

The Ability of Student's Increases for Mathematical Problem Solving after Learning by Discovery Method Can Help in Shaping a Better World

Neha Rathore¹, Anil Agarwal²

¹Researcher, Mathematics Department, Sage University, Indore, India

²Asso. Professor, Sage University, Indore, India.

¹tneha12332@gmail.com, ²anil.agarwal0731@gmail.com

Article Info

Volume 83

Page Number: 23720 – 23724

Publication Issue:

May - June 2020

Abstract

This research study investigate that on mathematical problem solving the capability of discovery learning method can help to develop logical, verbal, non-verbal reasoning which can help in shaping a better world. In Mathematical education by using mathematical activities we make mathematical education active, dynamic and more effective and when students dealing with their life problems they can solve it easily if their thoroughly and critically reasoning, systematically, think logically, adopt an objective and open attitude are properly develop. But we have observed that students are worry about numerous studies in mathematics that interfere with learning of math. There are three methods of teaching mathematics which are discovery learning, traditional method and problem solving. A teacher and student centered method is problem solving. In traditional method education is teacher-centered all the command is given by teachers. But teachers plays the role of facilitators in discovery learning and associated with construction and discovery of the knowledge .The findings of this investigation suggest learning by discovery methods, students are able to not only involve in best learning of mathematics but also able to solve their life challenges.

Article History

Article Received: 11 May 2020

Revised: 19 May 2020

Accepted: 29 May 2020

Publication: 12 June 2020

Keywords; *Methods of teaching, Discovery learning, Problem solving, Verbal, Non-verbal reasoning, Construct knowledge.*

I. INTRODUCTION

Mathematics is the mother of all science and governs the world of late economics, finance, so.scietc and what not. Nowadays mathematical research is progress over a period. From the last few decenniums the learning process are changing to student-centered from teacher-oriented and student centered to constructive knowledge. This idea of constructivist state that students become active learner, when teacher play a role of instructors for providing the support and challenge to the students to learn new things more desirably and favorably.

“Westwood and Moore” say that the discovery learning process begins with the presentation on

information or Problems that are carried out by the teacher (problem formulation) then students identify problems, collect, process, and analyze data from these problems (Exploration).

“Amin” states that an activity “discovery or invention” means an activity or lesson is designed so that students can discover the concepts and principles through his own mental process.

This study shows that

A) On student's mathematical success the effect of discovery learning.

B) To compare the achievement of students taught by discovery learning method and by traditional method.

II. LITERATURE REVIEW

In current psychology learning is one of the significant features in education. All over the world different types of learning theories and teaching methods are used. In Mathematics there are three methods of learning such as traditional, problem solving discovery method. Mathematics teacher must aware of different types of learning methods and they are master on their subject and method they are using. By using these methods students must develop Mathematical knowledge and concept understanding and are able to solve verbal and non-verbal reasoning problems which are helping them to think critically and solve their life problems.

2.1 Verbal reasoning

Verbal reasoning is a test of a skill rather than a test of learned knowledge. It is also recommended that children have a good grasp of synonyms, antonyms and a good general knowledge in terms of Mathematics.

To comprehend, understand, and evaluate written information critically is understood only by verbal reasoning. In powerful predictors of performance at work psychological research has shown that cognitive ability test along with other verbal reasoning tests are more result-oriented. In verbal reasoning language is not only a means communication it is a primary instrument of thought a defining feature of culture and an unmistakable mark of personal identity. (National council of Teacher of English [NCTE] and International Reading Association [IRA], 1996, P.12)

2.2 Non-verbal reasoning

By using pictures and diagram in non-verbal reasoning the problems can easily solved. Based on visual reasoning it tests the ability to solve problems and analyze visual information.

Essentially, non-verbal reasoning can deal with diagrams and pictures where as verbal reasoning can deal with words. The innovation of the 1905 Binet-Simon scale and factor analytic theories of intelligence brought a wave of new perspectives on intelligence testing.

2.3 Construct knowledge

A person is deemed to have of facts that he would have innovated had he made the usual and systematic inquiries is the constructive knowledge.

2.4 Discovery learning

The technique of inquiry-based learning is the discovery learning method and based approach to mathematical education. It is based on the concept that students discover their own knowledge and understanding of the world through experiencing things and reflecting on those experiences.

Discovery learning as a learning method that focuses on the active role of students in building new knowledge has many benefits. In many studies it is seen that, it provide an empirical evidence that discovery learning has a very good effect on cognitive learning outputs in Mathematics, such as think critically, learning achievement, communication, mathematical reasoning ability. In addition, discovery learning also plays an important role on the affective aspects, such as beliefs and motivation. Because of the much empirical evidence that shows the positive effect of discovery learning on student learning outputs it is compulsory to present the evidence exhaustively. One of the characteristics of discovery learning is that the role of the teacher is not imparting knowledge but rather creating and guiding classroom experience in which learners engage in order for discovering knowledge. A second characteristic of discovery learning is that while learners deal with discovery, the teacher motivates them to think profoundly. And the third feature is that learners acknowledge the challenge of realizing something by themselves rather than

requiring the teacher given them a reply. (Cruickshank et al., 1995)

The sense of discovery is to learning as follows the mental process of assimilating concepts and principles, learning how to use the mind to discovery. The opinion states that the invention is a mental process, where student are involved in using a mental process to find a concept or principle (Carin and Sund).

III. METHODOLOGY

This research was conducted to analyze the methods which are used in Mathematical learning such as traditional and discovery learning. Data were collected using self observation, interviews and by taking class-test students using experimental method. 40 students were taken for this experiment and two groups A and B were made and each group contains 20 students. Two mathematics teachers were taken to teach this two group having same qualification and experience teacher C and teacher D. Teacher C teach to group A two units by using traditional method and teacher D teach to group B the same two units by using discovery learning method after that teachers get changed. Now teacher D teach to group A to two units by using same traditional methods and teacher C teach to group B by same discovery learning methods. After over of this class test was taken from students and interview was taken from teachers. The questions taken in the test and interview and considered criteria in the observation were related to this two teaching methods traditional and discovery learning. The teaching methods were taken to analyze by the data.

IV. FINDINGS

As students play an important role in learning and teachers play an important role in presenting the content of text books to students, the researcher conducted class-test for students, interview for teachers and analyze their classes when they are teaching in their respective classes. In students test we asked 10 questions of non-verbal reasoning and

10 questions on concept and formula understanding in which 5-5 questions from each is objective type questions and rest of other questions are on problem solving. After over of this test the papers are checked by mathematics teachers and the data were collected.

S.No	Group A Students	Marks Obtained	
		Non-Verbal Reasoning (10 Questions 20 Marks)	Concept and Formula Understanding (06 Questions 30 Marks)
1	a	12	23
2	b	9	26
3	c	11	19
4	d	5	24
5	e	14	19
6	f	16	21
7	g	6	19
8	h	5	25
9	i	8	27
10	j	7	18

Table 1

S.No	Group B Students	Marks Obtained	
		Non-Verbal Reasoning (10 Questions 20 Marks)	Concept and Formula Understanding (06 Questions 30 Marks)
1	k	15	24
2	l	14	26
3	m	18	25
4	n	19	19
5	o	13	21
6	p	18	23
7	q	16	25
8	r	16	26
9	s	20	27
10	t	19	19

Table 2

From data table 1 and 2 we analyze that, group A students taught by traditional method are unable to solve questions which is based on non-verbal reasoning in short time period because they want more time to solve by traditional method on the other hand group B students which are taught by discovery learning method are easily solve this questions in a given time interval.

In concept and formula understanding group A and group B shows near about same result. But group A students have taken more time and used complicated process to solve the questions. On the other hand group B student uses logical, easy process and they are able to discover a new concept which is based on those units.

Researcher gave the same chance to teacher C and D to teach by both the methods traditional as well as discovery learning method. In traditional method they are using mathematical books, green-board in the class and class was arranged by teacher-oriented techniques.

In interview when asked about traditional teaching method which they both were taught in group A class, they answered

“When I teach a topic, firstly I introduced the topic and then I solve some problems on the board by using chalk and then I give some other examples to students and ask them to solve, when they are solving the examples, I go around the class and I can see whether they are able to solve problems if someone are unable to solve I help them to understood the topic.(Interview with teacher C and D on traditional method, February 2020)

Now when we asked about discovery learning method which they both were taught in group B class they replied,

“We have taken many discovery based-activities in the class we solve many exercises by using discovery method. We encourage the students to solve the questions by their own methods so that students must improve themselves to know what

concepts in mathematics are related to other concepts in engineering, commerce, business, and physics and so on. (Interview with teachers C and D on discovery learning method, February 2020)

As compare to traditional method students are more active and energetic in discovery learning method. In this method students are able to express their idea about the concept and the class is easily managed by student-oriented method. During the teaching and learning activities students were more active.

V. DISCUSSION

The effect of discovery learning on student’s mathematics learning results contains cognitive affective and logical characteristics. In learning mathematics every steps of discovery learning plays a major role. The student’s particular skill or ability is improved by highlighting some steps to develop student’s motivation, observation, and innovative thinking skills. By developing discovery learning students have high ability to develop analogy, observation, achievement, group discussion, self-regulated, conceptual understanding, retention, inquiry, beliefs, and critical thinking skills. In classroom during the teaching hour’s teacher C and D understood that when they are using discovery learning method instead of traditional learning method, students are more active in group discussion, class activities and students are active learner.

VI. CONCLUSION

By using data analysis and findings we conclude that discovery learning skill not only encourage the better learning of mathematics but also increases student’s creativity to solve their daily life problems. By the growth of discovery learning method students are able to think innovatively. It must be very articulate on mathematical teaching methods which includes short lecturer, student centered lectures and large creative discussion. In mathematical lectures using discovery learning students are more energetic, they think logically and

they are able to solve any challenging problem solving questions. This result indicate that students who learn mathematics by traditional methods are less active and innovative from the students who learned by discovery learning methods. By discovery learning method prepare students to solve problems more accurately and cope with their life challenges. The outputs of this study shows that the purposes and goal of mathematical teaching by discovery learning method can be achieve easily and its adaptation with mathematical education can help in knowledgeable teaching.

REFERENCES

- [1] A. Carin,. R.B. Sund, Teaching Science through Discovery (Charless E. Merrill, Columbus, 1980), pp.74
- [2] E. Hasibuan, “Improving Understanding Skills and Reducing Student Mathematical Anxiety by Using the ASIAS Learning Model”, Ph.D, thesis, Indonesia University of Education, 2014.
- [3] Geary, D.G. “Mathematics and learning disabilities. Journal of Learning Disabilities”, 37,4-15, 2004.
- [4] Arends R I and Kilcher A “Teaching for student learning: Becoming an accomplished teacher” (New York, NY: Routledge) 2010.
- [5] Westwood P “What Teacher Need to Know About Teaching Method (Victoria: ACER Press), 2008.
- [6] Westwood P “ What Teacher Need to Know About Teaching Methods”, 2008
- [7] Moore K .D “Effective instructional strategies: from theory to practice”,2005
- [8] Ball, D.L. Thames, M.H., & Phelps, G “Content knowledge for teaching: What makes it special? Journal of Teacher Education, 59
- [9] Charles, R and Lester, F. Teaching problem solving: What, why and how. Palo Alto, CA: Dale Seymour Publications.
- [10] Davis, P.J “What do I know? A study of mathematics self-awareness”. College Mathematics Journal, 1985.
- [11] Kline, M. “Mathematical through from ancient to modern times. NY: Oxford University Press, 1972.
- [12] Hoyles, .C and Lagrange J.B. “Mathematics education and technology-Rethinking the terrain” The 17th ICMI Study. NY: Springer, 2010.
- [13] Polya, G. “Mathematical discovery: On understanding, learning and teaching problem solving”. New York, NY: Wiley, 1965.
- [14] Borwein.P,. Liljedahl p, P. “Mathematicians on creativity”. Mathematical Association of America, 2014.
- [15] Hong, E., and Milgram, R.M. “Homework: Motivation and learning preference”. Westport: Bergin Garvey, 2000.
- [16] Sutherland, R. “Teaching for learning mathematics”, Maidenhead: Open University Press. 2007.
- [17] Maasz,. J and Schloeglmann, W. New Mathematics Education Research and Practice. Rotterdam: Sense Publishers, 2006.
- [18] Cruickshank, D. R., Bainer, D. and Metcalf, K. “The Art of Teaching. New York, NY: McGraw Hill, Inc. 1995.
- [19] Taplin, M. “Mathematics through Problem Solving. Math Goodies”, 2011. http://www.mathgoodies.com/articles/problem_solving.html
- [20] Stonewater, J. K. “Inquiry teaching and learning: The best math class study. School Science and Mathematics”, 2005. <https://doi.org/10.1111/j.1949-8594.2005.tb18034.x>