Chapter – VI

SUMMARY
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“Science is what the scientist does. It is a process by which we increase and refine our understanding of the universe through continuous observation, experimentation, application and verification”

Gagne (1965)

The aims and objectives that were laid down for science education were not implemented up to the mark. In this connection, National Science Education Standards (1996) emphasized changes in the teaching and content standards. In India, NCERT has brought out the national curriculum framework (2005) that viewed child as a constructor of his knowledge. It also recommended the development of scientific attitudes, values, creative, critical and generative thinking among the students and enable them to use their idea in various day to day life situations. In Overall, there expressed a shift of emphasis from information based and teacher-cantered education to process catered and learner friendly education.

The science education of today is far away from the above vision. In the traditional classroom, teaching is teacher dominated and depends heavily on the text books for the structure of the content. Students were the passive listener and there is little room for students initiated questions and independent thought. All the above ideas and processes occur repeatedly in constructivist writings. Insight from the review revealed that there are numbers of studies conducted on constructivism in west in various disciplines like mathematics, computer education, language learning and so on. Constructivist approach was tried out at different levels from early childhood education education to university level. In India, Constructivist approach is yet to get prominence not only at the research level but at level of awareness also.

Thus, it is felt necessary to study the effect of constructivist approach on the students of 6th grade in science subject in improving the achievement and associated skills in Indian context at elementary level.
The present study reveals that greater effects of Constructivist approach on the achievement of 6th grade students in science. The constructivist teaching and learning approach helps to enhance the academic achievement of the students. It was observed that the Constructivist teaching is more effective than the traditional teaching methods. The Constructivist approach believes that learners actively construct their knowledge in their attempts to make sense of their world. Hence the learning should emphasise the development and understanding of meaning. Students should be able to acquire experience and learn themselves, and apply what they learn to various and unpredictable situations that they might be encounter over the course of their worldly lives.

Obviously, the traditional teacher centred and text books guided classroom has failed to bring about the desired outcomes of producing learning students much heralded alternative is to change the focus of classroom from teacher dominated to student-centred or more appropriately, to the learning centred using a Constructivist approach. During the research most of the students shows positive attitude, interest and maximum participation in various activities in science learning.

The results of the findings indicate that there was improvement in academic performance of students in Constructivist group on post test and delayed post test level. Their score at post test level was higher than their score at pre-test level compared to their colleagues in Conventional lecture method. The same trend occurs in Delayed post-test level. Students in Constructivist group were able to retain (80-90%) of the concepts taught compared to their colleagues in Conventional lecture Group who could able to retain only 10% of the concepts taught.

In the view of afore mentioned findings the study has been able to establish that the hypotheses is acceptable because there was a statistically significant difference for the samples’ post test and delayed post-tests where the students who received Constructivist pedagogy scored higher than their colleagues in Conventional lecture group.
The findings of the study are on the line with the research findings of (Oludipe Bimbola and Oludipe Daniel, 2010), (Pallavi Kaul, 2010), (B.S. Fuspanjali, 2010), (Satyprakasha C.V.2010), (Hindir Karaduman and Dr Mahmet Gultekin, 2007), (Vandana Mehra, 2008-2009), K.V. Sridevi (2007).

So on the basis of the conclusion obtained in the present research it was concluded that Constructivist approach of teaching and learning is more effective than the traditional methods of teaching and learning in Science.

Thus, it is felt necessary to study the effect of Constructivist Approach on the 6th grade students Achievement in science in Indian context at elementary level.

Statement of the Problem

The problem under investigation is entitled as follows.-

"Effect of Constructivist Approach on the 6th Grade Students Achievement in Science"

Significance of the Study

The aims and objectives of science education at elementary level spelt out were unfortunately not implemented properly. In spite of many efforts made by the various committees and commissions as listed earlier, the quality of science education is not satisfactory. The textbooks are activity-based inclusion of learner-centered teaching learning process and increased utilization of community resources. But still, the change is not up to the mark. Science is being taught in the schools as a body of established facts obtained by individuals using infallible methods. The present classroom practices emphasize on the product side of science rather than the method of acquiring the knowledge, which is the scientific method that forms the process side of science.

In the Conventional classroom, the classes are usually driven by "teacher talk" and depend heavily on textbooks for the structure of the course. Teachers serve as pipelines and seek to transfer their thoughts and meanings to the passive students. Obviously, the traditional teacher-as-information-giver, textbook guided classroom has failed to bring about the desired
outcomes of science education. An alternate is to change the focus of the classroom from teacher dominated to student-centered using a constructivist approach. Studies have proved that Constructivist approach is effective to enhance the academic performance, attitude and interest of the students by using various methods and strategies.

An attempt was made by the investigator to study the effect of Constructivist Approach in the Indian context at elementary level schools to find out whether this method would be able to enhance the academic performance of the students, understanding of basic concepts, and better use and understanding of basic processes of science and can apply science concepts, processes and principles in various new day to day life situations. This study will be able to put emphasis on the learner centered or activity method.

The importance of the present study is to prepare students to become good adaptive learners i.e. students should be able to apply what they learn in school to the various unpredictable situations that they might encounter in the course of their work lives. Obviously, the traditional teacher as information giver and text book guided classroom has failed to bring about the desired outcome of producing thinking students.

Results of this study offer information about constructivist teaching approaches effectiveness in teaching science at all classroom levels and thus provide a vital guide for teachers, administrators, students, as well as instructional system builders. These groups will be guided accordingly as to design, methods, and arrangement of contents of learning materials consistent with the demands of constructivist classroom arrangements that enhances active learning engagement that eventually promote deeper learning and understanding of science knowledge, values, and skills.

Results of this study will also be very useful among researchers in the science education field as it offers the promise of widening their appreciation of the implication of constructivist models from a purely cognitive orientation to a combination of both cognitive and affective factors especially as it relates to building arrangement for learning among communities of learners.
The aim of present study was to determine the effect of constructivist approach on the 6th grade students’ achievement in science. To accomplish the afore-mentioned purpose the following objectives were established.

**Objectives of the Study**

1. To construct an instructional material comprising of lesson plan based on the principles of constructivist approach.
2. To construct and standardized an achievement test on the segment of Science of 6th grade students.
3. To compare the achievement in Science of two groups of students:
   i) Taught with the help of instructional material based on Constructivist approach of teaching and
   ii) Taught with the help of instructional material based on Conventional approach of teaching.
4. To study the effectiveness of constructivist approach and conventional approach on the achievement in Science of male and female students studying in 6th grade of Science subject.
5. To compare the achievement of two groups of students of 6th grade Science taught with the help of constructivist approach and conventional approach in terms of urban and rural background.
6. To study the effectiveness of constructivist approach and conventional approach on the achievement in Science in relation to different components of Socio –Economic Status i.e.
   i) Upper class Socio –Economic Status
   ii) Upper middle class Socio –Economic Status
   iii) Middle class Socio –Economic Status
   iv) Upper lower class Socio –Economic Status
   v) Lower class Socio –Economic Status
7. To compare the achievement in Science of Govt. school and public school students taught with the help of constructivist and conventional approaches.

8. To compare the effect of constructivist approach on the students of Experimental group at all the three levels of pairing i.e. Pretest-Posttest, Pretest-Delayed Posttest and Posttest-Delayed Posttest in terms of:
   i) Gender
   ii) Locality
   iii) Socio –Economic Status
   iv) Type of the school.

9. To compare the effect of constructivist approach on the achievement of Control group students at all the three levels of pairing i.e. Pretest-Posttest, Pretest-Delayed Posttest and Posttest-Delayed Posttest in terms of:
   i) Gender
   ii) Locality
   iii) Socio –Economic Status
   iv) Type of the school.

**Hypotheses of the Study**

1. There will be significant difference in the achievement of two groups of students-
   i) Taught with the help of instructional material based on constructivist approach of teaching and
   ii) Taught with the help of instructional material based on conventional approach of teaching.

2. There will be significant difference on the achievement of male students studying in the 6th grade of science subject taught with the help of constructivist approach and conventional approach.
3. There will be significant difference on the achievement of female students studying in the 6th grade of science subject taught with the help of constructivist approach and conventional approach.

4. There will be significant difference on the achievement of urban Science students studying in the 6th grade taught with the help of constructivist approach and conventional approach.

5. There will be significant difference on the achievement of rural Science students studying in the 6th grade taught with the help of constructivist approach and conventional approach.

6. There will be significant difference on the effectiveness of constructivist approach and conventional approach on the achievement of Upper class Socio-Economic Status students.

7. There will be significant difference on the effectiveness of constructivist approach and conventional approach on the achievement of Upper middle class Socio-Economic Status students.

8. There will be significant difference on the effectiveness of constructivist approach and conventional approach on the achievement of middle class Socio-Economic Status students.

9. There will be significant difference on the effectiveness of constructivist approach and conventional approach on the achievement of upper lower class Socio-Economic Status students.

10. There will be significant difference on the effectiveness of constructivist approach and conventional approach on the achievement of lower class Socio-Economic Status students.

11. There will be significant difference on the achievement of Govt school 6th grade Science students taught with the help of Constructivist and conventional approaches.

12. There will be significant difference on the achievement of Public school 6th grade Science students taught with the help of Constructivist and conventional approaches.
13. There will be significant differences on the achievement of Experimental Groups at all the three levels of pairing in terms of:

   i) Gender
   ii) Locality
   iii) Socio-Economic Status Groups
   iv) Type of Institution

14. There will be significant differences on the achievement of Control Groups at all the three levels of pairing in terms of:

   i) Gender
   ii) Locality
   iii) Socio-Economic Status Groups
   iv) Type of Institution

Operational Definitions of the Terms Used

In the present study a number of terms and concepts have been used. To convey the specific meaning, terms and concepts used in the study have been defined operationally as follows;

1. **Constructivist Approach**: In the present study Constructivist approach means a method of teaching and learning in which the learner is exposed to construct his own knowledge, experiences, ideas and concept based on his prior knowledge and experiences from his surroundings. It is a democratic way of teaching and learning which emphasizes on the various approaches and aspects of teaching and learning such as active participation, problem solving, learning by doing, Cooperative learning, individual leaning, activity based teaching and learning, Use of conversation, discussion, interaction with others and sharing ideas from an integral aspect for construction of knowledge. During this process the child learn many skills such as observing, hypothesizing, inferring etc. which leads to the development of scientific mind and positive attitude towards Science, which is the ultimate aim of Science teaching.
2. **Conventional or Traditional Approach:** In the present study the Conventional or Traditional Approach of teaching and learning means the approach involves the teacher centred methods of teaching in which the students remains as the passive listeners. This approach mainly focuses on the traditional methods of teaching and learning such as dictation method, lecture method, textbook readings, recitation etc. In the Conventional approach of teaching and learning the learner has no freedom to share his ideas, experiences, information and to form new concepts.

3. **Science Achievement:** - Achievement is the assessment of academic performance which is largely confined to evaluation in terms of the objectives like knowledge, understanding, application and skill. An achievement test in the selected content including all the four levels of objectives was constructed by the investigator. Thus achievement in science in the present study is the total score obtained by the students in the achievement test constructed by the investigator. This is assessed in terms of marks or grades in Himachal Board of school education and NCERT.

4. **Intelligence:** In the present study the intelligence of students were determined through the intelligence test and the score obtained in the test was taken to classify students as high intelligence or low intelligence groups.

5. **Socio Economic Status:** Socio Economic Status of an individual or family means his social and economic position in the Society in terms of his/their income, Education, Occupation etc. In the present study SES is further divided into Five Components i.e. Upper class, Upper middle class, Middle class, upper lower class and Lower class.

6. **Locality:** Locality refers to the specified place of an individual where he/she lives In the present study it is specifies as Urban and Rural areas.

7. **Gender:** means the classification of an individual on the basis of his/her sex. In the present study it is classified as Male and Female.
8. **Type of Institution:** means the management of the institution or school. In the present study it is classified as Govt. School and Public School.

9. **Groups:** means the number of persons or things belongs to a particular class or cluster. In the present study two groups were constituted namely experimental and Control group in both the schools. The groups which were taught with the help of Constructivist approach is known as Experimental groups and those taught with the help of Conventional approach termed as Control groups.

10. **Pre-Test:** - a test carried out prior to a course or program of instruction in order to determine the entry behavior of the learners.

11. **Post-Test:** a test carried out after the completion of a course or program of instruction in order to determine the extent to which the learner has achieved the specific objectives.

12. **Delayed Post-test:** - also called as the retention test. A test carried out after the 15-20 days of the Post test, used to check the retention power of the students for a particular program of instruction.

13. **Control Group:** In an experiment control group may be defined a group of subjects who do not receive any experimental treatment the group is included for comparison purposes.

14. **Experimental Group:** In an experimental group may be defined a group of subjects who receives the experimental treatment; the group is included for comparison purposes.

**Delimitation of the Study:**

The present study will be delimited to the following aspects:

1. The study was delimitied to 6th grade 140 students only.
2. The study was delimited to the syllabus prescribed by the Himachal Pradesh Board of School Education.
3. The study was further restricted to the Science Subject only.
4. The study was delimited to the ten chapters of 6th grade science subject.
5. The study was restricted to only one block i.e. Nalagarh, Distt Solan of Himachal Pradesh.

6. The study was further delimited to only two schools of Nalagarh Block, Distt Solan, Himachal Pradesh.

7. The study was delimited in terms of variables viz. Gender, Locality, Socio Economic Status and Type of Institute.

Method

A method is a systematic approach towards a particular phenomenon. Methodology used in any investigation, in fact, determines its density. Methods describe various steps of the plan of attack to be adopted in solving research problem.

Population

Any group of people or observations which include all possible members to that category is called population.

In the words of John W. Best and Khan (1993) "a population is any group of individuals that have one or more characteristics in common that are of interest to the researcher. The population may be of all the individuals of a particular type, or a more restricted part of a group."

In the present study all the students of 6th grade studying in the Govt. and Public schools in Himachal Pradesh constituted the population of the study.

Sampling Procedure

The quality of a piece of research stands or fall not only be the appropriateness of methodology and instrumentation but also be the suitability of sampling strategy that has been adopted.

There are two methods of sampling (Cohen and Holliday, 1979; 1982; 1996; Schofield 1996). The researcher must decide whether to opt for a probability (Random Sample) or a non probability sampling (Purpose Sampling). A probability sample, because it draws randomly from the wider population, will be useful if the researcher wishes to and will be able to make
generalization because it seeks representativeness of the wider population. This sampling is popular in randomized controlled trials. In random sampling, each member of the population under study has an equal chance of being selected and the probability of a member of the population being selected is unaffected by the selection of other members of the population i.e. each selection is entirely independent of the next.

Best and Khan (1993) hold that the primary purpose of the research has to discover the principle that have universal application but to study a whole population to arrive at generalization would be impracticable if not impossible. Some populations are so large that their characteristics cannot be measured before the measurement could be completed the populations would have changed.

Sampling is considered often desirable to reduce expenditure of time and energy permit measurement to greater scope or produce precision and accuracy.

After deciding about the field of constructivism, the investigator selected multi-stage random sampling technique to select the sample out of a’s population. Out of 12 districts of the State of Himachal Pradesh District Solan was selected on the basis of random sampling.

Further out of Five educational blocks in the District Solan the investigator has selected one Educational Block i.e. Nalagarh Educational Block on the basis of random sampling.

After that in Nalagarh Educational Block the investigator had selected two schools (one Govt Sr Sec School and one Public Sr Sec School) for conducting experiment on the basis of random sampling out of 15 Govt Sr Sec School and 13 Public Sr Sec Schools.

Two groups were constituted in each school namely, Experimental and Control group consisting of 35 students in each group in both the institutions. Hence Experimental and Control group has total 70 students. The total number of students in Experimental and control groups were 70 (35+35 = 70) and in Public Sr Sec School were also 70 (35+35 = 70) and the total number of students in both the groups were 140.
Equalization

Since the present research is an experimental in nature study the participants in both groups, namely the members of experimental and control groups, were attempted to equalize in terms of some features. The intelligence scores, pre achievement test scores and participants’ demographic features were used to form the groups.

In order to form two matched groups of the students, Ojha and Choudhury verbal Intelligence test was administered to all the 140 students of grade 6th. After arranging the students in an ascending order of their intelligence scores, they were randomly allotted into two groups, namely experimental group and control group. The students were allotted in each group on the basis of high and low intelligence scores in equal proportion.

The students were also examined through pre achievement test, the results of which showed more or less similar scores of both groups in both institutions. The investigator did not find any significant difference in the achievement scores of the experimental control and groups at the pre test level. Along with this both schools share the Demographic features such as.

1. Both schools follow the Himachal Pradesh Board of School Education syllabus and the text books prepared on the guidelines of National Council of Education Research and Training.
2. Both schools have same pattern of examinations.
3. Both schools have almost same infrastructure.
4. Both schools have Hindi as the medium for instructions in their institutions.
5. Both the schools have similar criteria for admission.
6. Both schools have the trained graduate teachers for teaching Science.

In the present study 6th class students were selected for the experimentation in Science subject, because the 6th class is the entry level to the elementary classes and students come from the different schools with different environments. Beside this it was easy to get permission and cooperation from the principals and teachers to the students for experiment.
higher classes especially 8th or 10th classes. Most of the teacher were not agreed to conduct the experiment. Hence in 7th to 10th classes the 6th class was considered to be most suitable from academically and administratively points of view for conducting the experiment.

Sample

A ‘sample’ is a group selected from a larger population with an aim of yielding information about this population as a whole. The process of drawing the sample from a large population is referred to as sampling.

After meeting the school authorities concerned and the Principals regarding the permission to conduct the instructional programme, after getting the permission, the science teachers of the both the schools were also taken into confidence. They were consulted about the syllabus taught in the class and learning levels of the students. Both the teachers were very happy and they gladly assumed their full cooperation to conduct experiment in their classes.

The group of 140 6th grade students including experimental and control groups were taken as the sample for the study.

Design of the Study

Design is a blueprint of the procedure that enables the researcher to test his hypotheses by reaching at valid conclusions about relationships between independent and dependent variables. It refers to the conceptual framework within which the experiment is conducted. The chosen research design is based on range of factors such as feasibility, time, cost, ethics, measurement problems, and the objectives of the study. The design of the experiment is critical for the validity of the results.

The present study was experimental in nature. Quasi experimental research design was used to achieve the purpose of the present study. The study was designed on the basis of Non equivalent pretest-posttest control group design. By keeping in view the nature of the study, pretest-posttest control group design was preferred to compare the participants of both groups and measure the degree of change as a result of treatments or interventions.
The study was conducted in Government. Senior Secondary School, Manpura, and Nav Jyoti Senior Secondary public School, Kharuni, in District Solan of Himachal Pradesh. Completing all the formalities, the Investigator had started experiment right from 6th December, 2010 and it was binded up on 4th March, 2011 with the successful completion of the task.

The sample of the study was divided in to two groups termed as 'Experimental Group' and this group was given treatment through new methodology based on constructivist Approach while the other group continued with the routine and conventional activities of the school and termed as 'control group'.

**Variables Structure**

Variables are those which vary or change from person to person or from situation to situation. According to Kerlinger (1978) a variable symbol to which numerals of values are assigned. In the opinion of Matheson et al (1978), variable is any factor that can be measured and can change. The various examples of variables are Achievement, Teaching methods, Locality, Curriculum and Weight etc.

In the present study the variables are as below:-

- Achievement
- Group
- Gender
- Locality
- Socio-Economic Status
- Type of institution i.e. Government and Public school
- Methodology of teaching- Constructivist and Conventional Approaches

The teaching method i.e. Constructivist Approach and Conventional Approach were the independent variables, while the Achievement in Science at different levels of testing i.e. Pretest, Posttest and Delayed Posttest level was the dependent variables.
Tool Used and Developed in the Study

For studying the effect of the methodology used in classroom teaching (Constructivist/Traditional) on the dependent variables (Achievement), various tools were used. A Science achievement test was developed to test and compare the achievement in Science of experimental and Control groups students at Pretest, Posttest and delayed Posttest levels. Keeping in the view, aims and objectives of the study the following tools were considered suitable for the problem under study.

1. Verbal Intelligence test
2. Socio-economic status scale
3. Science Achievement test
4. Lesson Plans based on Constructivist Paradigm

Procedural Details of the Study:

The study was carried out three main phases:

Phase-I Developmental Phase
Phase-II Try out of lessons
Phase-III Implementation phase

Developmental Phase:

At this stage, the investigator developed instructional material, including lesson plan, activity sheets, unit tests, tools namely Science Achievement test.

Phase-II Try out of the lessons

Four lessons from the units namely components of food, separation of substances, getting to know plants, and water were selected for pilot study and were tried out in the local school of Nalagarh, Distt Solan, following the HPBSE syllabus. The instructional materials developed were tried out on 60 students belonging to 6th grade at Nalagarh, Distt Solan. The units were taught using the constructivist approach for Three weeks. Units test were conducted.
after completion of each unit. By Getting feedback from the experts and subject teacher the investigator made modifications accordingly.

Phase-Ill-Implementation

The Achievement Test prepared by the investigator was administered to the 6th class under standard conditions after establishing proper rapport with the respondents. Keeping in the view the purpose of the study, the test was administered before final examinations.

The relevant Achievement Test was administered to class 6th in the month of December, 2010 before they appeared in the final examination in March 2011. The test was marked in the form of correct, incorrect, partially correct, unanswered response of the students for various items. The obtained scores were tabulated separately for control and experimental groups for further analysis.

Experimental Procedure

Procedure of Data Collection

Procedure of the experiment was comprised of two main stages. They are:

i) Selecting the experimental sample or selection of the sample.

ii) Conducting the experiment

Statistical Techniques used

In the present study, the following statistical techniques were employed to analyses the data obtained from the experiment of different groups in order to test the hypotheses.

1. Descriptive statistics:

2. Independent-Samples T test:

3. Paired -Samples T test:

4. SPSS (15.0) version was made use for the statistical analysis of data.
Analysis and Interpretation of Data

The objectives of the present study have been given in the Chapter I. The data related to the objectives were analyzed by using appropriate Statistical techniques as mentioned in the Chapter III. The results along with their interpretation have been presented here in this Chapter. From the interpretations presented in this Chapter, the following findings emerged:

- The Constructivist Approach was found to be effective in classroom transaction to enhance the learning level of the students in Science as compared to the Traditional Approach of teaching.
- The students in experimental group performed better on the Science achievement test than that of the students in Control group with respect to Gender, Locality, Socio-Economic Status and Type of Institution.
- Students of the Experimental group have the better retention power on the Science Achievement Test than that of the students of the control group with respect to Gender, Locality, Socio-Economic Status and Type of Institution.

Conclusions

On the basis of analysis and interpretation of data the following conclusions can be laid down:

I. There was no significant difference between the mean achievement scores of the experimental and control group students at Pre-test level.

II. There was a significant difference between the mean achievement scores of the experimental and control group students at Post-test level.

III. There was a significant difference between the mean achievement scores of the experimental and control group students at Delayed post test level.
IV. There was no a significant difference between the mean achievement scores of the male students of experimental and control group students at Pre test level.
V. There was a significant difference between the mean achievement scores of the male students of experimental and control group students at Post test level.
VI. There was a significant difference between the mean achievement scores of the male students of experimental and control group students at Delayed post test level.
VII. There was a significant difference between the mean achievement scores of the female students of experimental and control group students at Pre test level.
VIII. There was a significant difference between the mean achievement scores of the female students of experimental and control group students at Post test level.
IX. There was a significant difference between the mean achievement scores of the female students of experimental and control group students at delayed Post test level.
X. There was no a significant difference between the mean achievement scores of the urban students of experimental and control group students at Pre test level.
XI. There was a significant difference between the mean achievement scores of the urban students of experimental and control group students at post test level.
XII. There was a significant difference between the mean achievement scores of the urban students of experimental and control group students at delayed Post test level.
XIII. There was no a significant difference between the mean achievement scores of the rural students of experimental and control group students at Pre test level.
XIV. There was a significant difference between the mean achievement scores of the rural students of experimental and control group students at Post test level.
XV. There was a significant difference between the mean achievement scores of the rural students of experimental and control group students at delayed post test level.

XVI. There was no a significant difference between the mean achievement scores of the Upper class Socio economic status students of experimental and control group at Pre test level.

XVII. There was a significant difference between the mean achievement scores of the Upper class Socio economic status students of experimental and control group at Post test level.

XVIII. There was a significant difference between the mean achievement scores of the Upper class Socio economic status students of experimental and control group at delayed post test level.

XIX. There was no a significant difference between the mean achievement scores of the Upper middle class Socio economic status students of experimental and control group at pre test level.

XX. There was a significant difference between the mean achievement scores of the Upper middle class Socio economic status students of experimental and control group students at post test level.

XXI. There was a significant difference between the mean achievement scores of the Upper middle class Socio economic status students of experimental and control group students at delayed post test level.

XXII. There was no a significant difference between the mean achievement scores of the Middle class Socio economic status students of experimental and control group at pre test level.

XXIII. There was a significant difference between the mean achievement scores of the Middle class Socio economic status students of experimental and control group at post test level.

XXIV. There was a significant difference between the mean achievement scores of the Middle class Socio economic status students of experimental and control group at delayed post test level.

XXV. There was a significant difference between the mean achievement scores of the Upper lower class Socio economic status students of experimental and control group at Pretest level.
XXVI. There was a significant difference between the mean achievement scores of the Upper lower class Socio economic status students of experimental and control group at post test level.

XXVII. There was a significant difference between the mean achievement scores of the Upper lower class Socio economic status students of experimental and control group at delayed post test level.

XXVIII. There was a significant difference between the mean achievement scores of the Lower class Socio economic status students of experimental and control group at Pretest level.

XXIX. There was a significant difference between the mean achievement scores of the Lower class Socio economic status students of experimental and control group at Post test level.

XXX. There was a significant difference between the mean achievement scores of the Lower class Socio economic status students of experimental and control group at delayed post test level.

XXXI. There was no a significant difference between the mean achievement scores of the Govt. School students of experimental and control group at Pre test level.

XXXII. There was a significant difference between the mean achievement scores of the Govt. School students of experimental and control group at Post test level.

XXXIII. There was a significant difference between the mean achievement scores of the Govt. School male students of experimental and control group at delayed post test level.

XXXIV. There was no a significant difference between the mean achievement scores of the Public School students of experimental and control group at Pre test level.

XXXV. There was a significant difference between the mean achievement scores of the Public School students of experimental and control group at Post test level.

XXXVI. There was a significant difference between the mean achievement scores of the Public School students of experimental and control group at delayed post test level.
XXXVII. There was a significant difference between the mean achievement scores of the experimental group students at all the three levels of pairing i.e. Pretest-Post test, Pretest-Delayed Post test and Posttest-Delayed posttest.

XXXVIII. There was a significant difference between the mean achievement scores of the experimental group male students at two levels of pairing i.e. Pretest-Post test, Pretest-Delayed Post test. But there was no significant difference between Posttest-Delayed Post test level of pairing.

XXXIX. There was a significant difference between the mean achievement scores of the experimental group female students at all the three levels of pairing i.e. Pretest-Post test, Pretest-Delayed Post test and Posttest-Delayed posttest.

XL. There was a significant difference between the mean achievement scores of the urban students of experimental of students at all the three levels of pairing i.e. Pretest-Post test, Pretest-Delayed Post test and Posttest-Delayed posttest.

XLI. There was a significant difference between the mean achievement scores of the experimental group rural students at two levels of pairing i.e. Pretest-Post test, Pretest-Delayed Posttest, but there was no significant difference between Posttest-Delayed Post test level of pairing.

XLII. There was a significant difference between the mean achievement scores of the experimental group upper class SES students at two levels of pairing i.e. Pretest-Post test, Pretest-Delayed Posttest, but there was no significant difference between Posttest-Delayed Post test level of pairing.

XLIII. There was a significant difference between the mean achievement scores of the experimental group upper middle class SES students at two levels of pairing i.e. Pretest-Post test, Pretest-Delayed Post test, but there was no significant difference between Posttest-Delayed Post test level of pairing.

XLIV. There was a significant difference between the mean achievement scores of the experimental group middle class SES students at two
levels of pairing i.e. Pretest-Post test, Pretest-Delayed Post test, but there was no significant difference between Posttest-Delayed Post test level of pairing.

XLV. There was a significant difference between the mean achievement scores of the experimental group upper lower class SES students at two levels of pairing i.e. Pretest-Post test, Pretest-Delayed Post test, but there was no significant difference between Posttest-Delayed Post test level of pairing.

XLVI. There was a significant difference between the mean achievement scores of the experimental group lower class SES students at two levels of pairing i.e. Pretest-Post test, Pretest-Delayed Post test, but there was no significant difference between Posttest-Delayed Post test level of pairing.

XLVII. There was a significant difference between the mean achievement scores of the experimental group Govt. School students at two levels of pairing i.e. Pretest-Post test, Pretest-Delayed Post test, but there was no significant difference between Posttest-Delayed Post test level of pairing.

XLVIII. There was a significant difference between the mean achievement scores of the experimental group Public School students at two levels of pairing i.e. Pretest-Post test, Pretest-Delayed Post test, but there was no significant difference between Posttest-Delayed Post test level of pairing.

XLIX. There was a significant difference between the mean achievement scores of the Control group students at all the three levels of pairing i.e. Pretest-Post test, Pretest-Delayed Post test and Posttest-Delayed posttest.

L. There was a significant difference between the mean achievement scores of the Control male group students at all the three levels of pairing i.e. Pretest-Post test, Pretest-Delayed Post test and Posttest-Delayed posttest.

LI. There was a significant difference between the mean achievement scores of the Control group female students at all the three levels of
pairing i.e. Pretest-Post test, Pretest-Delayed Post test and Posttest-Delayed posttest.

LII. There was a significant difference between the mean achievement scores of the Control group urban students at all the three levels of pairing i.e. Pretest-Post test, Pretest-Delayed Post test and Posttest-Delayed posttest.

LIII. There was a significant difference between the mean achievement scores of the Control group rural students at all the three levels of pairing i.e. Pretest-Post test, Pretest-Delayed Post test and Posttest-Delayed posttest.

LIV. There was a significant difference between the mean achievement scores of the control group upper class SES students at two levels of pairing i.e. Pretest-Post test, Posttest-Delayed Posttest, but there was no significant difference between Pretest-Delayed Posttest.

LV. There was a significant difference between the mean achievement scores of the control group upper middle class SES students at two levels of pairing i.e. Pretest-Post test, Posttest-Delayed Posttest, but there was no significant difference between Pretest-Delayed Posttest.

LVI. There was a significant difference between the mean achievement scores of the Control group of middle class SES students at all the three levels of pairing i.e. Pretest-Post test, Pretest-Delayed Post test and Posttest-Delayed Posttest level of pairing.

LVII. There was a significant difference between the mean achievement scores of the Control group of upper lower class SES students at two levels of pairing i.e. Pretest-Post test, Posttest-Delayed Posttest, but there was no significant difference between Pretest-Delayed Post level of pairing.

LVIII. There was a significant difference between the mean achievement scores of the Control group of lower class SES students at two levels of pairing i.e. Pretest-Post test, Posttest-Delayed Posttest, but there was no significant difference between Pretest-Delayed Post level of pairing.
LIX. There was a significant difference between the mean achievement scores of the Control group of Govt. School students at all the three levels of pairing i.e. Pretest-Post test, Pretest-Delayed Post and Posttest-Delayed Posttest levels of pairing.

LX. There was a significant difference between the mean achievement scores of the Control group of Public. School students at all the three levels of pairing i.e. Pretest-Post test, Pretest-Delayed Post and Posttest-Delayed Posttest levels of pairing.

Educational Implications

On the basis of the findings, the present study has following educational implications:

(i) The results of the present study are indicative of the fact that instructional treatment has an impact on the learning outcomes of the students. The Students who were taught science by using constructivist approach attained better scores than the students who were taught with Conventional or traditional approach. Constructivist approach is more effective than the Conventional methods of teaching science to enhance the achievement in science. The teachers should use the constructivist approach in teaching of science, as in the Constructivist method, the learner constructs his own knowledge or experiences on the bases of his previous experiences and prior knowledge. This emphasizes the learning through the meaning making process rather than the memorization of concepts. So, this method can be practiced in the schools to facilitate meaningful learning among the learners and able to apply the learned knowledge in various day to day life situations.

(ii) The findings of the present study highlight the shift from teacher centered to learner centered classroom wherein the students are given full freedom to explore and discover the things on their own. The present study will be very useful to the teacher to creating the innovative classrooms situations wherein the students are meaning maker which is the ultimate aim of the learning. The role of teacher is just as guide and facilitator.
This study also revealed that the students have really enjoyed the classroom experiences and also felt that constructivist approach was not stressful. This study led to healthy relationship among the teacher and taught. The study also gives a picture of an innovative and democratic classroom where the priority is given to the student's autonomy and good teacher-student relationship.

The Model of the present study involves the active participation through the class. It not only improving their achievement level but also the scientific attitude and attitude towards science. Thus it is suggested that the school teachers should provide conducive environment to enhance the achievement and favorable attitudes.

The results of the this study, it is suggested that the teachers should provide suitable learning situations wherein the students get firsthand experience of handling the equipments, making the use of senses explore and experiment and lastly, infer the results.

As the constructivist philosophy believes in both individual and group construction of knowledge. So the teachers have to provide the opportunities to the students to work individually and within the group. This study also emphasizes that the students learn more effectively if they exposed in groups as they are able to share their information and knowledge with each other.

The pre-service and in-service training programs on Constructivist approach could be organized so as to develop the understanding and necessary skills for successful implementation of the constructivist teaching model in the classroom situations.

This study also emphasized the importance of a variety of learning experiences to advance different levels of learning. This focuses on the change in the trend of teaching from transmission of knowledge to construction the meaning of concepts based on prior experiences.

It is suggested that the Constructivist system of instruction may be used to all type of learners irrespective of their social background and sex. The teachers should put more emphases on imparting information.
at Comprehension level than merely at knowledge level. Also he should provide conducive environment in building favorable attitude towards the constructivist teaching.

(x) It is found that children more and enjoy learning more when they are actively involved, rather than passive listeners.

(xi) Constructivism promotes social and communication by creating a classroom environment that emphasizes collaboration and exchange of ideas, students must learn how to articulate their ideas clearly as well as to collaborate on tasks effectively by sharing in group projects.

(xii) Education works best when it concentrates on thinking and understanding rather than on rote memorization. Constructivism concentrates on learning how to think and understand.

(xiii) Constructivism gives students ownership of what they learn, since learning is based on students questions and explorations, and often the students have a hand in designing the assessments as well. Engaging the creative instincts develops students abilities to express knowledge through a variety of ways, the students are also more likely to retain and transfer the new knowledge to real life situations.

(xiv) Constructivist learning is transferable, In Constructivist classrooms; students create, organizing principles that can take with them to other learning settings.

(xv) Constructivism stimulates and engages students by grounding learning activities in an authentic, real world context. Students in Constructivist classroom learn to question things and to apply their natural curiosity to the world.

(xvi) A democratic managed learning environment was found suitable for the basic learning of concepts and principles. Democracy in school classroom helps to create an environment of mutual faith and cooperation, but appears to exert little pressure for higher attainments in the learning of complex concepts and principles, therefore, a blend of guided democratic ways with a tradition of discipline and hard work may help learners in advanced and complex learning.

(xvii) The Higher authorities like NCERT, SCERTs, DIETs and Teacher Training Institutes should include the constructivist method of teaching
in the teacher training programs. The pupil teachers are also to be taught with the theory of constructivism and should be allowed to practice during their teaching practice at schools.

Suggestions for Further Research
The scope of present study was delimited in a number of ways to assess the Effectiveness of the Constructivist approach in two Schools of Distt Solan of Himachal Pradesh. In the light of the results and findings of the study following suggestions are brought forth:-

(i) As the results of the Constructivist approach are more encouraging when compared with traditional teaching methods, Constructivist Approach and its different techniques should be included in the curriculum at all the level of education.

(ii) Constructivist Approach should be used in Science teaching and learning at the level of Elementary school, High school and College level.

(iii) The present study was conducted only a ten units of science syllabus prescribed by HPBSE. More studies may be conducted on larger portions of the total curriculum, in order to cross-validate the present findings.

(iv) Science laboratories should be designed to provide Constructivist learning.

(v) The Conferences, Seminars, Debates on Constructivism or Constructivist Teaching and learning should be introduced to the teachers at all the levels of education.

(vi) More Comprehensive research with longer period should be undertaken to determine the effect of Constructivist approach on teaching and learning.

(vii) Similar studies should also be conducted on other subjects.

(viii) Science teachers should incorporate Constructivists based teaching strategy in their methods of teaching.
(ix) Teachers can be provided with occupational training on preparing material accordance to Constructivist theory.

(x) Other Science units can be prepared as activity booklets according to Constructivist learning principles.

(xi) The present study was conducted on a sample of 140 grade students of 6th grade. Similar studies may also be conducted on large samples.

(xii) The present study was delimited to a few dimensions pertaining to constructivist approach. Further research may also be undertaken on other variables of Constructivist approach.

(xiii) The present study was restricted to the two schools of Distt Solan similar study on Constructivist Approach may also be conducted in other schools of the districts of Himachal Pradesh and other State.

(xiv) Research can be carried out to see the effect of Constructivist learning principles on student attitudes towards course, Achievement and retention can be examined for other course subjects.

(xv) Research can be carried out to see the effectiveness of Constructivist learning principles on development of students' attitude towards cooperation and team work can be patterned.

(xvi) Research can be carried out to see the effect of constructivist learning principles on development of students' critical thinking, creative thinking and problem solving skills.

(xvii) Transfer of learning from one situation to another is utmost importance. Therefore, Constructivist approach may be studied in relationship with intelligence, school climate, teachers' personality etc.