

# THE EFFECT OF USE OF IMPROVISED MATERIALS FOR INSTRUCTION ON ACHIEVEMENT OF PRIMARY SCHOOL PUPILS IN INTEGRATED

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## **Abstract**

The purpose of this paper was to investigate the effect of the use of teacher-made improvised materials on primary school pupils' achievement in science. It also determined if there was a significant main effect of gender and significant interaction effect of the use of improvised materials and gender. Using a non-equivalent pretest posttest control group design, it was found that the use of improvised materials and equipment improved primary school pupils' achievement. Gender also produced significant difference in favour of boys. There was no significant interaction effect of method of teaching by gender. Implications for practice were highlighted.

## **Introduction**

Improvisation in science teaching has been a subject of considerable focus in science education especially in this austere period. As far back as 1946, UNESCO published a book entitled: *Suggestions for Science Teachers in Devastated Countries*, authored by J. P. Stephen. This book was written to assist needy schools in war-ravaged countries after the Second World War. These countries cannot be described as less fortunate than the austerity-ravaged country a belongs to this group of countries. Lockard (1972) and Mayer (1978) have also written books aimed at assisting science teachers to produce materials and equipment locally for science teaching. The major idea has been to reduce dependence on imported and expensive science materials and equipment.

It is gratifying to note that science educators and teachers in Nigeria have accepted the challenge posed by the need to improvise during science teaching (Adeniyi, 1981; Alonge, 1979; 1980; 1981; Balogun, 1982; Igwebuike and Eyestemitan, 1991; Oladimeji, 1978; Osuagwu, 1982; Soyibo, 1983). For instance, Alonge (1979, 1980) has provided useful information about some local materials for school chemistry. He also gave the local names of such materials where they can be found and the experiments or investigations they can be used for. Soyibo investigated the use of improvised materials for teaching biology in Lagos state Secondary Schools. His findings included that 76 per cent of the teachers indicated that they improvise materials for teaching biology.

The austere situation in the country has not only come to stay but is getting more excruciating. With the current exchange rate of Naira (Nigerian currency) for other international currencies, importation of equipment and materials for science teaching is extremely difficult. The Federal Government of Nigeria has established some science equipment manufacturing centres. Efforts at such centres are expected to be augmented by local production of equipment and materials by the classroom teachers. To achieve this, science teacher education programmes emphasize improvisation of materials and equipment for science teaching.

But there is growing scepticism among science educators, though not documented, about the effectiveness of the use of such teacher-made materials and equipment. This is a result of the fact that most of the equipment and materials are not precise in measurement and descriptions. They are also not as attractive or appealing as the industrially produced or imported ones.

Some of the improvised materials and equipment are as crude as the junk which children use for their play activities. During such activities they develop some ideas about scientific phenomena which constructivist instructional strategy suggests science teachers should explore and use for instruction.

It would seem literature is mute about the efficacy of such materials for teaching science at the primary and secondary school levels. Yet such information would enable science teachers and educators determine if the efforts made so far are dissipated towards some profitable ends.

### **Purpose of the Study**

The purpose of the study was to find out if:

- (1) the use of teacher-made materials and equipment for science teaching will significantly improve achievement of primary school pupils in integrated science;
- (2) gender will have any significant effect on primary school pupils in integrated science; and
- (3) there will be any significant interaction effect of use of improvised materials and sex of the pupils.

### **Method**

#### **Sample**

A total of 100 (50 boys, 50 girls) Primary 5 (grade level 5 ) pupils from two primary schools in Warri, Delta State Nigeria formed the sample of the study. The target population of the study consisted of a total of 722 who were unevenly distributed in fourteen classes of Primary 5. Two intact classes, one from each of two schools were randomly selected and used for the study. Each of the classes had population slightly above 50 but only 50 in each class were randomly selected and used for the study. The two primary schools were; systematically selected. Some of the guidelines for the selection were; the schools should not have covered the topics to be used; they were about the same status and have about the same performance at the State School Leaving Certificate Examinations.

Intact classes were used to avoid disrupting normal class activities. The distribution of the subjects can be found in the variable matrix displayed in.

#### **Table 1 Instrumentation**

Pupils' achievement in integrated science was measured using a 25 - item multiple - choice instrument developed through the use of a table of specifications referenced to the objectives of instruction and the content. The instrument was validated by a group of science educators and primary school science teachers for appropriateness of the language level and representativeness of integrated science concepts taught during the experiment.

The initial version of the instrument (with 31 items) was administered to a randomly selected sample of 65 Primary 5 pupils in a school where the topic had been taught for pilot testing. The discriminatory power and difficulty index of each of the items were computed using the appropriate procedures. Six items did not meet the requirements and were extracted from the instrument. Their extraction did not cause a major tilt in the table of specifications used. The remaining 25 items were used for determining the reliability index of the test. Cronbach alpha (internal consistency) procedure yielded a value of 0.897.

### **Design and procedure**

A 11011-equivalent pretest - posttest control group design with random assignment of classes to experimental and control groups was employed to examine any treatment effect due to the use of improvised materials of teaching primary school science. After constituting the groups, the instrument was administered to the two groups to determine if they were equivalent. This procedure was the protesting, which was followed by eight weeks of treatment. The two groups were taught some concepts in integrated science drawn from *Science is Discovering*, a text popularly used in the *j* Delta State Schools.

The experimental group was taught using teacher - made science teaching materials and equipment relevant to the objectives of instrument mapped out. The control group was **taught** by the same teacher but without the improvised materials and equipment. The lessons were taught by the same teacher to reduce the effects of some extraneous teacher-variables like mastery of the subject matter and attitude to teaching.

Every other classroom procedure was the same in the two groups except the use of improvised materials. The treatment was localised to annul spillover effect which can confound the results of the experiment.

After eight weeks of teaching the two groups were given the posttest in the same manner the pretest was administered.

Result and Discussion

An analysis of pretest scores of the experimental and control group was carried out using t-test. The exercise indicated that there was no statistically significant difference between the two group means [t (98 = 87; p > 0.05). This means that the two groups were initially equivalent with respect to pretest scores.

A 2 x 2 ANOVA for orthogonal design (equal cell size) was carried out using mode of instruction and gender as independent variables and posttest score as dependent variable.

This was done to find out if there were group and gender effects on achievement. The summary of this is reported in table II

Table 1: Variables Matrix Showing Means and Standard Deviation.  
Mode of Instruction

	With Improvised Material (Experimental Group)	Without Improvised Material (Control Group)
Male	n = 25 X = 21.65 SD = 3.43	n = 25 X = 13.84 SD = 2.99
Female	n = 25 X = 20.80 SD = 3.89	n = 25 X = 11.32 SD = 3.70
Column	X = 21.22	X = 12.58

Table II: ANOVA Summary

Source of Variance	DF SS	MS
Main Effects	1 1866.24	1866.24
Group		
Gender	1 70.56	70.56 5.55 *
Interaction		
Group X Gender	1 17.68	17.68
Within - group	96 1221.56	12.72
Total	99 3176.04	

\*\* P < 0.01; \* P < 0.05

Table 2 shows that there were significant main effects of group [F(1, 96) = 146.70, P < 0.01] and sex [F(1, 96) = 5.55, P < 0.05], There was however, no significant interaction effect of group by sex [F(1, 96) = 1.39, P < 0.05]. These results and the data on Table 1 show that:

1. Use of improvised materials and equipment improved significantly primary sdwc achievement in integrated science. The group means for experimental and control groups are 21.22 and 12.58 respectively. A difference of 8.64 on a maximum score of 25 is phenomenal.
2. Sex produced significant difference in means in favour of males.
3. There was no significant interaction effect of group by sex of the pupil .

The result of this experiment has confirmed the expectation that pupils taught using improvised materials. Recommending the use of such materials and equipment is like making a case for the use of educational media for teaching primary school science which not is controverted.

But in some cases, improvised materials and equipment may not be the same with imported or industrially produced teaching materials and equipment in terms of specifications, precision and appeal. Their efficacy can therefore be controverted. It is gratifying to note that their use improved primary school pupils' achievement in science. Recommendations made by Alonge (1980; 1981), Balogun (1982), Oladimeji (1978) and Soyibo (1983) are strengthened by the findings of this study.

Statistically significant difference was also found in the achievement by boys and girls in favour of boys. This result agrees with the one obtained from studies conducted by Bajah (1979), Afemikhe (1982), Oikeh (1982) and Okebukola (1992). But the result contradicts the findings of the study by Wozencraft (1963) and Inomiesa (1989), which indicated that girls were superior to boys in achievement in science, and that there was no significant difference between boys and girls, respectively.

The difference between boys and girls observed in this study could be explained in part by what Ormerod and Duckworth (1975) referred to as sociological differences. These include differences in learning styles, response to different teaching strategies and teacher behaviour. It would seem plausible to say also that girls are not as active as boys in exploitation and manipulation bring about enriched experiences, which in some cases, are in harmony with experiences provided by school science.

#### **Implications for Practice**

While the need still exists to corroborate the findings of this study with those of other studies which are yet to be undertaken, it would seem plausible to recommend that science teachers at the primary school level should use improvised materials and equipment at this austere time. [Steadies should be carried out to determine primary school science teachers' awareness of some items that could be improvised and whether they can improvise them.

#### **Limitations of the Study**

Non-equivalent pretest-posttest control group design is weak because there is no total assurance that manipulation of the independent variable is the factor in the difference between pretest and posttest. There are threats to internal validity, and these include regression, selection testing interruption and selection-maturation interaction. Plausible threats to external validity may be preset-treatment interaction, selection-treatment interaction and reactive effects, though the last two controverted.

But according to Badmus (1974) and Gay (1976), if regular classroom test is used, pretest treatment interaction is not a threat to external validity. In this study, regular classroom test was used. The researcher was helpless in attempts to control for regression and selection interactions, plus could pose a challenge to the assertion that the difference in achievement found in this study, was due only to the use of improvised materials and equipment. Additionally, the time for the experiment was short and the concepts taught were few.

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