

**EFFECT OF MULTI-SENSORY APPROACH ON PERFORMANCE IN  
MATHEMATICS AT PRIMARY LEVEL**

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***Abstract***

*Mathematics is a subject of facts and formulas. Mathematics comes into the life of a student with the introduction of number sense and four basic arithmetical skills including addition, subtraction, multiplication and division. Once a student find problem in any one of these, it is difficult for him to proceed in the subject of mathematics as these skills lay down the basic foundation of mathematics. The present experimental study was conducted with an objective to study the effect of the Multi-Sensory Approach on Performance in Mathematics of students with difficulties in Arithmetic. The sample of the study consisted of 60 students of 3<sup>rd</sup> class of Government schools of Chandigarh having arithmetical difficulties. The results of the study show that Multi-Sensory Approach significantly improved the performance in mathematics of the students with difficulties in Arithmetic.*

***Keywords: Mathematics, Arithmetical skills, Teaching, Multi-Sensory Approach, Performance.***

**Introduction**

Mathematics is a one of the important and compulsory subjects of the school curriculum. Learning and solving mathematical problems can be an easy and fun game for some students but at the same time the toughest challenge for others. Mathematics subject is introduced to the students with the concept of number and four basic arithmetical skills of addition, subtraction, multiplication and division. Once a student find problem in any one of these, it is difficult for him to proceed further in the subject of mathematics as these skills lay the basic foundation of the subject.

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These skills also play an important role in developing students' interest, aptitude, performance and hence achievement in mathematics. However, there always exists a part of population of students who found these skills to be difficult and become unable to perform better in mathematics. The Annual Status of Education Report (ASER, 2016) indicated the wide variations in the ability of the students of class 5<sup>th</sup> in performing arithmetic. Only 21.1 per cent of the total students were found to perform the required arithmetic skills. Teachers make use of the different teaching methods and approaches for improving the performance of the students in the subject.

The term multi-sensory approach has been used by the different educators. Bullock (2003) states that multi-sensory supplements, such as Math manipulative support the child's use of visual, tactile, and/or auditory interactions with the material. These types of materials can help to bridge the gaps that most elementary teachers face while teaching young children novel and abstract Mathematical concepts. The Department for Education and Skills (DFES,2004) defined multi-sensory as using visual, auditory and kinesthetic modalities, sometimes at the same time. Kinesthetic refers to perceiving through touch and an awareness of body movements. Thus, these approaches are those which involve the use of two or more of the senses namely visual, auditory, tactile, and kinaesthetic at one time. This use of senses facilitates learning and understanding better. The idea behind the use of multi-sensory methods is that learning styles per se do not exist; instead learners use all their senses when absorbing information (Pashler, McDaniel, Rohrer and Bjork, 2008). In multi-sensory approach two or more senses are engaged in performing various activities: visual activities, auditory activities, tactile or kinaesthetic activities; aiming towards the learning of particular content or skill. Thus, these activities open the gate of learning for students. The detailed description of the different activities is as;

Visual Activities: Let them 'see'. Let them 'watch' and 'observe'. They will 'learn'.

Auditory Activities: 'Speak' to them and 'tell' them. Make them 'listen' and they will 'learn'.

Tactile Activities: Let them 'touch' the things with their hands and 'observe'. Let them 'touch' and 'count'. They will 'learn'.

Kinaesthetic Activities: Let them 'learn by doing', by 'performing'. Let them 'play with numbers'. They will 'learn'.

Multi-Sensory approach is great facilitator for students of all age and also for the teachers. Different research studies recommended to include in each mathematics teaching presentation at least three basic learning modalities; auditory, visual, and tactile, to meet the needs of most students (Caudill, 1998; Gadt-Johnson and Price, 2000; Willis and Johnson, 2001). The multi-sensory approach is also known as the O&G method (Orton Gillingham approach). In this approach, the students learn to read by using their different senses.

### **Objectives of the Study**

1. To study the differences in pre-test and post-test mean scores on Performance in Mathematics of students with difficulties in arithmetic in Experimental Group.
- 2 To study the differences in pre-test and post-test mean scores on Performance in Mathematics of students with difficulties in arithmetic in Control Group.
- 3 To study the effect of Multi-Sensory Approach on Performance in Mathematics of students with difficulties in Arithmetic (mean gain scores difference of CG and EG)

### **Hypotheses**

1. There will be no significant difference in the pre-test and post-test mean scores on Performance in Mathematics of students with difficulties in Arithmetic of the Experimental Group.
2. There will be no significant difference in the pre-test and post-test mean scores on Performance in Mathematics of students with difficulties in Arithmetic of the Control Group.
3. There will be no significant effect of Multi-Sensory Approach on Performance of Mathematics of Students with difficulties in Arithmetic.

### **Design of the study**

The study was conducted using pre test - post test control group design. In this, the researcher first conducted pre-test on the sample, followed by the experiment and then the post-test. The

researcher first conducted the test of arithmetical skills on the students. After this the experimental group was taught using multisensory approach, whereas the control group attended their regular classes. After this, the researcher conducted post test on both the groups.

### Sample

For the sample, the researcher diagnosed students studying in 3<sup>rd</sup> class of Government schools of Chandigarh with difficulties in arithmetical skills. For identification of sample, following steps were followed: Teacher referral form, Direct Observation, Notebooks, Coloured Progressive Matrices (CPM) and Diagnostic Test.

After following these steps, the researcher got a sample of 60 students and then matched them on the basis of their scores in the pre-test and then randomly divided into two groups: Experimental group and control group. The experimental group (N=30) was taught arithmetical skills using multisensory approach whereas the control group (N=30) attended their normal classes. The scores obtained by students in the first phase in the diagnostic test were the scores for pre-test of performance in mathematics. The experimental group was taught using multisensory approach including a combination of kinesthetic, tactile, visual and auditory activities. These activities are listed below in Table 1 along with the skills for which they were helpful for.

**TABLE 1: VARIOUS ACTIVITIES INVOLVED IN THE APPROACH ALONG WITH THE SKILLS**

Type of activities	Activities Involved	Skills
Kinesthetic Activities (involving body movement)	<ul style="list-style-type: none"> <li>• Walking Steps</li> <li>• Jumping</li> <li>• Number Line</li> <li>• Stairs up and down</li> <li>• Foot Prints and Sticks</li> <li>• Counting the Tables</li> </ul>	<ul style="list-style-type: none"> <li>• Number Recognition</li> <li>• Adding</li> <li>• Subtracting</li> </ul>
Tactile Activities (involving touch sense)	<ul style="list-style-type: none"> <li>• Touchmath Numerics</li> <li>• Flashcards</li> <li>• Postures</li> </ul>	<ul style="list-style-type: none"> <li>• Number Recognition</li> <li>• Adding</li> <li>• Subtracting</li> </ul>
Visual and Auditory Activities (Sense of vision and hearing)	<ul style="list-style-type: none"> <li>• These two senses are always a part of all the activities of this approach</li> </ul>	<ul style="list-style-type: none"> <li>• Number Recognition</li> <li>• Adding</li> <li>• Subtracting</li> </ul>

## Results & Discussion

The results have been discussed in the light of the hypotheses of the study.

### Hypothesis – 1

H<sub>01</sub>: There will be no significant difference in the pre-test and post-test mean scores on Performance in Mathematics of students with difficulties in Arithmetic in Experimental Group.

**Table 2: Pre-test and post-test scores on Performance in Mathematics of students with difficulties in arithmetic of the Experimental Group**

Stage	Mean	SD	SE <sub>D</sub>	Df	Difference in Means (post-pre)	t-values	Remarks
Pre-test	27.8	17.17	3.13	29	86.5	-25.80	.000**
Post-test	114.30	19.63	3.58				

\*Significant at .05 level of significance

\*\*Significant at .01 level of significance

As presented in Table 2, the difference in pre-test and post-test mean scores on performance in mathematics of Experimental group is found to be 86.5 and it was found to be significant. Hence the null hypothesis stating, “*There will be no significant difference in pre-test and post-test mean scores on performance in mathematics of students with difficulties in Arithmetic*” stands rejected. Thus, it can be interpreted that the performance in mathematics of students with arithmetical difficulties improved after teaching them with Multi-Sensory Approach.

### Hypothesis – 2

H<sub>02</sub>: There will be no significant difference in the pre-test and post-test mean scores on Performance in Mathematics of students with difficulties in Arithmetic in Control Group.

**Table 3: Pre-test and post-test scores on Performance in Mathematics of students with difficulties in Arithmetic of the Control Group**

Stage	Mean	SD	SE <sub>D</sub>	df	Difference in Means (post-pre)	t-values	Remarks
Pre-test	23.23	16.44	3.00	29	25.40	-4.124	.000**
Post-test	48.63	37.19	6.79				

\*Significant at .05 level of significance

\*\*Significant at .01 level of significance

As presented in the Table 3, the difference in pre-test and post-test mean scores on performance in mathematics of the Control group is found to be 25.40 and it was found to be significant. Hence the null hypothesis stating, “*There will be no significant difference in pre-test and post-test mean scores on performance in mathematics of students with difficulties in Arithmetic*” stands rejected for control group. Thus, it can be interpreted that the performance in mathematics of students with arithmetical difficulties also improved after teaching them with classroom teaching.

### **Hypothesis – 3**

H<sub>03</sub>: There will be no significant effect of Multi-Sensory Approach on Performance of Mathematics of Students with difficulties in Arithmetic.

**Table 4: Comparison of the pre-test and post-test scores on performance in Mathematics of students with difficulties in Arithmetic between Experimental Group (N=30) and Control Group (N=30)**

Variable	Group	Mean Gain Score	SD	SE <sub>D</sub>	Df	t-value	Remarks
Performance in Mathematics	EG	86.5	19.63	3.58	58	8.551	.000**
	CG	25.4	37.19	6.79			

\*Significant at .05 level of significance \*\*Significant at .01 level of significance

As shown in the table 4, the mean gain scores in Performance in Mathematics of the students with difficulties in Arithmetic of the Experimental Group and Control Group were found to be 86.5 and 25.4 respectively. The t-value was found to be significant ( $t=8.551$ ,  $t<.01$ ). Hence, the null hypothesis stating, “*There will be no significant effect of Multi-Sensory Approach on Performance in Mathematic of Students with Arithmetic Difficulties*” stands rejected.

Significant mean gain score difference in Performance in Mathematics indicates that Multi-Sensory Approach has significantly improved the performance of students in Mathematics. Hence, it can be interpreted that Multi-Sensory Approach has made more improvement in performance in mathematics of students with difficulties in arithmetic. The results are consistent with the studies of Scott, 1993; Bedard, 2002; Dev, Doyle & Valente, 2002; Wisniewski & Smith, 2002; Simon & Hanrahan, 2004; Cihak & Foust, 2008 and Obaid, 2013.

### **Conclusions**

On the basis of the findings, we may conclude that:

- Multi-Sensory Approach of teaching made a significant improvement in performance in mathematics of the students finding difficulties in arithmetic.
- Though performance in mathematics of students also improved with regular classroom teaching but the mean difference of pre-test and post-test scores go in favor of Multi-Sensory Approach.

### **Educational Implications**

Findings of the study reveal that the performance in mathematics of the students with arithmetical difficulties improved after teaching them with Multi-Sensory Approach. The purpose of using multi-sensory approach in teaching mathematics is to simplify the teaching and learning process for both the students and the teachers. In this era of technology, the use of such simple activities is interesting and playful for students. Also, the teacher does not need any special technology or electricity; rather, this teaching brings the students and teachers out of their regular tedious learning routine. The positive results of the approach suggest that this approach can be used for students who find difficulties in arithmetic and hence performs low in the subject.

## References

- Annual Status of Education Report (ASER). (2016). *Main findings : All India (rural) report*. from <http://img.asercentre.org/docs/Publications/ASER%20Reports/ASER%202016/aser2016nationalppt.pdf>. Retrieved April 18, 2017
- Bedard, J. M. (2002). *Effects of a Multi-Sensory Approach on grade one mathematics achievement*. Retrieved August 31, 2017 from <https://www.touchmath.com/pdf/JMB.pdf>.
- Bullock, J. (2003). The evolution of the importance of multi-sensory teaching techniques in elementary mathematics: Theory and practice. *Journal of Theory and Practice in Education*, 4(2), 239-252.
- Caudill, G. (1998). Matching teaching and learning styles. *Technology Connection*, 4(8), 11-14.
- Cihak, D. F., & Foust, J. L. (2008). Comparing number lines and touch points to teach addition facts to students with autism. *Focus on Autism and Other Developmental Disabilities*, 23(3), 131-137.
- Dev, P. C., Doyle, B. A., & Valente, B. (2002). *Labels Needn't Stick: "At-Risk" First Graders Rescued With Appropriate Intervention*. (Research Paper, Nazareth College of Rochester Rochester, New York). Retrieved February 17, 2017 from <http://www.touchmath.com/pdf/AppropriateIntervention.pdf>.
- Kashyap, D. (2008). Effect of mindfulness on reading anxiety reading ability and self esteem of students with dyslexia (Published doctoral thesis, Panjab University, Chandigarh). Retrieved April 20, 2017 from <https://shodhganga.inflibnet.ac.in/handle/10603/223463>
- Gadt-Johnson, C., & Price, G. (2000). Comparing students with high and low preferences for tactile learning. *Education*, 120(3), 581-585.
- Obaid, M. A. S. (2013). The Impact of Using Multi-Sensory Approach For Teaching Students With Learning Disabilities. *Journal of International Education Research*, 9(1), 75-82.
- Pashler, H., McDaniel, M., Rohrer, D., & Bjork, R. (2008). Learning styles concepts and evidence. *Psychological science in the public interest*, 9(3), 105-119.
- Scott, K. S. (1993). Multisensory mathematics for children with mild disabilities. *Exceptionality*, 4(2), 97- 111.



Simon, R., & Hanrahan, J. (2004). An evaluation of the touchmath method for teaching addition to students with learning disabilities in mathematics. *European Journal of Special Needs Education, 19*(2), 192-209.

The Department for Education and Skills (DFES). (2004). *Teaching and learning programme*. <http://learning.gov.wales/docs/learningwales/publications/140801-multi-sensory-learning-en.pdf>. Retrieved on March 28, 2017

Wisniewski, Z., & Smith, D. (2002). *How effective is touch math for improving students with special needs academic achievement on math addition mad minute test?* (Action research, Indiana University South Bend) Retrieved February 17, 2017 from <http://www.touchmath.com/pdf/Wisniewski-SkarbekPaper.pdf>.

Willis, J. & Johnson, A. (2001). Multiply with MI: Using multiples intelligences to master multiplication. *Teaching Children Mathematics, 7*, 260-270. Retrieved March 28, 2017 from <https://www.touchmath.com/pdf/JMB.pdf>.