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CHAPTER: 5

SUMMARY, FINDINGS AND CONCLUSIONS

5.1 INTRODUCTION:

This chapter contains discussion about results with according to null hypothesis formulated for the study. The summary of findings is given in this chapter. Conclusions drawn from the results are presented. The implications of present study are briefly discussed and suggestions are given for the further study may be undertaken in future.

5.2 SUMMARY OF THE STUDY:

5.2.1 STATEMENT OF THE PROBLEM:

The title of the present study was

“Effectiveness of constructivist approach in teaching science at primary level”

5.2.2 OBJECTIVES OF THE STUDY:

The objectives of the present study were as under

1. To study the effectiveness of constructivist approach on four phases of learning science at primary level.
   • To study the effectiveness of constructivist approach on “information getting” in learning science at primary level.
   • To study the effectiveness of constructivist approach on “applying” in learning science at primary level.
   • To study the effectiveness of constructivist approach on “analyzing” in learning science at primary level.
   • To study the effectiveness of constructivist approach on “creating” in learning science at primary level.

2. To study the effectiveness of constructivist approach on processing skills in learning science at primary level.
   • To study the effectiveness of constructivist approach on “recalling” in learning science at primary level.
• To study the effectiveness of constructivist approach on “comparing” in learning science at primary level.

• To study the effectiveness of constructivist approach on “classifying” in learning science at primary level.

• To study the effectiveness of constructivist approach on “imagining” in learning science at primary level.

3. To study the effectiveness of constructivist approach on meta-cognitive skills in learning science at primary level.

5.2.3 HYPOTHESIS OF THE STUDY:

The null hypothesis formulated for the present study were

Ho₁ There will be no significant difference between the mean scores of experimental group and control group on achievement test for information getting in science at primary level.

Ho₂ There will be no significant difference between the mean scores of experimental group and control group on achievement test for applying in science at primary level.

Ho₃ There will be no significant difference between the mean scores of experimental group and control group on achievement test for analyzing in science at primary level.

Ho₄ There will be no significant difference between the mean scores of experimental group and control group on achievement test for creating in science at primary level.

Ho₅ There will be no significant difference between the mean scores of experimental group and control group on achievement test for total achievement in science at primary level.

Ho₆ There will be no significant difference between the mean scores of experimental group and control group on recalling in science at primary level.

Ho₇ There will be no significant difference between the mean scores of experimental group and control group on comparing in science at primary level.

Ho₈ There will be no significant difference between the mean scores of experimental group and control group on classifying in science at primary level.
There will be no significant difference between the mean scores of experimental group and control group on imagining in science at primary level.

There will be no significant difference between the mean scores of experimental group and control group on total processing skills in science at primary level.

There will be no significant difference between the mean scores of experimental group and control group on meta cognitive skills awareness inventory in learning science at primary level.

5.2.4 VARIABLES OF THE STUDY:

In present study teaching methods i.e. constructivist teaching approach and traditional teaching approach were independent variables where as four phases of learning (Information getting, Applying, Analyzing and Creating), processing skills (Recalling, Comparing, Classifying and Imagining) and meta-cognitive skills were dependent variables.

5.2.5 POPULATION OF THE STUDY:

The students studied in Gujarati medium schools governed by Municipal Corporation of Anand in academic year 2013-2014 were the population for the present study.

5.2.6 SAMPLE FOR THE STUDY:

In present study out of twenty five schools governed by Anand Municipal Corporation three schools were selected randomly for the experiment. From each selected school students studied in standard seven were selected for the experiment. In each school students were selected randomly for experimental group and control group. Total 152 students were selected as sample for the study. Out of 152 students 72-72 students were randomly selected for experimental group and control group for the experiment.

5.2.7 DELIMITATION OF THE STUDY:

The present study was limited to the Gujarati medium primary schools governed by the municipal corporation of Anand, Anand District, Gujarat. The present research was limited to the students studied in standard 7 of primary schools in the academic year 2013-2014. To study the effectiveness of constructivist teaching approach and traditional teaching approach, the researcher selected three chapters/units for his teaching program from the textbook of science and technology of standard 7 prepared by GCERT. These units were: 1. Characteristics of Magnet, 2. Fertility of soil and 3. Motion, Force and Speed.
5.2.8 RESEARCH DESIGN:

According to objectives of the study to compare the effectiveness of constructivist teaching approach and traditional teaching approach the researcher used Randomized Experimental Group – Control Group Post Test Design.

5.2.9 RESEARCH TOOLS:

The tools employed for the present research were

1. Achievement tests for each unit and for all aggregated units prepared by the researcher. These achievement tests contained questions/items regarding four phases of learning.

2. A science processing skills test prepared by the researcher containing questions regarding processing skills.

3. A readymade meta-cognitive skills awareness inventory prepared by P. B. Acharya containing 52 statements about students’ meta-cognitive skills.

5.2.10 EXPERIMENTAL PROCEDURE:

The experimental procedure followed for this research is described below.

After doing all necessary pre-preparations the researcher started his experiment for 30 days from 11/09/2013 to 15/10/2013 in all selected schools. The experimental procedure followed in this research is described in following steps.

1. On very first day of experiment in all the selected schools the researcher established affective students-teacher relationship by effective orientation and conversation with students. After completing such formalities the researcher was divided the students of standard seven of all selected schools in two groups by using proper randomization technique as per the plan of experiment. These groups were (1) Experimental groups and (2) Control Groups.

2. The content of whole experiment was divided in to 30 hours and therefore the whole experiment was run in each school for 30 days.

3. The students of both groups were taught three selected units from the textbook of science and technology of standard seven. These selected units were (1) Characteristics of Magnet, (2) Fertility of soil, and (3) Motion, Force and Speed. The students of experimental group were taught with constructivist lesson plans and
different constructivist activities by the researcher. At the same time the students of control group were taught by the traditional teaching learning methods. Same procedure was followed in all the selected schools.

4. The students of both groups were taught the unit ‘Characteristics of Magnet’ for 7 days. After completion of this unit an achievement test of 30 marks containing questions of this unit regarding the four phases of learning was given to the students of both groups. The students of both group were gave their responses in the form of answers of questions of an achievement test. The time limit for the test was 1 hour.

5. After that the students of both groups were taught the unit ‘Fertility of soil’ for 8 days. After completion of this unit an achievement test of 30 marks containing questions of this unit regarding the four phases of learning was given to the students of both groups. The students of both group were gave their responses in the form of answers of questions of an achievement test. The time limit for the test was 1 hour.

6. Last unit ‘Motion, Force and Speed’ was taught to the students of both groups for 8 days. After completion of the unit an achievement test of 30 marks containing questions of this unit regarding the four phases of learning was given to the students of both groups. The students of both group were gave their responses in the form of answers of questions of an achievement test. The time limit for the test was 1 hour.

7. At the end of all three units the students of both groups were given an achievement test of 70 marks containing questions of all three units together regarding the four phases of learning. Time limit of the achievement test was 2 hours.

8. At the end of an experiment the students of both groups were given the science processing skills test of 50 marks. The science processing skills test prepared according to the content of all three units containing the questions of processing skills like recalling, comparing, classifying and imagining. Time limit of the science processing skills test was 2 hours.

9. To compare the effectiveness of constructivist teaching approach and traditional teaching approach on students’ meta-cognitive skills a ready made meta-cognitive skills awareness inventory was given to the students of both groups. The students of both groups were gave their responses against the statements of an inventory in the form of agree or disagree. The students of both groups were gave sign of ‘√’ and ‘×’ against each statement of inventory.
10. After collection of data the process of data analysis was done. Same procedure was followed for each selected school.

5.2.11 DATA COLLECTION:

In present research students of experimental group and control group were given an achievement test after completion of each unit and after completion of all units. The students of both groups were gave their responses in the form of answers of the questions asked in achievement test of each and all units. The same procedure was followed for the science processing skills test containing questions of all units given at the end of experiment. The students of both groups were gave their responses in the form of agree and disagree by giving sign of ‘√’ and ‘×’ against each statement of meta-cognitive skills awareness inventory.

5.2.12 DATA ANALYSIS:

For the data analyses following steps were followed.

Step 1: Responses of students of both groups on achievement tests and science-processing skills test were scored according to marking system.

Step 2: To compare the effectiveness of constructivist teaching approach & traditional teaching approach on students’ four phases of learning and on science processing skills, t-test for independent sample means was done by using SPSS program.

Step 3: The significance of difference between the mean scores of achievement test and science processing skills test was tested at 95% confidence interval level.

Step 4: Data collected from meta-cognitive skills awareness inventory were given scores according to manual of inventory. Then to compare means of both groups t-test used and significance of difference between the mean scores was tasted at 95% confidence interval level.

5.3 FINDINGS FROM THE DATA ANALYSIS:

5.3.1 FINDINGS FROM THE DATA ANALYSIS OF ACHIEVEMENT TESTS FOR FOUR PHASES OF LEARNING:

The findings from the data analysis of achievement tests for four phases of learning from all three experiments are stated below.

(1) From all three experiments it was observed from the result of t-Test that the mean scores of experimental group on achievement test for information getting were
significantly higher than that of control group. It means the students of experimental group were higher in achievement of information getting while learning science than the students of control group. So from the results conclusion made that the students taught with constructivist teaching approach were more effectively achieve information in learning science than the students taught with traditional teaching approach. It indicates that constructivist teaching approach was more effective than the traditional teaching approach in information getting while learning science.

(2) From all three experiments it was observed from the result of t-Test that the mean scores of experimental group on achievement test for applying were significantly higher than that of control group. It means the students of experimental group were higher in achievement of applying knowledge while learning science than the students of control group. So from the results conclusion made that the students taught with constructivist teaching approach were more effectively apply knowledge or ideas in learning science than the students taught with traditional teaching approach. It indicates that constructivist teaching approach was more effective than the traditional teaching approach in application of knowledge while learning science.

(3) From all three experiments it was observed from the result of t-Test that the mean scores of experimental group on achievement test for analyzing were significantly higher than that of control group. It means the students of experimental group were higher in achievement of analyzing while learning science than the students of control group. So from the results conclusion made that the students taught with constructivist teaching approach were more effectively analyze related concepts of science than the students taught with traditional teaching approach. It indicates that constructivist teaching approach was more effective than the traditional teaching approach in analyzing while learning science.

(4) From all three experiments it was observed from the result of t-Test that the mean scores of experimental group on achievement test for creating were significantly higher than that of control group. It means the students of experimental group were higher in achievement of creating while learning science than the students of control group. So from the results conclusion made that the students taught with constructivist teaching approach were more effectively creating new things by using knowledge and ideas of science than the students taught with traditional teaching approach. It
indicates that constructivist teaching approach was more effective than the traditional teaching approach in creating while learning science.

(5) From all three experiments it was observed from the result of t-Test that the mean scores of experimental group on achievement test for total achievement were significantly higher than that of control group. It means the students of experimental group were higher in achievement of information getting, applying, analyzing and creating while learning science than the students of control group. So from the results conclusion made that the students taught with constructivist teaching approach were more effectively achieve information, apply it, analyze related concepts of science and effectively use in creating new things during learning science than the students taught with traditional teaching approach. It indicates that constructivist teaching approach was more effective than the traditional teaching approach in total achievement of for phases of learning science.

5.3.2 FINDINGS FROM THE DATA ANALYSIS OF SCIENCE PROCESSING SKILLS TEST:

The findings from the data analysis of science processing skills test from all three experiments are stated below.

(1) From all three experiments it was observed from the results of t-Test that the mean scores of experimental group on science processing skills test for recalling were significantly higher than that of control group. It means the students of experimental group were easily recalled and used the information of related concepts of science than the students of control group. So from the results conclusion made that the students taught with constructivist teaching approach more effectively recalled the concepts of science while learning science than the students taught with traditional teaching approach. It indicates that the constructivist teaching approach proved more effective than the traditional teaching approach in recalling while learning science.

(2) From all three experiments it was observed from the results of t-Test that the mean scores of experimental group on science processing skills test for comparing were significantly higher than that of control group. It means the students of experimental group were assessed different objects, events or outcomes for similarities in learning science than the students of control group. So from the results conclusion made that the students taught with constructivist teaching approach more effectively compared
the things according to learned concepts of science while learning science than the students taught with traditional teaching approach. In indicates that the constructivist teaching approach proved more effective than the traditional teaching approach in comparing while learning science.

(3) From all three experiments it was observed from the results of t-Test that the mean scores of experimental group on science processing skills test for classifying were significantly higher than that of control group. It means the students of experimental group were more involved in grouping items into like categories by using concepts of science than the students of control group. So from the results conclusion made that the students taught with constructivist teaching approach were more effectively classified things according to learned concepts of science while learning science than the students taught with traditional teaching approach. In indicates that the constructivist teaching approach proved more effective than the traditional teaching approach in classifying while learning science.

(4) From all three experiments it was observed from the results of t-Test that the mean scores of experimental group on science processing skills test for imagining were significantly higher than that of control group. It means the students of experimental group were imagined better about creating new things by using learned concepts of science than the students of control group. So from the results conclusion made that the students taught with constructivist teaching approach more effectively imagined about creating new things while learning science than the students taught with traditional teaching approach. In indicates that the constructivist teaching approach proved more effective than the traditional teaching approach in imagining while learning science.

(5) From all three experiments it was observed from the results of t-Test that the mean scores of experimental group on science processing skills test for total processing skills were significantly higher than that of control group. It means the students of experimental group were recalled, compared, classified and imagined more than the students of control group. So from the results conclusion made that processing skills were more effectively developed and used by the students taught with constructivist while learning science than the students taught with traditional teaching approach. In indicates that the constructivist teaching approach proved more effective than the
traditional teaching approach in developing science processing skills while learning science.

5.3.3 FINDINGS FROM THE DATA ANALYSIS OF META-COGNITIVE SKILLS AWARENESS INVENTORY:

From all three experiments it was observed from the results of t-Test that the mean scores of experimental group on meta-cognitive skills awareness inventory were significantly higher than that of control group. It means students of experimental group were more understood and aware about their internal thoughts and plans while learning science. The students taught with constructivist teaching approach were more cleared about their declarative knowledge, procedural knowledge and conditional knowledge. Planning strategies, information management strategies, monitoring strategies, debugging strategies and evaluation strategies were well developed in the students of experimental group. So the constructivist teaching approach proved more effective in developing meta-cognitive skills than the traditional teaching approach while learning science.

5.4 CONCLUSIONS FROM THE FINDINGS:

5.4.1 CONCLUSIONS FROM THE FINDINGS OF ACHIEVEMENT TESTS FOR FOUR PHASES OF LEARNING:

(1) The students taught with constructivist teaching approach were more effectively achieve information in learning science than the students taught with traditional teaching approach. It indicates that constructivist teaching approach was more effective than the traditional teaching approach in information getting while learning science.

(2) The students taught with constructivist teaching approach were more effectively apply knowledge or ideas in learning science than the students taught with traditional teaching approach. It indicates that constructivist teaching approach was more effective than the traditional teaching approach in application of knowledge while learning science.

(3) The students taught with constructivist teaching approach were more effectively analyze related concepts of science than the students taught with traditional teaching approach. It indicates that constructivist teaching approach was more effective than the traditional teaching approach in analyzing while learning science.
(4) The students taught with constructivist teaching approach were more effectively creating new things by using knowledge and ideas of science than the students taught with traditional teaching approach. It indicates that constructivist teaching approach was more effective than the traditional teaching approach in creating while learning science.

(5) The students taught with constructivist teaching approach were more effectively achieve information, apply it, analyze related concepts of science and effectively use in creating new things during learning science than the students taught with traditional teaching approach. It indicates that constructivist teaching approach was more effective than the traditional teaching approach in total achievement of for phases of learning science.

5.4.2 CONCLUSIONS FROM THE FINDINGS OF SCIENCE PROCESSING SKILLS TEST:

(1) The students taught with constructivist teaching approach more effectively recalled the concepts of science while learning science than the students taught with traditional teaching approach. It indicates that the constructivist teaching approach proved more effective than the traditional teaching approach in recalling while learning science.

(2) The students taught with constructivist teaching approach more effectively compared the things according to learned concepts of science while learning science than the students taught with traditional teaching approach. In indicates that the constructivist teaching approach proved more effective than the traditional teaching approach in comparing while learning science.

(3) The students taught with constructivist teaching approach were more effectively classified things according to learned concepts of science while learning science than the students taught with traditional teaching approach. In indicates that the constructivist teaching approach proved more effective than the traditional teaching approach in classifying while learning science.

(4) The students taught with constructivist teaching approach more effectively imagined about creating new things while learning science than the students taught with traditional teaching approach. In indicates that the constructivist teaching approach proved more effective than the traditional teaching approach in imagining while learning science.
The processing skills were more effectively developed and used by the students taught with constructivist while learning science than the students taught with traditional teaching approach. It indicates that the constructivist teaching approach proved more effective than the traditional teaching approach in developing science processing skills while learning science.

5.4.3 CONCLUSIONS FROM THE FINDINGS OF META-COGNITIVE SKILLS AWARENESS INVENTORY:

The students taught with constructivist teaching approach were more cleared about their declarative knowledge, procedural knowledge and conditional knowledge. Planning strategies, information management strategies, monitoring strategies, debugging strategies and evaluation strategies were well developed in the students of experimental group. So the constructivist teaching approach proved more effective in developing meta-cognitive skills than the traditional teaching approach while learning science.

5.4.4 CONCLUSIONS FROM OVERALL EXPERIMENTS:

(1) The findings from the overall experiments stated that in all selected schools the students taught with constructivist teaching approach were higher in getting information in learning of science, in applying information during learning, in analyzing things or matters according to like categories and in creating new things or thinking about new ideas by using related information of science than the students taught with constructivist approach. It indicates that constructivist teaching approach was more effective than the traditional teaching approach in four phases of learning science at primary level.

(2) The findings from the overall experiments stated that in all selected schools the students taught with constructivist approach were higher in using of science processing skills like recalling, comparing, classifying and imagining as means of learning and conducting science than the students taught with traditional teaching approach. It indicates that constructivist teaching approach was more effective than the traditional teaching approach in inculcating, fostering and applying science processing skills in learning science at primary level.

(3) The findings from the overall experiments stated that in all selected schools the students taught with constructivist approach were more aware about their meta-cognitive skills in learning science than the students taught with traditional teaching
approach. It indicates that constructivist teaching approach was more effective than the traditional teaching approach in developing and fostering meta-cognitive skills during learning science at primary level.

(4) The findings from the overall experiment stated that constructivist teaching approach proved more effective than the traditional teaching approach in four phases of learning, in science processing skills and in meta-cognitive skills in learning science at primary level.

5.5 EDUCATIONAL IMPLICATIONS OF THE STUDY:

The following are the educational implications of the present research.

(1) The present research suggests that the atmosphere of science classroom should be learner centered rather than the teacher centered. The science students must given freedom to explore and discover things on their own. The teacher’s role should be as facilitator and guide.

(2) In constructivist classroom the learner comes to learning situations with knowledge gained from previous experiences and that prior knowledge influences their learning very positively. The students of constructivist classroom should given opportunities to modify their previous knowledge by providing them situations in which they can do science as scientists do.

(3) The constructivist teaching approach is more effective than traditional teaching approach in achievement of four phases of learning. It suggests that the process of teaching and learning should be changed. It emphasized learning through meaning making process rather than rote memorization of concepts. The trend of teaching should be changed from transmission of knowledge to constructing the meaning of concepts.

(4) The constructivist teaching approach thrums over the traditional teaching approach in inculcating and fostering processing skills. The atmosphere of science classroom should be democratic in which priority is given to students’ autonomy. In democratic situations students have right to think and share about their previous knowledge and ideas according to related concepts of learning.
(5) Meta-cognitive skills are well developed by employing constructivist teaching approach in the classroom. The constructivist teaching approach is aware the students about their internal plans and thoughts while learning.

(6) The constructivist teaching approach makes students more clear about their declarative knowledge, procedural knowledge and conditional knowledge. Planning strategies, information management strategies, monitoring strategies, debugging strategies and evaluation strategies were well developed in the students of experimental group.

(7) This study favors that the students should given the opportunity to work in groups. It fosters the peer learning and meaning making process while discussing with each other. The constructivist philosophy believes in both individual and group construction of knowledge.

(8) The constructivist teaching approach is an effective method in building up better perception of nature of science among the students, which is one of the main objectives of science education. From the present research it was revealed that there is a positive relation among constructivist approach and achievement in science, development in science processing skills and meta-cognitive skills.

(9) In this research, it was found that constructivist approach was effective in developing science process skills among the students. During the experiment the students of experimental group were given opportunities to develop the skills of recalling, communicating, comparing, reasoning, classifying and imagining. This research suggested that the teacher should provide suitable learning situations wherein students get first hand experience of handling the equipment, making use of senses, explore and experiment and infer about results.

(10) Training programs on constructivist approach could be organized for pre-service and in-service teachers so as to develop an understanding and the necessary skills for the successful implementation of constructivist teaching model in the classroom.

5.6 SUGGESTIONS FOR THE FURTHER RESEARCH:

(1) Like this research, studies could be conducted in other than science subjects at primary level.
(2) Like this research, studies could be conducted in secondary and higher secondary level by taking science textbook as teaching learning material.

(3) A comparative study could be taken up to find out the effectiveness of constructivist teaching approach between rural and urban area.

(4) This kind of experiment could be done by taking CBSE science text book as teaching learning material.

(5) A study could be undertaken to examine the characteristics and role of teachers in constructivist classroom.

(6) Study to investigate the interaction effect of constructivist approach with other variables like SES, age, personality factor in developing science process skills could be done.

(7) A study of teachers’ and students, attitude towards constructivist approach as teaching method could be considered.

(8) A constructivist based instructional approach to help primary and secondary level students to improve all the elements of scientific literacy could be taken up.

(9) Research could be done to examine the student perceptions of the constructivist classroom.

(10) A comparative study of individual constructivism and social constructivism could be taken up on secondary level students.