils' Attitude towards Basic Science" (QPABS) which were administered on all the participants. The researcher personally administered the pre-test for all the participants.

(ii) Procedure for Application of Treatment

The application of treatments in the two groups lasted six weeks to be completed. Two periods were given per week. The lesson guides containing the four topics were used by the researcher for six weeks of the treatments (Visual-analogy Instructional Strategy and Teacher Expository Instructional Strategy). Completions of the treatments were done with clear-cut instructional guides that directed the researcher's activities during the treatments. The demonstrations which contained four topics derived from the Primary III Syllabus based on (i) Energy (ii) Forms of Energy(Light energy) (iii)Forms of Energy(Heat Energy), and (iv)Uses of Light Energy were performed by the pupils.

1.6.8 Method of Data Analysis

The data collection from the respondents was sorted, coded and analyzed using t-test statistical analysis. The hypotheses formulated were tested at 0.05 level of significance. The decision rule was based on the probability valve (p). If p value is less than or equal 0.05, the null hypotheses were rejected but if p value is greater than 0.05 the null hypotheses were accepted.

1.7 Results

1.7.1. Testing of Hypothesis

Analysis of the Pre-test

Analysis of the pre-test scores of the two groups (experimental and control) was carried out to know the possible differences in the background knowledge of the lower primary school pupils in Basic Science. The Basic Science Achievement Test (SAT) was first administered to the pupils as pre-test, the data collected were subjected to t-test analysis and the result is presented in Table 1.

Table 1: *t-test analysis of the pre-test scores of lower primary school pupils exposed to visual-analogy and teacher expository instructional strategies in Basic Science.*

Strategies	N	Mean	S.D	t	df	Sig.(2-tailed)	Remark
Visual-analogy	23	11.8696	2.73536	1.080	38	.287	Not Significant
Teacher Expository	17	10.8824	3.01833				

(t = 1.080; p>0.05)

Results in Table 1 showed that there is no significant difference in the pre-test scores of lower primary school pupils taught with visual-analogy and teacher expository instructional strategies at (t = 1.080; p>0.05). It can be deduced from the table that there is not much variation in the pre-test scores of the lower primary school pupils exposed to the two instructional strategies considering the mean scores of visual-analogy **($\bar{x}$=**11.8696) and that of teacher expository ($\bar{x}$=10.8824). This result ascertained the equivalent ability of lower primary school pupils exposed to visual-analogy and teacher expository instructional strategies prior to the introduction of the treatments within the study area.

Hypothesis One: There is no significant difference in the academic performance of pupils exposed to visual-analogy and teacher expository instructional strategies in Basic Science.

In order to test this hypothesis, data collected on the post-test scores of lower primary school pupils exposed to visual-analogy and teacher expository instructional strategies in Basic Science were subjected to t-test analysis

and the result is presented in Table 2.

Table 2: *t-test analysis of lower primary school pupils' academic performance in visual-analogy and teacher expository instructional strategies in Basic Science.*

Strategies	N	Mean	S.D	t	df	Sig.(2-tailed)	Remark
Visual-analogy	23	13.52172.79398	3.576	38	.000	Significant	
Teacher Expository	17	10.7647	1.75105				

(t = 3.576; p<0.05)

Data presented in Table 2 indicated that there is significant difference in the academic performance of lower primary school pupils exposed to visual-analogy and teacher expository instructional strategies in Basic Science at (t = 3.576; p<0.05). Hence, the null hypothesis that states that there is no significant difference in the academic performance of lower primary school pupils exposed to visual-analogy and teacher expository instructional strategies in Basic Science is hereby rejected. The result implied that lower primary school pupils exposed to visual-analogy instructional strategy with a higher post-test mean score of ($\bar{x}$=13.5217) performed better than their colleagues taught with teacher expository instructional strategy and that teaching with visual-analogy instructional strategy is better at improving lower primary school pupils' performance in Basic Science.

Hypothesis Two: There is no significant difference in the attitude of pupils exposed to visual-analogy and teacher expository instructional strategies in Basic Science.

In order to test this hypothesis, data collected on the attitudinal scores of lower primary school pupils exposed to visual-analogy and teacher expository instructional strategies in Basic Science were subjected to t-test analysis and the result is presented in Table 3.

Table 3: *t-test analysis of lower primary school pupils' attitudinal scores in visual-analogy and teacher expository instructional strategies in Basic Science.*

Strategies	N	Mean	S.D	t	df	Sig.(2-tailed)	Remark
Visual-analogy	23	39.41185.09974	3.123	38	.003	Significant	
Teacher Expository	17	35.3913 3.01118					

(t = 3.123; p<0.05)

Result in Table 3 showed that there is significant difference in the attitude of lower primary school pupils exposed to visual-analogy and teacher expository instructional strategies in Basic Science at (t = 3.123; p<0.05). Therefore, the null hypothesis that states that there is no significant difference in the attitude of lower primary school pupils exposed to visual-analogy and teacher expository instructional strategies is hereby rejected. The result implied that lower primary school pupils exposed to visual-analogy instructional strategy with a higher attitudinal mean score of ($\bar{x}$=39.4118)exhibited better attitude towards Basic Science than their colleagues taught with teacher expository instructional strategy with an attitudinal mean score of ($\bar{x}$=35.3913). The result further revealed that lower primary school pupils really like the subject when taught with visual-analogy instructional strategy.

Hypothesis Three: There is no significant difference in the retention ability of pupils taught with visual-analogy and teacher expository instructional strategies in Basic Science.

In order to test this hypothesis, data collected on the retention ability scores of lower primary school pupils exposed to visual-analogy and teacher expository instructional strategies in Basic Science were subjected to t-test analysis and the result is presented in Table 4.

Table 4: *t-test analysis of lower primary school pupils' retention ability scores in visual-analogy and teacher expository instructional strategies in Basic Science.*

Strategies	N	Mean	S.D	t	df	Sig.(2-tailed)	Remark
Visual-analogy	23	15.30432.58377	3.312	38	.002	Significant	
Teacher Expository	17	12.88241.79869					

(t = 3.312; p<0.05)

Result in Table 4 indicated that there is significant difference in the retention ability of lower primary school pupils exposed to visual-analogy and teacher expository instructional strategies in Basic Science at (t = 3.312; p<0.05). Thus, the null hypothesis that states that there is no significant difference in the retention ability of lower primary school pupils exposed to visual-analogy and teacher expository instructional strategies is hereby rejected. The result implied that lower primary school pupils exposed to visual-analogy instructional strategy with a higher retention ability mean score of ($\bar{x}$=15.3043)had better retention ability in Basic Science than their counterparts taught with teacher expository instructional strategy with a retention ability mean score of ($\bar{x}$=12.8824).

1.8 Discussion of Findings

The study examined the effects of visual- analogy and teacher expository instructional strategies on pupils'

performance in Basic Science. The findings showed that there was no significant difference in the background knowledge of pupils exposed to visual analogy and teacher expository instructional strategies before the intervention. This revealed that pupils in both groups have homogenous ability before the introduction of the intervention. It means that pupils used for this study have relatively equal background knowledge in Basic Science.

The findings of the hypothesis one showed that there was significant difference in the academic performance of pupils exposed to visual analogy instructional strategy and those exposed to teacher expository instructional strategy. Further findings shows that pupils exposed to visual analogy instructional strategy performed better than their counterpart exposed to teacher expository instructional strategy. This shows that visual analogy instructional strategy helps to improve the academic performance of pupils in Basic Science than teacher expository instructional strategy. This was in conformity with the study of McDaniel (1993), who demonstrated that pupils performed better when asked to draw inferences about new scientific knowledge when they had been taught with analogies rather than literal descriptions.

Furthermore, results from hypothesis two showed that there was significant difference between the attitude of pupils taught with visual analogy instructional strategy and those taught with teachers' expository instructional strategy. Further analysis shows that pupils exposed to visual analogy instructional strategy exhibited better attitude towards Basic Science than their counterpart exposed to teacher instructional strategy. In addition, the results from hypothesis three revealed that that there was significant difference between the retention ability of pupils exposed to visual analogy instructional strategy than those exposed to teacher expository instructional strategy. Further observation from the mean scores of both strategies revealed that pupils taught with visual analogy instructional strategy had higher scores than those taught with teacher expository instructional strategy. It could then be deduced that those exposed to visual analogy instructional strategy have higher retention ability than those exposed to teacher expository instructional strategy hence, indicating that visual analogy instructional strategy enhances longer retention of Basis Science concepts in pupils than teacher expository instructional strategy. This is supported by study carried out by Glynn and Takahashi (1998) who opined that analogies can improve immediate recall as well as long-term retention. With middle school students, students who studied detailed graphic drawing parallels between an analog (a factory) and a target concept (an animal cell) had better performance on immediate knowledge tests as well as those administered two weeks later. Also Venville & Treagust (1996) noted that analogy can act as a memory aid to help students recall a concept which is difficult to remember. Therefore, since concepts being taught in Basic Science is something that needs to be remembered over longer periods of time, as it is most information taught in other subjects, visual analogy instructional strategy is the best strategy to use.

1.9 Summary

The results showed that pupils in visual-analogy group performed better than their counterpart in the teacher expository instructional strategy group. This confirmed that visual-analogy instructional strategy is more effective in enhancing pupils' academic performance. Furthermore, the result showed that there was improvement in the attitude of pupils exposed to visual-analogy instructional strategy than those exposed to teacher expository instructional strategy. Also improvement was noticed in the retention ability of pupils exposed to visual-analogy instructional strategy than those exposed to teacher expository instructional strategy.

1.1.0 Conclusion

The study shows that analogical instruction when applied to Basic Science students will improve their understanding of Basic Science concepts. This study has shown that when analogical instruction is used in a systematic manner, students' understanding of Basic Science concepts and elimination of misconceptions is more enhanced than with traditional instruction. Science teachers can often use analogical instruction in their classroom to enhance students' understandings and eliminate misconceptions. When analogical instruction is used, it is highly probable that these will lead to a significantly improved understanding of scientific conception and the elimination of alternative conceptions.

The findings of this study had ascertained the effects of visual-analogy instructional strategy and teacher expository instructional strategy in enhancing performance of pupils' in Basic Science, improving their attitude towards Basic Science and in retention of Basic Science concepts. Based on this findings, it can be concluded that visual-analogy instructional strategy is more effective in improving academic performance of pupils in Basic Science when compare with teacher expository instructional strategy. Also, visual-analogy instructional strategy improved pupils' attitude towards Basic Science than teacher expository instructional strategy. Lastly, visual-analogy instructional strategy is more effective in enhancing the retention ability of pupils in Basic Science than teacher expository instructional strategy.

1.1.1 Limitation of the Study

The study was limited to two public primary schools in Ondo West Local Government Area in Ondo State due to time and financial constraints. With the results from the study which are positive for the pupils' performance, retention and their attitudes, inherent limitations to this study still remain. Firstly, this study was limited by the relatively small number of pupil participants (N=40) and timeframe during which the data was collected. A more thorough research study would have included a significantly larger number of pupil participants than the 40 in this study.

Secondly, the limitation to this research study was that the concepts taught were limited to Energy, forms of energy and uses of light energy because the topics were established by the researcher to be difficult for pupils. Studies can also be carried out to cover other topics in Basic Science in general. Furthermore, in a bid to correctly fill the questionnaire, it had to be read to the pupils painstakingly to elicit responses from them after which the teachers had to fill the options picked by the students on the questionnaire. This wasted lots of time during the research process. Also, getting schools to cooperate with the researcher in making available pupils of their school for the research exercise was a herculean task. Those pupils are however essential to the research project.

Recommendations

From the findings of this study, the following recommendations are made:

- Teaching and learning materials should be provided by government agencies such as State Governments, Federal Ministry of Education, and National University Commission for effective utilization of teaching-with-analogy in the teaching and learning of Basic Science concept at primary school level
- Non-governmental organization (NGOs) and Parent Teachers Association (PTA) and other stakeholders in education should be encouraged to provide adequate financial and material resources for effective teaching and learning of Basic Science concepts at primary school level using visual-analogy instructional strategy
- Teaching with visual-analogy helped encourage visualization and reorganization of science facts in the learner's cognitive structure. It should therefore be encouraged for teaching in the science classroom.
- Basic Science teachers should adopt the use of teaching with visual-analogy instructional strategy in teaching difficult and abstract topics in Basic Science at primary school level.

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References

Ahmed, R. U. (2007). Technology Development and the need for Contemporary Teaching Techniques. *International Journal of Research in Education*, 4 (1&2), 145-153.

Akubuilo, D.U. (2004). The Effects of Problem Solving Instructional Strategies on Students' Achievement and retention in Biology with Respect to Location in Enugu State. *Journal of Science Teachers Association of Nigeria*.39(1&2),94-100

Arnold, M. & Millar, R. (1996). Exploring the use of analogy in the teaching of heat, temperature and thermal equilibrium, in G. Welford, J. Osborne, & P. Scott (Eds.), *Research in Science Education in Europe: Current Issues and Themes*. London: Farmer Press.

Asuafor, A. M. (2008). Extent of involvement of secondary of school sciences, technology and mathematics teachers in conduct of research and participation in science teachers association of Nigeria activities: implication for STM development in Nigeria. *JSTAN*, 43 (1&2), 27-34.

Chiu M. H (2000).The implications and reflections of studies in conceptual change, *Chinese Journal of Research in Science Education,* 8, 1–34.

Clement, J.; Brown, D. & Zietsman, A. (1989). Not all preconceptions are misconceptions: finding 'anchoring conceptions' for grounding instruction on students' intuitions. *International Journal of Science Education*, 11, 554- 565.

Dagher, Z. (1995). Analysis of analogies used by science teachers. *Journal of Research in Science Teaching*, 32 (3),259-270.

Duit, R. (1991). The role of analogies and metaphors in learning science. *Science Education*, 75 (6), 649-672.

Glynn, S.M. & Takahashi, T. (1998). Learning from Analogy Enhanced Science Text. Journal of Research in Science Teaching 35, 1129-1149.

Harrison, A. &Treagust, D. (1993). Teaching with analogies: A case Study in Grade-10 Optics. *Journal of Research in Science Teaching*, 30 (10), 1291-1307.

Njoku, Z.C. (2004). Effectiveness of Model for Science and Technology Instruction. *Journal of Science*

Teachers Association of Nigeria (39), 45-51

Nwachukwu, J. N. & Nwosu, A. A. [2007].Effects of demonstration method on different levels of students' cognitive achievement in senior secondary biology. *Journal of Science Teacher Association of Nigeria*, 42(1&2), 50-59.

Venville, G. &Treagust, D. (1996).The Role of Analogies in Promoting Conceptual Change in Biology. *Instructional Science*, 24, 295-320.

APPENDIX

QUESTIONNAIRE ON PUPILS ATTITUDE TOWARD BASIC SCIENCE (QPABS)

Name:……

School:……

Class:……....

The following is lists of questionnaire are designed to examine the attitude of pupils toward Basic Science. You are to indicate your level of agreement or disagreement to them by ticking ( ) in the appropriate column. Please read the statements below carefully and tick the appropriate choices that reflect your attitudes and perceptions toward Basic Science.

Key: YES OR NO

S/N		YES	NO
1	I like Basic Science		
2	Basic Science is too difficult		
3	I will not do Science in future		
4	I don't like the way Basic Science is being taught in the school		
5	I always feel happy anytime we want to do basic Science		
6	I always think about Basic Science anytime am in the house		
7	I like to ask questions during Basic Science		
8	Basic Science lessons are too boring		
9	I don't like our Basic Science teacher		
10	Basic Science looks like a magic		
11	The topics in Basic Science are too tough		
12	I don't feel happy anytime we want to write Basic Science test and exam		
13	I like doing Basic Science to any other subject		
14	Basic Science involves too many mathematics		
15	I lack basic background in Basic Science		
16	Basic Science is not easy to read and understand		
17	I am always afraid during Basic Science lesson		
18	I don't like anything that has to do with Science		
19	I have textbooks on Basic Science		
20	I am just doing Basic Science because it is important for my level		
21	Basic Science is one of the most interesting school subjects		
22	I am not satisfied with my performance in Basic Science		
23	School should have more Basic Science lesson each week		
24	I have the feeling I don't need Basic Science in future		
25	I don't think I can pass Basic Science in JSSCE		