"Effect of Activity Based Approach on Achievement in Science of Students at Elementary Stage"

Professor Badri Yadav

Received: 12 December 2012 Accepted: 31 December 2012 Published: 15 January 2013

Abstract

The present study on Activity Based Approach enhance achievement in sciences of class-VII students. Activity Based Approach consisted of different activities for the all round development of children at the elementary level. Activity should be prepared by low cost material which is available in the locality. Hence it is concluded that Activity Based Approach is significantly effective than the traditional approach of teaching.

Index terms— effect of activity based, approach on achievement in science - students at elementary stage?

1 Introduction

n view of modern developments in science and its importance in today's world. Science teaching has assumed a significant place in primary school curriculum. In India, government is concerned about the quality of science education and it has made significant changes to the country's educational system since it's independence. To maximize the achievement within a given set-up is therefore, the goal of every educationist, a teacher or educational administrator. One of the goals for school science that underlies the National Science Education **??**tandard (1996) is to educate students who are able to experience the richness and excitement of knowing about and understanding the natural world. The science education literature is filled with numerous research activities that suggest that variables such as personal, home, school, teacher etc. are helpful in increasing the achievement levels and knowledge of students in the area of science.

2 a) Meaning and its Importance of Science

Science is a body of empirical, theoretical and practical knowledge about natural world, produced by refresher making use of scientific methods which emphasis the observation, explanation and prediction of real world phenomena by experiment.

Humans have always been curious about the world around them. The inquiring and imaginative human mind has responded to the wonder and awe of nature in different ways, one kind of response from the earliest times has been to observe the physical and biological environment carefully, look for any meaningful patterns and relations, make and use new tools to interact with nature, and build conceptual models to understand the world. This human Endeavour is science.

Science is a dynamic, expanding body of knowledge covering ever new domains of experience. How is this knowledge generated? What is the so-called scientific method? As with many complex things in life, the scientific method is perhaps more easily discerned than defined. But broadly speaking, it involves several interconnected steps: observation, looking for regularities and patterns, making hypotheses, devising qualitative or mathematical models, deducing their consequences; verification or falsification of theories through observations and controlled experiments, and thus arriving at the principles, theories and laws governing the physical world. There is no strict order in these various steps. Sometimes, a theory may suggest a new experiment; at other times an experiment may suggest a new theoretical model. Speculation and conjecture also have a place in science, but ultimately, a scientific theory, to be acceptable, must be verified by relevant observations and/or experiments. The laws of science are never viewed as fixed eternal truths. Even the most established and universal laws of science are always regarded as provisional, subject to modification in the light of new observations, experiments and analysis.

The methodology of science and its demarcation from other fields continue to be a matter of philosophical debate. Its professed value neutrality and objectivity have been subject to critical sociological analysis. Moreover,

while science is at its best in understanding simple linear systems of nature, its predictive or explanatory power is limited when it comes to dealing with non-linear compel systems of nature. Yet, with all its limitations and failings, science is unquestionably the most reliable and powerful knowledge system about the physical world known to humans.

But science is ultimately a social Endeavour. Science is knowledge and knowledge is power. With power can come wisdom and liberation? Or, as sometimes happens unfortunately, power can breed arrogance and tyranny. Science has the potential to be beneficial or harmful, emancipative or oppressive. History, particularly of the twentieth century, is full of examples of this dual role of science.

How do we ensure that science plays an emancipative role in the world? The key to this lies in a consensual approach to issues threatening human survival today. This is possible only through information, transparency and a tolerance for multiple viewpoints. In a progressive forward-Looking society, science can play a truly liberating role, helping people out of the vicious circle of poverty, ignorance and superstition. In a democratic political framework, the possible aberrations and misuse of science can be checked by the people themselves. Science, tempered with wisdom, is the surest and the only way to human welfare. This conviction provides the basic rationale for science education.

3 b) Present Scenario of Science Education

Looking at the complex scenario of Science education in India, three issues stand out unmistakably. First Science education is still far form achieving the goal of equity enshrined in our constitution. Second, science education, even at its best develops competence but does not encourage inventiveness and creativity. Third, the overpowering examination system is basic to most, if not all, the fundamental problems of science education to address a range of issues related to science curriculum and problems in its implementation, but has particularly focused on the three issues mentioned above. First, we must use science curriculum as an instrument of social change to reduce the divide related to economic class, gender, caste, religion and region. We must use the textbooks as one of the primary instruments for equity, since for a great majority of school going children, as also for their teachers, it is the only accessible and affordable resource for education. We must encourage alternative textook writing in the country within the broad guidelines of the national curriculum framework. Information and Communication Technology (ICT) is also an important tool for bridging the social divides. ICT should be used in such away that it becomes an opportunity equalizer by providing information, communication and computing resources in remote areas.

Second, we believe that for any qualitative change from the present situation, science education in India must undergo a paradigm shift. Rote learning should be discouraged. Inquiry skills should be supported and strengthened by language, design and quantitative skills. Schools should give much greater emphasis on co-curricular and extracurricular elements aimed at stimulating investigative ability, inventiveness and creativity, even if these elements are not part of the external examination system. We strongly recommended a massive expansion of non-formal channels (for example, a truly large scale science and technology fair with feeder fairs at cluster/ district/ state levels) to encourage schools and teachers to implement this paradigm shift.

Third, we recommend nothing short of declaring examination reform as a National Mission (like other critical missions of the country), supported by funding and high quality human resources that such a mission demands. The mission should bring scientists, technologists, educationists and teachers on a common platform and launch new ways of testing students which would reduce the high level of examination related stress, curb the maddening multiplicity of entrance examinations, and research on ways of testing multiple abilities other than formal scholastic competence.

These reforms, however, fundamentally need the over arching reform of teacher empowerment. No reform, however well motivated and well planned, can succeed unless a majority of teachers feel empowered to put in practice. With active teacher participation, the reforms suggested above could have a cascading effect on all stages of science teaching in our schools.

4 c) Science and Technology

Technology is often equated to applied science and its domain is generally thought to include mechanical, electrical, optical and electronic devices and instruments, the household and comm.ercial gadgets, applications of chemical, biological, nuclear sciences and computer and telecommunication technologies. These various sub-domains of technology are, of course, interrelated. Viewing technology, especially modern technology, as applied science is, therefore, not wrong. Much of technology that we see around is indeed informed by the basic principles of science. However, technology as a discipline has its own autonomy and should not be regarded as a mere extension of science. After all, technology was part of ancient human civilizations and even prehistory, but science in its modern sense is relatively recent only about four centuries old. In fact there is much local technological knowledge existing around the world that is in danger of extinction due to the sweeping dominance of modern technology.

Basically science is an open-ended exploration; its end results are not fixed in advance. Technology, on the other hand, is also an exploration but usually with a definite goal in mind. Of course, technology is as much a creative process as science, since there are, in principle, infinite ways to reach the given goal. Creativity consists

in new ways of designing, planning and charting out the map to the final end, as also in innovative applications of the known principles of science. Technological solutions are guided as much by design, aesthetic, economic and other practical considerations as by scientific principles.

Science is universal; technology is goal oriented and often local specific.

Our very definition of progress is linked with advances in science and technology. These advances have led to unimagined new fields of work and transformed, often beyond recognition, traditional fields like agriculture, manufacturing, construction, transport and entertainment. People today are faced with an increasingly fast-changing world where the most important skills are flexibility in adapting to new demands and creativity in taking advantage of new opportunities. These imperatives have to be kept in mind in shaping science education.

5 d) Research on Pedagogy in Science Education

About 40 years ago science education came to be recognized around the world as an independent field of research. The concerns of this research are distinct from the concerns of science and those of general education. Its methods and techniques were initially borrowed from the sciences but new methods are being developed suited to the research questions.

Motivation for this research comes from the need to improve the practice of science education. We begin by asking, which methods of teaching work better than others? Studies in the 1970s typically compared experimental classrooms with Controls. New teaching aids were tried out; lecture methods were compared with activity-based teaching, and so on. These studies gave useful results in particular contexts but it was hard to replicate them. Conditions in classrooms are varied; teacher and student characteristics too vary widely. Teaching and learning are complex, context-dependent processes and one needs to first describe this complexity in order to understand it, before eventually aiming to control it.

The early studies led to many new lines of enquiry. One line looked at the social Context of teaching and learning and of the interpersonal dynamics occurring in science lessons. This kind of research has drawn on methods from sociology, linguistics and anthropology. New tools for classroom observation have reached a considerable level of sophistication. In general one knows that a supportive relationship among students and teachers, student participation in setting goals and making decisions, clear expectations and responsibilities, and opportunities for collaboration, are some factors which lead to better student outcomes.

Observations in science are usually motivated by a theory or a hypothesis. In a classroom, however, experiments are motivated by the teacher or the textbook; the students either watch or follow instructions; they are told which particular observation to focus on, and the inference is also told to them. Let us take an example. A candle is lighted and then covered with a glass. To the question, "What does the experiment show", the common answer is, "This experiment shows that air contains oxygen a clearly unwarranted conclusion, but one that is often accepted in classrooms.

Clearly, for experiment based science learning to be effective, there must be space and time for teachers and students to plan experiments, discuss ideas, and critically record and analyse observations. A good pedagogy must essentially be a judicious mix of approaches, with the inquiry approach being one of them.

6 e) Activity Based Approach

Through activity-based teaching has been accepted as a paradigm for science education and is also reflected in some measure in the textbooks developed at the national and state levels, it has hardly been translated to actual classroom practice. Activities still tend to be regarded as a way to verify the ideas/principles given in the text, rather than as a means for open-ended investigations. There is a general feeling that activity based teaching is expensive, takes more time that could be otherwise "fruitfully" used for 'text based' teaching, and does not prepare the child for examinations and competitive tests.

The concern about expenditure involved in activities/experiments cannot be dismissed. Most schools cannot afford well-equipped science laboratories. However, it is certainly possible to design low cost activities and experiments using easily available materials. Thus cost should not be allowed to become an excuse for neglecting the very base of learning science.

The method to teaching-learning process adopted must be suitable to the age and mental ability of pupils' social norms and available resources in the environment. The approach must be less burden to learning and increasing the eagerness and happiness of school life. The teaching-learning process conducted in different approaches like inductive and deduction analysis and synthesis. Child centred approach, lecture method and activity based approach.

The primary school children are in operational and concrete operational stages where cognitive development is very important. So, at this stage joyful learning should be important to the students. Keeping this mind activity based learning is very useful. If the activities are well selected, planned and organized in education. It influence the student learning capacity. Activity based approach in education was emphasized by different educationists like Rousseau, Devey etc.

7 f) Necessity of Activity Based Approach

The children of primary stage are incapable of formal reasoning. They cannot appropriate abstract ideas and attracted towards concrete and tangible things and also they can concentrate in a particular aspect for a short while. Curiosity is a dominant activities which are full of energy and find it uneasy to sit guilt for a long period. They love to be involved in different types of activities. Their minds are seldom to rest. Need for recognition is greater at this stage. They want appreciate even for the small things which they accomplish.

Activity based teaching provide opportunity for measuring learning through experience, direct observation and participation of children. The activity based approach provide opportunity for pupils to work in a co-operative manner, helps to develop original ideas making learning process in an entertaining manner. Attainment of competencies can be possible through activity based approach in teaching learning process.

Enhancing the quality of primary education is vital key to improving the teaching method in school. If the school is able to offer to the children diverse opportunity to learning by doing various activities then the school will be an attractive place for the pupils. There activities are guided by teacher in class-room situation.

8 g) Rationale of the Study

By looking at the present educational scenario, activity based teaching has been excepted as good strategy for science education as students actively participate in the process of learning.

The learning environment wont be conducive for students unless/until a teacher devised a good strategy of teaching. It has been observed that activity based approach teaching is the cornerstone of better intellectual development and it leads to critical pedagogy. Though this approach gives emphasis on the direct participation of the students in learning process, the students getting the right concept while engaging themselves and different activities.

It must be realized that a difficult concept is simplified merely by presenting at preferly rather it needs pre-requisites ideas, experiences and activities at the different levels.

As for as science is concern, the students suit be taught different concepts, theories, principles etc. through the sense of the everyday experiences as it has seen that majority of activities and experiments are inexpensive and use readily available materials, so that this core component of science curriculum should be implemented in all schools including those with adequate infrastructure.

Different activities in which students participate both inside and outside itself are among the multiple situation that can have an effort on science achievement. Extra-scholastic activities have been associated with an improved educational level, more interpersonal competencies, higher aspirations and better attention level **??**Mahovey, Cairos & Farwer, 2003).

The differences between boys and girls in relation to science achievement have received a lot of attention in recent years. While some studies indicate that in general boys achieve better **??**Gipps-1994 **??** Kingdon-1999), either no difference **??**Ventura-1992 **??** Calsambis-1995 **??** Mohapatra & Mishra-2000) or girls outperform boys **??**Calsambis-1995 **??**Calsambis- , soyibo-1999)) has been demonstrated.

By looking at all around the educational environment and keeping in view the researcher findings it is very much clear that activity based approach as some short of direct and indirect impact in the excellency level of the students and at the same time no studies conform whether the boys and girls are better achiever through this approach. This all things tempted the researcher to undertake the problems there in elementary school.

9 h) Statement of the Problem i) Operational Definition

Activity based approach:-This is a method of teaching where children learn through experience, observation and active participation. The students were engaged in motor activities while learning a basic concept.

10 j) Delimitation of the Study

By keeping in view the time and resource, the scope of the present study was limited in a certain area.

? The study was conducted on the students of Shri Kanwartara High School at district-Khargone in M.P. ? The study was confined to only 7 th class students.

? Due to limited time, 10 periods of science class were taken.

11 k) Objectives of the Study

The study will be undertaken having the following objectives:

? To study the effect of activity based approach on achievement in Science of Class-VII students.

? To compare the achievement score of boys and girls in Science taught through activity base approach of class-VII students.

12 l) Hypotheses of the Study

? There would be better achievement in science, if the experimental group is taught through activity based approach.

? There is no significant difference in the mean score of Science achievement of experimental group with respect to gender district of M.P., students studying in class-VII. In order to achieve the objectives and test the hypotheses of the study, the school was selected randomly. The sample was selected from the population of 113 students. The investigator has selected the sample through random sampling procedure. Sixty students were randomly selected (using a table of random number) and randomly assigned (using lottery) to two groups of 30 each. This design was selected to control all sources of internal validity and random assignment can be emphasized while selecting two groups, Pre-test controls mortality and randomization and "control group" controls maturation, history, testing and instrumentation. The only weakness in this design is pretest-treatment-interaction. The selected children were randomly divided into two groups through lottery system. Out of the two groups one was randomly allotted to experimental group and the other to control group.

print. It consists of 37.5%, MCQs, 25% fill in the blank, 27.5% true/false and 10% matching type questions to measure knowledge, understanding and problem solving ability of the students.

Achievement test having forty items were formulated each dimension such as 42.5% knowledge, 30% understanding and 27.5% application area related to the selected topics. The items were presented before a panel of expert to judge its content validity. The nature of the achievement test is question-cum-answer sheet.

The instructional tool is based on a certain lesson plan having five steps; introduction, presentation, different activities, recapitulation and evaluation lesson plans were developed in different sub-units of each topic, keeping in view the need of students and the activities to be performed for each sub-unit.

The activity based materials were developed according to the different competencies of each and every sub-unit.

13 d) Procedure of Data Collection

After selecting required number of the samples randomly assigned into two groups, out of the two groups one group was randomly assigned to experimental group and the other to control group. The initial achievement scores of both the groups were recorded by the teacher-made achievement test in science.

The investigator taught to experimental group through activity based approach whereas the control group by traditional method of teaching. After the completion of the treatment, both the groups were tested. Post-test scores of both the groups were compared to see the effect of activity based approach on achievement in science. The post-test scores of experimental group were further analyzed to study the effect of activity based approach on the science achievement with respect to gender.

14 IV Version I

15 e) Data Analysis

Post-test scores were analyzed to see the effect of activity based approach on achievement in science. For interpretation of results both descriptive and inferential techniques were adopted. Hypotheses testing were made according to followed in testing null and directional hypotheses.

16 III.

17 Analysis and Interpretation

Analysis and interpretation of the data is the most important and crucial step in educational research. After data has been scored and tabulated, it has to be analysed and interpreted to drawn proper inference. Analysis of data means studying and organized materials in order to discover inherent facts. However, valid, reliable and adequate the data may be, it does not serve any worth while purpose unless carefully edited, systematically classified, tabulated and scientifically analysed. The analysis of data emphasizes the following main function.

? To make the raw data meaningful.
? To test the hypotheses.
? To obtain significant result.
? To estimate parameters.
? To draw useful interference.

18 a) Results

In the present study dependent variable is achievement in science and independent variable is activity based approach.

19 i. Analysis of result regarding the effect of activity based approach on achievement in science for pre-test scores

To study the effect of activity-based approach on the science achievement mean, standard deviation and t-value were computed and are presented in the table 3.1 given below. The obtained t-value = 0.367 for 58 degrees of freedom is less than the table values of 1.67 and 2.39 at 0.05 level and 0.01 level respectively of not significant on one tailed test.

It is clear that there is no significant difference between two means scores of experimental group and control group.

ii. Analysis of result regarding the effect of activity based approach on the achievement in science for post-test scores.

To study the effect of activity-based approach on the science achievement mean, standard deviation and t-value were computed and are presented in the table 3.2 given below. The obtained t-value = 3.969 for 58 degrees of freedom is grater than the table values of 1.67 and 2.39 at 0.05 level and 0.01 level respectively of significant on one tailed test.

Here the researcher has to use a one tailed test because every reason to believe that his treatment will produce an effect in the positive direction only.

Hence it is right to accept the directional hypothesis. Which indicate that there is a significant difference between the mean scores of science achievement of experimental group and control group?

Thus we may say that (99 times out of 100) the gain is significant and activity based approach may be taken as a significant enhanced for science achievement of students.

From the mean scores, it can be conclude that activity based approach enhanced the achievement of science than the traditional method of teaching. From the table it is found that obtained't' is 9.21 with df=58. The t-value to be significant at 0.05 level and 0.01 level with df=58 required the value of 1.67 and 2.39 respectively on one tailed test. Here the calculated t value is greater than required t-value. Hence there is significance difference in the achievement score of experimental group and control group.

20 iii. Analysis of impact of activity-based approach on achievement in science of students with respect to knowledge based items

From the mean scores it can be conclude that activity-based approach enhanced the achievement of science than the traditional methods with respect to knowledge based items.

21 iv. Analysis of impact of activity based approach on

achievement in Science of students with respect to understanding based items. From the table it is found that obtained't' is 4.267 with df=58. The t-value to be significant at 0.05 level and 0.01 level with df=58 required the value of 1.67 and 2.39 respectively on one tailed test.

Here the calculated t-value is greater than required t-value. Hence there is significance difference in the achievement scores of experimental group and control group.

From the mean scores it can be concluded that activity based approach enhanced the achievement of science than the traditional methods with respect to understanding based items.

v. Analysis of impact of activity-based approach on achievement in science of students with respect to the application based items. From the table it is found that obtained't' is 2.33 with df=58. The t-value to be significant at 0.05 level and 0.01 level with df=58 required the value of 1.67 and 2.39 respectively on one tailed test.

Here the calculated t-value is greater than required t-value at 0.05 level but less than required tvalue at 0.01 level.

Hence there is significant at 0.05 level but not significant at 0.01 level.

From the mean scores, it can be conclude that (95 items out of 100) the gain significant such as activity-based approach enhanced the achievement in Science than the traditional method of teaching w.r. to the application based items.

The following graph shows the mean different between the experimental and control group after the treatment.

22 Figure A :

The graph shows the mean difference between the groups The above graph shows that the mean difference of experimental group is better than control group. It means the treatment group students performed better with regard to knowledge, understanding, application than the control group. Hence the activitybased approach is better than conventional method of teaching.

vi. Analysis of result regarding the effect of activity based approach on the science achievement of experimental group with respect to gender.

To study the effect of activity based approach on the science achievement of experimental group with respect to boys and girls means, S.D. and t-value are computed and are presented in the table 3.3 given below. For the significance at 5% and 1% levels, the critical t-value are 2.05 and 2.76 respectively. Our computed t-value is 2.066 crosses the table value 2.05. It shows that differences are significant at 0.05 level but does not reach 2.76. Hence it is not significant at 0.01 level. Consequently we can not reject the null hypothesis at 0.01 level only reject the null hypothesis at 0.05 level. We find from table that the critical value of 't' with degrees of freedom at 5% level of significance is 2.05. Our computed value of 't' i.e. 1.101 is quite small than the critical table value 2.05 and hence is not significant on two-tailed test.

Thus, we can say that no any significant difference between boys and girls regarding application based items achievement scores of experimental group.

The following graph shows the mean different between the boys and girls of experimental group after treatment. The above graph shows that the mean scores of boys is less that the girls. It can be conclude that the gender has influence on the achievement of science in experimental group.

23 Global Journal of Human Social Science

24 b) Interpretation of results

One of the major objectives of the study was to see the effect of activity based approach on achievement in science. Accordingly hypotheses were formulated and verified employing "pretest post test control group design" with randomized group and the results are interpreted below.

i. Treatment wise difference in Science achievement of students The directional hypothesis H 1 is stated as "There would be better achievement in Science, if experimental group is taught through activity based approach". **??**.2) shows that the t-value is 3.969. As the calculated value is greater than the table value, the t-value is considered to be a significant. Hence the directional hypothesis is accepted.

It means that the methods of teaching influence the achievement score in science on the students i.e. science achievement depends upon the pedagogy.

Examination of these two means indicated that, activity based approach treatment was superior to traditional treatment with reference to knowledge, understanding and application based items.

The result of this study was supported by a number of studies (G. Mahimaran & Dr. K. **??**nanda-2009 **??** Sethi, A.K.-2008 **??** Rout, T K (2007 **??**, Agarwal & Gupta-2009 **??** Sahu (1997 **??**, Dahara (1996) in which comparisons have been made between innovative methods of teaching and traditional methods of teaching.

25 ii. Gender wise difference in Science achievement

The null hypothesis H 0 is stated as "There is no significant difference in the mean score of science achievement of experimental group with respect to gender". This states that H 0 = M B ? M G Where M B = Mean score of boys M G = Mean score of girls H 0 = Null hypothesis That 't' calculated under (Table 3.3) shows that the t-value is 2.066. Here the obtained 't' value required the table under of 2.05 to be significant at 0.05 level for 28 degrees of freedom. As the calculated value is grater than the table value, the t-value is considered to be significant at 0.05 level but not significant at 0.01 level.

It means difference between boys and girls exist. From the mean scores, it can be concluded that girls is better than boys in science achievement with respect to knowledge based items only. From the above findings it clear that there exists significantly differences between means of the achievement scores of experiments group students after teaching through activity based and means of the achievement scores of the control group students after teaching through traditional method. From the analysis and interpretation of the data it is found that the hypotheses are accepted. Lastly, it is conclude that the activity based approach has significantly positive effect on enhancing the content wise achievement and academic achievement of class-VII students.

V.

26 Educational Implication

Activity based approach have greater interest and better attitude towards the material learned by students than that conventional approach (traditional method). It seems to be co-operative, competitive learning conditions, rewarding learning experiences, personalized attention to each student learning problems and social problems of students. Hence activity based approach can fulfill the need in teaching learning situation by providing quality improvement instruction.

27 Conclusion

Concluded that the present study on Activity Based Approach enhance achievement in sciences of class-VII students. Activity Based Approach consisted of different activities for the all round development of children at the elementary level. Activity should be prepared by low cost material which is available in the locality. Hence it is concluded that Activity Based

The present study has some practical aspects and implementation for the educational system as follows :

Approach is significantly effective than the traditional approach of teaching. [1]

[1]

Figure 1: ""

1

Sex	Experimental group	Control group	No. of sample
Boys	17	18	35
Girls	13	12	25
Total	30	30	60

b) Design

Figure 2: Table 1 :

2

Groups (Randomly assigned)	Pre-test	Independent variable	Post-test
Experimental group	T 11	New treatment	T 21
Control group	T 12	treatment Traditional	T 22

Figure 3: Table 2 :

3

Statistical technique	.1 Experimental group	Control group
Mean	22.33	22.33
S.D	5.55	4.99
SE D	1.362	
t-value	0.367**	
df	58	

Figure 4: Table 3

3

Statistical technique	.2 Experimental group	Control group
Mean	32.33	27.50
S.D	4.42	5.60
SE D	1.30	
t-value	3.969**	
df	58	

*[Note: ** Significant at 0.01 levels. (on one tailed test)]*

Figure 5: Table 3

3

.2 (a)
Mean, S.D and t-value of post-test achievement scores in science of experimental group and control group with respect to knowledge based items

Figure 6: Table 3

3

.2 (b)

Mean, S.D and t-values of post-test achievement scores in science of experimental group and control group with respect to understanding based items.

Statistical technique	Experimental group	Control group
Mean	9.466	6.80
S.D	2.291	2.54
SE D	0.62	
t-value	4.267**	
df	58	

*[Note: ** Significant at 0.01 levels. (on one tailed test)]*

Figure 7: Table 3

3

.2 (c)

Mean, S.D and t-values of post-test achievement scores in science of experimental group

Figure 8: Table 3

3

.3

Statistical technique	Boys	Girls
Mean	31.64	33.76
S.D	4.95	2.66
SE D	1.027	
t-value	2.066**	
df	28	

** Significant at 0.05 levels (on two tailed test)

Figure 9: Table 3

Thus we can say that (95 times out of 100) the gain is significant.
vii. Analysis of knowledge based item's post-test scores of experimental group with respect to gender.
The mean, S.D and t-value of post-test scores of experimental group regarding the knowledge based items with respect to gender are computed and are presented in the table 3.3(a) given below. Table 3.3 (a) Statistical technique Boys Mean 16.324 S.D 0.922 SE D 0.282 t-value 2.53** df 28 ** Significant at 0.05 levels (on two tailed test) Girls 17.03 0.634 viii. Analysis of understanding based item's post-test scores of experimental group with respect to gender. Mean, S.D and t-value of post-test scores of experimental group regarding the knowledge based items with respect to gender, were computed and are presented in the table 3.3(b) given below. Table 3.3 (b) Statistical technique Boys Girls Mean 8.88 10.24 S.D 2.867 1.846 SE D 0.86 t-value 1.58** df 28 ** Not significant at 0.05 levels (on two tailed test). We find from table that the critical value of 't' with degrees of freedom 28 at 5% level of significance is 2.05. Table 3.3 (c) Statistical technique Boys Mean 7.35 S.D 3.30 SE D 1.078 t-value 0.101** df 28 ** Not significant at 0.05 levels (on two tailed test) Girls 7.46 2.61

Figure 10:

40 Boys
Girls
35
30
16.32 Major Findings 17.03 (1) Experimental group of students are perform better in 10.24 15 20 25 IV. scie

0 5 (3) Gender has significant influence on the achievement Knowledge Understanding of science in experime

Figure 11:

VII.

Figure 12:

IV Version I Bibliography 1. **??**garwal and Gutpa, (2000). Effect of activity based instructional material on academic achievement of elementary students. 2. **??**alkrishna, B. (2009)