THE MODERATING EFFECT OF ATTRIBUTION ON SELF-CONCEPT AND NUMERICAL ANXIETY IN PREDICTING ACHIEVEMENT IN MATHEMATICS

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Abstract

Mathematics has been labeled as a difficult subject among many students. They suffer from a depressing state such as numerical anxiety. Thus, the main objective of this study is to investigate whether attribution has a moderating effect on self-concept and numerical anxiety in predicting achievement among college students enrolled in Mathematics in the Modern World. It also aims to find out if attribution moderates the effect of self-concept and numerical anxiety on math achievement. A total of 192 students from Baliuag University who took up Mathematics in the Modern World in the school year 2019-2020 participated in the study. The researcher used a descriptive-correlational design with a questionnaire as the main instrument in gathering data. Descriptive statistics, correlation, regression, and moderation analyses were utilized. Results showed that the combined effects of self-concept and numerical anxiety significantly predict student's academic achievement (p<.001). Moreover, attribution has significant moderating effects on self-concept and mathematics achievement (p<.05) and on numerical anxiety and mathematics achievement (p<.001). The researcher recommends that the study be forwarded to the College of Liberal Arts and General Education of Baliuag University, as well as to the Center for Career and Counseling and the Center for Academic Development and Research, so that relevant and appropriate actions may be undertaken to further improve the students' performance in Mathematics in the Modern World.

Keywords: attribution, mathematics in the modern world, numerical anxiety, self-concept

The Research Problem and its Background

All students are entitled to experience education in a constructive environment. Also, they need to know themselves, which can be defined as student ratings of their skills, ability, enjoyment and interest in a particular subject. They are seen as important factors in education.

One factor is that people must understand themselves, such as how they perform effectively, in order to comprehend their own potential and manage their own issues. This is referred to as self-concept. Additionally, math-self-concept is defined as an individual's style of thinking, feeling, acting, valuing, and evaluating himself or

herself in relation to mathematical performance (Ayodele, 2011). Mathematics self-concept is defined as an individual's perceptions about his or her mathematical abilities (Ireson & Hallam, 2009). Moreover, it has been demonstrated that mathematics self-concept is positively related to mathematics accomplishment (Ireson & Hallam, 2009) and to student judgments of their mathematical aptitude, enjoyment, and interest (Erdogan & Engul, 2014). Perceived capacity to succeed and confidence in mathematics have also been associated with a favorable self-image in mathematics (Reyes, 1984). Furthermore, it has been argued that an individual's self-concept regarding mathematics is related to their propensity to engage in quantitative scenarios (Eccles & Wigfield,1985; Schoon, 2015).

Additionally, both with and without disabilities can experience discomfort as a result of anxiety when confronted with particular academic assignments. It is critical for teachers to be aware of anxiety symptoms and their impact on pupils' academic performance (Dobson, 2012).

Anxiety is a natural reaction to certain circumstances. A minor level of anxiety is normal, but severe anxiety can be a serious problem. Academic anxiety might be exacerbated over time. As a student's academic performance deteriorates, the level of anxiety associated with specific academic activities increases (Huberty, 2012). Most teachers may have students with numerical anxiety. More so, numerical anxiety, one of the dimensions of math anxiety, refers to everyday situations requiring working with numbers (Diaz, 2009). Anxiety can have an undesirable effect on the information processing system. People with anxiety have difficulty storing and recovering information (Nelson & Hardwood, 2011). Also, Acevedo et al. (2020) stated that mathematical anxiety is inversely related to achievement. Some students are very problematic with mathematics because of anxiety. Furthermore, not all teachers recognize the signs of anxiety and the effects on their students. If teachers can spot the signs, they can help the students cope with academic anxiety.

It is observable that numerous students in our society feel dreaded when presented with mathematics. Whether we refer to this phenomenon as math avoidance, math phobia, or what is more commonly referred to as math anxiety, the fact that millions of people suffer from this condition is a depressing reality. They despise mathematics not because they are bad at arithmetic, but because they have negative reactions to arithmetic and poor encounters with educators and tutors (Swetman, 1994), parents (Scarpello, 2007) and peers (Garba et al., 2020). As a result, they would avoid it whenever possible (Brown et al., 2008).

A lot of studies on mathematics self-concept and numerical anxiety in connection to academic achievement have been conducted. According to Karimi and Kumar (2010), mathematics anxiety is a strong predictor of mathematics and overall academic achievement. Additionally, they discovered that gender has a minor influence on the impact of mathematics anxiety on mathematics performance and academic performance in general. However, a reasonable amount of anxiety may actually aid performance; excessive anxiety hinders performance, particularly in advanced mental skills and conceptual processes (Shemp, 1986). On the other hand, research supports the view that a positive or negative self-concept is a significant facilitator of academic achievement in mathematics and that a change in self-concept typically results in a corresponding change in academic achievement or performance

(Ayodele, 2011). Moreover, there is a need for additional research on the numerical anxiety of pupils of various genders.

Attribution theory examines how individuals comprehend events and how this relates to their thinking and behavior. Although Heider (1958) proposed the first psychological theory of attribution, Weiner and colleagues (Jones et al., 1972; Weiner, 1975, 1986) constructed a theoretical framework that has evolved into a prominent research model in social psychology. According to the theory of attribution, people want to understand why they do what they do, i.e., attribute causes to action. A person attempting to understand why another person did something may assign the conduct to one or many causes. A three-stage process results in an attribution: (1) the individual must perceive or observe the behavior, (2) the individual must believe that the behavior was purposeful, and (3) the individual must determine whether they believe the other person was coerced into performing the behavior (in which case the situation is attributed as the cause) (in which case the cause is attributed to the other person). Weiner's study concentrated on four attribution variables: effort, luck, ability, and task difficulty. Weiner (1974) focused on the four achievement attributions namely: ability, effort, luck, and ask difficulty.

The need to assess mathematics performance in Mathematics in the Modern World is very important, especially now that the Philippine educational system has shifted from 10 years to a 12-year basic education program. In line with this, colleges and universities must also upgrade in terms of quality. That’s why the Commission on Higher Education under (CMO No. 20, series of 2013) made an implementation of Mathematics in the Modern World in the school year 2018-2019 across all the universities and colleges in the country. This is one of the important changes to the new curriculum that Baliuag University has been implementing since 2018. Mathematics in the Modern Word is divided into two sections, The Nature of Mathematics and Mathematics as a Tool. The topics included in the Nature of Mathematics are Mathematics in our world, Mathematical Language and Symbols, and Problem Solving and Reasoning. Also, the topics included in The Mathematics as a tool are Data Management, Geometric Designs, Codes, Linear Programming, The Mathematics of Finance, Apportionment and Voting, Logic, The Mathematics of Graphs and Mathematical Systems.

In light of these studies and observation, the researchers have decided to study the effects of mathematics self-concept and numerical anxiety on the students’ Mathematics in the Modern World performance. The research aims to determine whether mathematical self-concept and numerical anxiety are predictors of students’ Mathematics in the Modern World performance Also, the main focus of the study is to determine the students’ levels of mathematics self-concept (MSC) and numerical anxiety (NA) and Mathematics in the Modern World, the relationship between mathematics test anxiety and mathematics achievement, the relationship between numerical anxiety and mathematics achievement and whether MTA and NA predict mathematics achievement. Specifically, it aims to answer the following research questions:

1. What is the demographic profile of the respondents in terms of:
   a. colleges/department; and
   b. gender?

2. What is the level of Baliuag University's college students' score in:
   a. Mathematics in the Modern World Achievement;
   b. Mathematics Self-Concept;
   c. Numerical Anxiety; and
   d. Attribution ?

3. Is there a significant relationship between Mathematics Self Concept (MSC) and Grades in Mathematics in the Modern World?

4. Is there a significant relationship between Numerical Anxiety (NA) and grades in Mathematics in the Modern World?

5. Do Mathematics Self-Concept (MSC) and Numerical Anxiety (NA) predict Grades in Mathematics in the Modern World?

6. Does attribution moderate the effect of mathematics self-concept on the achievement in Mathematics in the Modern World?

7. Does attribution moderate the effect of numerical anxiety on students' achievement in Mathematics in the Modern World?

Hypotheses of the Study

The researcher came up with the following null hypotheses below.

1. Ho: There is no significant relationship between mathematics self-concept and MMW achievement.

2. Ho: There is no significant relationship between numerical anxiety and MMW achievement.

3. Ho: Mathematics self-concept predicts MMW Achievement.

4. Ho: Numerical anxiety predicts MMW Achievement.

5. Ho: Mathematics self-concept and numerical anxiety predict MMW achievement.

6. Ho: Attribution moderates the effect of mathematics-self-concept to MMW achievement.

7. Ho: Attribution moderates the effect of numerical anxiety to MMW Achievement.

Contribution to Knowledge and Impact of the Study - Further extending the theory by adding more variables could be explored in the future Theoretical and Conceptual Frameworks-Adding other variables would yield more contribution to knowledge.

Theoretical and Conceptual Framework

The study contributes to knowledge and has an impact by providing students, teachers, and others in the education sector with a better understanding of the factors that can influence and moderate mathematics achievement. As a result, policies and interventions will be developed that will result in positive academic outcomes.

According to Brezavcek et al.,(2020), there are a variety of factors that influence university students' mathematics achievement. The first set of variables are psychological in nature and include attitudes toward mathematics, intelligence, math anxiety, self-concept, study habits, mathematical aptitude, numerical ability, achievement motivation, cognitive style, self-esteem, interest in mathematics, test anxiety, reading ability, problem-solving ability, mathematical creativity, educational and occupational aspiration, personal adjustment, locus of control, emotional stability, and confidence in math. Second are social variables such as socioeconomic status, school environment, home environment, parental education, parental involvement, parental occupation, parental income, social status, social relationships, school type, teacher expectations, and social maturity. Thirdly, biographical and instructional variables such as gender, location, instructional methods, caste, birth order, teacher effectiveness, and home tutoring are considered. Further extending the theory by adding more variables like psychological, social, biographical and instructional variables could be explored in the future as these would yield more contribution to knowledge.

For the conceptual framework, Figure 1 presents the conceptual framework of the study. This study attempts to analyze the effect of Mathematics Self-Concept on Mathematics in the Modern World performance, and the effect of numerical anxiety on Mathematics in the Modern World performance. Also, the attribution variables play as a moderator between mathematics self-concept and grades in MMW and between numerical anxiety and MMW. For this framework, the independent variables are the Mathematics Self-Concept and Numerical Anxiety. The dependent variable is the Mathematics in the Modern World Achievement and the moderating variable is the Achievement Attribution.

A. **Conceptual Model**

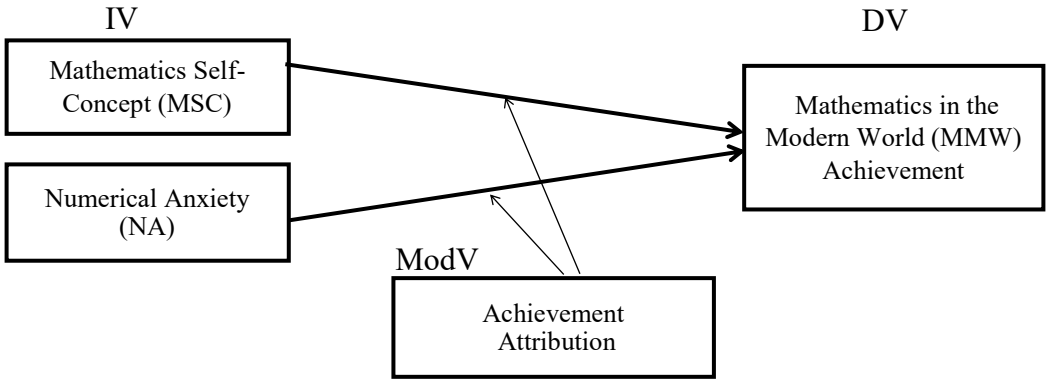

Figure 1. Conceptual Model

B. Statistical Model

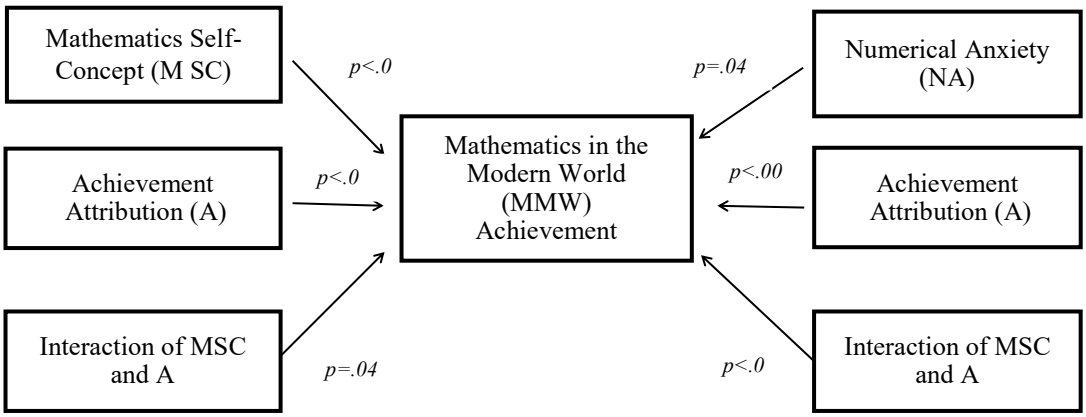

Figure 2. Statistical Model

Research Design

The study used a descriptive-quantitative approach because it aimed to study if mathematics test anxiety and numerical anxiety predict Mathematics in the Modern World Achievement. It involved gathering of data in order to test hypotheses and to answer questions about the current status of the participants of the study. The study utilized correlation, analysis of variance, regression analysis and moderation analysis, which are very important in quantitative research.

Sampling Method

The study's participants were 192 respondents from First Year College students who took Mathematics in the World in the 2019-2020 school year; students who dropped out and transferred to other schools were not included in the study. The reason for choosing the first-year college students in the school year 2019-2020 is due to the availability of the data that can already be found in the archives of the Baliuag University's Registrar's Office. The research may be useful in the long run as the students' progress through the grades. Power analysis using G * Power 3.1 calculator for multiple regressions with an alpha of .05 is also used to analyze the sample size. It shows that the sample size of 192 has a small to medium effect size of f^2=0.082 and a power of 0.95 which is more than the acceptable power of .80 according to (Cohen, 1992).

Instrumentation

Instruments were used for data collection of mathematics self-concept, numerical anxiety and attribution. It also utilized Confirmatory Factor Analysis and Internal Consistency Test through Cronbach's Alpha Test.

The first questionnaire was adapted from the research of Ayadole (2011) about Self-concept and Performance of Secondary School Students in Mathematics. A pre-test was conducted and it was found to have a high internal consistency with

Cronbach's alpha of .85. It is a 20-item self-report questionnaire titled, "Self-concept towards Mathematics" in which the students will be asked to rate how they think, feel, act, value and evaluate themselves in Mathematics on a five-point scale, namely: Strongly Agree = 5, Agree = 4, Somehow = 3, Disagree = 2 and Strongly Disagree =1.

The instrument for measuring numerical anxiety was adapted from the 19-item test of Howard Morada's research about Correlation of Numerical Anxiety and Mathematics Performance. A pre-test was conducted and it was found to have acceptable internal consistency with Cronbach's alpha of .75. It can be answered using the Likert Scale. 1 = Very Low, 2 = Low, 3 = Somehow, 4 = Agree and 5 = Strongly Agree. It is very reliable.

On the other hand, the instrument for attribution variables like luck, task difficulty, effort and ability was inspired based on the research of Boruchovitch (2004) about "A Study of Causal Attributions for Success and Failure in Mathematics among Brazilian Students A pre-test was conducted and it was found to have acceptable internal consistency with Cronbach's alpha of .71. It is also answerable by Likert scale. 1 = Strongly Disagree 2 = Disagree 3 = Somehow, 4 = Agree and 5 = Strongly Agree. Reverse coding will also be applied to numbers 5, 6, 7 and 8.

For the grades in Mathematics in the Modern World, no instrument will be applied but it will be taken only from the records coming from the Registrars' office. Only students who are currently studying at Baliuag University are the only participants in this research.

The results of the study may also be useful in monitoring the level of mathematics self-concept and numerical anxiety of the students and improving Mathematics in the Modern World performance in the upcoming years.

This study used an online questionnaire through the use of Google Form Questionnaire. The students were given examinations that would measure their level of mathematics self-concept, numerical anxiety and attribution.

The questionnaire was conducted at the students' most convenient time. The design of the questionnaire was made simple in order to avoid any confusion on the part of students. They were proven and tested with a high measure of validity, and mainly used for various situations involving groups of students who are taking Mathematics as a subject. The results then were analyzed and compared to the grades of the students in Mathematics in the Modern World taken from the Baliuag University's Registrar.

Data Gathering and Procedure

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Data Analysis Procedure

The researcher collected, collated and tabulated the data for in-depth analysis. Microsoft Excel, scientific calculator and IBM SPSS 20 (Statistical Package for Social Science) and SPSS Amos 20 are used as necessary computing tools. The analyses of the data were as follows:

The data collected in this study underwent statistical treatment and analysis. The following tools were used in analyzing and interpreting the data:

1. The demographics of the respondents were described using frequency counts and descriptive statistics. The dependent variable which is the students' Mathematics in the Modern World Achievement was directly coded in the SPSS. The two independent variables, namely mathematics self-concept and numerical anxiety, the moderating variable which is attribution, were reversely coded in the SPSS with the exception of items 5, 6,7 and 8 in the attribution. This is to make the variables parallel with one another and lean toward the same directions, Then, students' scores on the 20-item test in MSC, the 19-item test in Numerical Anxiety and on the 8-item test in the Attribution Variables were analyzed.

2. The correlations between mathematics self-concept and grades in the Mathematics of the Modern World, numerical anxiety and grades in Mathematics in the Modern World were measured using Pearson's Product Moment Correlation through the use of SPSS.

3. The interpretation of the result of Pearson's Product Moment Correlation reported by Evans (1996) was used for this study.

4. To determine if there is a significant difference among the variables, the p-value identified its significance using an F-distribution. If the p-value is below .05, then a significant difference exists. If the p-value is above .05, then no significant difference exists.

5. Regression analysis was used to determine if mathematics self-concept predicts MMW achievement and if numerical anxiety predicts MMW. Furthermore, multiple regression analysis was used to know if the combined effects of mathematics self-concept and numerical anxiety predict MMW performance.

6. Moderation analysis was used if attribution moderates the effect of mathematics self-concept and numerical anxiety on the students' grades in (MMW).

Results and Discussion

Table 1
Frequency and Percentage Distribution of Respondents According to Gender

College	Frequency	Percentage
Female	126	65.6
Male	66	34.4
Total	192	100.0

Table 1 showcases the distribution of respondents according to their gender. One hundred twenty-six (65.6%) of those polled are females, while sixty-six (34.4%) are males.

Table 2
Frequency and Percentage Distribution of Respondents According to College Department

College	Frequency	Percentage
CBAA	33	17.2
CEDE	60	31.3
CEHD	20	10.4
CHMT	21	10.9
CITE	5	2.6
CLAGE	5	2.6
CNAHS	48	25.0
Total	192	100.0

Table 2 showcases the distribution of respondents according to their respective college departments. There are one hundred sixty (31.3%) students from CEDE, twenty (10.4%) from CEHD, twenty-one (10.9%) from CHMT, forty-eight (25.0%) from CNAHS, and five (2.6%) from each CITE and CLAGE department.

Table 3
Mean and Standard Deviation of Students' Mathematics in the Modern World (MMW) Achievement, Mathematics Self-Concept, Numerical Anxiety and Attribution

	Descriptions			
	N	M	SD	Interpretation
MMW Achievement	192	1.83	0.420	High
Mathematics Self-Concept	192	2.52	0.680	High
Numerical Anxiety	192	2.58	0.582	High
Attribution	192	2.97	0.608	Moderate

Table 3 presents the mean and standard deviations of MMW Achievement, Mathematics Self-Concept, Numerical Anxiety and Attribution. The results (M =1.83, SD=.420, N=192) suggest that students' level of MMW Achievement was high. Also, the results (M=2.52, SD=,680, N=192) suggest that students' level of Mathematics Self-Concept is high. Likewise, the results (M=2.58, SD=.582, N=192) suggest that the students' level of Numerical Anxiety is high. Lastly, the results (M=2.97, SD=.608, N=192) suggest that the students' level of Attribution is Moderate.

Table 4
Pearson R Product-Moment Coefficient Table for the Mathematics Self-Concept and Mathematics in the Modern World (MMW) Achievement

Variable	Statistical Treatment	MMW Achievement
Mathematics Self-Concept	Pearson Correlation	.861
	Sig.	.000
	N	192

A Pearson product-moment correlation coefficient was computed to assess the relationship between the mathematics self-concept of college students and their Mathematics in the Modern World (MMW) achievement. It was found that there is a significant relationship between the two variables, $r = .861$, $N = 192$, $p = .000$. A very strong positive relationship was found to exist between mathematics self-concept and MMW achievement. Hence, if college mathematics self-concept increases, then their level of MMW achievement also increases. Likewise, we can also conclude that if the college mathematics self-concept decreases, then their level of MMW achievement also decreases. It supports the findings of Ireson and Hallam (2009) who stated that mathematics self-concept is positively associated with mathematics achievement.

Table 5
Pearson R Product-Moment Coefficient Table for the Numerical Anxiety and Mathematics in the Modern World (MMW) Achievement

Variable	Statistical Treatment	MMW Achievement
Numerical Anxiety	Pearson Correlation	-.013
	Sig.	.853
	N	192

A Pearson product-moment correlation coefficient was computed to assess the relationship between the numerical anxiety of college students and their level of MMW Achievement. It was found that there is no significant relationship between the two variables, r = -.013, N = 192, p = .853. A very weak negative relationship was found to exist between college numerical anxiety and MMW achievement. Hence, if college numerical anxiety increases, then their level of MMW achievement decreases. Likewise, we can also conclude that if the college numerical anxiety decreases, then their level of MMW achievement increases. It supports the statement of Acevedo et al. (2020) who stated that mathematical anxiety is inversely related to achievement. This is not conclusive because the variables were found to have a very weak relationship and not significant.

Table 6
Regression Analysis of Mathematics Self Concept and Numerical Anxiety in Predicting Mathematics in the Modern World (MMW) Results

	Df	SS	MS	*F*	*p*
Regression	2	24.982	12.941	271.190	.000
Residual	189	8.705	.046		
Total	191	33.687			

To determine whether the students' levels of mathematics self-concept and numerical anxiety predicts the Mathematics in the Modern World (MMW) Achievement of the students, multiple regression analysis was used. It was found that these two factors, when combined, do significantly predict the achievement test results [F (2, 189) = 271.90, p<.001].

Table 7
Coefficients in Regression Analysis of in Predicting Mathematics in the Modern World Achievement

	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	*t*	*P*
(Constant)	.522	.1	.091	5.744	.000
Math Self-Concept	.532	.023	-.861	-23.286	.000

Results revealed that students' math self-concept (b = .532, p < .001) predicts MMW achievement. On the other hand, numerical anxiety (b = 010, p = .695) does not predict MMW Achievement when taken individually. However, when these two independent variables are combined, they predict MMW achievement. The study's findings support Ayadole's (2011) hypothesis that mathematics self-concept has a strong influence on mathematics achievement. On the other hand, the results on numerical anxiety contradict the findings of the findings of Karimi and Kumar (2010) stating that mathematics anxiety is a good predictor of mathematics performances and overall academic performances.

Table 8
Analysis for Attribution as Moderator between Math Self Concept and Mathematics Achievement

	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	*t*	*p*
(Constant)	.346	.086	.	4.002	.000
Math Self-Concept	.519	.023	-.840	22.406	.000
Attribution	-.061	.026	.089	2.362	.019
(Constant)	.746	.218		3.421	.001
Math Self-Concept	.339	.093	.5499	3.653	.000
Attribution	-.068	.070	-,099	-9.77	.330
Interaction MSCxA	.057	.029	.388	1.997	.047

The results revealed that students' Mathematics Self Concept (b = ,339, p < .001.) predicts the Mathematics in the Modern World (MMW) Achievement and Attribution (b = -.068, p <.001) did otherwise when taken individually, However, the

interaction of mathematics self-concept and attribution (b = .057, p = .047) predicts MMW Achievement. Hence, attribution moderates the effect of mathematics self-concept on MMW Achievement. The result of the study supports the finding of Weiner (1974), who stated that students' future academic achievement can be significantly influenced by achievement attribution.

Strength of Moderation - R Square Change from Model 1 with Attribution and MSC as Predictors and Model 2 with MSC, Attribution and the Interaction as Predictors (s)

Model Summary									
Model	*R*	*R* Square	Adjusted *R* Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	*F* Change	df1	df2	Sig. *F* Change
1	.865[a]	.749	.746	.21160	.749	281.678	2	189	.000
2	.868[b]	.754	.750	.20995	.005	3.988	1	188	047

a. Predictors: (Constant), Attribution, MSC

b. Predictors: (Constant), Attribution, MSC, Interaction of MSC and Attribution

The results show that there is a significant change R Square as shown from.749 to .754 for models 1 and 2. It means that there is an additional of .5% of the variance in the dependent variable or MMW achievement can be predicted after the interaction of math self-concept and attribution was included as one of the predictors along with math self-concept and attribution.

Table 9
Analysis for Attribution as Moderator between Numerical Anxiety and Mathematics Achievement

	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	*t*	*P*
(Constant)	1.408	.164	.	8.587	.000
Numerical Anxiety	-.112	.055	-.155	-2.059	.041
Attribution	.241	.052	.349	4.620	.000
(Constant)	-1.052	.550		-1.913	.057
Numerical Anxiety	.803	.203	1.112	3.956	.000
Attribution	.973	.165	1.409	5.909	.000
Interaction (NAxA)	-2.66	.057	-1.980	-4.662	.000

Results revealed that students' numerical anxiety (b = .803, p < .001.) and attribution (b = .973, p < .001) predict Mathematics in the MMW when taken individually. All the more, the interaction of mathematics self-concept and attribution (b = -2.66, p < .001) predicts MMW Achievement. Hence, attribution moderates the effect of mathematics concepts on MMW Achievement. The result of the study supports the finding of Weiner (1986), who stated that students' future academic achievement can be significantly influenced by their causal attributions for their successes or failures. Moreover, the interaction between numerical anxiety and attribution resulted to a negative beta. Previous research indicates that children with anxiety disorders make significantly more negative (internal, global, and stable) attributions for negative events than normal controls (f Bell-Dolan & Wessler, 1994).

Strength of Moderation: R Square Change from Model 1 with Attribution and MSC as Predictors and Model 2 with MSC, Attribution and the Interaction as Predictors

Model Summary

Model	*R*	*R* Square	Adjusted *R* Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	*F* Change	df1	df2	Sig. *F* Change
1	.319[a]	.102	.092	.40015	.102	10.691	2	189	.000
2	.441[b]	.195	.182	.37986	.093	21.738	1	188	.000

a. Predictors: (Constant), NA, Attribution, Dependent Variable: MMW

b. Predictors: (Constant), NA, Attribution, Interaction of NA and Attribution (NA x A) Dependent Variable: MMW

The results show that there is a significant change *R* Square as shown from .102 to .195 for models 1 and 2. It means that there is an additional of 9.3% of the variance in the dependent variable or MMW achievement can be predicted after the interaction of numerical anxiety and attribution was included as one of the predictors along with numerical anxiety and attribution.

Conclusions

Based on the findings of this study, the following were concluded:

1. The Baliuag University students' levels of MMW Achievement, Mathematics Self-Concept and Numerical Anxiety are high while the students' level of Attribution is Moderate.

2. A very strong significant positive relationship was found to exist between mathematics self-concept and MMW achievement. However, a very weak negative and no significant relationship was found to exist between numerical anxiety and MMW achievement.

3. Mathematics Self-Concept and Numerical Anxiety predict MMW Achievement when combined. However, it is only the Mathematics Self-Concept that predicts MMW achievement when taken individually.

4. Attribution moderates the effects of both Mathematics Self-Concept and Numerical Anxiety to MMW Achievement.

Recommendations

Based on the conclusion of the study, the researcher suggests the following recommendations:

1. More intensive approaches in teaching should be done to increase the students' level of Mathematics in the Modern World performance.

2. The guidance office, teachers and other stakeholders may keep and monitor a profile of students' mathematics self-concept, numerical anxiety and achievement attribution so they would be able to determine how the students will perform in the MMW subject.

3. Further research must be done to support the findings that mathematics self-concept and numerical anxiety predict mathematics achievement. Moreover, encouraging and motivating the students to have positive perspective may drive their levels of math self-concept. Also, more researches should be undertaken by future researchers to discover different ways to manage and cope with numerical anxiety, as it has been shown to predict mathematics achievement when combined with math self-concept.

4. More studies should be conducted to demonstrate that achievement attribution moderates the effect of mathematics self-concept to mathematics achievement and numerical anxiety to mathematics achievement. Teachers and students should have better understanding, and consider the contributing factors of achievement attribution like luck, effort, task difficulty and ability in order to perform well in Mathematics.

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