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Cracking the Algebra Code: Unveiling the Key Influencers of College Scholars' Performance with Predictive Analysis

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Abstract

Performance in mathematics, more specifically in Algebra**,** is influenced by different factors. They may even predict students' success in mathematics. Thus, this study on predicting college scholars' performance in Algebra was conducted. To answer this problem, the researcher utilized a quantitative-predictive method of research using the developed performance test administered to the randomly selected 167 college scholars. To identify predictors of performance in the algebra of the scholars, stepwise multiple regression was used. The study showed that the performance level in Algebra of the college scholars was average. However, when competencies were considered, the level of their performance varied from low to average, considering the identified factors. Further, the results highlight the significance of both "GPA in high school math and "Attitude" in predicting the students' performance in Algebra." While "GPA in high school math" demonstrates a negative association, "Attitude" shows a positive influence. It can be inferred that students have poor mastery of the competencies in Algebra. These results provide a valuable understanding of how these variables contribute to the variation in the outcome of interest. Thus, GPA in high school math and college scholars' attitudes towards mathematics are potential predictors of performance in Algebra. In this regard, teachers are encouraged to develop learning exercises and enhancement activities to develop students' skills, especially in word problem-solving. Students are also encouraged to develop a positive attitude toward the subject.

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Introduction

Algebra is one of the most important areas of Mathematics. However, because of the nature of generalization and abstraction, Algebra is considered a difficult area of Mathematics (Chick, Stacey, Ji & Jo, 2001). In almost all parts of the globe, students experience difficulties learning algebra (Drijvers & Warren, 2003). More and more students are realizing that Algebra is a challenging subject to learn. (Stacey, Chick, & Kendal, 2004). This is a worldwide phenomenon, and algebra education deserves special attention.

According to Erbas (2004), many students find algebra to be difficult and a barrier. Since algebra is more than just a standalone subject of mathematics, it can be challenging to teach and learn, which can make learning more advanced mathematics more difficult. It's been proven through experience and research that the path to algebra is never as easy as one may hope. Algebraic exercises are challenging to learn and impart. The teacher should be studied to prevent, decrease, or otherwise address the difficulty students experience studying mathematics, among all other factors that could provide a challenge.

Likewise, Wynegar and Fenster (2009) posited that many community colleges demand college algebra as a core course for their science and mathematics programs. The course's passing percentage was the lowest of any class. The administration made it plain that it wanted to lower this high failure rate, and it allocated funding to do so. Several alternative instructional approaches were tried to boost performance and raise the passing rate. However, mathematics continues to be challenging for college students.

Furthermore, although algebra is important for students' education and futures, American students perform poorly on the National Assessment of Educational Progress (NAEP) in algebra (Chazan & Yerushalmy, 2003). In actuality, a group of first-year college students answered incorrectly in 53.8% of all Remedial Intermediate Algebra tests (Pinchback, 1991). Pinchback identified an alarming 40.2% of these inaccurate responses as being the result of mistakes brought on by ignorance of the necessary information.

In the Philippines, it is widely acknowledged that the majority of students learn algebra with great difficulty. Large-scale studies conducted here and abroad have all shown that student’s achievement in algebra is low. In the United States, the number of students who study algebra has increased significantly. However, despite the increase in both national and international exams, student performance in algebra is still dismal. (Valverde &

Trejo, 2002). The striking evidence of pupils' algebraic performance in several other nations, including the Philippines, reveals factors to be looked into and studied. Thus, this study on the predictive analysis of the factors influencing the performance in Algebra of college scholars of the Northern Negros State College of Science and Technology (NONESCOST) was conducted.

Objectives of the Study

The main purpose of this study was to determine performance in Algebra and identify predictors of college scholars' performance in Algebra. Specifically, this research aimed to (1) determine college scholars' level of performance in Algebra as a whole and in terms of the competencies when grouped according to sex, age, GPA in mathematics during high school, attitude towards mathematics, and study habit, and (2) identify potential predictors college scholars' performance in Algebra.

Methodology

Research Design

Quantitative research design more specifically the descriptive-predictive was utilized in this research. This was used because the researcher's purpose is to describe the level of performance based on the identified factors and recognize factors as potential predictors of college scholars' performance in Algebra. According to Creswell (2008), predictive analysis involves two different kinds of variables: predictor and criteria. The criterion variable, or expected result, is what is predicted when the predictor variable is used to generate a forecast or prediction. In this study, the criterion variable was the students' performance in algebra while the predictive variables were the identified factors such as sex, age, GPA in fourth-year math, attitude toward mathematics, and study habits.

Participants of the Study

The participants of the study were 167 randomly selected first-year college scholars from the population of 287 scholars of NONESCOST. To determine the actual participants of the study, the researcher determined the sample size using Slovin's formula. These participants were then randomly selected from different areas of specialization where they were enrolled.

Data Gathering Instrument

The researcher created an algebra performance test on his own to gauge the college student's proficiency in the subject. The responders had an option between four alternatives for each of the test's 50 multiple-choice items. There are four stages in the production of the performance test: planning, preparing the test items, trying out the test items, and evaluating the instrument.

Planning the test includes setting up behavioral objectives and the construction of the table of specifications. A one-way table of specifications was prepared by the researcher from which items were distributed from the different competencies.

On the other hand, the researcher used a multiple-choice item structure for creating the test items. This format included a problem and a list of potential solutions. Either a direct question, an omitted statement, or a question form was used to communicate the issue. This acted as the object's stem. The alternatives, choices, or possibilities that are given as answers are the key and the rest are distractions.

Writing the test items is one of the preparation steps for the exam items. The researcher researched and skimmed books on college algebra for students as well as other relevant references for designing the items for the seven skills. The researcher also conducted an informal conversation with college mathematics teachers to get their input on the topics and level of difficulty of the questions. The intended number of 50 items was doubled to 100 items with four possibilities.

Test items underwent editing after writing. The test items are edited by the researcher's colleague teacher who teaches mathematics and has experience with test design. The test's tryout is the following step in this regard. Thirty college students who have studied the subject and are also students were invited to participate in the test's tryout. Students were given a questionnaire to fill out during the practice test, and they were told to circle the letter that corresponded to the correct response.

The procedure of item analysis came next. The efficiency of each alternative as well as the item's discriminating power and difficulty were examined for each item. For the selection and improvement of test items, item difficulty, and item discrimination are frequently employed as criteria. The Upper-Lower Index Method was applied during item analysis.

The last stage is the evaluation of the test. After the final form was administered and scored, the researcher proceeded to the evaluation of the instruments by determining their validity and reliability. In this regard, content validation was used to determine the validity of the research instrument. The content validity of the research instrument was conducted by considering the expertise of eight master teachers; one was a professor at the Philippine Normal University Visayas teaching mathematics subjects in the undergraduate and graduate programs. Of the eight validators, five of them rated the research instrument to a very high degree while three of them rated it to a high degree.

On the other hand, to establish the reliability, Kuder-Richardson Formula 20 was used. In this study, the reliability index using Kuder-Richardson Formula 20 was 0.90.

Statistical Data Analysis

Descriptive and inferential statistics were used in this research. For the problem that determined the level of performance in the algebra of the scholars as a whole and in terms of the different competencies when grouped according to the identified factors, mean and standard deviations were used. On the other hand, for a problem that determined potential predictors of the performance of the scholars, stepwise multiple regression analysis was used.

Results and Discussion

This research aimed to determine college scholars' performance in Algebra and identify predictors of their performance. The presentation of the results focused on the analysis and discussion of college scholars' performance in Algebra in the competencies of sets and real numbers, algebraic expressions, polynomials, special product and factoring, rational expressions, exponents, radicals, and linear equations. Likewise, this presentation of results focused on identifying potential predictors of college scholars' performance in Algebra.

Table 1: Performance in Algebra of the First-Year College Scholars

Competencies	No. of Items	M	SD	Interpretation
Sets and real numbers	**6**	1.90	1.32	Low
Algebraic expressions and polynomials	7	2.65	1.42	Low
Special products and factoring	7	2.80	1.76	Low
Rational expressions	7	2.45	1.13	Low
Exponents	7	3.18	1.68	Average
Radicals	7	2.87	1.35	Average
Linear equations	9	3.09	1.52	Low
As a Whole	50	18.95	5.97	Low

The performance in Algebra of the college students' scholars is low *(M = 18.95, SD = 5.97)*. However, when competencies were taken individually, the level of performance in sets and real numbers, algebraic expressions and polynomials, special products and factoring, rational expressions, and linear equations is also low while average in exponents and radicals. These results indicate that first-year college scholars find Algebra difficult. Their mastery level of the different competencies is poor, especially in sets and real numbers, algebraic expressions and polynomials, special products and factoring, rational expressions, and linear equations.

In a similar vein, Chick et al., cited by Arca (2008), stated that although Algebra has traditionally been a key subject in school mathematics curricula, it is thought to be a barrier for students. The formal and algorithmic nature of algebra, the abstract level at which problems are discussed, the object nature of algebraic expressions and formulas, and the compact algebraic language with its norms and symbols are some of the challenges associated with studying algebra. Students frequently don't view algebra as a natural and meaningful way to solve issues as a result of these challenges.

Foster (2007) claims that algebra is a generalized form of arithmetic and that the use of letters and signs helps to generalize arithmetic. Without a doubt, the subject is abstract because of the usage of letters and signs. Algebra is regarded as a challenging branch of mathematics due to the nature of generalization and abstraction. Furthermore, according to Valverde (2002), algebra is regarded as a challenging branch of mathematics due to the nature of generalization and abstraction. Here in the Philippines and abroad it is widely acknowledged that the majority of students learn Algebra with great difficulty. Large–scale studies conducted here and abroad have all shown that students' achievement is low in Algebra. In the United States, for instance, students who studied Algebra have increased significantly. But despite the increase in student performance on Algebra items on both national and international assessments results are still disappointing.

Table 2. Performance in Algebra of College Scholars when Grouped According to Sex

Competencies	No. of items	Male			Female		
		M	SD	Interpretation	M	SD	Interpretation
Sets and real numbers	6	1.69	1.40	Low	1.98	1.29	Low
Algebraic expressions and polynomials	7	2.73	1.63	Low	2.62	1.33	Low
Special products and factoring	7	3.08	1.74	Average	2.69	1.76	Low
Rational expressions	7	2.45	1.19	Low	2.45	1.11	Low
Exponents	7	3.16	1.70	Average	3.19	1.68	Average
Radicals	7	2.78	1.43	Low	2.92	1.32	Low
Linear equations	9	3.41	1.51	Low	2.96	1.52	Average
As a Whole	50	19.30	6.38	Low	18.80	5.81	Low

Table 2 disclosed that the level of performance in Algebra of male *(M = 19.30, SD = 6.38)* and female *(M = 18.80, SD = 5.81)* college scholars are low. However, when competencies were considered individually, male and female college students scholars' performance in sets and real numbers, algebraic expressions and polynomials, radicals, and linear equations was low. On the other hand, they have an average level of performance in algebra on exponents.

Although the level of performance in Algebra of the college scholars is almost the same, considering obtained means scores, the highest mean scores were obtained by the males. This can be interpreted to mean that males' levels of performance are better than that of female college scholars. Else-Quest, Hyde, and Linn (2010) conducted a new analysis of international research and found that girls from countries where gender equity is more common are more likely to perform better on mathematics assessment tests. Although boys are more confident in their math skills, girls around the world are not less skilled in math than boys.

Additionally, they noted that genuine scientific data contrasts with prejudices regarding women's perceived mathematical inadequacy. In their analyses, it was demonstrated that when given the appropriate educational resources and exposure to visible female role models who are proficient in mathematics, girls will perform at the same level as boys.

Table 3: Performance in Algebra of College Scholars when Grouped According to Age

Competencies	No. of items	17 and below			18 and above		
		M	SD	Interpretation	M	SD	Interpretation
Sets and real numbers	6	1.90	1.39	Low	1.89	1.24	Very Low
Algebraic expressions and polynomials	7	2.79	1.44	Low	2.48	1.38	Low
Special products and factoring	7	2.79	1.72	Average	2.82	1.82	Low
Rational expressions	7	2.40	1.22	Low	2.51	1.00	Low
Exponents	7	3.16	1.70	Average	3.21	1.67	Average
Radicals	7	2.88	1.37	Average	2.86	1.34	Average
Linear equations	9	2.99	1.51	Low	3.22	1.55	Low
As a Whole	50	18.91	5.81	Low	18.99	6.21	Low

When grouped according to age, the level of performance in the algebra of the college scholars with an age range of 17 and below *(M =18.91, SD = 5.81)* and with an age range of 18 and above *(M = 18.99, SD = 6.21)* is low. However, when competencies were taken individually, the level of performance of the college scholars with the age range of 17 and below and 18 and above in almost all of the competencies are low except in exponents where their level is average.

Considering the obtained mean scores, the highest mean was obtained by college scholars with an age range of 18 and above. Along this line, Arca (2011) in her study of the proficiency of second-year college students in algebra supported the present findings. Her study indicated that second-year-college students whose ages were 17 and below obtained the highest mean score than those whose ages were 18 and above. However, Villacorte (2010) on word problem proficiency in linear algebra of nursing students, it was revealed that older students perform better in word problem-solving in linear algebra than younger ones.

Similarities and differences in the result of the present study and that of the study of Arca and Villacorte can be attributed to their respective respondent groups, while the present study utilizes ESGP-PA scholars who are typically of lower academic profile than those of the nursing students and second-year college students in the study of Villacorte and Arca.

Table 4: Performance in Algebra of College Scholars when Grouped According to GPA in High School Math

Competencies	No. of items	High Achievers			Average Achievers			Low Achievers		
		M	SD	Interpre-tation	M	SD	Interpre-tation	M	SD	Interpre-tation
Sets and real numbers	6	3.13	0.99	Average	1.94	1.37	Low	1.64	1.18	Low
Algebraic expressions and polynomials	7	2.38	1.06	Low	2.87	1.49	Average	2.30	1.26	Low
Special products and factoring	7	4.88	1.55	High	2.91	1.86	Average	2.30	1.29	Low
Rational expressions	7	2.63	0.92	Low	2.57	1.13	Low	2.20	1.13	Low
Exponents	7	4.88	1.12	High	3.37	1.61	Average	2.58	1.65	Low
Radicals	7	2.88	1.25	Average	3.13	1.41	Average	2.40	1.13	Low
Linear equations	9	3.00	1.60	Average	3.19	1.48	Average	2.90	1.61	Average
As a Whole	50	23.75	4.30	Average	19.97	6.18	Low	16.31	4.65	Low

The findings from Table 4 shed light on the relationship between high school math performance, college scholars' GPAs, and their proficiency in Algebra. It becomes apparent that college scholars with high GPAs in high school math display an average level of performance in Algebra, as indicated by a mean score of 23.75 and a standard deviation of 4.30. Conversely, those with average GPAs exhibit a low performance *(M = 19.97, SD = 6.18)*, and the trend continues among those with low GPAs who demonstrate a low performance *(M = 16.31, SD = 4.65)* in the same area.

However, when we delve into the individual competencies within Algebra, the picture becomes more intricate. College scholars' proficiency in algebraic concepts is not uniform. Their performance ranges from low to high across different competencies. Notably, they excel in special products and factoring as well as exponents, showcasing a notably high level of competence. Yet, their performance levels in sets and real numbers and radicals are merely average, indicating a diverse skill distribution within the realm of Algebra.

On the contrary, for college scholars with average GPAs in fourth-year mathematics, their performance in various Algebraic domains can be described as average. This is observed in areas such as algebraic expressions and polynomials, special products and factoring, exponents, and radicals. They also maintain an average level of performance in competencies like sets and real numbers, rational expressions, and linear equations.

Conversely, the results concerning college scholars with low GPAs in fourth-year mathematics underscore a consistent pattern of low performance across all competencies within Algebra. This consistency reinforces the notion that those who excel in the broader realm of mathematics tend to perform well in the domain of Algebra, while those who struggle with mathematics as a whole similarly face challenges within the specific context of algebraic concepts. These results collectively highlight the interconnectedness between mathematical achievement and algebraic competence, suggesting that high achievers in mathematics generally exhibit prowess in algebraic reasoning and problem-solving.

Generally, the table's results suggest that those who excel in mathematics tend to perform well in Algebra. However, individual competencies within Algebra can vary greatly among college scholars. The findings also highlight that achieving a good performance in mathematics generally corresponds to a good performance in algebraic concepts.

Table 5: Performance in Algebra of College Scholars when Grouped According to their Attitude Towards Mathematics

Competencies	**No. of items**	**Negative**			**Positive**		
		M	**SD**	**Interpretation**	**M**	**SD**	**Interpretation**
Sets and real numbers	6	1.56	1.09	Low	1.89	1.24	Low
Algebraic expressions and polynomials	7	2.46	1.30	Low	2.48	1.38	Low
Special products and factoring	7	2.38	1.28	Low	2.82	1.82	Average
Rational expressions	7	2.29	1.15	Low	2.51	1.00	Low
Exponents	7	2.21	1.29	Low	3.21	1.67	Average
Radicals	7	2.44	1.11	Low	2.86	1.34	Average
Linear equations	9	3.04	1.37	Low	3.22	1.55	Low
As a Whole	50	16.38	4.05	Low	18.99	6.21	Low

The comprehensive analysis of college scholars' performance in Algebra, both collectively and segmented by their attitudes toward mathematics, is summarized in Table 5. This table underscores the impact of attitudes on Algebraic performance. Examining the data, it becomes evident that the level of performance in Algebra among college scholars with negative attitudes towards mathematics (M = 16.38, SD = 4.05), as well as those with positive attitudes (M = 19.98, SD = 6.31), is characterized as low.

However, the significance of attitudes becomes even more pronounced when competencies within Algebra are considered individually. Specifically, college scholars with negative attitudes toward mathematics exhibit consistently low performance across all assessed competencies. In stark contrast, college scholars with positive attitudes toward mathematics demonstrate an interesting variation. Their performance in algebraic expressions and polynomials, special products and factoring, exponents, and radicals registers as average, suggesting a moderate level of proficiency. Conversely, their performance in sets and real numbers, rational expressions, and linear equations remains low.

This study's results yield a discernible insight: the influence of attitudes toward mathematics on college scholars' performance is substantial. Scholars who possess a positive attitude towards mathematics outperform their counterparts with negative attitudes. This finding highlights the integral role that a positive attitude plays in fostering success in Algebra. It signifies that a constructive mindset towards mathematics significantly contributes to enhanced performance and competency in algebraic concepts, ultimately reaffirming the interconnectedness of attitudes and academic achievements.

Table 6: Performance in Algebra of College Scholars when Grouped According to their Study Habits

Competencies	No. of items	Poor			Good		
		M	SD	Interpretation	M	SD	Interpretation
Sets and real numbers	6	1.75	1.28	Low	1.97	1.34	Low
Algebraic expressions and polynomials	7	2.80	1.65	Low	2.59	1.31	Low
Special products and factoring	7	2.71	1.66	Low	2.84	1.81	Average
Rational expressions	7	2.45	1.29	Low	2.45	1.06	Low
Exponents	7	3.33	1.67	Low	3.11	1.69	Average
Radicals	7	2.80	1.40	Low	2.91	1.34	Average
Linear equations	9	3.29	1.42	Low	3.00	1.57	Low
As a Whole	50	19.14	6.16	Low	18.86	5.91	Low

The findings depicted in Table 6 offer insights into the relationship between college scholars' study habits and their performance in Algebra. The table reveals that the level of performance in Algebra among college scholars with both poor study habits (M = 19.14, SD = 6.16) and those with good study habits (M = 18.66, SD = 5.91) is uniformly characterized as low.

However, delving into individual competencies within Algebra brings forth a more nuanced picture. Both sets of college scholars, those with poor study habits and those with good study habits demonstrate low performance in sets and real numbers, rational expressions, and linear equations. Interestingly, however, they exhibit an average level of performance in algebraic expressions and polynomials, special products and factoring, exponents, and radicals. This suggests a consistent pattern where the scholars perform comparably well in specific algebraic domains, regardless of the quality of their study habits.

Interpreting these results, it becomes apparent that the scholars' performance levels seem to remain largely unchanged regardless of whether they possess poor or good study habits. This implies that the impact of study habits on their Algebraic performance might be less influential than initially anticipated. In essence, these findings suggest that while study habits can be beneficial for overall academic success, their influence might not be a primary determinant of Algebraic performance among these college scholars. This insight underscores the complex interplay of factors that contribute to academic achievement and indicates that other variables could be playing a more significant role in shaping their proficiency in Algebra.

Predictors on the Level of Performance in Algebra of College Scholars

The presented analysis involves a regression model aimed at understanding the relationship between certain predictor variables and college scholars' level of performance in Algebra. The approach used for variable selection is stepwise, with the criteria for adding and removing variables based on their probability of contributing to the model (p-values). Two models are explored: In the first model, only "GPA in high school math" is included as a predictor, while in the second model, "Attitude" is added alongside "GPA in high school math."

Table 7: Variables Entered/Removed

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	GPA HS Math	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
2	Attitude	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).

a. Dependent Variable: As a Whole (Performance in Algebra)

The analysis of this table reflects the iterative process of building the regression models. The utilization of a stepwise variable selection method is evident, which involves sequentially adding or excluding variables based on the specified criteria for entry and removal. In the first model, "GPA in high school math" was deemed significant enough to be included in the model based on the specified criteria. Similarly, in the second model, "Attitude" met the criteria and was added as a predictor.

This stepwise approach aids in identifying the variables that contribute the most to explaining the variance in the dependent variable, reflecting college scholars' performance in Algebra. By adhering to specific probability thresholds, this method ensures that variables added or removed are statistically meaningful in the context of the model.

Table 8: Model Summary

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.338[a]	.114	.109	5.63444
2	.394[b]	.155	.145	5.51983

a. Predictors: (Constant), GPA High School Math
b. Predictors: (Constant), GPA High School Math, Attitude

The summary statistics present a meaningful perspective on the relationship between variables. In the initial model, where "GPA in high school math" serves as the predictor of the dependent variable, the R-squared value of 0.114 signifies that approximately 11.4% of the variation in the dependent variable, likely indicating Algebraic performance, can be accounted for by the high school math GPA. These findings underline that the high school math GPA has a limited but discernible influence on the observed variance in Algebraic performance.

When "Attitude" is introduced into the second model, the R-squared value notably increases to 0.155. This elevation in the R-squared value suggests that the inclusion of "Attitude" as an additional predictor contributes to a more comprehensive explanation of the variance in Algebraic performance, encompassing around 15.5% of the observed variability. This finding points towards the significance of "Attitude" in enhancing the model's ability to elucidate the factors influencing Algebraic performance among college scholars.

It's important to note that the adjusted R-squared values, although slightly lower than the R-squared values, offer a more robust reflection of the model's explanatory power. The presence of multiple predictors in the model necessitates consideration of model complexity. The marginal reduction in adjusted R-squared values is indicative of this complexity, indicating that the model accounts for a meaningful proportion of variance while acknowledging the increased intricacy due to the presence of multiple predictors.

Table 9: ANOVA Result

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	676.281	1	676.281	21.302	.000[b]
	Residual	5238.234	165	31.747		
	Total	5914.515	166			
2	Regression	917.671	2	458.836	15.059	.000[c]
	Residual	4996.844	164	30.469		
	Total	5914.515	166			

a. Dependent Variable: As a Whole (Performance in Algebra)
b. Predictors: (Constant), GPA High School Math
c. Predictors: (Constant), GPA High School Math, Attitude

In Table 9, labeled "ANOVA Result," key statistical findings are presented, shedding light on the significance and explanatory power of the regression models used to understand college scholars' performance in Algebra. The first model showcases the Regression sum of squares as 676.281, spanning a single degree of freedom. This translates to a Mean Square of 676.281. The calculated F-statistics stands at 21.302, indicating the model's significance. The corresponding p-value is marked as 0.000, underscoring its statistical importance. These findings affirm that the inclusion of the predictor "GPA in high school math" in the first model contributes significantly to explaining the variance observed in the dependent variable, which likely represents performance in Algebra. Additionally, the Residual sum of squares is 5238.234, while the Total sum of squares, encapsulating all degrees of freedom, remains 5914.515.

In the second model, the Regression sum of squares increases to 917.671, encompassing two degrees of freedom. This leads to a Mean Square of 458.836. The computed F-statistics reaches 15.059, reflecting its significance. The associated p-value, marked as 0.000, further underscores the model's statistical importance. These outcomes reaffirm the meaningful contributions made by the predictors "GPA in high school math" and "Attitude" in the second model. These predictors jointly contribute to explaining the variance observed in the dependent variable. The Residual sum of squares is 4996.844, while the Total sum of squares remains consistent at 5914.515.

The outcomes of the ANOVA analysis validate the statistical significance of both regression models. The exceptionally low p-values ($p < 0.001$) for both models unequivocally highlight their importance. These findings signify that the inclusion of "GPA in high school math" in the first model and subsequently "Attitude" in the second model indeed result in meaningful contributions to the explanation of the variance observed in the dependent variable, likely representing the performance of college scholars in Algebra. Consequently, these results underscore the relevance and effectiveness of the selected predictors within the models, affirming their ability to illuminate the factors that influence the Algebraic performance of college scholars.Table 10: Coefficients

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	27.356	1.874		14.601	.000
	GPA HS Math	-3.686	.799	-.338	-4.615	.000
2	(Constant)	21.493	2.776		7.742	.000
	GPA HS Math	-3.166	.804	-.290	-3.937	.000
	Attitude	2.730	.970	.208	2.815	.005

a. Dependent Variable: As a Whole (Performance in Algebra)

Table 10, titled "Coefficients," serves as a pivotal source of information, offering insights into the intricate relationships between predictors and the dependent variable. These coefficients, whether unstandardized or standardized, unveil crucial dynamics within the regression models.

In the first model, the constant term labeled "Constant" stands at 27.356, accompanied by a standard error of 1.874. The significant t-statistic of 14.601 aligns with a p-value of 0.000, indicating strong statistical significance. The predictor "GPA HS Math" demonstrates an unstandardized coefficient of -3.686, linked to a standard error of 0.799. This predictor's standardized coefficient, denoted as Beta, assumes a value of -0.338, indicating a moderate negative effect on the dependent variable. The corresponding t-statistic of -4.615 confirms its statistical importance ($p < 0.001$).

Transitioning to the second model, the "Constant" term is now 21.493, with a standard error of 2.776. The t-statistic of 7.742 corresponds to a p-value of 0.000, highlighting its statistical significance. The predictor "GPA HS Math" in this model holds an unstandardized coefficient of -3.166, linked to a standard error of 0.804. The standardized coefficient (Beta) of -0.290 signifies a moderate negative impact. The t-statistic of -3.937 underlines its statistical significance ($p < 0.001$). Additionally, the predictor "Attitude" presents an unstandardized coefficient of 2.730, accompanied by a standard error of 0.970. The standardized coefficient (Beta) of 0.208 signifies a moderate positive influence on the dependent variable. The t-statistic of 2.815 emphasizes its statistical importance ($p = 0.005$).

The presence of the label "Dependent Variable: As a Whole (Performance in Algebra)" underscores the context within which these coefficients operate. These coefficients furnish essential insights into the intricate connections between predictors and the dependent variable. In the first model, an increase in "GPA in high school math" correlates with a decrease in the dependent variable, assuming other variables remain constant. In the second model, "GPA in high school math" retains its negative effect, while "Attitude" introduces a positive effect. This signifies that an increase in "Attitude" corresponds to an increase in the dependent variable's value, indicating improved performance in Algebra after considering other variables.

Table 11: Excluded Variables

Excluded Variables[a]

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics
						Tolerance
1	Sex	-.083[b]	-1.121	.264	-.087	.984
	Age	.017[b]	.229	.819	.018	.999
	Attitude	.208[b]	2.815	.005	.215	.947
	Study Habits	-.018[b]	-.251	.802	-.020	1.000
2	Sex	-.064[c]	-.886	.377	-.069	.976
	Age	-.001[c]	-.017	.986	-.001	.991
	Study Habits	-.033[c]	-.457	.648	-.036	.995

a. Dependent Variable: As a Whole (performance in Algebra)
b. Predictors in the Model: (Constant), GPA High School Math
c. Predictors in the Model: (Constant), GPA High School Math, Attitude

This table sheds light on the variables that were not deemed significant enough to be included in the final models. The exclusion of "Sex," "Age," and "Study Habits" suggests that, within the scope of this study and its specified criteria for inclusion, these variables did not have a substantial impact on explaining the variance in the dependent variable, which likely represents performance in Algebra.

The Beta In values provide insight into the direction and magnitude of the relationships these excluded variables had with the dependent variable, after controlling for other predictors. The t-statistics and significance levels

(Sig.) reveal whether these relationships are statistically significant. The partial correlations reflect the unique contribution of these variables to the dependent variable's variation, considering the presence of other predictors.

The collinearity statistics, specifically the tolerance values, offer information about the potential multicollinearity among predictors. Tolerance values close to 1 indicate low multicollinearity, while values close to 0 suggest higher levels of multicollinearity. The high tolerance values here suggest that there is no severe multicollinearity among the remaining predictors.

The analysis highlights the significance of both "GPA in high school math and "Attitude" in predicting the dependent variable which is the students' performance in Algebra." While "GPA in high school math" has a negative association, "Attitude" has a positive influence. These findings provide a valuable understanding of how these variables contribute to the variation in the outcome of interest. Nonetheless, consideration should be given to the excluded variables, as they might still have relevance in explaining the dependent variable's behavior.

Along this line, Marpa (2014) in his study of factors associated with the learning engagement in mathematics of first-year college students revealed that GPA in the previous mathematics class and attitude towards mathematics predicts first-year college students learning engagement in mathematics.

Conclusion

The presented analysis provides valuable insights into the performance of college scholars in Algebra, along with the factors that contribute to their performance. The performance in Algebra among these scholars is generally low, as evidenced by the overall mean score and standard deviation. When examining individual competencies within Algebra, it becomes apparent that students struggle particularly with sets and real numbers, algebraic expressions and polynomials, special products and factoring, rational expressions, and linear equations. However, their performance is relatively better in exponents and radicals.

The study also underscores the challenges students face when learning Algebra. This is in line with existing literature that highlights the difficulties associated with Algebra due to its abstract nature, formal character, and complex algebraic language. Despite efforts to improve students' performance in Algebra, challenges persist both in the Philippines and internationally.

The study delves into the influence of various demographic and psychological factors on Algebraic performance. The findings reveal interesting trends when scholars are grouped according to sex, age, GPA in high school math, attitude toward mathematics, and study habits. These factors exhibit varying levels of influence on Algebraic performance across different competencies.

The regression analysis performed in the study yields valuable insights. The first model, which includes only "GPA in high school math" as a predictor, shows that high school math GPA has a moderate negative influence on Algebraic performance. The second model, which introduces "Attitude" as a predictor, demonstrates that attitude toward mathematics has a moderate positive influence on performance. The adjusted R-squared values suggest that these predictors, collectively, can explain a meaningful portion of the variance in Algebraic performance.

Variables such as sex, age, and study habits were excluded from the final models, indicating that, within the scope of this study and its criteria, they did not have a substantial impact on explaining the variance in Algebraic performance.

Overall, this study reinforces the complex nature of Algebra learning and performance and emphasizes the importance of factors like high school math GPA and attitude toward mathematics in predicting Algebraic performance. The findings have implications for educational strategies and interventions aimed at improving students' performance in Algebra, including fostering positive attitudes toward the subject and addressing the challenges associated with its abstract nature.

COMPETING INTERESTS

The author has no competing interests to declare.

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