Effect of Multi-Sensory Strategies and Its Implication on Mathematics Learning Ability

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Abstract

A perusal of human civilization reveals that mathematics has its influence at every stage of human progress and development. It is imperative that our students should know the contributions of great mathematicians and about their real purpose of mathematical inventions. Through this approach, teachers can present information in multiple ways and engage all students in the learning process. Because multi-sensory teaching allows teachers to present information to students using a number of different means of sensory input, this method adheres to the universal design of learning (UDL) (Metcalf, Evans, Flynn and Williams, 2009) by providing a flexible learning environment that accommodates students' differences with regard to the ways in which they learn. Mathematics may be thought of as a highly disciplined mode of thinking. The teachers should help students to appreciate the structure and pattern which underlie mechanical and computational skills.

KEYWORDS: Multi-sensory teaching, mathematical, universal design of learning and thinking

INTRODUCTION

Intense global competition, rapid technological changes, advances in manufacturing and information technology and discerning customers are forcing manufacturers to optimize manufacturing process, operations, and all the possible nodes of supply chains that enable them to deliver high-quality products in a short period of time**.** Mathematics plays an important role in human life. Mathematics of today is the result of the efforts made by a group of men for centuries and it reflects the culture and civilization of human race. It is being said that of mathematics is the history of human civilization. A perusal of human civilization reveals that mathematics has its influence at every stage of human progress and development.

Commercial necessity was the force behind all mathematical inventions. Arithmetic developed as a result of man's need to assess his wealth and geometry form surveying land. In the development of mathematics curriculum at secondary/higher secondary school level, very little attention has been given to the history of mathematics due to constrain of time. It is imperative that our students should know the contributions of great mathematicians and about their real purpose of mathematical inventions.

Through this approach, teachers can present information in multiple ways and engage all students in the learning process. Because multi-sensory teaching allows teachers to present information to students using a number of different means of sensory input, this method adheres to the universal design of learning (UDL) (Metcalf, Evans, Flynn, and Williams, 2009) by providing a flexible learning

environment that accommodates students' differences with regard to the ways in which they learn.

LITERATURE REVIEW

Many studies have addressed the effectiveness of multi-sensory instruction as a method of intervention for students with disabilities (Ashbaugh, 2016). Kok Hwee and Houghton (2011) examined the impact of a multi-sensory approach on the reading achievement of 77 Singaporean primary-school-aged children with dyslexia. The educators used the Orton- Gillingham (OG) technique that involves visual, auditory, and kinesthetic modalities. In this study, the students practiced reading using multi-sensory methods for eight weeks. The results of the study confirmed that combining the three modalities through the OG technique was effective in bringing about significant improvements in reading.

Al Sayyed (2013) investigated the impact of using an approach that focused on auditory, visual, and tactile senses in order to teach mathematics to students with learning disabilities. Study participants were separated into an experimental group and a control group. Both groups received eight weeks of mathematics instruction. Students in the experimental group were taught using a multi-sensory approach, while students in the control group were instructed with more traditional methods. At the end of the session, students who were taught using the multi-sensory approach achieved better outcomes on a post-test than students in the control group, suggesting that the multi-sensory approach helped students to have a better understanding of mathematics. This is an important finding given the challenges of teaching mathematics to students with disabilities.

Jubran (2012) conducted a study to determine the effects of using a multi-sensory approach to teach students English as a second language. The study's sample was comprised of 122 10th grade students divided into an experimental group that learned through a multi-sensory approach, and a control group that learned in more traditional ways. Both groups received eight weeks of English language instruction, at the end of which statistically significant differences between the two groups' levels of achievement were found in favour of the experimental group, which was taught via the multi-sensory approach. Although these students did not have disabilities, their ESL status makes their outcomes relevant to the target group.

Further, Martin, Gaffan and Williams (1998) and Niki and Lisa (2001) both conducted studies on the use of a multisensory room where one or more forms of sensory-based learning were presented. Sensory rooms, as Fowler (2008) describes them, are spaces that contain equipment designed to provide specific sensory stimulation to users. Ideally, these sensory experiences are tailored to the perceived needs of the users. Martin et al.'s (1998) study of 27 adults with severe/profound learning disabilities who exhibited challenging behaviours took place over the course of 16 weeks. Niki and Lisa's (2001) study which took place over the course of six weeks, focused on two participants diagnosed with autism: one female subject, age 17, and one male subject, age 16. Both studies found that multi-sensory rooms did not result in clear positive or negative effects on negative behaviours. However, the participants did become more relaxed while they were in them.

The literature has helped to define multi-sensory, which as the term implies refers to representations of material that address two or more of the five senses, and demonstrated ways it can motivate students, affect their abilities to learn, and positively affect their academic outcomes. The universal design of learning (UDL), conceptualized to improve learner engagement and learning outcomes, specifies three core means by which the learner can receive information: multiple means of

representation, multiple means of engagement, and multiple means of assessment (Brand & Dalton, 2012).

Multi-sensory instruction is a classroom practice that may be well suited to the three principles of UDL (Metcalf, Evans, Flynn, and Williams 2009). Just as multi-sensory instruction makes use of different sensory channels for conveying information, UDL do with the three elements. According to Bernacchio and Mullen (2007), the idea behind UDL is to provide flexible curricula and instruction that matches all students' abilities. Students are usually provided intervention in groups within the classroom, and each group may include students from different ability levels. The students can observe and learn from one another. It also uses technology to maximize success for all students. Thus, it gives all students a chance to socialize with one another and express their knowledge through engagement with and among school community that offer choices, incentives, and support.

By using the three channels of UDL, teachers can effectively integrate multi-sensory learning opportunities into children's daily learning. Further, UDL provides rich environments that offer learners numerous opportunities for social interaction, direct physical contact with the environment, and a changing set of objects for play and exploration (Brand & Dalton, 2012).

Furthermore, UDL is not only about teachers presenting information; it is also about students being able to deal with and assess the information. Students may have accurate ideas about what teachers are trying to present yet be unable to demonstrate their understanding. UDL or/and multisensory approaches can help students to demonstrate their understandings through the materials they have examined when they were learning. That is, by repeating the same activities with which have been taught, students can demonstrate their understanding to their teachers. By placing emphasis on presenting information in ways that make it available to every student regardless of his/her preferred learning style, both approaches can provide all students with equal opportunities to learn via their respective strength. These methods help both teachers and students to meet their educational goals.

Multi-sensory approach to intervention can help students to improve their levels of performance. This study aimed to real-world use of this method of intervention in the classroom as well as to explore the multi-sensory modalities and activities of students and to examine their perspectives regarding a multisensory approach to teaching mathematics

PURPOSE OF THE STUDY

A teacher of mathematics needs to explore the full potential of these for more effective mathematics teaching. This is a pre-instructional technique. The teacher, before introducing a lesson has to prepare the minds of the students to receive new knowledge. For effective learning, the teacher has to ensure students' willingness to learn. The learning becomes more meaningful when the new knowledge is integrated with the previous knowledge and relates it with the new experience. The following behaviours are essential for set induction.

- ❖ Establishing a cognitive and emotional rapport with the Students
- ❖ Recalling and integrating previous knowledge with new knowledge
- ❖ Maintaining continuity and logical thinking of students
- ❖ Arousing and maintaining the student interest

The main components of the skill are

Arrest attention: Use of voice gesture and eye contact. Use of audiovisual aids changing the pattern of teacher-students interaction.

Focus attention on the topic: Test the previous relevant for learning the new topic. Can also use knowledge acquired from various source like classroom, book, friends, technologies and etc.

Introduce an element of interest: Using teaching aids bringing out the significance of the new lesson.

Arouse the curiosity: Creating a suitable problematic situation. Posing an intriguing problem

OBJECTIVE OF THE STUDY

1) To Study the Use of Multi-sensory Strategies and its Implication on Mathematics Learning Ability
2) To Identify the Types of Multi-sensory Strategies Materials Which Are Suitable For Mathematics Learning Ability?
3) To Examine the Multi-sensory Strategies and its Implication on Mathematics Learning Ability For higher Secondary Students.
4) To establish A Reusable Framework to Showcase the Usage of Multi-sensory Strategies and its Implication on Mathematics Learning Ability

CONCEPTUAL FRAMEWORK

Auditory (Verbal, Linguistic)

An auditory learner is one who gets the most out of a lecture or verbal class instruction. They interpret what they hear much easier than information they see or read in a book. Auditory learners rely on words to understand concepts and lessons. Speech and the written word are used in much the same way a visual learner uses pictures and images. This could be an effective teaching style for students with dyslexia or dysgraphia.

Visual

A visual learner is a student who learns from watching. They learn much faster when they can look at diagrams, maps, blueprints or pictures. If they can see an activity being performed, it is much easier for them to comprehend and use the information. Many children on the Autistic Spectrum are said to be visual learners. This can also be an effective teaching style for students with dyscalculia – since visualizing math problems can be easier for them.

Kinesthetic

Kinesthetic learners are best able to absorb information if they are using their hands on teaching techniques give them a better understanding of how things work and solving problems than other learning styles. Kinesthetic learners like to touch and feel things. Students with aphasia, or difficulty with language, will learn better with active methods of teaching.

Aural (Auditory – musical)

Children who experience difficulty retaining information often turn to music to strengthen their ability to absorb and utilize information. A perfect example is the ABC song that young children are taught. By putting the letters to music, the brain is better able to remember them and recall them as they are needed.

Logical (Mathematical)

Logical or mathematical styles of learning include using reasoning and logical deductions to arrive at answers to various types of problems. Students who learn best with logic and reasoning are often highly organized and prefer structure to an open way of learning.

Social (Interpersonal)

Students who learn better in a group setting are called or social or interpersonal learners. They work best in groups where they can discuss concepts and share the responsibility of achieving a mutual goal. Students with learning can help one another by working together and using complimentary learning styles to achieve their goals.

Solitary (Intrapersonal)

Students who learn best on their own are known as solitary learners. They thrive using an intrapersonal or singular learning style that allows them to focus fully on what the task they are performing.

Combination

The majority of individuals, adults and children alike, use a combination of learning styles. As a person gets older and begins to figure out which type of learning style is most effective for them, they will begin to learn and adapt much faster. Children know how they learn and will often give teachers clues. Some will continually reach for an object or ask to try it on their own. Others will ask for techniques and problems to be shown to them again and again until they grasp the concept.

CONCLUSION

Mathematics may be thought of as a highly disciplined mode of thinking. The teachers should help students to appreciate the structure and pattern which underlie mechanical and computational skills. Many situations can be broken down by analysing them into interrelated constituent problems which can be explored be well-known mathematics techniques. Wherever there is structure, relationship, regularity, systematic variation, there is mathematics. To recognise this, one needs some knowledge of mathematical skill and formulae, but above all one needs imagination, appreciation of order, structure and pattern, combined with a flexible, roving interest to live in the changing, challenging and exciting world around us.

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