Curiosity, Motivation, Attitude, Gender, and Mathematics Performance

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ABSTRACT This study sought to determine the curiosity, motivation, and attitudes of fourth year students of a government-owned secondary school in Bulacan in relation to their performance in Mathematics. It utilized the descriptive-correlation method of research. It was revealed by the randomly selected 321 Grade 10 respondents that in terms of curiosity, they felt that they have the ability to seek out opportunities to challenge themselves and grow as a person resulting in higher motivation and higher effect on mathematical performance. Motivation directly affected the respondents' perception about performance while attitude contributed a lot to performance in mathematics. Furthermore, the male students differed from their female counterparts in their mathematical performance. Female students were more curious, motivated, and have positive attitude towards mathematics than the males. However, there was no significant difference between the means of the male and females in all the variables. The study also showed that motivation is a significant predictor of mathematics performance.

Keywords: *Attitude, curiosity, mathematics performance, motivation*

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Introduction

One of the important tools of our life is mathematics. It is a tool we can use to get knowledge in communicating with others. It can make life a little bit easier and become more creative. It helps improve our critical thinking abilities and problem solving skills. 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, in all these things, mathematics is involved.

Understanding what factors affect academic performance gives us a better picture of how teachers can help students perform well in mathematics (Mata, Monteiro, & Peixoto, 2012). Curiosity, motivation, and attitudes are very important factors in mathematics performance. This study was conducted to find out which among the variables predict mathematics performance.

Performance of students in mathematics is often determined by the final grade in the subject. In the Philippines, achievement test is also used as a basis for national input policy formulation. In other words, a student who is able to pass in the subject is expected to have mastered the important skills and knowledge needed. It is necessary to determine how students perform mathematically and how their skills are integrated in a context of a mathematical problem. This study considers the relationship between curiosity, motivation, attitude, and the mathematics performance of students. To promote increased mathematics performance, educators must find strategies to increase students' self-esteem and self-confidence in their ability to do mathematics.

Purpose of the Research

The study was designed to identify the predictors of performance in mathematics of Grade 10 students.

This study aimed to determine the curiosity, motivation, and attitudes of Grade 10 students in a government-owned school in Bulacan, Philippines in relation to their performance in mathematics. The study was designed to answer the following questions:

1. How may the Grade 10 students be described in terms of:
    1.1. Curiosity;
    1.2. Motivation;
    1.3. Attitudes; and
    1.4. Mathematics Performance? Is there any significant difference between male and female students perception in terms of their:
    1.5. Curiosity;
    1.6. Motivation;
    1.7. Attitude; and
    1.8. Mathematics Performance?
2. Which of the independent variables predict mathematics performance?

Framework of the Study

Performance of students in mathematics is often determined by the cumulative grade in the subject. In the Philippines, achievement test is also used as a basis for national policy formulation. In other words, a student who is able to pass in the subject is expected to have mastered the important skills and knowledge needed. It is necessary to determine how students perform mathematically and how their skills are

integrated in the context of mathematical problem solving. This study considered the relationship between curiosity, motivation, attitude, and the mathematics performance of students. To promote increased mathematics performance, educators must employ strategies that enhance students' self-esteem and self-confidence in their ability to do mathematics.

Curiosity formed by students was categorized into exploration, absorption, epistemic, and perceptual (Doronilla, 2012). Among other adaptive outcomes, curiosity is suspected to play a role in the development of intelligence, wisdom, happiness, meaning in life, distress tolerance, and satisfying and engaging social relationships (Kashdan et al., 2009; Silvia, 2006). Curiosity is basically a "hunger for exploration," as stated by Stumm and Hell (2012). Likewise, the teacher is a strong believer in the importance of a hungry mind for achievement; thus, a construct considered as one of the variables in the study (Stumm, Hell & Chamorro, 2000). These statements denote that teachers have a great opportunity to inspire curiosity in their students and develop engaged and independent learners which can lead to better mathematics performance.

Epistemic curiosity states are aroused by novel questions, complex ideas, ambiguous statements, and unsolved problems, all of which may point to a "gap" in one's knowledge and reveal a discrepancy between that which one knows and desires to know (Litman & Spielberger, 2005). Epistemic and perceptual curiosity differ in terms of the types of stimuli that activate the emotions states and behaviors that are motivated by them (Collins, Litman & Spielberger, 2004). Early research in this area identified perceptual curiosity as evoked by complex or ambiguous pattern of sensory stimulation (e.g., lights, sounds) and motivated behaviors such as visual inspection in order to acquire new information (Loewenstein, 2007).

One of the most important factors that lead learners to their goals is the drive known as motivation. It is a zest and determination with a kind of excitement that leads learners to persevere to reach greater height (Singh, 2011). Peklaj and Puklek (2007) concluded that motivation plays a major role in students' academic work and in their achievement.

Self-efficacy, task value, and goal orientation are the three components of motivation (Doronilla, 2012). According to Chemers and his collaborators (2001), self-efficacy plays a significant role in student achievement since confident students use better learning and problem solving strategies, work harder, persist longer, and have higher academic expectations. Self-efficacy is commonly defined as the belief in one's capabilities to achieve a goal or an outcome (Kirk, 2007). Margolis and McCabe (2006) quoted that students with a strong sense of efficacy are more likely to challenge themselves with difficult tasks and be intrinsically motivated (Kirk, 2013). Students with low self-efficacy believe they cannot be successful. Thus, students with poor self-efficacy have low aspirations which may result in disappointing academic performances, becoming part of a self-fulfilling feedback cycle (Margolis & McCabe, 2006).

Curiosity, motivation, and attitude are all aspects contributing to the mathematics performance of a student. These variables play major roles in students' mathematics performance. Some researcher found out that academic performance can be increased if students' intellectual curiosity is regularly renewed and stimulated. Tella (2007) mentioned that the important aspect of effective learning is the issue of motivation of students in education and the impact on academic performance.

All the variables discussed are found in the framework (Figure 1) of this study. The independent variables are curiosity, motivation, and attitude. The dependent variable

is mathematics performance. The study sought to determine whether the independent and the dependent variables are significantly correlated. The symbol of the line segment indicates relationship.

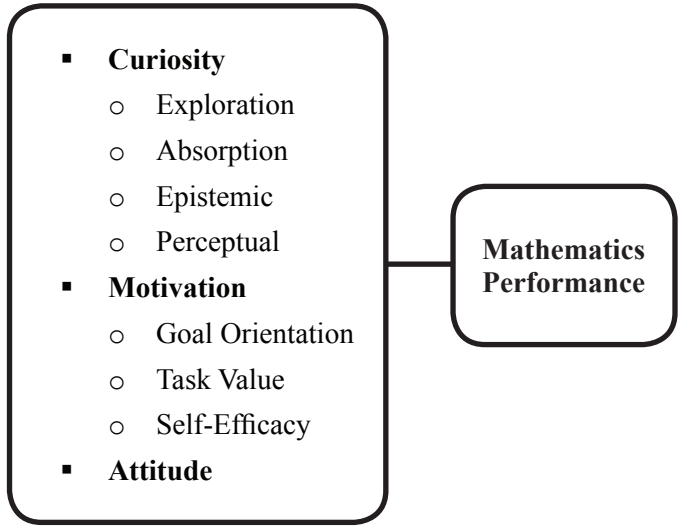

Figure 1. Framework of the Study

The figure above shows the direct relationship of the predictive variables with the dependent variable which is Mathematics performance.

Methodology

The descriptive method of research was used in the study which was designed for the researchers to gather information about present existing conditions needed in the chosen field of study. This method entitles researchers to interpret the theoretical meaning of the findings and hypothesis development for further studies. According to Calderon and Gonzales (2007), descriptive research describes and interprets *what is*. It is concerned with conditions of relationships that

exist; practices that prevail; beliefs; processes that are going on; effects that are being felt, or trends that are developing.

The study involved 321 respondents from six (6) sections with 55 students in a class. The participants of this study belonged to two (2) sections with 25 students each, consisting of 25 boys and 25 girls. They were drawn using a stratified random sampling technique which is done by simply drawing randomly the desired sample size from each subgroup. They were given the Curiosity Inventory, Motivation Inventory, Attitude Inventory, and Mathematical Proficiency Test. Data analysis included mean, standard deviation, and regression analysis.

Results and Discussion

The following results were obtained in the course of this research:

Table 1 shows the summary of the mean perception on curiosity, motivation, and attitude. On the mean perception on curiosity, exploration obtained the highest mean of 4.01 with a standard deviation of 0.59 while epistemic curiosity obtained the lowest mean of 3.43 and a standard deviation of 0.55. This means that the bulk of curiosity remains in curiosity of abstractness of the concept. The students felt that they have the ability to seek out opportunities to challenge themselves and grow as persons. Also, the finding denotes the need to make such complex-abstract ideas to be presented in more concrete and practical ways.

In consonance with the study of Doronilla (2012), among other adaptive outcomes, curiosity is suspected to play a role in the development of intelligence, wisdom, happiness, meaning in life, distress tolerance, and satisfying and engaging social relationships (Kashdan et al., 2009;

Silvia, 2006). Curiosity is basically a "hunger for exploration," as stated by Stumm and Hell (2012). Likewise, the teacher is a strong believer in the importance of a hungry mind for achievement; thus, a construct considered as one of the variables in the study (Stumm, Hell & Chamorro, 2000).

It can be seen from the summary of mean perception on motivation that the highest mean of 3.93 with a standard deviation of 0.60 was obtained by self-efficacy, and the lowest mean of 3.65 with a standard deviation of 0.60 was obtained by task value. This means that students were confident enough to perform the specific task. Motivation directly affected the students' perception about performance. The higher the students' motivation, the higher the effect was on mathematical performance of the students. The drive of the students, since they were motivated, made them excited and attentive to mathematics. Students with a strong sense of efficacy are more likely to challenge themselves with difficult tasks and be intrinsically motivated (Margolis & McCabe, 2006).

It can be concluded from the summary of the mean perception on attitude that the higher mean was obtained by positive attitudes. With a mean of 3.92 and a standard deviation of 0.77, positive attitudes among students still prevailed even if they thought that learning mathematics is difficult. Attitude contributed a lot to perception of mathematics. Attitude in life allows us to make sense of ourselves, make sense of relationships, and make sense of the world around us (Mubeen, Saeed, & Arif, 2013).

Table 1. Learners' Perception

Components	Mean	SD	Verbal Description
Learners' Perception on Curiosity			
Exploration	4.01	.59	Often
Absorption	3.56	.74	Often
Epistemic Curiosity	3.43	.55	Often
Perceptual Curiosity	3.82	.61	Often
Overall	3.71	.48	Often
Learners' Perception on Motivation			
Goal Orientation	3.79	.55	Often
Task Value	3.65	.60	Often
Self-Efficacy	3.93	.60	Often
Overall	3.79	.53	Often
Learners' Perception on Attitude			
Positive	3.92	.77	Often
Negative	2.84	.68	Sometimes
Overall	3.38	.53	Sometimes

The data displays the summary of the mean perception on curiosity, motivation, and attitudes. Generally, the female students were more curious and motivated, and had positive attitude towards mathematics. Based on the collected data, it seems that the female students were more inclined to mathematics than the male students during the course of study. With regards to academic performance, the male students had a mean of 24.64 with a standard deviation of 10.90 while the female students had a mean of 23.04 with a standard deviation of 7.83. The overall performance in mathematics of the males and females is demonstrated by the mean of 23.84 with a standard deviation of 9.43. This can be interpreted to mean scores in the low average of distribution in kurtosis. However, there was no significant difference between the means of the males and females.

Table 2. Summary of Mean Perception on Curiosity, Motivation, and Attitude

Components	Gender	No. of Stud.	Mean	SD	t value	p value
Curiosity	M	25	3.57	.50	-2.003	*.051
	F	25	3.84	.44		
Motivation	M	25	3.69	.60	-1.324	.192
	F	25	3.89	.43		
Attitude	M	25	3.28	.65	-1.315	.195
	F	25	3.48	.38		

**significant @ .05*

As shown in Table 3, among the independent variables (curiosity, motivation, and attitude), the best predictor of mathematics performance was motivation with a Beta value of 0.32. Motivation is the significant variable to predict mathematics performance of the respondents. It is the driving force that makes students to be challenged and surpass it through solving skills. It is a zest and determination that leads one to persevere to reach greater heights (Singh, 2011). It is the internal drive that helps activate one's behavior and be persistent to achieve his/her goal in life. Garut, (2011) indicated that motivational beliefs are the outcomes from direct learning experience. Motivational beliefs act as favourable contexts of learning and also refer to the students' opinion of the efficiency and effectiveness of learning and teaching method (Boekerts, 2002). Other research findings showed that individual student's characteristic variables such as motivational orientations, self-esteem, and learning approaches are important factors influencing academic achievements (Tella, 2007). Of all the personal and psychological variables that have attracted researchers in this area of educational achievement, motivation seems to be gaining more popularity and leading other variables (Tella, 2003).

The table below presents the independent variable that can predict mathematic performance.

Table 3. Regression Values

Mode 1	Beta	t value	p value	Verbal Description
Curiosity	-.14	-.72	.47	Not Significant
Motivation	.32	2.34	.02	Significant
Attitude	-.06	-.44	.66	Not Significant

Conclusions and Recommendations

The results of this study lead us to important conclusions: The level of curiosity affects the inquisitiveness of the learner. Motivation is a significant predictor variable of mathematics performance. Positive attitudes among students can strengthen their motivation and engagement to learn more in mathematics.

The researchers recommend the following based on the findings of the study: Provide mathematics activities that will increase students' curiosity towards mathematics; motivate students properly to make them hooked on the topic presented; teachers must use more suitable learning strategies to make the subject important and useful to students in order to prevent negative outcomes; future studies may consider covering a larger scope of respondents and differences of turn-over among respondents; in further research efforts, this study might be extended considering other factors effective in attitude and achievement in mathematics; and also, this study might be modified into a parallel study for future researchers to perform experimental designs to develop mathematics performance.

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