# Effects of Multimedia Instructional Strategy and Traditional Instructional Strategy on Upper Basic Pupils' Achievement in Basic Science in Imo State

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## ABSTRACT

*The study investigated the effects of multimedia instructional strategy and traditional instructional strategy on upper Basic Pupils' achievement in Basic Science. The researcher asked two research questions and formulated two hypotheses to guide the study. The study adopted quasi-experimental research design. The area of this study is Imo State of Nigeria. Sample size of 80 sampled from a population of 41,996 Upper Basic two pupils in Imo State public education system using purposive and simple random sampling techniques were used to sample two Basic Schools. A researcher-made Basic Science Achievement Test (BSAT) for pre-treatment and post-treatment tests was used for data collection. Reliability coefficients of 0.89 and 0.79 were obtained for BSAT for Pre-treatment and BSAT for Post-treatment respectively. To answer the research questions the researcher used mean and standard deviation, while the hypotheses were tested using ANCOVA F-ratio. The major findings of the study are: pupils taught using multimedia instructional strategy (MIS) performed better in the Researcher-Made Basic Science Achievement Test (BSAT) than those taught using traditional instructional method; gender had no significant influence on the Basic Science achievement of pupils as measured by their mean score in the Basic Science achievement test (BSAT). Based on the findings, one of the recommendations was that teachers of Basic Science should always adopt multimedia instructional strategy for teaching their pupils due to the fact that the strategy is able to improve pupils' achievement in Basic Science and this will enable the pupils to cater for themselves in their classrooms and hence improve their learning outcomes.*

**KEYWORDS: Researcher-Made Basic Science Test, multimedia instructional Strategy, Traditional Instructional strategy, post-treatment test, male and female pupils, Imo State**

## Introduction

Primary Education is a major component of education in the universal Basic Education (UBE) programme in Nigeria. The core objective being the universalization of access and quality in the delivery of basic education. Others are to inculcate in the children permanent literacy, numeracy and the ability to communicate effectively. According to Bradsford, Brown and Cooking (2008), to ensure effective achievement of those core objectives, multimedia should be encouraged in teaching and learning, especially in the teaching and learning of basic science. In this modern age of advanced technology, the success of any educational enterprise could be measured not only in terms of how much instruction is given by the teacher, but also in terms of technologies and media employed to ensure maximum cognitive development or advancement of learners (Orstein and Levis, 2006). Multimedia aids in education could be defined as the combination of various electronic and technological devices employed by the teacher and learner to enhance the interest, acquisition and retention of knowledge. Such include combination of print media like newspapers, magazines, journals and books and electronic media like television, Radio, slides, CD-ROM, projectors, DVDs and interactive media like cell phones and the internet.

The primary school is the formative stage of an individual. At this stage, audio and visual impressions made on a child in the process of teaching and learning leave a long-lasting effect on the educational development of the child. Children are curious and inquisitive about their environment at this stage. They are observant, persistent and enjoy entertaining learning experiences, and would want to make sense out of the natural world. The teaching of basic science starts from Nursery through primary to secondary and tertiary institutions and is the basis for such courses as medicine, biochemistry, microbiology, zoology, botany and even environmental sciences. Basic science is meant to expose the learners to nature (facts, principles and concepts), processes and attitudes and then equip them with skills (Elliott, Kratochwill, Cook and Travers, 2001). Learners expect that the materials and method of instruction should be easily transferable to the real world. Thus, the task of the teacher includes, among others, to provide the materials and experiences to aid learning and meet the learner's expectations (Dike, 2004).

At this point, it becomes pertinent to find out how the application of multimedia affects performance of pupils in Basic Science. Primary school teachers are expected to select and use appropriate instructional media during lesson presentation (Taylor, 2009). The researcher through careful attention observed poor academic performance of pupils especially in Basic Science. The researcher reasoned that this poor performance could be as a result of the methods of teaching. Basic Science being a science subject requires to be taught using demonstration and using instructional materials that the pupils can observe and try their hands on. Could the use of multimedia enhance pupils' achievement in Basic Science in primary schools?

**Objective of the Study**

The objectives of the study are to ascertain the:

1. mean achievement scores in a Researcher-Made Basic Science Test (RMBST) of pupils taught using the multimedia instructional Strategy (MMIS) and the Traditional Instructional strategy (TIS) in the post-treatment test; and
2. mean achievement scores of male and female pupils who were taught Basic Science using the traditional Instructional Strategy (TIS) and Multimedia Instructional Strategy (MMIS) in the post-treatment test.

## Research Questions

The following research questions guided the study:

1. What are the mean achievement scores in a Researcher-Made Basic Science Test (RMBST) of pupils taught using the multimedia instructional Strategy (MMIS) and the Traditional Instructional strategy (TIS) in the post-treatment test?
2. What are the achievement scores of male and female pupils who were taught Basic Science using the traditional Instructional Strategy (TIS) and Multimedia Instructional Strategy (MMIS) in the post-treatment test?

## Hypotheses

The following hypotheses were tested at 0.05 level of significance:

1. The mean achievement scores in a Researcher-Made Basic Science Test (RMBST) of pupils taught using the multimedia instructional Strategy (MMIS) and the Traditional Instructional strategy (TIS) in the post-treatment test do not differ significant.
2. The achievement scores of male and female pupils who were taught Basic Science using the traditional Instructional Strategy (TIS) and Multimedia Instructional Strategy (MMIS) in the post-treatment test do not differ significantly.

## Method

The study adopted a quasi-experimental research design. The design involves intact groups, pre-test, treatments, post-test, non-randomization. The area of this study is Imo State of Nigeria. The population of the study is 41,996 Upper Basic two pupils in Imo State public education system. Purposive and simple random sampling techniques were used to sample two Basic Schools in the area of the study, which led to sample size 80 pupils. The sample size comprises of 40 pupils for each of the instructional strategy. For the pupils in Multi-media instructional strategy group, 18 were females while 22 were males. Similarly, for the pupils in the traditional instructional strategy, 19 were females, while 21 were males. The instruments used for data collection were researcher-made Basic Science Achievement Test (BSAT) for pre-treatment and post-treatment tests. The BSAT for pre-treatment and post-treatment tests were given to three experienced Basic Science teachers in a Basic School and two specialists in educational measurement and evaluation for content and face validation. The internal consistency for each of the instruments was computed using Kuder-Richardson formula twenty, ($KR_{20}$). Internal consistency coefficients of 0.89 and 0.79 were obtained for BSAT for Pre-treatment and BSAT for Post-treatment respectively. The research questions were answered using mean and standard deviation, while the hypotheses were tested using ANCOVA F-ratio.

## Experimental Procedure

The following procedures will be adopted in the administration of the instruments:

### (a) *Pre-Test Session*

Before the treatment, the pupils were given a pre-test. The test was administered by the regular Basic Science teachers in the sampled schools who have undergone training. The scripts were marked by the researcher. The pre-test was used to:

- determine the pupils initial knowledge of the subject-matter they would learn later;

- determine the comparability of the two groups with respect to their achievement in the pre-test scores.

***(b) Treatment Session***

The main treatment for the study was the teaching of the topics to Upper Basic pupils in the sampled schools, through the use of the Multi-media instructional strategy and the traditional instructional strategy. The pupils in group one were taught using Multi-media instructional strategy, while those in the group two were taught using traditional instructional strategy. The teaching lasted for eight weeks.

The teaching of both groups was done during the normal school Basic Science periods, using the lesson notes prepared by the researcher. During the period of the experiment, the researcher paid regular visits to the sampled BSAT to ensure that the participating teachers carried out instructions strictly as contained in lesson notes.

***(c) Post Test Session***

After the treatment, the BSAT for Post-treatment test was administered to the pupils in the two groups. The scripts were marked by the researcher and the pupils' scores were recorded.

***(d) The Retention Test***

Two weeks after the post treatment test, the retention test was administered using the same BSAT for Post-treatment.

The scores of the pupils were collated and analyzed. The research questions were answered using mean and standard deviation, while the hypotheses were tested using ANCOVA F-ratio at 0.05 level of significance.

**Results**

**Research Question One:** What are the mean achievement scores in a Researcher-Made Basic Science Test (RMBST) of pupils taught using the multimedia instructional Strategy (MMIS) and the Traditional Instructional strategy (TIS) in the post-treatment test?

**Table 1: Mean and Standard Deviation Scores of Pupils Exposed to MMIS and TIS Groups in the Pre-treatment and Post-treatment Tests**

| | | Pre-treatment | | Post-treatment | |
|---|---|---|---|---|---|
| **Group** | ***n*** | $\bar{X}$ | ***S*** | $\bar{X}$ | ***S*** |
| **MMIS** | 40 | 15.85 | 2.91 | 31.15 | 5.74 |
| **TIS** | 40 | 15.88 | 3.02 | 16.15 | 2.98 |

Table 1 shows that the mean scores of the pupils exposed to the Multi-media instructional strategy, MMIS and traditional instructional strategy, TIS in the pre-treatment test are 15.85 and 15.88 respectively. Similarly, their respective standard deviations are 2.91 and 3.02. Also, the mean scores of the pupils exposed to the MMIS and TIS in the post-treatment test are 31.15 and 16.15 respectively. Their respective standard deviations are 5.74 and 2.98. The mean score of the pupils in the MMIS group is higher than the mean score of the pupils in the TIS group, which shows that the pupils in the MMIS group performed better than the pupils in the TIS group.

**Hypothesis One:** The mean achievement scores in a Researcher-Made Basic Science Test (RMBST) of pupils taught using the multimedia instructional Strategy (MMIS) and the Traditional Instructional strategy (TIS) in the post-treatment test do not differ significant.

**Table 2: Summary ANCOVA F-ratio Table for Testing Hypothesis One**

**Tests of Between-Subjects Effects**

Dependent Variable: Posttest

| Source | Type III Sum of Squares | Df | Mean Square | F | Sig. | Partial Eta Squared |
|---|---|---|---|---|---|---|
| Corrected Model | 4571.019[a] | 4 | 1142.755 | 54.899 | .000 | .745 |
| Intercept | 852.012 | 1 | 852.012 | 40.931 | .000 | .353 |
| Pretest | 68.337 | 1 | 68.337 | 3.283 | .074 | .042 |
| Treatment | 4487.016 | 1 | 4487.016 | 215.559 | .000 | .742 |
| Gender | .105 | 1 | .105 | .005 | .944 | .000 |
| Treatment * Gender | .850 | 1 | .850 | .041 | .840 | .001 |
| Error | 1561.181 | 75 | 20.816 | | | |
| Total | 50878.000 | 80 | | | | |
| Corrected Total | 6132.200 | 79 | | | | |

a. R Squared = .745 (Adjusted R Squared = .732)
b. Critical f-value = 4.00

Presented in Table 2 is the ANCOVA F-ratio for testing hypothesis one. From the table, the calculated F-ratio is 215.559, the p-value is 0.000, while the tabulated F-ratio is 4.00. Since the calculated F-ratio is greater than the tabulated F-value and the p-value is less than the alpha level of 0.05 the null hypothesis one is rejected. Hence, the mean achievement scores in a Researcher-Made Basic Science Test (RMBST) of pupils taught using the multimedia instructional Strategy (MMIS) and the Traditional Instructional strategy (TIS) in the post-treatment test differ significantly. This shows that the treatments (MMIS) had significant effect on the pupils' achievement in Basic Science.

**Research Question Two:** What are the achievement scores of male and female pupils who were taught Basic Science using the traditional Instructional Strategy (TIS) and Multimedia Instructional Strategy (MMIS) in the post-treatment test?

**Table 3: Mean and Standard Deviation Scores of Pupils Exposed to MMIS and TIS Groups in the Pre-treatment and Post-treatment Tests**

| | Male | | | Female | | |
|---|---|---|---|---|---|---|
| **Group** | $n$ | $\bar{X}$ | $S$ | $n$ | $\bar{X}$ | $S$ |
| **MMIS** | 22 | 30.95 | 5.71 | 18 | 31.39 | 5.93 |
| **TIS** | 21 | 16.29 | 2.70 | 19 | 16.00 | 3.33 |

In Table 3 the mean scores of the male pupils exposed to MMIS and TIS in the pre-treatment test are 30.95 and 16.29 respectively. Similarly, their respective standard deviations are 2.70 and 3.33. Similarly, the mean scores of the female pupils exposed to the MMIS and TIS in the post-treatment test are 31.39 and 16.00 respectively. Their respective standard deviations are 5.93 and 3.33. The mean score of the male and female pupils in the MMIS group is higher than the mean score of the male and female pupils in the TIS group, which shows that the male and female pupils in the MMIS group performed better than the male and female pupils in the TIS group.

Also, the mean score of female pupils in MMIS group is slightly higher than that of male pupils in the same group. The female pupils in MMIS seem to have performed better than the male pupils in the same group. Conversely, the mean score of male pupils in the TIS group is slightly higher than that of female pupils in the same group. In the TIS group the male pupils seem have performed better that their female counterparts.

**Hypothesis Two:** The achievement scores of male and female pupils who were taught Basic Science using the traditional Instructional Strategy (TIS) and Multimedia Instructional Strategy (MMIS) in the post-treatment test do not differ significantly.

**Table 4: Summary ANCOVA F-ratio Table for Testing Hypothesis Two**

| $MS$ | $df_1$ | $df_2$ | $F_{Cal}$ | $p$ | $F_{Crit}$ | $\eta_p^2$ | $Decision$ |
|---|---|---|---|---|---|---|---|
| 0.105 | 1 | 75 | 0.041 | 0.840 | 4,00 | 0.001 | $H_{01}$ is accepted |

*Results Extracted from Table 2*

The results in Table 4 show that the calculated F-ratio is 0.041, the p-value is 0.840, while the tabulated F-ratio is 4.00. Since the calculated F-ratio is less than the tabulated F-ratio and the p-value is greater than the alpha level of 0.05 the null hypothesis two is accepted. Hence, the achievement scores of male and female pupils who were taught Basic Science using the traditional Instructional Strategy (TIS) and Multimedia Instructional Strategy (MMIS) in the post-treatment test do not differ significantly. This shows that pupils gender had no significant effect on their achievement in Basic Science.

## Discussion

Findings from the study reveal that a difference exists in the performance of pupils taught with multimedia and traditional methods. Pupils performed better in the Researcher-Made Basic Science Achievement Test (BSAT) using multimedia instructional strategy than traditional instructional method. Since the mean scores of pupils taught with MMIS improved significantly, it shows that the instructional strategy improved pupils' achievement scores in Basic Science more than TIS. The finding shows that the use multimedia instructional strategies has positive effects on pupils' academic performance. Since the multimedia instructional method has been found to enhance pupils' performance in Basic more than the traditional strategy, it becomes clear that the balance should be made between the two methods of teaching when planning learning experiences in the school. This could be attributed to the fact that multimedia instructional method is child-centred than the traditional strategy. This finding corroborates with the findings of Hartley (2007), Ahmed (2004), Mayer (2002), Morris (2004), Osokoya (2009), who reported that the use of learner participatory instructional strategies (such as audio-visuals like VCD and Television were used to synchronize lesson presentation) enhances literacy skills in reading and aids performance of learners in both internal and external examinations effectively.

The finding of this study revealed that the mean achievement scores of male and female pupils taught using the Multi-media instructional strategy, MMIS and Traditional instructional strategy, TIS in the post-treatment test do not differ significantly. The result shows that gender had no significant influence on the Basic Science achievement of pupils as measured by their mean score in the Basic Science achievement test (BSAT). The treatment group that was exposed to MMIS did not have a significantly different gender mean score in the BSAT. The result of this study, therefore, indicates that male and female pupils benefited equally from the treatment. The fact that the mean difference between male and female pupils was not significant shows that gender was not a factor in the Basic Science achievement of pupils exposed to MMIS. This is contrary to the findings of Adeosun (2002) who found that girls have better achievement than boys in his research carried out on effect of multi-media packages on pupils' achievement and retention in Social Studies.

## Educational Implications of the Study

The fact that instructional strategy has significant effect on pupils' interest implies that teachers must be well familiar with the various teaching methods so as to be able to adopt the most appropriate ones in any given situation. The teachers should be able to go beyond the traditional approach to science learning in stimulating and sustaining the learners' interest in the subject. That is to say, teachers create opportunities in the teaching-learning process where the learner will have to acquire not only scientific knowledge but scientific skills and attitudes as well. Finally, the findings of this study have implication for policy makers such as the Ministry of Education and the various institutions involved in the training of teachers with regards to the need for enhanced pre-service and in–service training programmes for teachers.

To the teachers, the findings of this study provide a useful feedback as regards the efficiency of multimedia instructional strategy over traditional instructional strategy, which will make the teachers to use MM instructional strategy as a basis for planning their instruction. Since MM instructional strategy is effective in enhancing pupils' achievement in Basic Science topics, the primary School teachers should consider using it as a substitute to the traditional format, in teaching Basic Science.

The findings of the study concerning the mean achievement scores of male and female pupils in multimedia instructional strategy group implies that MMIS can be used to improve pupils' achievement in Basic Science irrespective of their gender. Hence, MMIS can be used in schools to teach male and female pupils Basic Science. This finding also implies that both male and female pupils have equal chances of having their Basic Science achievement scores improved by MMIS.

## Conclusion

The researcher, therefore, conclude that multimedia instructional strategy (MMIS) is an effective teaching strategy for teaching Basic Science in Upper Basic Schools. Hence, the instructional strategy could be adopted by Basic Science teachers.

## Recommendations

Based on the findings and implications of this study, the following recommendation was made:

1. Teachers of Basic Science should always adopt multimedia instructional strategy for teaching their pupils. The strategy is able to improve pupils' achievement in Basic Science. This will enable the pupils to cater for themselves in their classrooms and hence improve their learning outcomes.
2. Pupils should always be allowed to participate actively and interact freely with the teachers as this will improve their academic achievement gain in their subjects.
3. Short time training, workshops and seminars should be organized by ministries of education and related government agencies for training of teachers on how to make use of MMIS in teaching Basic Science and other subjects effectively.
4. Teacher training institutions such as colleges of education and the universities that offer Basic Science education courses should adopt MMIS as a teaching strategy for teaching their pupils, since it improves academic achievement.
5. The female as well as male pupils benefited equally when taught Basic Science using MMIS, the teaching strategy should be used in teaching the pupils Basic Science irrespective of their gender.

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