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Effectiveness Of Cognitive Constructivist Approach In The Acquisition Of Science Process Skills

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Abstract:

*The present research paper is the report of an experiment conducted to find out the effectiveness of Cognitive Constructivist Approach (CCA) in the acquisition of science process skills(Basic, Intermediate, Advanced) among ninth graders belonging to same intelligence and socio-economic status. In order to see the effect of CCA in the acquisition of science process skills, an experimental parallel group design was employed. The total sample comprised of sixty four (32 *2=64) students. The analysis of the data showed that the experimental group who learnt through Cognitive Constructivist Approach were attaining significantly higher mean scores than conventional group who were taught through traditional method for science process skills.*

1.Introduction

The rapid advancement of Science and Technology and in the increasing demands for more and more scientists to meet ever arousing domains of science based activities has accelerated the need for expanding scientific approach in teaching – learning process. The National Curriculum Framework (NCF) developed by National Council of Educational Research and Training (NCERT) in 2005 recommends a paradigm shift from rote memory to ‘learning by doing’ and ‘learning by understanding’. It suggests that curriculum should help students to develop their own thinking and ideas through experience, action and reflection.

To create the bubbling thirst and the curiosity in the student minds, the learner must not be a passive listener but an active participant of the classroom. They should learn the process aspect of science. To arrive at such results, the conventional methods seem to be insufficient. The most prevalent method is the Cognitive Constructivist approach where the learners construct their own knowledge for better retention and application in a needed situation. So, the students in a cognitive constructivist classroom acquire all the process skills in science like observation, classification, hypothesizing etc.

2.Related Studies : An Overview

Several investigations have been conducted to find out the effectiveness of constructivist approach in the teaching of science subjects. Gundogdu, Kerim(2010)revealed that the constructivist methods and materials were very much effective on the attitudes of teacher’s towards human rights education. Uksei, Ulku(2010/2008)came out with the need to combine social constructivist activities with cognitive constructivist ones with incorporation of personalized learning approaches. Demirci, Cavide (2009)revealed that there is a significant difference between the means of achievement and retention in learning scores of constructivist learning and other learning theory applied to sociology and anthropology. Constructivist learning theories bears more positive results than other theoretical means. Dijkstra, Sanne (1997)argues that constructivist theory helps the students to achieve an “objectified” knowledge and problem solving skills. Light, Richard; William, Nathalie(2008)suggest that constructivist perspectives on learning can be used to develop student-centered, inquiry –based approaches to teaching individual sports. Jubilee Padmanabhan (2006)found out that constructivist approach has a positive effect on the achievement of students in science. She also pointed out that

constructivist approach has a positive effect on the problem solving ability of students in science.

N.Ramkumar sudarshan C.Panigrahi(2006)conducted a study on the acquisition of process skills by IV standard pupils through an instructional programme in environmental studies.They used constructivist model as an instructional framework for process skill development.This model facilitated the teacher in evolving teaching strategies for enhancing teacher-pupil interactions during the acquisition of process skills.

3.Objectives of the study

The objectives of the study are ;

- To prepare a lesson plan based on cognitive constructivist approach for selected units in science for class IX
- To study, the level of acquisition of science process skills by the students through cognitive constructivist approach.
- To find out whether there is any influence of cognitive constructivist approach in acquisition of science process skills.
- To find out whether there is any significant difference between boys and girls in acquisition of science process skills.

4.Hypotheses Of The Study

The hypotheses formulated in the light of the above mentioned objectives are;

4.1.Major Hypothesis

The newly adopted cognitive constructivist model of instruction is effective over conventional methods in the acquisition of science process skills.

4.2.Specific Hypotheses

- There exist no significant difference between pre-test and post-test scores of the control group.
- There exist no significant difference between pre and post-test scores of experimental group.

- There is a significant difference between the mean scores of post-test of experimental and control groups.
- There is no significant difference between boys and girls in their acquisition of science process skills among the students of experimental group.

5. Research Design

The experimental method has been adopted for this study, in which, control and experimental groups are employed. The investigator taught the control group through conventional method and the experimental group was taught through the Cognitive Constructivist approach.

6. Sample Of The Study

The subjects of the study were the students of class IX of Government Higher Secondary School in Ramanathapuram, Tamilnadu, India. The homogenous groups which are matched on the basis of variables consisting sixty four students, are randomly assigned into two groups namely control group and experimental group. The parallel two-group design is adopted for knowing the effectiveness.

Experimental Group and Control Group comprise twenty girls and twelve boys each respectively. For matching the two groups a post-test was also conducted. By analyzing the scores it was found that there is no significant difference in the mean scores of both groups.

GROUP	BOYS	GIRLS	TOTAL
CONTROL	12	20	32
EXPERIMENTAL	12	20	32

Table No. 1: Sample Table

7. Tools And Techniques Used In The Study

Cognitive constructivists approach based lesson plans and Science process skill tests I & II are the tool of present study.

8. Procedure

Process skills test from the selected units were administered to both experimental and control groups as pre-test. After conducting pre-test, the investigator has taught the same

units through conventional method to the control group and cognitive constructivists approach to the experimental group. A total of twenty sessions have been taken to complete experimentation.

After the implementation of cognitive constructivist approach for twenty sessions to the experimental group and traditional approach of teaching for control group, the Science process skills test was administered to both experimental and control groups as a post-test. Further, both the scores were subjected for computation to arrive statistical findings.

9. Statistical Techniques Applied

Both descriptive and inferential statistics were employed for the analysis of the data. Descriptive statistics such as mean, standard deviation etc. were used.

Inferential statistics namely “t”-test was also applied.

10. Results And Discussion

To find out the effectiveness of cognitive constructivist approach on the acquisition of science process skills, the following hypotheses were tested.

10.1. Hypothesis – 1

There is no significant difference between pre-test scores of control group.

TEST	N	MEAN	STANDARD DEVIATION	t
PRE-TEST	32	24.093	4.52	1.970
POST-TEST	32	26.812	4.84	NS

Table 3: Significance of Difference in Mean Scores of Pre and Post Test Scores of Control Group

NS-Not Significant at 0.05 level

Since the calculated “t” value (1.970) is lower than the table 2 (3.097) value, it is found that the conventional method did not influence the development of science process skill among the children. Hence the hypothesis framed by the investigator is accepted.

10.2. HYPOTHESIS – 2

There exist no significant difference between pre-test and post-test scores of experimental group.

TEST	N	MEAN	STANDARD DEVIATION	t
PRE-TEST	32	21.625	4.155	8.983*
POST-TEST	32	30.375	3.488	

Table 4: Significance of Difference in Mean Scores of Pre and Post Test Scores of Experimental Group

** Significant at 0.05 level.*

Since the calculated “t” value (8.983) is higher than the table value (1.973), it has been concluded that the cognitive constructivist approach has great significance in the acquisition of science process skills among the learner. Hence, the hypothesis framed by the investigator is rejected.

10.3.HYPOTHESIS – 3

There is a significant difference between the mean scores of post-test of Control and Experimental groups.

The above hypothesis is tested using t-test. The t-value that is obtained through the comparison of post-test scores of experimental group and control group reveals indirectly the effectiveness of cognitive constructivist approach.

GROUP	N	MEAN	STANDARD DEVIATION	t
EXPERIMENTAL	32	30.375	3.488	3.097*
CONTROL	32	26.812	4.840	

Table 2: Significance of Difference between the Mean Scores of Post Test of Experimental and Control Groups

** Significant at 0.05 level.*

It is evident from the above table that a significant change is observed between the posttest scores of experimental and control groups. The t-value of 3.097 is found to be significant at 0.05 level. So the formulated hypothesis is accepted. The experimental group taught through cognitive constructivist approach performed better than the control group in science process skill test. It means that there is a significant influence of cognitive constructivist approach on attainment of science process skills.

10.4.HYPOTHESIS – 4

There is no significant difference between boys and girls in their acquisition of Science process skills among the learners of experimental group.

The hypothesis was formulated to know the significant difference between boys and girls in the acquisition of science process skills

GROUP	N	MEAN	STANDARD DEVIATION	t
BOYS	12	29.58	3.199	0.894
GIRLS	20	30.85	4.096	

Table 5:Significance of Difference between Mean Scores of Boys and Girls in Experimental Group

NS- Not significant at 0.05 level.

It is evident from the above table that the t-value ($t = 0.894$) is not significant at 0.05 level. So the hypothesis formulated by the investigator is accepted i.e. there is no significant difference between boys and girls in their acquisition of Science process skills.

11.Major Findings Of The Study

The present study was aimed at finding out the acquisition of science process skills through cognitive constructivist approach. The analysis was carried out based on the hypotheses formulated, by using descriptive and inferential statistical tools. The major findings of the study are as follows:

- The analysis of post process skills revealed that the experimental group students performed better after undergoing the experimental treatment of cognitive constructivist approach in science teaching
- The level of student' acquisition of science process skills was high through Cognitive Constructivists model.
- Cognitive constructivist approach was found equally effective for both boys and girls in acquiring science process skills.
- It was found that use of cognitive constructivist approach in teaching science is more effective than conventional approaches in acquiring science process skills.
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12. Conclusion

In a cognitive constructivist classroom learner learn more, and enjoy the learning because they are actively involved in the learning process. Learning is active when it concentrates on thinking and understanding, rather than on rote memorization. Cognitive constructivism concentrates on how to think and understand and hence learning become active. Cognitive constructivist learning is transferable. In cognitive constructivist classrooms, learners create and organizing principles that they can take with them to other learning settings. By grounding learning activities in an authentic, real world context, cognitive constructivism stimulates and engages learners. Learners in cognitive constructivist classrooms learn to question things and apply their natural curiosity to the world. Learners in a cognitive constructivist classroom acquire science process skills more effectively because they are provided opportunities in learning activities.

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