



The Effect of the 4MAT System of Instruction of teaching on Retention of Mathematics Concepts.

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Abstract Mathematics is an essential subject closely connected to our lives, yet it's perceived by many of the students as difficult, abstract and not realistic. This affects the performance of the students in Mathematics. The concepts learned must be applied in new situation and this level of applicability comes when concepts learned are retained. The methods adopted for teaching mathematics must make connect with students so that they find the subject relatable and meaningful. One such method could be the 4MAT system of instruction proposed by Bernice McCarthy. 4MAT system of instruction is a model of learning that considers learning styles and brain hemispheric preferences of the learners. This study investigates the influence of the 4 MAT system of instruction of teaching on retention of Mathematics concepts in students of standard 8th. The study used the quasi experimental approach following the two group pretest posttest design. The sample of the study composed of 243 students. The findings of the study showed that there exist significant difference between the experimental group and control group on retention scores in favour of the experimental group. Thus the researcher concluded that the 4 MAT system of instruction was an effective method for teaching mathematics and it helps in retention of concepts in Mathematics.

Key Words: 4MAT System of Instruction, Learning Style, Brain hemispheric preferences, Mathematics, Retention

1. INTRODUCTION:

Learning is effective when the learner is able to apply the learning in new situation. In simple terms the learning must be retained to be recalled when needed. Thus learning retention is an individual's ability to transfer new information into their long-term memory so that it is easily recalled and that knowledge is applied to new situations in future. German psychologist Hermann Ebbinghaus in his famous theory of Forgetting Curve stated that brain forgets quickly and explored the exponential nature of forgetting. Research shows that an average learner forgets 70% of what they learned within 24 hours and 90% of what they learned in a week if they don't make an effort to retain it. (Helen Colman, 2022) [1]. The fading of learning happens due to various reasons the major being difficulty of information, how meaningful it is to the person and how it's represented. The human brain finds it difficult to remember concepts that are irrelevant or unrelated to its needs or environment. This calls for methods that are student centred and make the learning meaningful realistic and takes into consideration their individual differences. Just as individuals have different fingerprints, they have different learning styles (Dunn 1990) [2]. Moreover, each individual uses different cerebral hemispheres while processing information in the brain (Davis 2004) [3]. One of the learning models taking individual differences in learning into account is the 4MAT model. The advantages of 4MAT are that it takes individual differences such as learning styles and processing functions of the brain into consideration. (İdris Aktas & İbrahim Bilgin 2015) [4]. The 4MAT teaching model is an integrated teaching approach, which enables different teaching strategies and methods based on the constructivist theory to be compiled. This model also encourages students to develop their own understanding and perceptions. (Sezginson Şeker & Dikkartın Övez 2018) [5]. 4MAT model, which is one of the contemporary educational approaches, is based on perceiving and processing knowledge. It defends developing student-centered learning environments based on the learning styles of students and making students discover knowledge by themselves. It enables students to use both hemispheres of their brains effectively (McCarthy, 1990) [6]. The researchers have recommended methods that make learning meaningful to the learners and that helps in retention. Mathematics has its imprints in all walks of life. Mathematics has its relations with all disciplines be it natural sciences, social sciences,



psychology, education, medicine, statistics, economics, technology space science and computers. In the simplest sense, mathematics is described as “an abstract form of life” (Altun, 2006) [7]. Despite being an important subject it also the subject that many students love to hate. In 2005, Gallup conducted a survey in which they asked the students to specify the subject name that they find the most difficult. And unsurprisingly, maths is the subject that students find the most difficult [8]. The under recognition of students' need and interest with their pre-existing level of knowledge and skills towards mathematical concepts are the major determining factors of lower achievement in mathematics. Student's interest and positive feeling of mathematics increase the pass in mathematics. (Bed Raj Acharya 2017) [9]. Another factor for lowering the performance of students in mathematics is anxiety towards the subject. Mathematics anxiety is the negative feeling towards mathematics learning. Mathematics anxiety has been defined as "an inconceivable dread of mathematics that can interfere with manipulating numbers and solving mathematical problems within a variety of everyday life and academic situations"(Buckley 1982) [10]. Students with low mathematics anxiety enjoy mathematics class, which enables them to develop confidence. These students are likely to have better cognitive, meta-cognitive, and social skills which enable them to perform better in mathematics class. (Parab & Pandya 2016) [11]. The research indicated that the performance in mathematics could be bettered by adopting methodologies that learner centred, meaningful and reduce the negative emotions towards Mathematics. Thus 4 MAT is recommended to be used for Mathematics education.

1.1 Conceptual Base: 4 Mode Application Techniques System of Instruction:

Bernice McCarthy developed the 4 MAT system of instruction in 1970s. The theory was formulated based on the long standing theories in the field of learning and neurological advancement on brain hemispheric preferences. The 4MAT-teaching model is a conceptual framework for teaching and learning which is based on the work of John Dewey (Experimental Learning), Carl Young (Individual Theory), and most directly, David Kolb (Experimental Learning Theory). The premise is that individuals learn primarily in one of four different but supplementary ways based on how they perceive and manipulate information, (McCarthy & White & McNamara, 1987; McCarthy & McCarthy, 2006) [12]. Bernice McCarthy's 4 MAT model consists of four quadrants. Each quadrant represents a learning style. Quadrant 1 represents Type 1: Imaginative learners, quadrant 2 represents Type 2: the analytic learners, quadrant 3 represents Type 3: the common sense learners and quadrant 4 represents Type 4: the dynamic learners. In addition to learning styles the 4 MAT is characterised by the brain hemispheric preferences. Each of the four learning style quadrants was converted into a condition to cover right–mood, left–mood functions. In the second and third quadrants of the established model left–mood is dominant, on the other hand, in the first and fourth quadrants an inclination to right–mood process type is observed (McCarthy,1990) [13]. The 4 MAT system of instruction is an integration of learning styles and brain hemispheric preferences in a sequence and it was referred to as natural learning cycle by McCarthy. 4 MAT is an eight steps instructional cycle that accounts for the learning styles and brain hemispheric preferences of the learners. The first quadrant step 1 of the cycle is Connect (create an experience), the step 2 of the cycle is Examine (Reflect on the experience). The second quadrant step 3 is Image (Integrate the Observation into Concept), step 4 is Inform (Developing Theories and Concept). The third quadrant step 5 is Practice (Using Information Practically), step 6 is Extend (Integrating Material with Self). The fourth quadrant step 7 is Refine (Analyzing for Usefulness or Application), step 8 is Perform (Integrating Application and Experience). The 4 MAT learning cycle addresses the four fundamental questions Why? What? How? and If? The students use their experiences in the first and second steps of the first quadrant. At this stage connections are made between the student's environment and concepts. The question of the first quadrant i.e. stage 1 is Why? The students analyse their experiences and conceptualisation happened in the third and fourth steps of second quadrant i.e. stage 2.

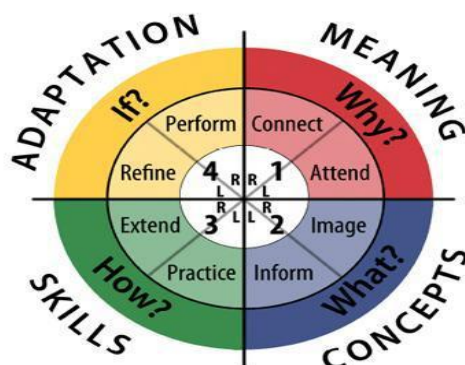


Figure 1: The 4MAT System (Source: <https://4mat4learning.com.au/what-is-4mat/>)



The question of the second quadrant i.e. stage 2 is What? The students implement the concepts learned and learning is individualized in fifth and sixth steps of the third quadrant i.e. stage 3. The question of the third quadrant i.e. stage 3 is How ? The practice and experience are integrated in the seventh and eighth steps of the fourth quadrant. The question of fourth quadrant i.e. stage 4 is If ?

McCarthy proposed that all learners find a place in one of the four quadrants of the cycle. Each quadrant represents a learner and hence it mandates the teacher to prepare a learning environment that would suit every learning style. The whole cycle is more valuable than any part of it; because the learning activity in each quarter cycle ensures a better understanding for the students there and the learning activities in other quarters make it possible for the students to get used to the learning styles other than their own learning styles. As a result of this situation, students are influenced by each other and they renew their learning styles. (Bülbül and Özsoy, 2016) [14].

1.2 Literature review:

Doug Rohrer, Kelli Taylor (2006) found that long-term retention was boosted by distributed practise and unaffected by overlearning. Unfortunately, most mathematics textbooks rely on a format that emphasizes overlearning and minimizes distributed practise [15]. Hopkins, R.F., Lyle, K.B., Hieb, J.L. et al (2016) on the basis of their research findings suggested that spaced retrieval practice can have a meaningful, long-lasting impact on educational outcomes [16]. Oh Nam Kwon, Chris Rasmussen, Karen Allen (2010) investigated students' retention of mathematical knowledge and skills in two differential equations classes [17]. Serkan Narli (2010) investigated the effectiveness of the constructivist learning environment on learning and long-term knowledge retention in mathematics. The results of this study add additional support to the claim that teaching for conceptual understanding can lead to longer retention of mathematical knowledge. Analysis of the data revealed that the students in the constructivist learning environment showed better retention of almost all of the concepts related to Cantor set theory than the students in the traditional class [18]. N Bhatti (2018) carried out an experimental study to investigate the effect of CAI and conventional method for retention of mathematics. On the basis of research findings, it was found that CAI being an auto instructional mode of instruction helped in improving retention of Mathematics at undergraduate level [19]. Enikanolaye, Ayodeji John (2021) investigated the Effects of Multimedia Instructional Strategy on Senior School Students' Performance and Retention in Mathematics. The findings of the research found that multimedia instructional strategy improves and stimulates student's retention level thus, multimedia instructional package helps to concretize the learning of mathematics and makes learning more effective [20]. The researchers indicate that retention could be improved by adopting methodologies that are centered on the learner and his needs. The 4 MAT system of instruction is a learner centered method and literature reviews have revealed that research done in 4MAT in various disciplines to study the effect of 4 MAT on learning, academic performance and retention. Bowers, Patricia Shane (1987) tested the effectiveness of 4 MAT on academic achievement and attitude in science of grade 6 students in North Carolina City schools. The results obtained showed that the students exposed to 4 MAT scored greater academic achievement and attitude [21]. Szewczyk, Lester (1987) studied the Effect of 4MAT upon Achievement and Selected Attitudinal Factors of High School Geometry Students and found that there was significant difference in favour of the experimental group taught by 4MAT [22]. Rhonda M. Wilkerson and Kinnard P. White (1988) evaluated the effects of the 4MAT system on achievement and retention of learning. They found significant differences in favour of 4 MAT experimental group [23]. İnel, Y. (2018), concluded based on his research that the 4MAT teaching method was more effective than the existing teaching method in improving the academic achievement of the students with respect to the unit "The Journey of Democracy" in social studies for grade 6th [24]. The review of literature indicated that in India not many studies on 4 MAT system of Instruction have been undertaken. Hence the researcher attempted to study the effectiveness of 4 MAT system of instruction of teaching on the retention of Mathematics concepts of students of standard 8th.

1.3 Need of the Study:

Galileo Galilei has quoted "Nature is written in mathematical language"[25]. There is mathematics in all living and non-living entities found in nature. The world cannot be imagined without Mathematics. It's rightly an important part of formal education throughout the world from elementary level to. Doctorate level. The importance of mathematics is marred by its perception of being abstract and difficulty to learn. Unfortunately in most of the cases the perception is instilled in the students by society. The researcher further felt that parents and teachers also to an extent are responsible for instilling this perception in students resulting in mathematics anxiety and fear. Research has shown that mathematical anxiety is a detrimental factor for mathematics learning. Mathematics anxiety is a negative emotion towards the subject. Cates and Rhymer (2003) found that students with higher levels of mathematics anxiety had significantly lower computational fluency in all areas of mathematical computations [26.] The lacklustre prior knowledge in Mathematics leads to disinterest in the subject. Those students who have lack of sufficient prior knowledge did not want to learn and



could not get success in the further level. Hence retention of mathematics concepts is very important. Moreover, the notion persists among many that mathematics is confined to mathematics textbooks and not applicable to real situations. The most important aspect of mathematics learning is the methodology adopted to teach mathematics. The methods adopted to teach further distances the student from mathematics. The methods adopted to teach mathematics must address the learner's needs and requirements. The teacher needs to manage a suitable environment for learning and motivate the learners. The researcher felt that the 4MAT system of instruction would be apt to meet the needs of the learner as it takes into consideration the learning styles and brain dominance preferences of the learners. The 4 MAT model is an eight step learning cycle and when the learners pass through all the steps they are going from these stages of learning reflective observation, concept formulation active experimentation and concrete experience. The role of the teacher changes in each quadrant, the first and second the teacher plays a decisive role as the learning activities for concept formulations are executed here. The third and fourth quadrant is the application part and the learner takes control over his/her learning. The 4MAT is learner centred and takes into account the diverse needs of the learner thus would improve the academic performances and retention of learning. The researches have shown the brain retains what it finds meaningful hence meaningful learning experiences would lead to better retention of learning. The 4MAT system of instruction provides meaningful learning experiences to learners and they take ownership of their learning. Thus the researcher felt the need to study the effect of the 4MAT System of Instruction on teaching on Retention of Mathematics Concepts.

1.4 Significance of the Study:

The methods adopted for teaching mathematics should make connect with the learner and make mathematics learning realistic. The negatives associated with the learning of mathematics like mathematics anxiety, fear and disinterest must be overcome by the learner centred teaching methodologies. The research conducted have shown that students' academic performances and interest in mathematics can be improved by adopting appropriate teaching methods. 4 MAT system of instruction provides one such tool in the hands of the teacher. The 4 MAT provides a learning environment suitable for all learners by taking into account their learning styles and brain hemispheric preferences. Research done in the field of education has shown that the retention of mathematical concepts increases by adopting innovative methods of teaching. The 4 MAT system of instruction makes the learning meaningful to the learner and the brain retains what is meaningful. The present study of 4 MAT would help in the retention of Mathematics concepts by making mathematics learning more realistic and meaningful. The results of the study would motivate the teachers to adopt the 4 MAT model of learning for all disciplines.

1.5 Statement of the Problem:

A study of the effect of 4 MAT System of Instruction of teaching on the Retention of Mathematics concepts in students of standard 8th.

2. OPERATIONAL DEFINITIONS USED IN STUDY:

Effect: In the study effect was measured in terms of retention scores of students in mathematics.

4 MAT system of instruction is the eight step learning cycle developed by McCarthy and was the method adopted to teach the experimental group.

Retention For the present study retention means scores of the students in the researcher made retention test.

3. RESEARCH QUESTIONS:

- “Does the 4 MAT system of instruction have any effect on the retention of mathematics concepts in students of standard 8th?”
- Is there a difference in the retention of mathematics concepts amongst the girls and boys students of standard eighth taught through the 4 MAT system of Instruction and conventional method?
- Does the 4 MAT system of instruction has any effect on the retention of Mathematics concepts of standard 8th students based on their gender?

HYPOTHESIS.

- i) There is no significant difference between the effect of the 4MAT system of instruction of teaching and the conventional method of teaching on retention of mathematics concepts in the students of standard 8th.



- ii) There is no significant difference between the effect of the 4MAT system of instruction of teaching and the conventional method of teaching on the retention of mathematics concepts of standard 8th students based on their gender.
- iii) There is no significant difference in the retention of mathematics concepts of boys and girls of standard 8th exposed to the 4MAT system of instruction of teaching.

4. METHODOLOGY:

Research Method:

The study used the quasi experimental approach following the two group pretest posttest design. The experimental group was subjected to the 4MAT model of teaching and the control group was taught by conventional method. The classes in schools are pre-formed hence random placement of subjects to experimental and control groups is not possible. So the randomness of selection was confined to assign one class as experimental and other as control group from the available classes.

Sample:

The sample for the research study consisted of a total 243 students from Mumbai suburban schools. The experimental group consisted of 120 students and the control group consisted of 123 students. The distribution of the sample selected is given in Table 1.

The number of students in experimental and control group

Group	Female	Male	Total
Experimental	51	69	120
Control	53	70	123
Total	104	139	243

Both the groups were subjected to Entry Behaviour Test to ascertain the prior knowledge and ascertain group equivalence. Also, Pre -test mean scores obtained on the achievement test were analysed and found that both the experimental and control group were equivalent.

Data Collection Tools:

The researcher prepared the Draft copy of the Test consisting of 52 items and carried out a pre-pilot study to determine the validity and reliability. The Discrimination power and Difficulty index of each item was found and 26 items were selected for the final draft of Test. The same test was used at the beginning of teaching process (pre-test), after the teaching process (post -test) and delayed post -test (Retention test)

Data Collection Process:

The pretest was given to students before the intervention. The experimental group was taught by 4 MAT and the control group by conventional method. The post test was administered after the intervention. The delayed post test also known as retention test was given after an interval of a month.

5. DATA ANALYSIS

The data collected was subjected to descriptive data analysis to confirm its normal distribution so that parametric tests could be used. The significance between the groups was established by sample t-test, ANOVA and ANCOVA. The analysis results are given in the subsequent tables.

Total Sample:

Table 2 gives means of retention scores of both the groups and the testing of significance by independent samples t-test

Group	n	Mean	SD	df	t value at 0.05	t observed Value	Level of Significance
Experimental	120	28.21	3.45	241	1.97	30.25	p<0.05
Control	123	12.95	4.35				



As seen in the above table there exists a significant difference in the retention scores as the t value (30.25) is much greater than the table value at 0.05 (1.97). The means of two groups differ significantly and are in favour of the experimental group.

Table 3 gives testing the significance of experimental and control groups on retention scores by ANOVA.

Source of Variation	df	SS	MS	F	F _{critical} at 0.05
Between Groups	1	14139.20	14139.20	915.15	3.88
Within Groups	241	3723.50	15.45		

As seen in the above table there exists a significant difference in the mean scores of the retention as the F value (915.15 for df 1,241) is much more than the table value F_{critical} at 0.05 (3.88 for df 1,241). Thus indicating that the experimental group differs significantly from the control group after experimentation. The ANCOVA was performed on retention (delayed post-test) scores adjusted based on the post-test to ascertain the significance obtained due to the method adopted.

Table 4 gives testing the significance of retention scores adjusted based on the post-test by ANCOVA after experimentation.

Source of Variation	df	SS	MS	F	F _{critical} at 0.05
Adjusted means	1	1159.18	1159.18	112.64	3.88
Adjusted Errors	240	2469.94	10.29		
Adjusted Total	241	3629.12			

As seen in the above table there exists a significant difference in the mean scores of the retention as the F value (112.64 for df 1,241) is much more than the table value F_{critical} at 0.05 (3.88 for df 1,240). Thus demonstrating that the experimental group differs significantly from the control group after experimentation. The results indicated that the experimental group exposed to 4 MAT performed had higher level retention than the control group taught by conventional method. The statistical analysis confirmed that the students exposed to the 4MAT model had a high level of retention compared to students taught by the conventional method. Thus the null hypothesis is rejected.

Gender Groups

Table 5 gives means of retention scores of the gender groups and the testing of significance by independent samples t-test

Group	n	Mean	SD	df	t value at 0.05	t observed Value	Level of Significance
Experimental Boys	69	28.43	3.2	137	1.98	23.89	p<0.05
Control Boys	70	12.59	4.5				
Experimental Girls	51	27.90	3.77	102	1.98	18.64	p<0.05
Control Girls	53	13.43	4.13				

As seen in the above table there exists a significant difference in the retention scores of Experimental boys as the t value (23.89) is much greater than the table value at 0.05 (1.97). The means of two groups differ significantly in favour of experimental boys group. Also for experimental girls group t value (18.64) is much greater than the table value at 0.05 (1.97) and thus means of two groups differ significantly in favour of experimental boys group.



Table 6 gives testing the significance of experimental and control groups on retention scores by ANOVA.

	Source of Variation	df	SS	MS	F	F _{critical} at 0.05
Boys	Between Groups	1	8728.50	8728.50	570.53	3.91
	Within Groups	137	2095.94	15.30		
Girls	Between Groups	1	5440.38	5440.38	347.36	3.93
	Within Groups	102	1597.53	15.66		

As seen in the above table there exists a significant difference in the mean scores of the retention of experimental boys as the F value (570.53 for df 1,137) is much more than the table value F_{critical} at 0.05 (3.91 for df 1,137). Thus indicating that experimental group boys differ significantly from the control group boys after experimentation. The mean retention scores of retention of experimental group girls as the F value (347.36 for df 1,102) is much more than the table value F_{critical} at 0.05 (3.88 for df 1,102). Thus the experimental group girls differ significantly from the control group girls on retention scores The ANCOVA was performed on retention (delayed post-test) scores adjusted based on the post-test to ascertain the significance obtained due to the method adopted.

Table 7 gives testing the significance of retention scores adjusted based on the post-test by ANCOVA after experimentation.

Group	Source of Variation	df	SS	MS	F	F _{critical} at 0.05
Boys	Adjusted means	1	334.76	334.76	33.4	3.91
	Adjusted Errors	136	1362.44	10.02		
	Adjusted Total	137	1697.2			
Girls	Adjusted means	1	845.28	845.28	78.63	3.93
	Adjusted Errors	101	1085.84	10.75		
	Adjusted Total	102	1931.12			

As seen in the above table there exists a significant difference in the mean scores of the retention of experimental boys as the F value (33.4 for df 1,136) is much more than the table value F_{critical} at 0.05 (3.91 for df 1,136). Thus demonstrating that experimental group boys differ significantly from the control group boys after experimentation. As seen in the above table there exists a significant difference in the mean scores of the retention of experimental girls as the F value (78.63 for df 1,102) is much more than the table value F_{critical} at 0.05 (3.93 for df 1,102). Thus demonstrating that experimental group girls differ significantly from the control group girls after experimentation. The statistical analysis confirmed that both girls and boys exposed to 4MAT model had high level of retention compared to boys and girls taught by the conventional method. Thus the null hypothesis is rejected.

Gender groups of Experimental Group:

Table 8 gives means of retention scores of the Experimental gender groups and the testing of significance by independent samples t-test

Group	n	Mean	SD	df	t value at 0.05	t observed Value	Level of Significance
Experimental Boys	69	27.94	3.29	118	1.98	1.03	p>0.05
Experimental Girls	51	27.25	4.03				



As seen in the above table there exists no significant difference in the retention scores of experimental gender groups as the t value (-1.03) is less than the table value at 0.05 (1.98). The means of two groups doesn't differ significantly.

Table 6 gives testing the significance of experimental gender groups on retention scores by ANOVA.

Source of Variation	df	SS	MS	F	F _{critical} at 0.05
Between Groups	1	13.85	13.85	1.05	3.92
Within Groups	118	1551.45	13.15		

As seen in the above table there exists no significant difference in the mean scores of the retention as the F value (915.15 for df 1,118) is less than the table value F_{critical} at 0.05 (3.88 for df 1,118). Thus indicating that boys and girls of the experimental group don't differ significantly. The ANCOVA was performed on retention (delayed post-test) scores adjusted based on the post-test to ascertain the significance obtained due to the method adopted.

Table 7 gives testing the significance of retention scores adjusted based on the post-test by ANCOVA after experimentation.

Source of Variation	Df	SS	MS	F	F _{critical} at 0.05
Adjusted means	1	3.55	3.55	0.43	3.92
Adjusted Errors	117	974.12	8.33		
Adjusted Total	118	977.67			

As seen in the above table there exists no significant difference in the mean scores of retention scores as the F value (3.92 for df 1,117) is less than the table value F_{critical} at 0.05 (3.92 for df 1,117). Thus demonstrating that experimental boys and girls don't differ significantly after experimentation. The results indicated that in the experimental group exposed to 4 MAT the boys and girls didn't differ significantly on the retention scores. The 4 MAT is not gender biased. The statistical analysis confirmed that both girls and boys exposed to 4MAT performed well in retention in Mathematics. Thus the null hypothesis is retained.

6. RESULTS AND DISCUSSION:

The result of the present study reflected increased retention in Mathematics for students subjected to 4MAT compared to the control group taught by conventional method. This was in consensus with the findings of the fellow researchers which indicated that the retention could be improved by use of innovative and learner centered methods and gives meaningful learning experiences to the learner. Like, Modebelu and. Ogbonna's (2014) study on the effect of reform-based-instructional method learning styles on students' achievement and retention in mathematics or Al-Balushi, Khadija A. & Al-Balushi, Sulaiman M's (2018) study on brain-based learning for student direct and postponed retention in science or Porandokht Fazelian, Abdolrarim Naveh ebrahim, Saeed Soraghi (2010) study on effect of 5E instructional design model on learning and retention of sciences for middle class students. The finding of this study showed that the students taught using 4 MAT showed significant retention compared to the control group. The findings of the study are also in accordance with the studies conducted on 4MAT by fellow researchers. Like, Abdelsalam Adili (2017) study on the effect of using McCarthy's' Model (4 MAT) on 8th grade students' retention of learning in Jordan or Feyza Aliustaoğlu and Abdul Kadir Tuna, (2018) study on grade 7 students in Kastamonu- Turkey on the effectiveness of 4MAT on academic achievement and retention in Transformation Geometry. The statistical analysis of the data collected showed that the performance of 4 MAT groups was significantly different than the control group [27-36]. Based on the analysis of the findings the research study infers that the 4 MAT system of instruction is an effective method of teaching. The 4 MAT uses a constructivist approach and provides opportunities for learners with all learning styles and takes into account the brain hemispheric preferences. Based on the results of the research conducted the researcher put forth the following suggestions. Mathematics learning can be enhanced by using the 4MAT as the cycle of learning makes the concepts meaningful and realistic. Research indicates that meaningful and realistic materials are retained by the human



brain. Thus the 4 MAT system of instruction could be considered to be implemented in mathematics education and may be extended to all other disciplines. The prospective teacher should be aware of the learning styles, brain dominance, multiple intelligence, emotional intelligence and address them in their teaching learning process and make learning an effective and fruitful venture for the learners.

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