

Influence of Characteristic Processes in Mathematics on the academic performance in "Juan Mejía Baca" High school Chiclayo.ZULOETA SALAZAR, José Felix¹**Abstract**

This research was carried out in "Juan Mejía Baca" High school, Chiclayo. It was performed with a sample of 25 female and 27 male students of third grade High School, who are from 13 to 16 years old. The type of research was basic and the design was non-experimental transectional correlational / causal. The research was based on determining the influence of the processes characteristic of mathematics on the academic performance in mathematics subject. These processes were dimensioned in four independent variables; the academic performance in the mathematics subject was considered as a dependent variable. The academic performance in the mathematics subject was obtained by calculating the average of each of the four semesters. The obtained results from the parametric analysis, through correlation and multiple regression, showed that the processes or variables handling algorithms and problems solving affected on academic performance in this order. Multiple regression analysis confirmed that the academic performance increased 0,636 by each point of increasing in the algorithm management test, the academic performance increased points and for each point of increase in problem solving academic performance it increased 0.277 points.

Keywords: Correlation, regression, characteristic processes.

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Introducción

It is possible that Mathematics are the most difficult subject in the learning process for high school students in our country, it could be due to their level of complexity and their abstraction of conceptual and procedural contents. On the other hand, there are many factors which limit their comprehension: The teaching/ learning methodology, socio-economic factors in the family, social environment, psychological and cognitive aspects, etc. The low performance at school has been shown many times in this whole context, and it is more highlighted in public educational institutions, just as this research is carrying out.

Mathematics has been considered such a very difficult subject to learn by the traditional teaching system, which do not develop a significant learning, and this methodology is still in our country, promoting rote learning, creating limited mathematical knowledge, which reduces mathematics to mere mechanization in problem solving, without promoting comprehension and reasoning skills in students. This lack of skills move towards boredom and indifference to learn Mathematics.

The difficulty of understanding mathematics in third grade of "Juan Mejía Baca" high school, situated in "José Olaya" slum -Chiclayo city, is the major problem in the teaching -learning process, where students' low grades is demonstrated in a general way. Therefore, it is important for the researcher to analyze one of their principal causes in low-performing schools.

The study of the relation and the influence of the characteristics of the processes in mathematics which are related to academic performance were presented in this research in a specific way. These processes are: problem solving, reasoning and demonstration, interpretation and communication and finally, management of algorithm.

The relation and degree of influence of each process on academic performance and jointly in this research was determined, in other words, all processes characteristics of mathematics about academic performance. The statistical analysis will be carried out through the correlation and linear and multiple regression, to find the most appropriate mathematical model in data (qualifications), which were found through the tests applied for each process. In addition, this model allows us to make predictions or approximations in the academic performance in mathematics.

On the other hand, the association and degree of dependence of processes and the academic performance will allow us to understand one of the factors that limit the learning of mathematics, therefore it will be possible to establish possible solutions to understand and improve teaching - learning process of mathematics by professors, the cognitive development process of students presents a difficulty level because is a rigorous and scientific character that involves a degree of greater complexity.

Method

Type of research:

According to the purpose pursued: Basic.

According to the Research Design: Non-Experimental, correlational / causal transection.

Design of Hypothesis Testing:

The general research hypothesis was proposed in multivariate statistical hypotheses as follows:

H0: $\beta_1 = \beta_2 = \beta_3 = \beta_4 = 0$ (There is no regression. The Characteristic Processes of mathematics area has not effect on the Academic Performance)

H1: $\beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq 0$ (There is regression: one of the coefficients in the Characteristic Processes of the mathematics area has influence on Academic Performance.

Where: β_1 , β_2 , β_3 and β_4 are the standardized partial regression coefficients or beta coefficients of the multiple regression estimation equation: $\hat{Y} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4$

Results and discussion

Population and Sample

The population is constituted by the third grade students of "Juan Mejía Baca" high school from "José Olaya" slum . Chiclayo, as shown in the following table:

Tabla 1.

Third grade Student's' distribution from

"Juan Mejía Baca" High school

"José Olaya" slum. Chiclayo.

Classroom	Gender		Total
	Male	Female	
Third A	14	14	28
Third B	18	12	30
Total	32	26	58

Fuente. "Juan Mejía administration high school

The population's size (N = 58 students),

It is relatively small; all the students were considered as a sample to carried out the study.

Data collection for the techniques and instruments:

To collect the information and to evaluate the characteristic processes of Mathematics, the questionnaire technique was applied through the written test, which evaluates problem solving, understanding and demonstration, interpretation and communication and management of algorithms.

To recollect the information corresponding to the academic performance in the mathematics subject, the documentary technique was applied through the minutes and Mathematics' records.

Tabular presentation of Information related to characteristics of processes in Mathematics:

Table 2

Third grade Student's' distribution from high school, according to their score obtained in the test of problem solving.

[Score>	N° Students	Percentage (p _i)
3 - 5	31	59,62
5 - 7	10	19,23
7 - 9	6	11,54
9 - 11	1	1,92
11 - 13	3	5,77
13 - 15	1	1,92
Total	52	100,00

Source: Problem solving test.

Table 3

Third grade student's distribution from high school, according to their score in the understanding and demonstration test.

[Score>	N° Students (n _i)	Percentage (p _i)
4 - 6	31	59,62
6 - 8	14	26,92
8 - 10	6	11,54
10 - 12	1	1,92
Total	52	100,00

Source: understanding and demonstration test.

Table 4

Third grade student's distribution from high school, according to their score obtained in interpreting and communication test.

[Score>	N° Students (n _i)	Percentage (p _i)
2 - 5	8	15,38
5 - 8	5	9,62
8 - 11	13	25,00
11 - 14	20	38,46
14 - 17	5	9,62
17 - 20	1	1,92
Total	52	100,00

Source: Interpreting and Communication test.

Table 5

Student's distribution of the third grade of high school, according to their score obtained in the Management of algorithms test.

[Score>	N° Students (n _i)	Percentage (p _i)
3 - 5	36	69,23
5 - 7	10	19,23
7 - 9	3	5,77
9 - 11	2	3,85
11 - 13	1	1,92
Total	52	100,00

Source: Management of Algorithms

Presentation of information related to academic performance in mathematics:

Table 6

Student's distribution of the third grade of high school, according to their score obtained In Mathematics

[Score>	N° students (n _i)	Percentage (p _i)
8 - 10	4	7,69
10 - 12	21	40,38
12 - 14	18	34,62
14 - 16	3	5,77
16 - 18	5	9,62
18 - 20	1	1,92
Total	52	100,00

Source: Direction of "Juan Mejía Baca" high school

Correlation analysis and multiple regression of academic performance in mathematics with the characteristic processes of Mathematics.

The independent variable of managing algorithm and the dependent variable of academic performance are included in this equation because both are correlated (R = 0,632) (see table 7). It is also observed that R = 0,632; R Square = 0,400; Std Error = 1,71098 (see table 8, model 1). In addition, the regression (Sig. = 0,000) (see table 9, model 1) and the regression coefficient of the management algorithms are highly significant (Sig. = 0,000) (see table 10, model 1). Therefore, the variable or process characteristic of the management algorithms were the first variable in the multiple regression model.

The problems solving is included in the equation as second variable because has the largest coefficient of partial correlation (R = 0,436) (see table 11, model 1). In addition, it can be observed R = 0,717; R Square = 0,514; Std. Error = 1,55503 (see table 8, model 2) it can be observed that there is an increase of R, R Square, and a decrease of Std. Error, which is favorable for the variable or process characteristic of problems solving remain in the equation. It is also observed that the regression (see table 9, model 2) and the regression coefficient of the variable problems solving are highly significant (Sig. = 0,001) (see table 10, model 2).

The third variable is interpretation and communication model because they have the greater coefficient of partial correlation (R = 0,207) (see table 11, model 2), but since it is not significant in the model but also because they have a significance of 0,149 (look table 11, model 2) that is bigger than the specified of 0,05; it would not approach to the equation.

The equation of the regression model:

$$\hat{Y} = \beta_0 + \beta_4 X_4 + \beta_1 X_1$$

$$\hat{Y} = 8,030 + 0,636 X_4 + 0,277 X_1$$

Academic performance estimated= 8,030 + 0,636

* Management of algorithms + 0,277

* Problems solving.

Interpretation means that the academic performance in mathematics subject is linearly correlated to the management of algorithms and problem solving; for each point increased in the management algorithms, the academic performance increases in 0,636 points and for each point increased in the problems solving, the academic performance increases in 0,277 points.

The coefficient of determination is 0,494 (see table 8, model 2), which indicates that 49.4% of the observed variability in academic performance is explained by the management of algorithms and problems solving.

Table 7

Correlation coefficient of academic performance in mathematics subject.

Characteristic Processes	Correlation Coefficient	Problem Solving	Reasoning And demonstration	Interpret. And Comunic.	Management Of algorithm	Academic Performanc.
Porblems Solving	Pearson Correlation	1	.469(**)	.218	.095	.397(**)
	Bilateral	.	.000	.121	.504	.004
	N	52	52	52	52	52
Reasoning Demonstration	Pearson Correlation	.469(**)	1	.189	.342(**)	.409(**)
	Bilateral	.000	.	.181	.013	.003
	N	52	52	.52	52	52
Interpretation Communication	Pearson Correlation	.218	.189	1	.300(*)	.389(**)
	Bilateral	.121	.181	.	.031	.004
	N	52	.52	52	.52	52
Management of algorithm	Pearson Correlation	.095	.342(**)	.300(*)	1	.632(**)
	Bilateral	.504	.013	.031	.	.000
	N	52	52	.52	52	52
Academic performance	Pearson Correlation	.397(**)	.409(**)	.389(**)	.632(**)	1
	Bilateral	.004	.003	.004	.000	.
	N	52	52	52	52	52

* Correlation is Interpretation significant at 0.01 (Bilateral).

** Correlation is significant at 0.05 (Bilateral)

Table 8

Correlation Coefficients of the academic performance in mathematics subject with the characteristic processes of mathematics area, depending on model.

Modelo	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.632(a)	.400	.388	1,71098
2	.717(b)	.514	.494	1,55503

A Predictors: (constant), management of algorithms

B Predictors: (constant), management of algorithms, problems solving.

Table 9

Variance analysis of multiple regression in mathematics' academic performance with characteristic processes mathematics, depending on model.

Model	Source of variation	Sum of squares	Df	Mean square	F	Sig.
1	Regression	97,459	1	97,459	33,292	.000(a)
	Residual	146,372	50	2,927		
	Total	243,831	51			
2	Regression	125,344	2	62,672	25,918	.000(b)
	Residual	118,488	49	2,418		
	Total	243,832	51			

A Predictors: (constant), management of algorithms

B Predictors: (constant), management of algorithms, problem solving

C Dependent variable: academic performance.

Table 10

Coefficients of the multiple regression equation in mathematics subject's academic performance with the processes characteristic of mathematics, depending on model.

Model	Variable	Unstandard Standard Coefficients		Beta	T	Sig.
		B	Std. Error			
1	(constant)	9,32	,566		16,47	,000
	Managemn of algorithm	,67	,116	,632	5,77	,000
2	(constant)	8,03	,639		12,58	,00
	Managemn of algorithm Problems solving	,64	,106	,600	6,0	,000
		,28	,082	,340	3,4	,001

A Dependent variable: academic performance.

Table 11

Partial correlations and variables are excluded from the multiple regression equation in Mathematics subject's academic performance with characteristic processes of the mathematics area, depending on model.

Model	Variable.	Beta in	T	Sig	Partial Correla tion	Colline arity statistic Toleran ce
1	Problem solving Reasoning	,340(a)	3,4	,001	,436	,991
	Demonst. Interpret.	,219(a)	1,93	,060	,265	,883
2	Comunic.. Reasoning	,219(a)	1,96	,056	,270	,910
	Demonstrt. Interpret.	,065(b)	,54	,594	,077	,691
	Comunic..	,155(b)	1,47	,149	,207	,874

A Predictors in the model: (constant), management of algorithms

B Predictors in the model: (constant), management of algorithms, Problems solving

Conclusions

The following conclusions are indicated according to the results obtained in the research.

The characteristic processes of the mathematics, management of algorithms and problems solving were associated (correlated) meaningfully with academic performance in mathematics subject.

In the same way, these two processes had influence on the academic performance, as well as demonstration and reasoning processes and management of algorithms.

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