



## AN EXPERIMENTAL STUDY OF THE EFFECT OF HANDS-ON ACTIVITIES IN MATHEMATICS IN RELATION TO ACHIEVEMENT AND CONCEPT RETENTION OF VII STANDARD STUDENTS IN GOVERNMENT SCHOOLS OF DELHI.

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### ABSTRACT

The present study was conducted to study the effect of hands-on activities in Mathematics in relation to achievement and concept retention of VII standard students in government schools of Delhi. The sample of the study was 164 students from three different government schools. The self-made post test of achievement and self-made test of concept retention were used to collect the data. The obtained data was analyzed with the help of t-test for two objectives. The major findings of the study include (i) Students who are taught through hands-on activities in Mathematics achieved better than students who are taught through conventional method. (ii) Students taught through hands-on activities retained the concept better than students taught through conventional method in Mathematics.

**KEYWORDS** : Hands-on activities, achievement, concept retention

### Introduction:

Elementary school stage forms the basis of students' education. At this stage, students learn number of subjects but among all the subjects, Mathematics is considered as most important. At the same time, it is also considered as one of difficult subjects. Teaching and learning Mathematics sometimes lead to fear and anxiety in students' mind. They assumed Mathematics as dull and boring subject due to its process based teaching.

The subject with reasoning and logic is taught in an illogical technique. The disinterest of students in the subject is due to its teaching in a mechanical way. It ultimately leads to failure, absenteeism and even drop-out from the school. According to revised policy formulations of National Policy of Education (1986), "The new thrust in elementary education will emphasize three aspects: (i) universal access and enrolment, (ii) universal retention of children up to 14 years of age; and (iii) a substantial improvement in the quality of education to enable all children to achieve essential levels of learning." Today, the foremost target of country like India is Universalization of elementary education (UEE). To achieve this target, quality of education especially Mathematics education should be taken care of. The essence of effective teaching is to encourage learners to understand 'how to learn' rather than to make them able to follow mechanical procedures by memorizing the mathematical formulas. The idea of 'one method is suitable to all the concepts' in Mathematics is a false belief in 21st century. Rather, it will make the teaching of Mathematics more complex and difficult. This led to the idea of variety of teaching techniques including the use of hands-on activities and manipulative materials in classrooms of Mathematics.

Teaching of Mathematics is a crucial task and success of the task in order to make the students learn the subject relies upon various factors. Earlier the focus of teacher was to cover the whole syllabus by communicating different formulas and procedures to the students with the use of chalk and duster. Teachers were trained to reproduce the concepts in front of students whatever they have learnt in their time from their teachers. So, basically teaching and learning was considered as a generic process in which one generation transfer their knowledge to the next generation. The process continued by simply recalling the old concepts. Teacher did not put efforts in gaining new ideas and techniques. But now in the modern era, there are ample resources of information that are accessible to learners. However, if teachers continue to use the same traditional methods, it will go on to suppress the curiosity of learners for learning new things. Also, these methods enhance the students' capabilities to get good marks without understanding the concept. This leads to lack of knowledge in the subject and failure in life. Therefore, while planning the classroom teaching activities, a teacher needs to think from the level of students. His teaching process should not be rigidly formed rather it should be flexible according to the needs and abilities of students. Teachers should plan the teaching techniques by keeping in mind the concepts to be

taught, background of the students and academic level of students. One such teaching technique is use of hands-on activities to make the students able to understand the abstract concepts by using concrete materials. National Curriculum Framework (NCF) 2005 argued that "School Mathematics must be activity-oriented."

Hands-on activities help the students in learning due to their visual and tactile appeal. These activities make lessons more easy, enjoyable and effective for all students i.e. below average, average and gifted students. Hands-on materials help the students in understanding and retain the concept that can be difficult and abstract because these materials make learning a fun. So, teachers should use different hands-on activities to satisfy the needs of the learners.

### Objectives:

1. To compare the effect of teaching through hands-on activities and conventional method in Mathematics in relation to achievement of students.
2. To compare the effect of teaching through hands-on activities and conventional method in Mathematics in relation to concept retention of students.

### Hypotheses:

1. There is no significant effect of teaching through hands-on activities and conventional method in Mathematics in relation to achievement of students.
2. There is no significant effect of teaching through hands-on activities and conventional method in Mathematics in relation to concept retention of students.

### Review of Related Literature:

**Pandey (2016)** outlined in an article in Hindustan times dated December 12 that NCERT proposed a survey to test children's learning skills. MHRD put forth a 'Draft Learning Outcomes' document prepared by the NCERT for elementary stage (class 1-8). In this document, NCERT proposed that teaching techniques in schools should be in accordance with expected learning outcomes of students. To incorporate this, a paradigm shift in teaching and learning strategies is required. This leads to the strategies which focus onto find the competency levels of students rather than concentrating on rote learning and textbook based assessment.

**Cass et al. (2003)** aimed to determine the effect of manipulative materials in relation to the procedural learning, transfer of learning in daily life and retention of the concept in geometry. Students with learning disability were taught the geometric concepts through geo boards. Results of the study revealed that use of concrete manipulative materials helps in procedural learning and encourage students to apply knowledge in daily life. Also, researcher found that these concrete materials help students to learn skills of problem-solving and long-term retention.

**Method:**

The present study is experimental in nature. The present study was done by using True Experimental Design. The use of this design may restrict the external validity. To overcome this limitation present study was extended to include more than two groups. These groups were matched on the basis of their previous knowledge by conducting an achievement test. Each group was chosen and assigned at random with lottery method of simple random sampling. After assigning the treatments to different groups as experimental groups (E) and control group (C), only experimental groups were exposed to experimental treatment i.e. experimental groups were taught Mathematics through hands-on activities and control group was taught through conventional method. After completion of the instructional treatment to measure the effect of teaching through hands-on activities and conventional method, post-test of achievement in Mathematics was conducted. Time span of instructional treatment was four weeks. After four weeks of experimental phase, a retention test was conducted to measure the concept retention.

**Sample:**

In sample three government schools were selected from Delhi. Out of which, two were allotted as experimental group (E) and one as control group (C) randomly. Total sample of the study was 164 students of VII standard.

**Tables 1: Division of Sample among Experimental Group and Control Group**

Experimental Group			Control Group		
S. No.	Name of School	Number of Students	S. No.	Name of School	Number of Students
1	Government Co-ed. Senior Secondary School, Mahavir Enclave	46	1	Government Co-ed. Senior Secondary School, Nangloi	57
2	Government Co-ed. Senior Secondary School, Dwarka	61			
	Total	107		Total	57

The data collected with the help of tools was analyzed by using statistical method i.e. t-test.

**Tools:**

1. An achievement test to match the groups.
2. A self-made post-test to measure the achievement of students in Mathematics.
3. A self-made test to measure the concept retention of students in Mathematics.

**Results and discussions:**

**1. Achievement of Experimental and Control Group of Government School Students**

The mean score of experimental and control group of government school students in the test of achievement along with their respective t-value are given in table 2.

**Table 2: Achievement of Experimental and Control Group**

Group	N	Mean	S.D	t-value
Experimental	107	10.37	2.516	10.52*
Control	57	6.72	1.868	

\*p < 0.01

As it is evident from the table 2; mean score of experimental group is 10.37 whereas mean score of control group is 6.72. There is a significant difference between mean value of experimental group and control group as t-value is 10.52 which is greater than tabular

value at 0.01 level. Hence, it is significant at 0.01 level. Also, mean score of experimental group is (10.37) is higher than the mean score of control group is (6.72). This means that students of experimental group achieve more than the students of control group. In other words, students achieved better when they are taught through hands-on activities than conventional method.

**2. Concept Retention of Experimental and Control Group of Government School Students**

The mean score of experimental and control group of government school students in the test of concept retention along with their respective t-value are given in table 3.

**Table 3: Concept Retention of Experimental and Control Group**

Group	N	Mean	S.D	t-value
Experimental	107	7.36	2.806	3.33*
Control	57	5.86	2.754	

\*p < 0.01

As it is evident from the table 3; mean score of experimental group is 7.36 whereas mean score of control group is 5.86. There is a significant difference between mean value of experimental group and control group as t-value is 3.33 which is greater than tabular value at 0.01 level. Hence, it is significant at 0.01 level. Also, mean score of experimental group is (7.36) is higher than the mean score of control group is (5.86). This means that students of experimental group retain better than the students of control group. In other words, students retain better when they are taught through hands-on activities than conventional method.

**Conclusion:**

From the above results, it is concluded that government school students who are taught through hands-on activities in Mathematics achieved better than students who are taught through conventional method. Also the students taught through hands-on activities retain the concept better than students taught through conventional method in Mathematics.

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