

# MATHEMATICAL CURIOSITY AS A CORRELATE OF MATHEMATICS PERFORMANCE AMONG HIGHER SECONDARY STUDENTS

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## ABSTRACT

In this study, Joyous Exploration, Deprivation Sensitivity, Stress Tolerance, Thrill Seeking and Social (General and Covert) Curiosity are the factors were used for investigation among higher secondary students to identify the Mathematical Curiosity relationship with their Mathematics Performance on the specific dimensions of Matrix, Calculus, Probability and Algebra. Six hundred samples (Girls -300 & Boys -300) of higher Secondary students from different types of school (govt., govt-aided and private) were taken for the study using random sampling technique. The Five-Dimensional Curiosity Scale Revised (Kashdan et al 2020) was used to collect Mathematical curiosity and for Mathematics Performance researcher developed the tool based on Mathematics syllabus of higher secondary contains 60 questions. The result revealed that the relationship between mathematics performance and mathematical curiosity are related, which is notable for further to develop the Mathematical curiosity among the students.

**Keywords:** Mathematical Curiosity, Mathematics Performance, Joyous Exploration, Deprivation Sensitivity, Stress Tolerance, Thrill Seeking and Social (General and Covert) Curiosity, Matrix, Algebra, Calculus, Probability

## 1. INTRODUCTION

Everyone have a question that a student who is more curious about knowing Mathematics will do have greater performance in Mathematics? Mathematics is the most important tools of our life. It is a tool we can use to get knowledge in communicating with others. It can make life a little easier and become more creative. It helps to improve our problem- solving skills critical thinking abilities. It also makes us prepared for the future because our world is full of numbers to handle, like whenever we pick up the phone, manage money, travel to some places, play games, meet new friends, unintentionally, all these things, mathematics is involved.

There are many factors that influence mathematics performance of students. Some of them are sociological, psychological and personological factors. Curiosity is mostly associated with all aspects of human development, which extracts the process of learning and solicitude to acquire knowledge and skill. Curiosity is considered as a behaviour and emotion associates over millennium of years, since the driving force not only for human development and also in developments in mathematics, science, language and industry.

Among 167 samples Freshman Pre-service teachers Belecina (2016) found that Mathematical Curiosity which contains epistemic curiosity, perceptual curiosity, exploration and absorption are the factors and Epistemological beliefs significantly related with Mathematics Performance and also it influences Mathematics Performance. Randomly selected 321 students of government-owned secondary school in Bulacan were taken by Charina (2016) found that male and female differed in their Mathematics Performance. And also concluded that Female students were more curious than Male students in Mathematics performance. The Performance in Mathematics has consistently become the primary measure in the progress of students for their higher education purpose. Using Multivariate Regression Mahama (2022) identified that student's performance in both maths and science complement one another due to curious behaviours in the class room. Contemporary data specifies the female in the U.S. have reached uniformity with boys in mathematics performance. Hyde (2009).

## **2. METHODOLOGY**

### **2.1 OBJECTIVES**

Considering theoretical aspects and review of the related literature, the objectives were formulated as follows:

- To ascertain the relationship between Mathematical Curiosity and Mathematics Performance.
- To find out the difference between Male and Female of Higher Secondary Students with respect to their Mathematical Curiosity and Mathematics Performance.
- To find out the difference among the Higher Secondary Students in different Type of Schools with respect to their Mathematical Curiosity and Mathematics Performance.

### **2.2 Sample**

The sample consists of 600 higher secondary students (300 Girls and 300 Boys) drawn from various government, government-aided and private schools in and around Chennai district.

### **2.3 Procedure and Materials**

**Mathematical Curiosity:** The Five-Dimensional Curiosity Scale Revised by (Kashdan et al., 2020) contains Joyous Exploration, Deprivation Sensitivity, Stress Tolerance, Thrill Seeking and Social (General and Covert) Curiosity are the five measures of mathematical Curiosity. Of 24 items with 7 response options. They are "Does not describe me at all", "Barely describes me", "Somewhat describes me", "Neutral", "Generally describes me", "Mostly describes me", "Completely describes me" with relevant scores from 1 to 7 for all items except for Stress Tolerance for which reverse score should be taken.

**Mathematics Performance:** The administered tool contains 60 items with multiple choice questions with one correct answer out of four options under the major classification of the topic's Matrix, Calculus, Probability and Algebra from higher secondary Tamil Nadu syllabus developed by the researcher with the guidance from the guide (2019).

## **3. STATISTICAL ANALYSIS**

**Hypothesis 1: There is a significant relationship between Mathematical Curiosity and Mathematics Performance.**

MATHEMATICAL CURIOSITY	MATHEMATICS PERFORMANCE				
	MATRIX	CALCULUS	PROBABILITY	ALGEBRA	OVERALL MATHEMATICS PERFORMANCE
JOYOUS EXPLORATION	0.015	0.077	0.018*	0.021*	0.033
DEPRIVATION SENSITIVITY	0.039	0.07	0.044	0.011	0.001
STRESS TOLERANCE	0.033	0.029	0.021	0.013**	0.009
THRILL SEEKING	0.014*	0.065	0.026	0.07	0.052*
GENERAL SOCIAL CURIOSITY	0.014	0.012**	0.017	0.10	0.014*
COVERT SOCIAL CURIOSITY	0.04	0.051*	0.04	0.084	0.08
OVERALL CURIOSITY	0.026**	0.001**	0.020**	0.019**	0.010**

**Table 3.1** Correlation showing the relationship among dimensions of Mathematical Curiosity and Mathematics Performance.

**Note:** \* denotes Significance at 5% level.

\*\* denotes Significance at 1% level.

Pearson correlation coefficient method was used to find the relationship between the variable's Mathematics Performance and Mathematical Curiosity. The above table indicates that the relationship between mathematics performance and mathematical curiosity are related at 1% level of significance. The dimension matrix of mathematics performance is not related to none of the dimensions of mathematical curiosity except thrill seeking. The dimension calculus of mathematic performance is related to the dimensions of mathematics curiosity except for Joyous Exploration, Deprivation Sensitivity, Stress tolerance and Thrill Seeking. The dimension probability of mathematics performance is not related to none of the dimensions of mathematics curiosity except joyous exploration. The dimension algebra of mathematics performance is significantly related to the dimensions of joyous exploration and stress tolerance except deprivation sensitivity, thrill seeking, general social curiosity and covert social curiosity.

**Hypothesis 2: There is no significant difference between Male and Female of Higher Secondary Students with respect to their Mathematical Curiosity and Mathematics Performance.**

**Table 3.2** t- test showing the difference between Male and Female students in their Mathematical Curiosity and Mathematics Performance.

Dimensions of Mathematical Curiosity and Mathematics Performance	GENDER				t- value	Level of Significance
	Male		Female			
	Mean	SD	Mean	SD		
Joyous Exploration	15.03	4.126	14.86	4.037	0.500	NS
Deprivation Sensitivity	15.03	4.080	14.88	3.960	0.467	NS
Stress Tolerance	15.23	4.158	15.45	4.143	0.639	NS
Thrill Seeking	15.14	4.118	15.40	3.842	0.789	NS
Social Curiosity - General	15.43	4.078	15.31	3.936	0.346	NS
Social Curiosity - Covert	14.90	4.181	15.60	3.947	2.089	0.05
<b>Overall Mathematical curiosity</b>	<b>90.77</b>	<b>9.783</b>	<b>91.50</b>	<b>9.053</b>	<b>0.953</b>	<b>NS</b>
Matrix	7.72	2.565	7.54	2.871	0.810	NS
Calculus	15.62	3.687	15.22	3.721	1.323	NS
Probability	8.35	2.010	7.89	2.399	2.545	0.05
Algebra	7.83	2.583	7.41	3.012	1.833	NS
<b>Overall Mathematics Performance</b>	<b>39.51</b>	<b>6.600</b>	<b>38.05</b>	<b>7.1220.</b>	<b>2.604</b>	<b>0.01</b>

**Note: NS – Non-significant**

It is inferred from the table that male and female students do not differ significantly in respect to overall Mathematical Curiosity(0.953)and also with all the dimensions of Mathematical Curiosity of Joyous Exploration(0.500), Deprivation Sensitivity(0.467), Stress Tolerance(0.639), Thrill Seeking (0.789)and General SocialCuriosity(0.346)except for the Covert- Social Curiosity(2.089)at 5% level of significance.Mean value of overall Mathematical Curiosity is higher for the female students (91.50) than the male students(90.77). This may be because females are treated equally with males.Since the P value is higher than 0.05 level, the hypothesis is accepted at 5% level of significance.

It is inferred from the table that male and female students differ significantly in respect to overall Mathematics Performance. The male and female students do not differ significantly with respect to the dimension of Matrix (0.810), Calculus(1.323),exceptprobability (2.545) at 1% level of significance and Algebra(1.833).The meanvalue of overall Mathematics Performance is higher for the male students (39.51) than the female students (38.05). This may be because male students are good at problem solving thanfemales.Since the P value is less than 0.05 level, the hypothesis is rejected at 5% level of significance.

**Hypothesis 3: There is no significant difference among the Higher Secondary Students in different Type of Schools with respect to their Mathematical Curiosity and Mathematics Performance.**

**Table -3.3** One – way Analysis of Variance showing the mean difference in Mathematical Curiosity and Mathematics Performanceof students studying in different Type of Schools.

Dimensions of Mathematical Curiosity and Mathematics Performance	Types of School			F ratio	P value	Level of Significance
	Govt.	Govt. Aided	Private			
Joyous Exploration	14.92 <sup>a</sup> (4.376)	14.95 <sup>a</sup> (3.829)	14.96 <sup>a</sup> (4.033)	0.07	0.993	NS
Deprivation Sensitivity	15.15 <sup>a</sup> (4.016)	14.72 <sup>a</sup> (3.770)	15.00 <sup>a</sup> (4.260)	0.575	0.563	NS
Stress Tolerance	16.43 <sup>a</sup> (4.233)	16.80 <sup>a</sup> (4.156)	16.75 <sup>a</sup> (4.067)	0.462	0.630	NS
Thrill Seeking	15.16 <sup>a</sup> (3.674)	15.66 <sup>a</sup> (4.270)	15.00 <sup>a</sup> (3.969)	1.487	0.227	NS
Social Curiosity - General	15.17 <sup>a</sup> (3.866)	15.51 <sup>a</sup> (4.109)	15.43 <sup>a</sup> (4.048)	0.391	0.677	NS
Social Curiosity - Covert	15.00 <sup>a</sup> (3.793)	15.48 <sup>a</sup> (4.398)	15.27 <sup>a</sup> (4.025)	0.717	0.489	NS
<b>Overall Mathematical Curiosity</b>	<b>91.82<sup>a</sup> (9.575)</b>	<b>93.13<sup>a</sup> (10.542)</b>	<b>92.41<sup>a</sup> (9.436)</b>	<b>0.877</b>	<b>0.417</b>	<b>NS</b>
Matrix	7.44 <sup>a</sup> (2.835)	8.27 <sup>b</sup> (2.463)	7.19 <sup>a</sup> (2.747)	8.754	0.000*	0.01
Calculus	15.01 <sup>a</sup> (3.659)	15.16 <sup>a</sup> (4.193)	16.07 <sup>b</sup> (3.122)	4.909	0.008*	0.01
Probability	7.76 <sup>a</sup> (2.346)	8.22 <sup>b</sup> (2.089)	8.38 <sup>b</sup> (2.190)	4.356	0.013*	0.05
Algebra	7.66 <sup>a</sup> (2.929)	7.47 <sup>a</sup> (2.944)	7.72 <sup>a</sup> (2.554)	0.419	0.658	NS
<b>Overall Mathematics Performance</b>	<b>37.86<sup>a</sup> (8.158)</b>	<b>39.12<sup>ab</sup> (6.434)</b>	<b>39.37<sup>b</sup> (5.831)</b>	<b>2.800</b>	<b>0.062</b>	<b>NS</b>

Note: 1.\* denotes Significance at 5% level.

## **2.The value within the bracket refers to SD.**

Based on the Duncan multiple range test, it reveals that there is no significant difference between the students with respect to Joyous Exploration, Deprivation Sensitivity, Stress Tolerance, Thrill Seeking, General & Covert Social Curiosity, Overall Mathematical Curiosity, Algebra and Overall Mathematics Performance. There is a significant difference of Matrix and Calculus with respect to type of school at 1% level of significance. Hence the hypotheses rejected with regard to Matrix and Calculus. And also there is a significant difference in probability among the students studying in different types of school at 5% level of significance, hence the hypothesis is rejected with regard to Probability. There is significant difference between Government and Government – Aided, Private and Government – Aided for Matrix, Government and Private, Government – Aided and Private for Calculus and Government and Government – Aided, Government and Private for Probability. While there is no significant difference between Government and Private, Government and Government – Aided, Government – Aided and Private for Matrix, Calculus and Probability respectively.

## **4.RESULTS**

The result shows that, the relationship between mathematics performance and mathematical curiosity are related at 1% level of significance. Thrill seeking is the only factor of Mathematical Curiosity related to the factor Matrix of Mathematics Performance. Social Curiosity of General and Covert are the factors of Mathematical Curiosity related to the factor Calculus of Mathematics Performance. Joyous Exploration is the only factor of Mathematical Curiosity related to the factor Probability of Mathematics Performance. Joyous Exploration and Stress Tolerance are the factors Mathematical Curiosity related to the factor Algebra of Mathematics Performance.

The result shows that, male and female students do not differ significantly in respect to overall Mathematical Curiosity and also with all the factors of Mathematical Curiosity of Joyous Exploration, Deprivation Sensitivity, Stress Tolerance, Thrill Seeking and General Social Curiosity except for the Covert- Social Curiosity at 5% level of significance.

The result shows that, male and female students differ significantly in respect to overall Mathematics Performance. The male and female students do not differ significantly with respect to the factors of Matrix, Calculus, except probability at 1% level of significance and Algebra.

## **5.DISCUSSION**

Mathematical Curiosity include epistemic curiosity, perceptual curiosity, exploration, and absorption revealed that they are significantly related to the Mathematics Performance of Freshman Preservice Teachers Belicanca. et.al (2016). The results support the study in which the higher secondary students Mathematical Curiosity related to the Mathematics Performance at 1% level of Significance. But some of the factors of Mathematics curiosity and Mathematics Performance are not related. Namely factors such as Joyous Exploration, Deprivation Sensitivity, Stress Tolerance, Thrill Seeking of Mathematical Curiosity are not related to the factor Calculus of Mathematics Performance. This may be due to the chapter Calculus is newly introduced in higher secondary. Hence the students are unaware of the

chapter Calculus. Thus they may not explore the joy, they couldn't analyse the thrill involved in the problems and the connectivity of the problems with our real life.

Jaen et al. (2016) in the study found that male students differed from their female counterparts in their Mathematics Performance which contradicts the study that male and female do not differ significantly in respect of Mathematical Curiosity and Mathematics Performance. Because, since they are belonging to higher secondary everyone understands their role in education and everyone needs to be placed in the best institution for their higher education. Hence there is no gender bias.

Duncan multiple range test reveals that there is no significant difference between the students with respect to Type of Schools in Overall Mathematical Curiosity and Overall Mathematics Performance. Even though the students are belonging to different type of schools their Mathematics Curiosity will be the same for one another. But based on the factors Matrix, Calculus and Probability of Mathematics Performance differ significantly based on their types of school. This may be due to the teachers teaching style, the environment, the student-teacher relationship and etc., Hence type of school plays significant role in students' life particularly in higher secondary mathematics.

## 6. CONCLUSION

Mathematics is one of the pivotal subjects which is interconnected with our day-to-day life. Curiosity is known for "hunger for exploration" as said by Stumm et al. (2011). In a similar manner, the mathematics teacher is strongly believing the importance of a hungry mind for Performance. Hence the study was considered with two demographic variables as gender and types of school of Mathematical curiosity in relation to Mathematics Performance. Conclusion attained was that there was no gender difference with regard to Mathematical Curiosity which is very essential for individual development. While still there remain gender differences in Overall Mathematics Performance which can be eliminated by ensuring the use of teaching materials and examples which are inclusive and avoid gender stereotypes.

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