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INFLUENTIAL FACTORS IN MATHEMATICAL PERFORMANCE OF THE UNAC ENGINEERING STUDENT

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Abstract: The present investigation aims to know the factors involved in the academic performance in mathematics of engineering students at the National University of Callao to improve the teaching-learning process and raise the quality of graduates. Therefore, by operationalizing the independent variable, factors such as: The same student entered the University, the teacher who teaches mathematics during the first five academic semesters of the curriculum, the academic performance is analyzed, the report notes of the minutes of the courses of mathematics and of the determining factors are complemented with the question question of the regular students of the faculty on the aspects of the matter, teacher and personnel, included of the Academic Year 2016 to 2019, it was demonstrated the existing relationship Between the factors, the performance and the academic performance of the student through the Chi-square for a confidence level of 95%. Some activities are proposed to achieve the participation of the family in the school performance of students in order to help improve their school performance.

Keywords: university student, institutional problems, teaching methodology, academic performance.

1 Introduction

In recent years, academic performance and student dropout as a phenomenon has been widely studied and modeled [1] both nationally and internationally. UNESCO (1998) proposes that higher education be reformed and aligned towards a student-centered approach that responds to the work and development requirements of nations [2]. That is why the possible causes that may affect the academic performance of engineering students have been identified, especially in the vital courses for the professional career that encompass them, such as mathematics in order to find strategies to face and prevent it. At the University of Callao (UNAC), there are eleven engineering majors, including electrical, electronics, mechanical, industrial, etc., in which students, according to the curriculum, must take mathematics courses in their first 5 semesters as a basis fundamental of their professional training. It is of great relevance what is observed according to the academic reports reflected in the transcripts: a considerable percentage of 23.2% disapproved and 6.4% students who withdrew from the course, as can be seen in Table N ° 1.

Table N ° 1: Distribution of engineering students in Mathematics of the UNAC

Distribution of students of Engineering in Mathematics of the UNAC	
RESULTS	%
Approved	70.40
Disapproved	23.20
Retreats	6.40
TOTAL	100.00

For this reason and as a consequent action of the aforementioned, the present research aimed to generate evidence to better understand this problem using data from the UNAC and examining a set of factors from three large dimensions: Pedagogy, Institutional and Personal that were found to affect academic performance in Mathematics.

2 Materials and methods

2.1 Matter

A. Academic Performance

Academic performance is a result of the influence of factors from the student's external and internal environment, which can positively or negatively affect the final result [3]. This is an indicator of the level of learning achieved by the student, which represents the level of effectiveness in achieving the curricular objectives for the various subjects, and in our country it is expressed through a

qualifying or weighted average based on the vigesimal system ; that is, the grades vary from 0 to 20 points, where the score of 10 or less is failing; for this reason, in the national and international educational system this indicator is given greater importance [4]. For many Latin American countries, the low academic performance of students is a current problem that transcends the academic environment to become a social, institutional and personal concern, for which there are several investigations in this regard. The most important decline in academic performance is in mathematics, mainly due to difficulties in learning mathematics, institutional directives and personal motivations.

B. Academic Performance in Mathematics

Mathematics is the science that studies quantities, structures, spaces, and change. Mathematics deduces every accepted conjecture based on already proven axioms and theorems [5]. It has many branches, such as: set theory, arithmetic, algebra, geometry, mathematical analysis, trigonometry, among others. Mathematical logical reasoning and processes such as problem solving and the interpretation of mathematical language are considered important skills in the integral development of the student. A suitable mathematical formation and its development, allows the development of science, technology and the educational level of the whole society. However, mathematics is an educational subject or discipline towards which many students manifest a negative predisposition or even rejection for various reasons, such as the method used, the expectations and style of the teacher, the influence of stereotypes based on social and cultural factors [6]. This situation has generated both national and international concern about how to improve the level of student learning achievement (academic performance) in mathematics at different educational levels. High school grades are the most effective predictor of the performance of college-bound students [7]. Obtaining an objective measure of this construct is complex and in many cases even controversial, due to all the variables and forms of calculation to be considered depending on the nature of the contents of the subject to be evaluated and the teacher. Historically, it is widely accepted that the marks of an exam as a result of an evaluation of a course in a set period of time, constitute the most common indicators of a certain learning, being this a social criterion, legally accepted in the educational system [8].

C. Influencing Factors

Tourón proposes two major factors that affect academic performance. The first referred to the (personal) characteristics of the student: previous academic performance or entrance tests, aptitude variables (intelligence, reasoning), personality variables, professional interests, personal self-concept, motivation, etc. The second focused on the teaching-learning process: such as the quality of the teachers, the didactic system used, the characteristics of the institution, etc. [9]. For the research we have seen it necessary to add, to these two factors, the institutional value; since it starts from the supervising and

organizing body where the bases for the dictation of mathematics classes are given.

- Institutional Factor

Institutional factors are those aspects related to the educational institution in terms of the operating procedures they comply with, since these influence decisions that can improve educational quality, with, for example, measures that establish, control or modify schedules, curricula, distribution of students in classrooms, etc. To guarantee the quality of university education, it is urgent to analyze the impact of the factors or variables that influence academic performance [10].

The main problem being the lack of concern of academic institutions through their authorities in providing adequate logistics, as regards classrooms, being for example not having air conditioning for the corresponding station, not having audio, computer and computer equipment of optimal quality projection, problem of small classrooms in times of midterm and final exams; also not having optimally operational laboratories and / or sufficient stock to carry out laboratories.

- Pedagogical Factor

Successful achievement and learning in mathematics continues to be a global challenge, and great efforts are made to advance improvement proposals, generally involving teachers, in terms of their training, improvement or classroom practice [11].

The teacher must first consider how to get students to participate actively in class work [12].

The deficiency is that the vast majority of teachers who teach mathematics in the different areas of engineering are not educators by profession, they teach subjects as professionals in mathematics. None of the teachers have the teaching methodology, which translates into the concern of the students of not understanding why theorems such as Laplace's Transform, Second Differential Equations, order, partial derivatives, etc. are important, that is, the teacher does not reach the student and even more so the mathematical topics taught are not applied to the engineering area. Regarding pedagogy, they do not take into consideration the following: Relationship (teacher's ability to communicate and interact with their students), organization-planning (the way the teacher prepares, organizes and plans the programs, contents, inputs and available resources for the development of his classes), motivation (expressed in the interest and enthusiasm that he prints in his pedagogical action), didactic strategies (they favor participation and the construction of knowledge in his students), updating-qualification (understood as the broad and deep knowledge about the contents and processes that he teaches, due to his

continuing education), self-regulation-monitoring (expressed in the autonomy that he displays to verify, evaluate and provide feedback on his pedagogical work) and attention to learning rhythms and styles (teacher's ability to guide teaching according to the needs of each student) [13].

- Personal Factor

Students go through different processes of change in their university trajectory: the transition between upper secondary and higher levels, adapting to a new system that prepares them for the labor market, going from being adolescents to young people with greater responsibilities, among others [14].

The academic performance of adolescents is influenced and determined by numerous factors. The lifestyle and health behaviors adopted in this period can be related to academic performance, in such a way that adolescents with healthier lifestyles and behaviors may present a more adapted academic performance. Likewise, maintaining correct indicators of psychological health is related to adapted academic performance [15].

The student arrives at the University with a poor mathematical academic performance, even the students who enter the university in the first positions have difficulty with the mathematics courses that are taught in each of the professional engineering careers, which leads to a poor performance in both math and academic performance in general. All this led to the use and adaptation of a scale to assess students' attitudes, emotions and beliefs about their competence in mathematics, as well as self-assessment regarding their academic success / failure in the curricular discipline of Mathematics [16].

2.2 Method

The research method to be used will be mixed by being based on the qualitative when carrying out the analysis of reality, observation and evaluation of the phenomenon with questions to the people involved, which were analyzed with the quantitative method using processes that are based on the measurements and statistics.

A. Participants

The universe is made up of all 20,000 regular students from the 2016 to 2018 semester of the engineering careers of the National University of Callao. The sample size was determined using the formula for finite populations using a confidence level of 90%, for the selection simple random sampling will be taken into account.

Table N ° 2: Determination of the sample size for finite populations

Determination of sample size for finite populations	
$n_0 = \frac{NZ^2pq}{e^2[N - 1] + Z^2pq}$	
relative error: e	0.05
populationsize: N	20000
p:	0.268
q:	0.732
CONFIDENCE LEVEL: 1- α	0.9
AREA TO THE LEFT OF -Z	0.05
-Z	-1.645
Z	1.645
INITIAL SAMPLE SIZE: n_0	210.085471
Regla	
$\frac{n_0}{N} > 0,05 \rightarrow n = \frac{n_0}{1 + \frac{n_0}{N}}$	
$\frac{n_0}{N}$	0.01050427
THE SAMPLE SIZE n is:	208

B. Instruments

The data collection was carried out through a questionnaire of questions through a personalized interview with the students of each engineering faculty of the National University of Callao

C. Procedures

Appropriate statistical techniques were used to achieve the objectives and carry out the testing of the hypotheses, with the support of specialized statistical software.

3 Results

After having applied the research instrument and obtained the grades of the mathematics courses of the engineering students, the tabulation process began in the SPSS version 25 program, in order to organize, capture and analyze the data. To test the hypothesis, a Chi Square test was performed using Tables N ° 3 and N ° 4.

Table N ° 3: ObservedValues

Academic performance	MOTIVATING FACTORS			TOTAL
	Personal	Pedagogical	Institutional	
Low	10	30	20	60
Regular	25	28	30	83
Good	30	20	15	65
TOTAL	65	78	65	208

Table N ° 4: ExpectedValues

Academic performance	MOTIVATING FACTORS			TOTAL
	Personal	Pedagogical	Institutional	
Low	18.75	22.50	18.75	60
Regular	25.94	31.13	25.94	83
Good	20.31	24.38	20.31	65
TOTAL	65	78	65	208

The Ji-square calculated is:

$$x^2 = \sum_{i=1}^r \sum_{j=1}^k \frac{(O_{ij} - E_{ij})^2}{E_{ij}}$$

$$x^2 = \frac{(10 - 18.75)^2}{18.75} + \frac{(30 - 22.5)^2}{22.5} + \dots + \frac{(15 - 20.31)^2}{20.31} = 14,4454742$$

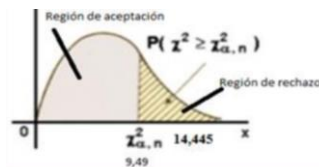


Fig. 1 calculated chi square

We observe that the calculated Chi-square is greater than the Chi-square of the table, that is, it is falling in the rejection region, which means that we must reject the null hypothesis (Ho) and accept the alternative hypothesis (H1) manifesting the motivating factors institutional, pedagogical and personal if they influence the mathematical performance of the Engineering student.

4. Conclusions

According to the research carried out, the objective has been met and the hypothesis formulated has been verified, since through the Chi-square test it resulted that there is an influence of the factors investigated on the academic performance of the students. confirmation of this, the following final conclusions of the study are presented below. There is a significant difference in the academic performance of students who have a teacher depending on the curricular design used, where those who have an educational training by competence obtain a better academic performance compared to those who have a traditional training. This study serves to take into account the implementation of an integrated methodology that sought to improve directives and institutional organization that involve mathematics courses, as well as how the teacher can increase or decrease student performance and finally personal reasons such as love, respect and cultural values of each person increase academic performance. This research was successful as it shows deficiencies to be overcome for the well-being of engineering students at UNAC.

5. RECOGNITION

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