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Reflective abstraction model of studying high school mathematics by ix standard students

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Abstract

Largely the students of mathematics find difficulty to learning math's concepts and the similarity between the terminologies as well as in the derivations may develop few misperceptions in learning process. Moreover the APOS strategy provides the computational skills in math learning. Advanced mathematical thinking is inclusive of constructive theory and parallel construction of own knowledge on mathematical learning. In this present study the APOS strategy was adopted to VIII standard students by TATA interactive system and pre-test- post-test experimental analysis the students of experimental group were better than the control group.

Keywords: reflective abstraction, learning, mathematics

Introduction

Advanced mathematical thinking is inclusive of constructive theory and parallel construction of own knowledge on mathematical learning.

Dubinsky (1991) proposed to use of reflective abstraction of Piaget (Beth & Piaget 1966) in advanced mathematical thinking. Dubinsky (1991) and Asiala, Brown, DeVries, Dubinsky, Mathews, and Thomas (1996) [1] determined six kinds of reflective abstractions: interiorization, coordination, reversal, encapsulation, thematization, and generalization in mathematics education and these are mentioned in the table 1.

Based on these reflective abstraction of mind, the APOS theory has been developed by Dubinsky and his colleagues. Action, Process, Object, Schema are the mental structures that an individual builds by the mental mechanism of reflective abstraction.

Based on these theoretical propositions the present study has been undertaken and the utility of the APOS theory is checked for its efficiency.

Need For the Study

Failure Mode Effect Analysis (FMEA) on reading: Failure mode and effect analysis, or FMEA, is an attempt to delineate all possible failures, their effect on the system, the likelihood of occurrence, and the probability that the failure will go undetected (Pyzdek, 2010).

Table 1: The FMEA on mathematics learning of the students

Mode of failure	Effect of failure	S.I	Causes of failure	O	Controls	D	R	Recommended action
Lack of understanding mathematics	Lack of learning attainments	6	Lack of dynamic ability in moulding the students to compute	5	Periodical inspection of authorities	7	210	Resourceful Training to and Payment as per the norms
Hampering The fullest potential in remarkable learning outcome			Lack of parental care in learning maths concepts	6	Periodical visit of authorities	4	144	Creating infrastructural facilities
			Poor administrative and academic practices towards textual learning.	7	Effective monitoring	5	210	Implementation of suitable strategies to Improve the leadership qualities
			Lack of skill training of the students for text preparation	5	Constant Motivation by feedback	7	210	Providing motivational programs–counselling
			Reluctance for continuous evaluation on mathematical skills	4	Effective monitoring	4	112	Providing motivational programs–counselling
Responsibility	Authorities of nodal agencies, managements, fads of the institutions, Faculty and students							

[(R = SI×O×D) S.I – Severity Index; O – opportunity; D – Detection possibility; R- Risk priority number]

Further the FMEA analysis shows that the Lack of dynamic ability in moulding the students, Poor administrative academic practices and in Lack of skill training of the students (210) are the most negative dominant factors which may negatively influence the VIII standard. Hence it is indispensable to take on the current study and it is entitled "Constructivist Modelling of Learning High School Mathematics by VIII Standard Students".

Specific Objectives

1. To find out the significance difference between the control group and experimental group students at pre-test level.
2. To find out the significance difference between the control group and experimental group students at post-test level.

Hypothesis of the Study

1. There is no significance difference between the control group and experimental group students at pre-test level.
2. There is no significance difference between the control group and experimental group students at post-test level.

Tools Used For the Study

The self-prepared tools are made for the present study from

1. Tata Class Edge based learning mathematics adopted for the IX standard students
2. An achievement test (pre and posttest) in mathematics. The Reliability and validity of the tool was 0.78 and 0.82 respectively. The objective based questionnaire was set to test the achievement of the VIII standard students. The APOS strategy was adopted as stipulated by Dubinsky *et al* (1991).

Sampling

The investigators have selected the experimental and control groups among VII standard students in James Memorial Matriculation Higher Secondary School, Pragasapuram. There were 20 students in each group. The pre-test was administer to the two groups and the purposive sampling was adopted.

Data Analysis

Table 2: Significance Difference between Control and Experimental Group Students Based On Pre-Test in Mathematics

Group	N	Mean	S.D	Calculate 't' value	Remarks 5% level
Control group	30	4.37	1.262	1.566	NS
Experimental Group	30	4.91	1.616		

(At 5% Level of significance the table value of't' is 1.96). (NS-Non significant)

It is inferred from the above table that there is no significant difference between control and experimental group students based on pre-test in mathematics so the above stated hypothesis has been accepted at the table value of 1.96 and the non- significant results showed the students of the both groups have similar test score at pretest level.

Table 3: Significant Difference between Control Group and Experimental Group Students Based On Post-Test in Chapter

Group	N	Mean	S.D	Calculate 't' value	Remarks 5% level
Control group	30	11.55	3.180	10.247	S
Experimental Group	30	20.93	3.832		

(At 5% Level of significance the table value of 't' is 1.96). (S-Significant)

It is inferred from the above table that there is significant difference between control group and experimental group students based on post-test in mathematics so the above stated hypothesis has been rejected at the table value of 1.96 and the significant results showed the students of the experimental group outdid the control group in test score at posttest level. Hence it was stated that the TATA based interactive system was effective in learning mathematics by VIII standard students.

Discussions

The reflective knowledge based constructivism is fostered by the TATA interactive system as the same technology influence the mental construct of the students in experimental group and this research outcome is in congruence with the mathematical research conducted and analyzed by Dubinsky (1991) and Asiala, Brown, DeVries, Dubinsky, Mathews, and Thomas (1996) [1]. Though the use of FMEA in educational research is meagre unlike the in industrial units for identifying the defective process, it is now much apprehended that the same can be adopted in academic process as analytical outcomes generated by Hariharan and Mohanasundaram (2013) [6].

Suggestions

Since the technology inspires the learning process, the reflective constructivism method of teaching can be adopted for acquiring the language skills. Moreover, the mechanism of the mental constructs are to be profoundly researched such a manner that can emphasise the brain parts responsible for the development of reflective skills.

Conclusion

The mathematical learning has been under constant change as the newest form of technological revolution takes place in our modern society and the TATA interactive system can be exemplified. The students develop much acquaintance with learning the mathematical concepts as the present study has proven.

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