Research Paper Education

Apos Based Mental Constructs for Learning Mathematics by Ix Standard Students

Hari Haran.R

Assistant professor Dr.sivanthi Aditanar College of Education Tiruchendur TamilNadu

ABSTRACT

Generally the students have difficulty in learning mathematics and so as to have direct them to build the most suitable mental structure through their computational brain, APOS strategy is derived. In this experimental study totally 70 IX standard students were purposely selected and allotted equally in two groups – control and experimental and the. The pre-test –post-test tool was implemented. Results predicted that the ICT enabled Tata Interactive system was very much helpful to have more achievement in the experimental group

KEYWORDS APOS based mental constructs, learning, mathematics.

Introduction

An individual does not learn mathematical concepts directly. He/she applies mental structures to make sense of a concept (Piaget, 1964). Learning is facilitated if the individual possesses mental structures appropriate for a given mathematical concept. If appropriate mental structures are not present, then learning the concept is almost impossible.

The above imply that the goal for teaching should consist of strategies for: [a] helping students build appropriate mental structures, and [b] guiding them to apply these structures to construct their understanding of mathematical concepts. In APOS Theory, the mental structures are actions, processes, objects and schemas. In the following subsections (1) each of these is briefly described, and (2) then the ACE Teaching Cycle; which constitutes the pedagogical strategies used, based on the hypothesis and the implication for teaching; is described.

APOS Theory of human mind in learning the mathematics

Aneshkumar Maharaj (2013) has framed the studied the students understanding the derivatives. He conceptualised APOS theory based mathematical derivations for easier learning process. His formulations are: APOS (Action, Process, Object and Schema)

The main mental mechanisms for building the mental structures of action, process, object and schema are called interiorization and encapsulation (Dubinsky, 2010; Weller *et al.*, 2003). The mental structures of action, process, object and schema constitute the acronym APOS. APOS theory postulates that a mathematical concept develops as one tries to transform existing physical or mental objects. The descriptions of action, process, object and schema; given below; are based on those given by Weller, Arnon & Dubinsky (2009). Aneshkumar Maharaj (2013) formulated suitable examples to clarify those descriptions.

Tata interactive system

The multiple learning experiences Model-the Tata Class Edge instructional Tata Interactive systems (TIS) is a pioneer and global leader in custom learning solutions.

NEED FOR THE STUDY

Since various mathematical models and theories in mathematics education can the accurate and supports the prediction of errors committed, it develops the explanatory power and it can be applicable to a broad range of phenomena. In addition to this, it helps to organize one's thinking about complex, interrelated phenomena and serve as a tool for analysing data, and provide a language for communication of ideas. Having these view, the present study is framed.

Variables:

Dependent variable: Achievement, Independent variable: Teaching mathematics to the IX standard students through Traditional method and through the Tata interactive system

Objective of study

To find out the effectiveness of APOS program in mathematics teaching in IX standard students.

Methodology

In this experimental study totally 70 IX standard students were purposely selected and allotted equally in two groups – control and experimental and the. The pre-test –post-test tool was implemented based on APOS theory.

Results of Hypothesis testing – 1

There is no significant difference in the effectiveness of APOS program in mathematics teaching in IX standard students with regard to control and experimental group.The ;t'test was adopted in the present study.

TABLE: 1- Difference between the control and experimental group students in their gain scores

Group	N	Mean	S.D	Calculated 't' value	'p' value	Remark
Control Group	32	17.03	7.91	8.86	.00	Significant P<0.05
Experimental Group	32	34.12	7.52			

From the above table it is observed that all the obtained' value are more than the critical value at 0.05 level of significance and hence, the null hypothesis is rejected. It means that there is a significant difference between control and experiment group students in their gain scores. The experimental group students are better than the control group students in their gain scores.

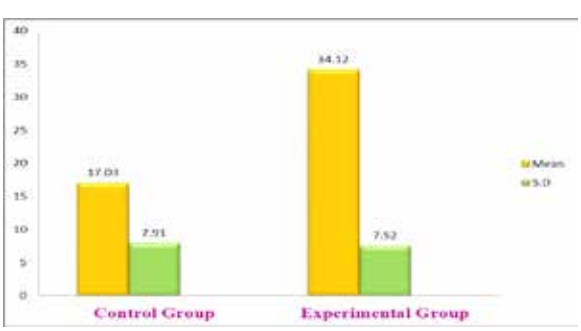


Figure: 4.3.1- Graph showing the mean difference between control and experimental group students in their gain scores

Results of Hypothesis testing – 2

There is no significant difference between the mean scores of the control and experimental group students in their gain scores for the attainment of action, process, object and schema objectives.

TABLE: 2 - Difference between the control and experimental group students in their APOS dimension

Objectives	Control Group		Experimental Group		Calculated 't' value	'p' value	Remarks p<0.05
	Mean	S.D	Mean	S.D			
Action	5.09	3.13	7.50	2.92	3.18	.02	Significant
Process	4.94	2.66	8.63	2.15	6.09	.00	Significant
Object	4.09	2.76	8.66	2.09	7.45	.00	Significant
Schema	3.16	2.79	9.34	2.73	8.96	.00	Significant

From the above table it is observed that all the obtained't' values are more than the critical value at both level of significance (0.05 and 0.01 level) and hence, the null hypothesis is rejected. It means that there is a significant difference between the gain scores of control and experimental group students in attainment of action, process, object and schema.

Interpretation

It is interpreted here that the experimental group performed better than the control group in their gain scores. It is due to the ICT enabled Tata interactive system that was adopted in the present study. Moreover, the students of experimental group have realized the importance of APOS learning method for easy learning of mathematics.

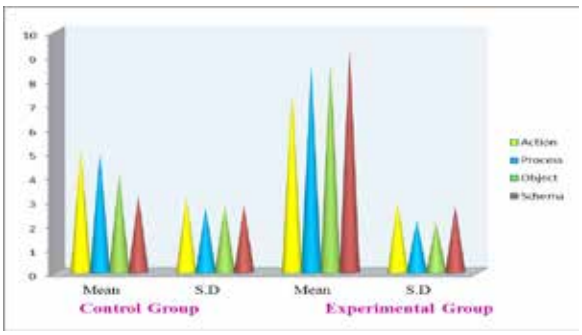


Figure: - Graph showing the mean difference between the control and experimental group students in their gain scores for attaining the objectives

Conclusion and educational implications

After these general considerations, the assumption on mathematical knowledge is focused on by making an APOS analysis of the derivative concept. The result of this analysis is called a *genetic decomposition*. A genetic decomposition of a concept is a structured set of mental constructs which might describe how the concept can develop in the mind of an individual (Asiala *et al.*, 1996). So, a genetic decomposition postulates the particular actions, processes and objects that play a role in the construction of a mental schema for dealing with a given mathematical situation. The genetic decomposition arrived at for the derivative concept, is indicated by the constant research.

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