



Effect of Improvised Apparatus on Academic Achievement of Science Students at Secondary Level

KEYWORDS

Improvised apparatus, PAT, Secondary level

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ABSTRACT *The present investigation was to study the effect of improvised apparatus on students' academic achievement in science at secondary level. The present study has been carried out by Quasi-experimental method. A Two schools have been selected on the basis of stratified sampling i.e. government school and convent school from Agra city. Some improvised apparatus have been made to teach topics in physics of IX standard by the investigators using locally available resources (no cost-low cost). A Physics Achievement Test (PAT) was developed by the investigators for the data collection. The 'academic achievement' being primary objective, the investigators had to focus on other areas like knowledge, understanding, application and skills. Therefore, these educational objectives have also been tested and found better academic achievement when students taught with improvised apparatus in science.*

Introduction

Learning is not a setting of information. The behaviourists say, learning is a relatively permanent change in the behaviour through the reinforcement practice. The demands of education are increasing day by day. Our traditional methods of teaching have failed miserably to cope with the increasing demand for education, because teachers and classrooms increase arithmetically, while the demand for education increase geometrically. The stereotype teaching impedes effective learning process and creates a barrier between the child and teacher. The relevance of science teaching is to make individuals scientifically literate to develop scientific attitude and to enable them to solve problems by applying scientific methods. But due to some constraints the present classroom teaching could not able to satisfy the children's curiosity and does not help them to understand and apply some of the basic principles and concepts of science, to learn scientific enquiry skills and methods of solving problems. Hence, there arise needs of using some Improvised Apparatus in science teaching. Improvised Apparatus are best compellers, potent starters and motivators. As a result they enable student to learn faster, remember longer, gain more accurate information, received and understand delicate concepts. If science is poorly taught, badly learnt, it is little more than burdening the mind with dead information. Since Improvised Apparatus can be used to gain and extend first-hand experience while direct experience is most effective in comprehending ideas. To have direct experience, with those and other in an accessible objects and phenomena would be too expensive, dangerous and difficult, to scope of teaching aids becomes pronounced. In brief, the Improvised Apparatus are supplementary devices by which the teaching through utilization of sensory channels helps us to clarify, establish and correlate accuracy of concepts, interpretations.

Statement of the problem

The present study is entitled as "Effect of Improvised Apparatus on Academic Achievement of Science Students at secondary level".

Justification of the problem

The present in study deals with academic achievement with the help of Improvised Apparatus in science. Improvised Apparatus facilitate the teacher to teach their lesson in a well-organized manner they make difficult concepts simpler and clearer in a scientific way. But the condition here is, Improvised Apparatus must be made in accordance with maturity level of the learner. Improvised Apparatus help in the process

of conceptualization as it involves the principle of Learning by Doing. Jerome.s. Bruner emphasis science must be thought through concept formation mere facts injection. Edgar Dale, in his Cone of learning experiences, says, "I hear I forget, I see I remember, I do understand". To reach this assumption of the learner, Improvised Apparatus must be used by the teacher up to great extent. They make the learner more attractive and attentive as they avoid passive learning while pupils become more active and interactive. Improvised Apparatus correct misconceptualization and secure additional ideas among students. It leads to academic success of the pupils later on. It all depends upon, how effectively teacher uses different Improvised Apparatus during classroom communication process. So, the present study has been taken up.

Objectives of the study

The objectives of the study are as follows,

1. To compare academic achievement of students in science between experimental group and control group.

Subsidiary objectives:-

- To compare academic achievement of students in science between experimental group and control group at knowledge objective
- To compare academic achievement of students in science between experimental group and control group at understanding objective
- To compare academic achievement of students in science between experimental group and control group at application objective
- To compare academic achievement of students in science between experimental group and control group at skill objective

Hypotheses of the study:

The hypotheses of the present study were as follows,

1. There will not be significance difference in academic achievement of science students taught with and without Improvised Apparatus.

Subsidiary hypotheses:

1(i) There will not be significance difference in the academic achievement at 'Knowledge objective' of science students taught with and without Improvised Apparatus.

1(ii) There will not be significance difference in the academic

achievement at 'Understanding objective' of science students taught with and without Improvised Apparatus.

1(iii)There will not be significance difference in the academic achievement at 'Application objective' of science students taught with and without Improvised Apparatus.

1(iv)There will not significance difference in academic achievement at 'Skill objective' of science students taught with and without Improvised Apparatus.

Delimitations of the study

The following are the delimitations of the study,

1. Teaching learning materials is too vast a field to be compressed in to a single study. For example, a detail study of films, projectors, non – projected aids itself could form a separate for study. Therefore, present study was delimited to Improvised Apparatus only.
2. The study was restricted to only one subject namely Science (Physics) and only one class, that is ix standard.
3. Due to time limit, the present study was restricted to only Agra schools (UP).

METHOD OF THE STUDY

The present study has been carried out by Quasi-Experimental Research method to find out the achievement with utilization of Improvised Apparatus in science students at ix standard. The Experiment has undergone following three phases.

Phase-I: In the first phase, the science teachers were given orientation about Improvised Apparatus i.e need and significance of Improvised Apparatus, preparation of different Improvised Apparatus, and its application in science and how they enhance teaching learning process and how they helps in academic achievement of science.

Phase-II: In the second phase, attractive Improvised Apparatus have been developed to teach Microscope and Pressure, Weighing Machine along with lesson plans. Here, the researcher has developed Microscope by Using stick Tripod stand, Empty bulb of 60 candle after nicely removing Aluminum's top and other inside parts, filling 50% of water in the bulb. The researchers have also developed a Weighing machine by using Bike tube for filling water, attaching pipe from air piston so as to circulate water from the tube when we keep some weight on the tube, a scale tied along with water pipe for measuring particular weight.

Phase-III: In the final phase, is known as follow-up, taught in Experimental group with the help of Improvised Apparatus made according to nature of the lesson.

Sampling

Two schools have been selected in the present study on the basis of stratified sampling. The purposive sampling has been followed to select the schools by the researchers. A pre-test has been administered to the whole sampling, and then divided in to two group i.e. experimental group and control group based on pre-test results.

Government school - 1	Convent school - 1
Experimental group - 30	Experimental group - 30
Controlled group - 30	Controlled group - 30
Total 60	Total 60

Description and administration of the Tool

The researcher has considered PAT (Physics Achievement Test) as best tools of research in view of the short time in which the study has to be completed. The researcher has designed Physics Achievement Test covering small portions

of 2 units and purely objective followed by Blue print. The maximum time of achievement test was fixed 30 minutes and maximum marks for test was 25 and conducted for both groups i.e. Experimental and Control group. Then, the entire data was quantified, so that the relationship between the achievement and utilization of Improvised Apparatus in science subject came to be known.

Organization and Tabulation of Calculated Data

Table No. 3.7.1 Comparisons between Experimental group and Controlled group

Group	N	Mean	SD	df	T value obtained	Significance at 0.05 levels
Experimental group	60	28.42	10.6	118	2.27	Significant
Controlled group	60	24.00	10.8			
Subsidiary objectives (objectives)						
I. Knowledge						
Experimental group	60	5.13	1.77	118	2.04	Significant
Controlled group	60	3.60	1.73			
II. Understanding						
Experimental group	60	7.57	2.28	118	2.26	Significant
Controlled group	60	6.57	2.56			
III. Application						
Experimental group	60	8.90	3.42	118	2.00	Significant
Controlled group	60	7.80	2.55			
III. Skill						
Experimental group	60	9.40	2.81	118	2.90	Significant at 0.01 levels
Controlled group	60	7.83	3.12			

Statistical Techniques used for calculating data

The data was quantified, tabulated and analysed in appropriate situation on the basis of post test results of both experimental and groups. The mean and standard deviation of obtained results calculated. T – Tests were used to know the significance of achievement in science with the help of Improvised Apparatus.

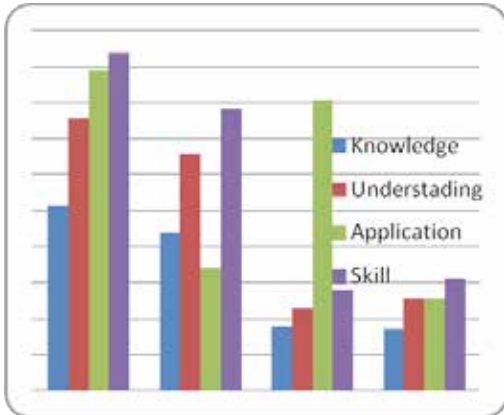
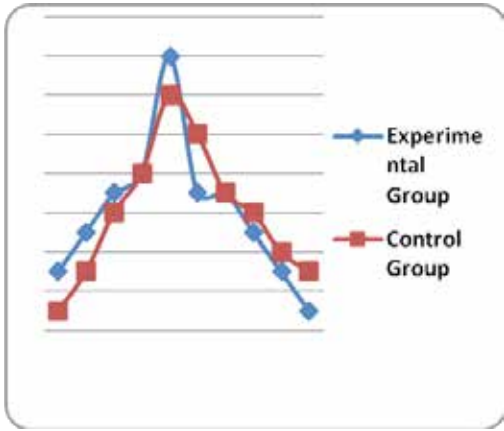
Analysis and interpretations of data

In pursuance of objectives, the data gathered are tested through the significance difference at 0.05 levels.

Results and Discussion

Table – IV (i) Comparison between experimental group and controlled group in terms of 'Academic Achievement'

Group	N	Mean	SD	D F	't' value Obtained	Significance at 0.05 level
Experimental group	60	28.48	10.6	118	2.27	Signifi-
Controlled group	60	24.00	10.8			

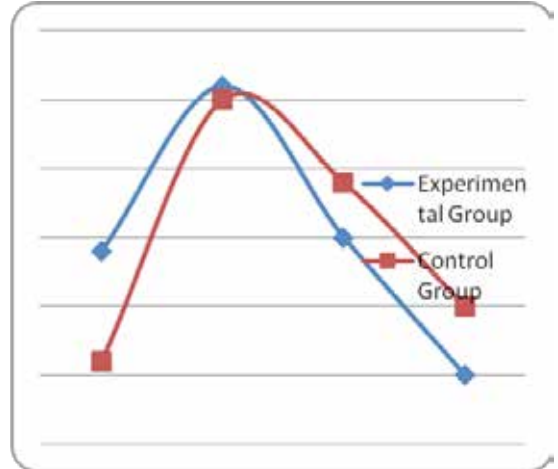
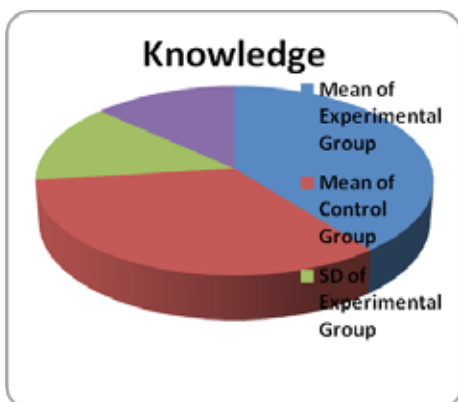


Overall comparison of Academic Achievement between experimental group and controlled group

H01: From the table no. IV(i), the mean and standard deviation of Experimental group were 28.42 and 10.6 whereas mean and SD of control group were 24.00 and 10.8 respectively, the obtained "t" value was 2.27. It clearly indicates that there is a significance difference in the scores of experimental group and control group at 0.05 levels with reference academic achievement in science at IX standard. So, the null hypothesis has been rejected.

Table – IV (ii) Comparison of 'Knowledge objective' of Experimental group and Controlled group

Group	N	Mean	SD	D F	't' value obtained	Significance at 0.05 level
Experimental group	60	5.13	1.77	118	2.04	Significant
Control group	60	3.60	1.73			



Comparison of 'Knowledge objective' between Experimental group and Control group

SH1(i): From the table no.IV(ii), the mean and SD of the experimental group was 5.13 and 1.77 respectively whereas the mean and SD of control group was 3.60 and 1.73 and the obtained't' value was 2.04. It clearly indicates that there is a significance difference in the scores of experimental group and control group at 0.05 levels with special reference to 'Knowledge objective' of experimental group and control group. So, the null hypothesis has been rejected.

Table-IV (iii) Comparison of 'Understanding objective' between Experimental group and Controlled group

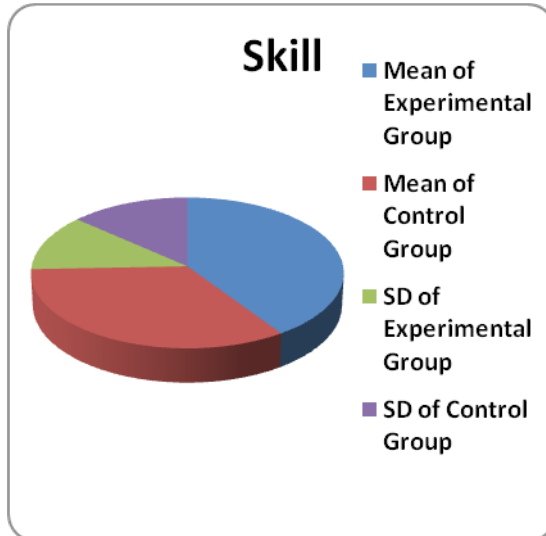
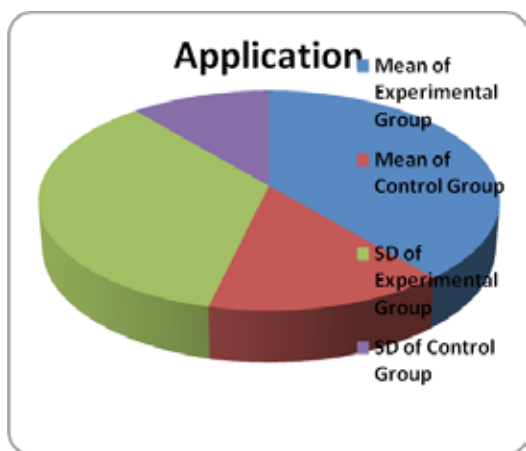
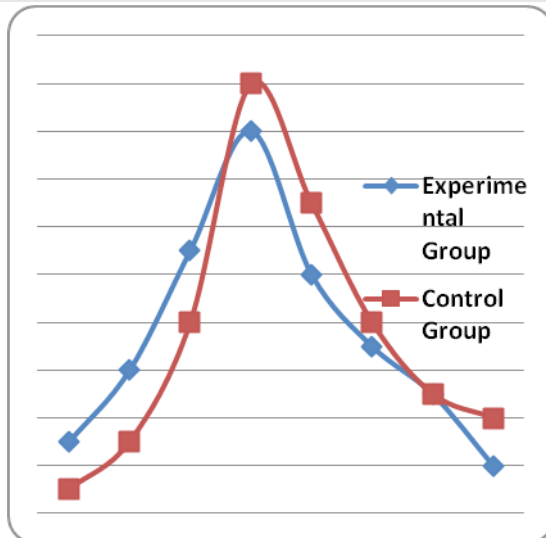
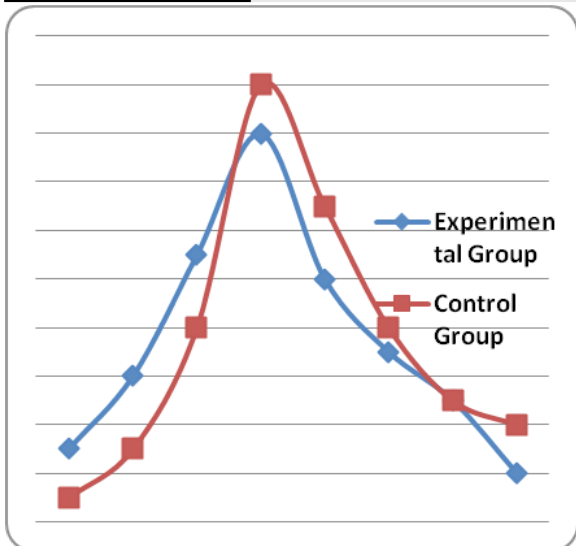
Group	N	Mean	SD	D F	't' value obtained	Significance at 0.05 level
Experimental group	60	7.57	2.28	118	2.260	Sig-nificant
Control group	60	6.57	2.56			

Comparison of 'Understanding objective' between Experimental group and Control group

➤ **SH 1(ii):** From the table no.IV(iii), the mean and SD of experimental group were 7.57 and 2.28 whereas mean and SD of control group were 6.57 and 2.56 respectively and the obtained 't' value was 2.26. It clearly indicates that there is a significance difference in the scores of experimental group and control group at 0.05 levels with special reference to 'Understanding objective' of experimental group and control group. So, the null hypothesis has been rejected.

Table – IV (iv) Comparison of 'Application objective' between Experimental group and Control group

Group	N	Mean	SD	D F	't' value obtained	Significance at 0.05 levels
Experimental group	60	8.90	3.42	118	2.00	Significant
Controlled group	60	7.80	2.55			



Comparison of academic achievement between experimental group and controlled group at 'Application objective'

Comparison of academic achievement between experimental group and controlled group at 'Skill objective'

SH 1(iii): From the table no.IV(iv), the mean and SD of experimental group were 8.90 and 3.42 whereas mean and SD of control group were 7.83 and 3.12 and the obtained 't' value was 2.90. It clearly shows us there is a significance difference in the scores of experimental group and control group at 0.01 levels with special reference to 'Application objective' of experimental group and control group. So, the null hypothesis has been rejected.

SH 1(iv): From the table no.IV(v), the mean and SD of experimental group were 9.40 and 2.81 whereas mean and SD of control group were 7.83 and 3.12 respectively. The obtained t value was 2.90. It clearly indicates us there is a significance difference in the scores of experimental group and control group at 0.01 levels with special reference to 'Skill objective' of experimental group and control group. So, the hypothesis has been rejected.

Table- IV(v) Comparison of 'Skill objective' of Experimental group and Control group

Group	N	Mean	SD	D F	't' value obtained	Significance at 0.01 levels
Experimental group	60	9.40	2.81	118	2.90	Significant
Controlled group	60	7.83	3.12			

Major findings of the study

- Using different Improved Apparatus in teaching science leads to better academic achievement of IX class students.
- Achievement in science at 'knowledge objective' was better when students are taught with the Improved Apparatus at IX standard.
- Achievement in science at 'Understanding objective' was better when students are taught with the Improved Apparatus of IX standard.
- Achievement in science at 'Application objective' was better when the students are taught with Improved Apparatus of IX standard.
- Achievement in science at 'Skill objective' was better when students are taught with Improved Apparatus of IX standard.

Comparisons and Conclusions

Findings from the present study revealed that there was significant effect of treatment on students' achievement in science. It is therefore observed that using improvised apparatus assists the teacher economically and also allows students' interaction, which makes students to achieve better in their lesson. It makes students use their intellectual ability during learning and teaching processes. Improvised apparatus encourage creativity, bringing learning home wards and often better suited to the climatic conditions of the local environment which improve and enhance students' achievement. This finding corroborates previous finding like that of Olosunde, (Isola, 2010). The reason for this might be due to the efficiency of the Physics teachers used for the study in handling the improvised apparatus, and the locally improvised materials were easily understood by the students. This finding however contradicts those of Bassey (2002), who reported that students taught with the standardized instructional materials had the highest achievement. This result agreed to the view of Moronfola (2002) who stressed

that Science subjects should be taught primarily as a practical subject. Omosewo (2008) ascertained that in a modern Science curriculum programme, students (male and female) need to be encouraged to learn not only through their eyes or ears but should be able to use their hands and head to manipulate apparatus.

Educational Implications and Recommendations

The place of Improvised Apparatus in the effective implementation of any educational programme cannot be undermined. Improvised Apparatus perform such functions as the extension of the range of experience available to learners, supplement and complement the teacher's verbal explanations thereby making learning experience richer and providing the teacher with interest into a wide variety of learning activities. Improvised Apparatus supplement, clarify, vitalize, emphasize instruction and enhance learning in students. So, it is advised to all science teachers, to use different Improvised Apparatus in their daily classroom instruction as it helps in better learning.

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