



A STUDY ON CONCEPTUAL CHANGE APPROACH IN LEARNING MATHEMATICS AMONG NINTH STANDARD STUDENTS

R. Prabhu¹ and Dr. G. Subramonian²

¹Assistant Professor, Sri Ramakrishna Mission Vidyalaya College of Education (Autonomous), Coimbatore, Tamil Nadu.

²Associate Professor, Sri Ramakrishna Mission Vidyalaya College of Education (Autonomous), Coimbatore, Tamil Nadu.



ABSTRACT:

“Concept” is the basic unit of learning. From infancy to any age, a learner accumulates different concepts through learning and maturation. “Conceptual Change” refers to the development of fundamentally new concepts, through restructuring elements of existing concepts, in the course of knowledge acquisition. This article deals with the Study on Conceptual Change Approach in learning mathematics among ninth standard students. The research article is based on the experimental design. Pre test, Post test and Retention test methods were used for the study. The study revealed that there is a significant difference between the Experimental Group and Control Group with respect to their Pre test, Post test and Retention test scores.

KEYWORDS : Learning Mathematics, Differentiation, Aggregation, Characterization, Ninth Standard Students, Misconceptions, Conceptual Change Approach (CCA).

INTRODUCTION

Concepts are the basic units of thought that underlie human intelligence and communication. Human knowledge is conceptual and forms an integrated whole. In characterizing human knowledge, one needs to consider two topics, namely, context and hierarchy. The two topics have significant implications for concept formation and organization. A context in which concepts are formed provides meaningful interpretations of the concepts. The theory view of concepts attempts to, to a large extent, reflect the contextual feature of concepts. The formation of individual concepts and the overall conceptual structure depend on one’s theory of a domain. One’s theories and complex knowledge structures play a crucial role in concept formation, combination and learning. Human knowledge is organized in a tower or a partial ordering. The base or minimal elements of the ordering are the most fundamental concepts and higher level concepts depend on lower-level concepts. The first-level concept is formed directly from the perceptual data. The higher-level concepts, representing a relatively advanced state of knowledge, are formed by a process of abstracting from abstractions. In concept formation, there are two basic issues known as aggregation and characterization. Aggregation aims at the identification of a group of objects so that they form the extension of a concept. Characterization attempts to describe the derived set of objects in order to obtain the intension of the concept. For aggregation, one considers two main processes called differentiation and integration. Differentiation enables us to grasp the differences between objects, so that we can separate one or more objects from other objects. Integration is the process of putting together elements into an inseparable whole. As the final step in concept formation, characterization provides a definition of a concept. Hence, teachers must be trained to understand the different levels of concept formation prevalent among students. Ninth standard students were taken for the present study to analyse the effectiveness of conceptual change approach in enhancing Learning mathematics among them.

PROCESS OF CONCEPTUAL CHANGE

Memory is the ability to encode, store and recall information. The memory is linked to three processes viz. encoding, storage and retrieval. For all these processes the main phenomenon to be considered is "Concept". The level of memory is solely dependent on assimilation and understanding of concepts without any ambiguity in its original form. Teaching is a process to alleviate the misconceptions prevailing among students. To overcome misconceptions, Conceptual Change Approach is to be fully implemented. Teachers should be equipped to identify the common misconceptions of the students and to analyze the ways and means of overcoming the same. Only on successful implementation of Conceptual Change Approach, Short term memory could be converted to Long term memory, thereby resulting in efficient learning among students.

OBJECTIVES OF THE STUDY

- To study the misconceptions prevalent among ninth standard students related to the mathematical concepts of their school syllabus.
- To construct diagnostic test to logically identify misconceptions in learning mathematics based on the syllabus of ninth standard students.
- To study the effectiveness of conceptual change approach in overcoming misconceptions in learning Mathematics among ninth standard students using statistical tool.

HYPOTHESES OF THE STUDY

1. There is no significant difference between the scores of Pre-test and Post-test of experimental group of Ninth Standard Boys.
2. There is no significant difference between the scores of Post-test and Retention test of Experimental Group of Ninth Standard Boys.
3. There is no significant difference between the Scores of Pre-test and Post-test of Experimental Group of Ninth Standard Girls.
4. There is no significant difference between the scores of Post-test and Retention test of Experimental Group of Ninth Standard Girls.
5. There is no significant difference between the scores of Pre-test and Post-test of control group of Ninth Standard Boys.
6. There is no significant difference between the scores of Post-test and Retention test of Control Group of Ninth Standard Boys.
7. There is no significant difference between the Scores of Pre test and Post-test of Control Group of Ninth Standard Girls.
8. There is no significant difference between the scores of Post-test and Retention test of Control Group of Ninth Standard Girls.

METHODOLOGY AND SAMPLE

The investigator chose experimental design to study the effectiveness of Conceptual Change Approach (CCA) in enhancing learning Mathematics among ninth Standard Students. Students of ninth standard were split into two groups namely experimental group and control group based on the IQ level and pretest scores. The pre test, post test and retention test method are used to find the effectiveness. One hundred students studying ninth standard were selected for the study, they were split into two equal groups namely experimental and control groups. The treatment was given to experimental group where as the control group is given traditional way of teaching methodology.

DATA ANALYSIS

Hypothesis 1: There is no significant difference between the scores of pre-test and post-test of experimental group of ninth standard boys.

Table 1: Analysis of Scores of Pre-test and Post-test of Experimental Group of Ninth Standard Boys

Scores	N	Mean	SD	't' value	df	Level of Significance
Pre-test	26	14.19	2.10	14.416	25	Significant at 1% level
Post-test	26	22.54	2.61			

Table-1 shows that the calculated t-test value is 14.416 which is greater than the table value of 2.787 at 1% level of significance. Since the calculated value is greater than the table value, the hypothesis “there is no significant difference between the scores of pre-test and post-test of experimental group of ninth standard boys” is rejected. It is inferred that there is significant difference between the Pre-test and Post-test scores, that is Conceptual Change Approach has effective impact in Learning Mathematics on Ninth Standard Boys of Experimental Group.

Hypothesis 2: There is no significant difference between the scores of post-test and retention test of experimental group of ninth standard boys.

Table 2: Analysis of Scores of Post-test and Retention test of Experimental Group of Ninth Standard Boys

Scores	N	Mean	SD	't' value	df	Level of Significance
Post-test	26	22.54	2.61	6.967	25	Significant at 1% level
Retention test	26	24.92	2.45			

Table-2 reveals that the calculated t-test value is 6.967 which is greater than the table value of 2.787 at 1% level of significance. Since the calculated value is greater than the table value, the hypothesis “there is no significant difference between the scores of post-test and retention test of experimental group of ninth standard boys” is rejected. It is inferred that there is significant difference between the Post-test and Retention test scores that is Conceptual Change Approach has effective impact in Learning Mathematics on Ninth Standard Boys of Experimental Group.

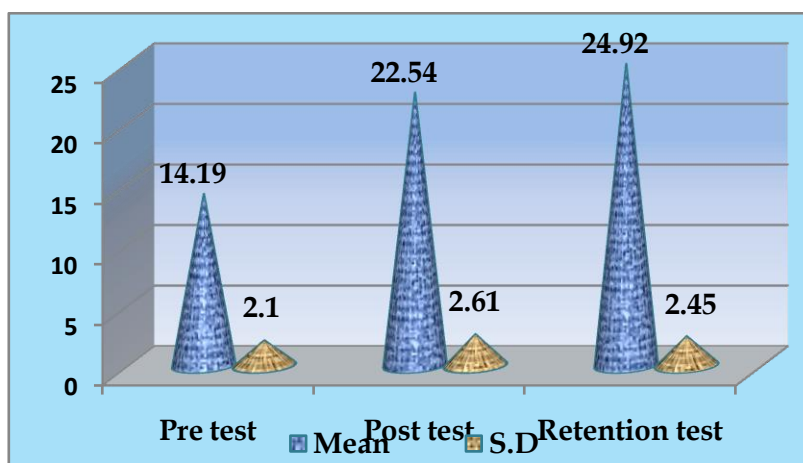


Fig. 1 showing the Mean and SD of Pre, Post and Retention test of Experimental Group of Ninth Standard Boys

Hypothesis 3: There is no significant difference between the scores of pre-test and post-test of experimental group of ninth standard girls.

Table 3: Analysis of Scores of Pre-test and Post-test of Experimental Group of Ninth Standard Girls

Scores	N	Mean	SD	't' value	df	Level of Significance
Pre test	24	13.83	1.69	16.349	23	Significant at 1% level
Post-test	24	22.46	2.25			

Table-3 depicts that the calculated t-test value is 16.349 which is greater than the table value of 2.807 at 1% level of significance. Since the calculated value is greater than the table value, the hypothesis “there is no significant difference between the scores of pre-test and post-test of experimental group of ninth standard girls” is rejected. It is inferred that there is significant difference between the Pre-test and Post-test scores, that is Conceptual Change Approach has effective impact in Learning Mathematics on Ninth Standard Girls of Experimental Group.

Hypothesis 4: There is no significant difference between the scores of post-test and retention test of experimental group of ninth standard girls.

Table 4: Analysis of Scores of Post-test and Retention test of Experimental Group of Ninth Standard Girls

Scores	N	Mean	SD	't' value	df	Level of Significance
Post-test	24	22.46	2.25	4.962	23	Significant at 1% level
Retention test	24	24.25	2.63			

Table-4 shows that the calculated t-test value is 4.962 which is greater than the table value of 2.807 at 1% level of significance. Since the calculated value is greater than the table value, the hypothesis “there is no significant difference between the scores of post-test and retention test of experimental group of ninth standard girls” is rejected. It is inferred that there is significant difference between the Post-test and Retention test scores that is Conceptual Change Approach has effective impact in Learning Mathematics on Ninth Standard Girls of Experimental Group.

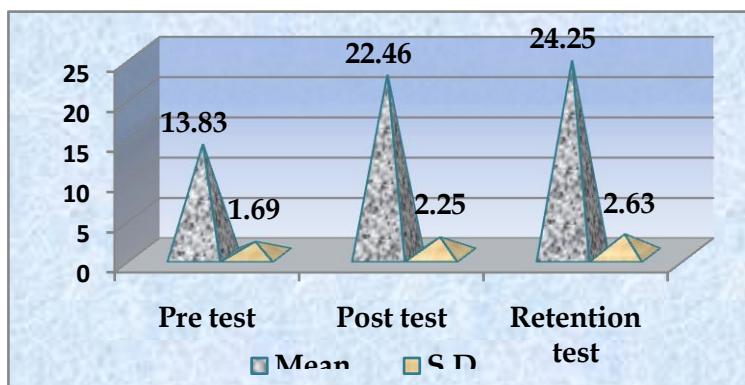


Fig. 2 showing the Mean and SD of Pre, Post and Retention test of Experimental Group of Ninth Standard Girls

Hypothesis 5: There is no significant difference between the scores of pre-test and post-test of control group of ninth standard boys.

Table 5: Analysis of Scores of Pre-test and Post-test of Control Group of Ninth Standard Boys

Scores	N	Mean	SD	't' value	df	Level of Significance
Pre-test	23	14.13	2.82	1.817	22	Not Significant
Post-test	23	14.52	3.03			

Table-5 shows that the calculated t-test value is 1.817 which is lesser than the table value of 2.074. Since the calculated value is lesser than the table value, the hypothesis “there is no significant difference between the scores of pre-test and post-test of control group of ninth standard boys” is accepted.

Hypothesis 6: There is no significant difference between the scores of post-test and retention test of control group of ninth standard boys.

Table 6: Analysis of Scores of Post-test and Retention test of Control Group of Ninth Standard Boys

Scores	N	Mean	SD	't' value	df	Level of significance
Post-test	23	14.52	3.03	0.651	22	Not Significant
Retention test	23	14.02	2.09			

Table-6 depicts that the calculated t-test value is 0.651 which is lesser than the table value of 2.074 and is not significant. Since the calculated value is lesser than the table value, the hypothesis “there is no significant difference between the scores of Post-test and Retention test of Ninth Standard Boys of Control Group” is accepted.

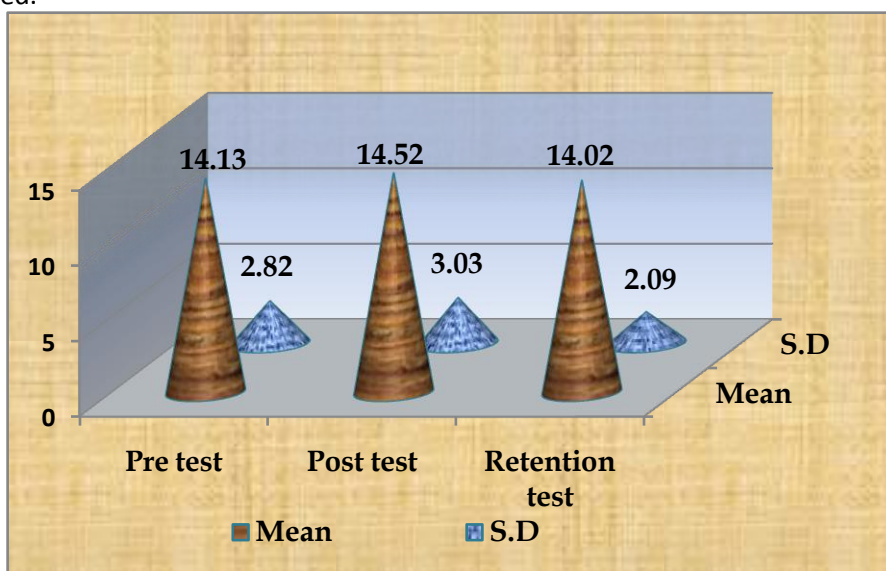


Fig. 3 showing the Mean and SD of Pre, Post and Retention test of Control Group of Ninth Standard Boys

Hypothesis 7: There is no significant difference between the scores of pre test and post-test of control group of ninth standard girls.

Table 7: Analysis of Scores of Pre-test and Post-test of Control Group of Ninth Standard Girls

Scores	N	Mean	SD	't' value	df	Level of Significance
Pre-test	27	14.33	2.32	0.486	26	Not Significant
Post-test	27	14.44	2.34			

Table-7 shows that the calculated t-test value is 0.486 which is lesser than the table value of 2.056 and is not significant. Since the calculated value is lesser than the table value, the hypothesis “there is no

significant difference between the scores of Pre-test and Post-test of Control group of Ninth Standard Girls” is accepted.

Hypothesis 8: There is no significant difference between the scores of post-test and retention test of control group of ninth standard girls.

Table 8: Analysis of Scores of Post-test and Retention test of Control Group of Ninth Standard Girls

Scores	No.	Mean	S.D	't' value	df	Level of significance
Post-test	27	14.44	2.34	1.140	26	Not Significant
Retention test	27	14.56	2.42			

Table-8 depicts that the calculated t-test value is 1.140 which is lesser than the table value of 2.056 and is not significant. Since the calculated value is lesser than the table value, the hypothesis “there is no significant difference between the scores of post-test and retention test of control group of ninth standard girls” is accepted.

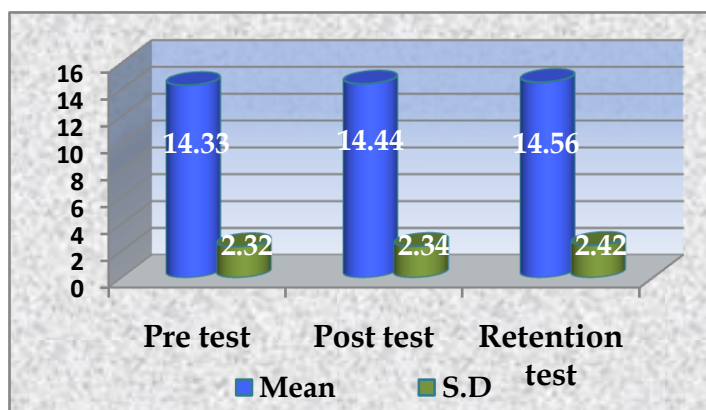


Fig. 4 showing the Mean and SD of Pre, Post and Retention test of Control Group of Ninth Standard Girls

FINDINGS OF THE STUDY

- There is no significant difference between the scores of Pre-test, Post-test and Retention test of experimental group of ninth standard boys is rejected.
- There is no significant difference between the scores of Pre-test, Post-test and Retention test of experimental group of ninth standard girls is rejected
- There is no significant difference between the scores of Pre-test, Post test and Retention test of control group of ninth standard boys is accepted.
- There is no significant difference between the scores of Pre-test, Post-test and Retention test of control group of ninth standard girls is accepted.

CONCLUSION

As a result of Conceptual Change Approach, the students were able to excel in their studies and the desired output of teaching could be achieved. It was observed from the study that the Conceptual Change Approach has effectively influenced learning mathematics. It not only resulted in memorizing the concepts by the students, but also in improving the knowledge acquired on the concept. The Conceptual Change Approach can be utilized in all other subjects to effectively transform teaching into efficacious learning.

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