

# Assessment analysis of the education system applied to the mathematics subject area at the Educational Institution "Los Negros", in the municipality of Algeciras (Colombia)

## Análisis de la Evaluación del sistema educativo aplicado al área de matemáticas en la institución educativa "Los Negros" del municipio de Algeciras

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#### ABSTRACT:

Educators in Colombia are compelled to show effectiveness, which is measured with the results obtained from the Pruebas SABER Pro. However, it is possible that educational institutions are being assessed with inadequate criteria. The objective of this work is to perform a bibliographic search on assessment processes and analyze the subject area of mathematics at the Educational Institution "Los Negros", in Algeciras, Huila (Colombia), in order to generate teaching strategies and to make future comparisons with other educational institutions of Colombia.

**Keywords:** Assessment, analysis, educational system.

#### RESUMEN:

Los educadores en Colombia deben mostrar efectividad, lo cual es evaluado con las pruebas Saber pro, sin embargo, es posible que las instituciones estén siendo evaluadas con criterios inadecuados. El objetivo de este trabajo fue hacer una revisión bibliográfica de los procesos de evaluación y analizar el área de matemáticas en la institución Educativa "Los Negros" del municipio de Algeciras, Huila (Colombia), para generar estrategias de enseñanza y hacer comparaciones a futuro con otras instituciones Colombianas.

**Palabras clave:** Evaluación, Análisis, Sistema educativo

## 1. Introduction

Assessment is a process that is carried out to measure and give results to a datum or set of qualitative or quantitative data determined by certain values (Turnbull, 1995), (Popham, 1999). The assessment of educational quality is a scientific analysis which measures the values obtained within this teaching and learning process (Barnett, 1992). Assessment must have precise results based on standards and values for each institution (Adams, 1993). Assessment is also considered as the systematic appraisal which is based on scientific methods and processes (Darling-Hammond, 1994).

In the teaching and learning process, it is necessary to use methods that allow to measure the objectives achieved inside and outside the classroom (Popham, 2000). Assessment, as the main mechanism within the education system can analyze the progress and the results to ensure a relevant and meaningful education for the student, teacher and more importantly for society (Noaman et. al, 2017).

Assessment can improve educational quality (Decristan et. al, 2015). Educational establishments can carry out improvement processes based on the different types of assessment, considering the results, contents, methodology and internal relationships (William, D. & Thompson, 2017).

In Colombia, education is the basic right of an individual and a public service that has a social function and is defined as an integral learning process, which involves personal, cultural, and social development, based upon the students' rights and duties (Minima, E.L. et. al 2018). The structure of law is based on five pillars:

1. Access: it implies that every citizen will have the right to enter the educational system.
2. Continuity: when the learning process has started it shall continue until completed.
3. Quality: to offer education with high quality and evaluation standards.
4. Relevance: the educational system must be adjusted to the needs of both students and society.
5. Opportunity: the educational process begins from the first to the eleventh grade, training students for higher education.

Assessment has progressed in terms of educational quality and this is demonstrated by the different results of national and international tests, adapting little by little to the social and cultural needs that society requires (Campbell, C. M., 2015).

In the Educational Institution " Los Negros " in the municipality of Algeciras, the educational system is made up of pre-school education, basic primary education, basic secondary education, and mid secondary education. Pre-school, basic primary, basic secondary and mid secondary education are regulated and supervised by the Department's Secretariat of Education and by the Colombian Ministry of National Education.

Preschool education is the first relationship that students have in the learning process, the main objective is to develop biological, sensory, cognitive and affective aspects of a student in an integral and harmonious way, and skills such as communication, autonomy, and creativity for a healthy coexistence and well-being (Voogt, J., 2017)

Primary basic education comprises five grades of schooling, starting from the first to the fifth, each of them have the duration of a school year (Ercikan, K. et. al, 2015). The main objective is to recognize the physical, intellectual and emotional potential of students, therefore seeking a harmonious, balanced and inclusive development, so that they, as members of society, are certain about the decisions they make to give solutions to their problems (Augustin, T. et. al, 2015). In this cycle, knowledge tests are applied in the third and fifth grades, in all public and private institutions of the country (Popkova, E. G, et. al, 2015).

Secondary basic education begins once basic education is completed in primary school, this comprises four grades of schooling ranging from the sixth to the ninth, The main objective is to identify and assess the factors that have an influence on social, cultural, economic and political development aspects of the country (Minima, E. L., et al, 2018). In this cycle, knowledge tests are applied in the ninth grade, in all public and private educational institutions of the country (Voogt, J., 2017).

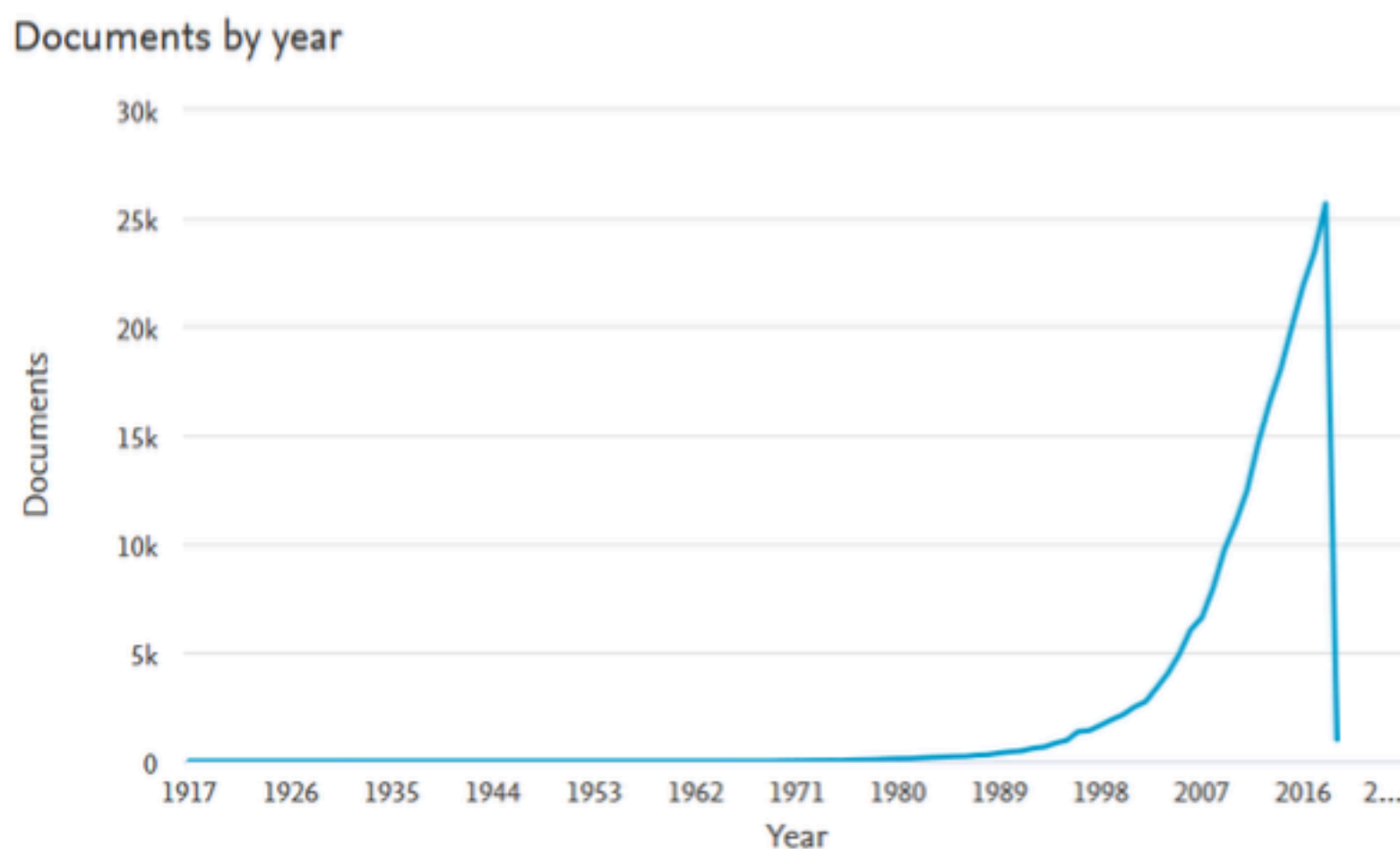
Mid secondary education has the tenth and eleven grades, and its main objective is to strengthen personal, social and cultural development achieved at the level of secondary education (Augustin, T., et. al, 2015). In this cycle, a knowledge test is applied in the eleventh grade, in all public and private institutions in the country (Popkova, E. G., et al 2015).

## 2. Materials and methods

A systematic search was carried out to find the main characteristics of the assessment mechanisms in education which have been carried out worldwide during the period of 2013-2018 in order to contextualize our case of study in the area of mathematics of the Educational Institution "Los Negros", in the municipality of Algeciras, in the department of Huila, Colombia. A search of scientific articles was carried out in the main bibliographic databases available on the Internet, specifically in Scopus, Scimago, ISI Web of Knowledge, Google Scholar, Springer, ScienceDirect, among others. The resulting references were limited to articles that contained education quality assessment methods, emphasizing on those which made an analysis of the obtained information. Review papers, editorials, and congress articles were excluded. Likewise, if a duplicate article were to be found, the one to be published would be the one found in a more recent magazine with higher impact. In Figure 1 the graph shows the articles per year.

**Figure 1**

Number of articles per year. Nearly 227,500 articles written on the subject of assessment in the education system. Scopus



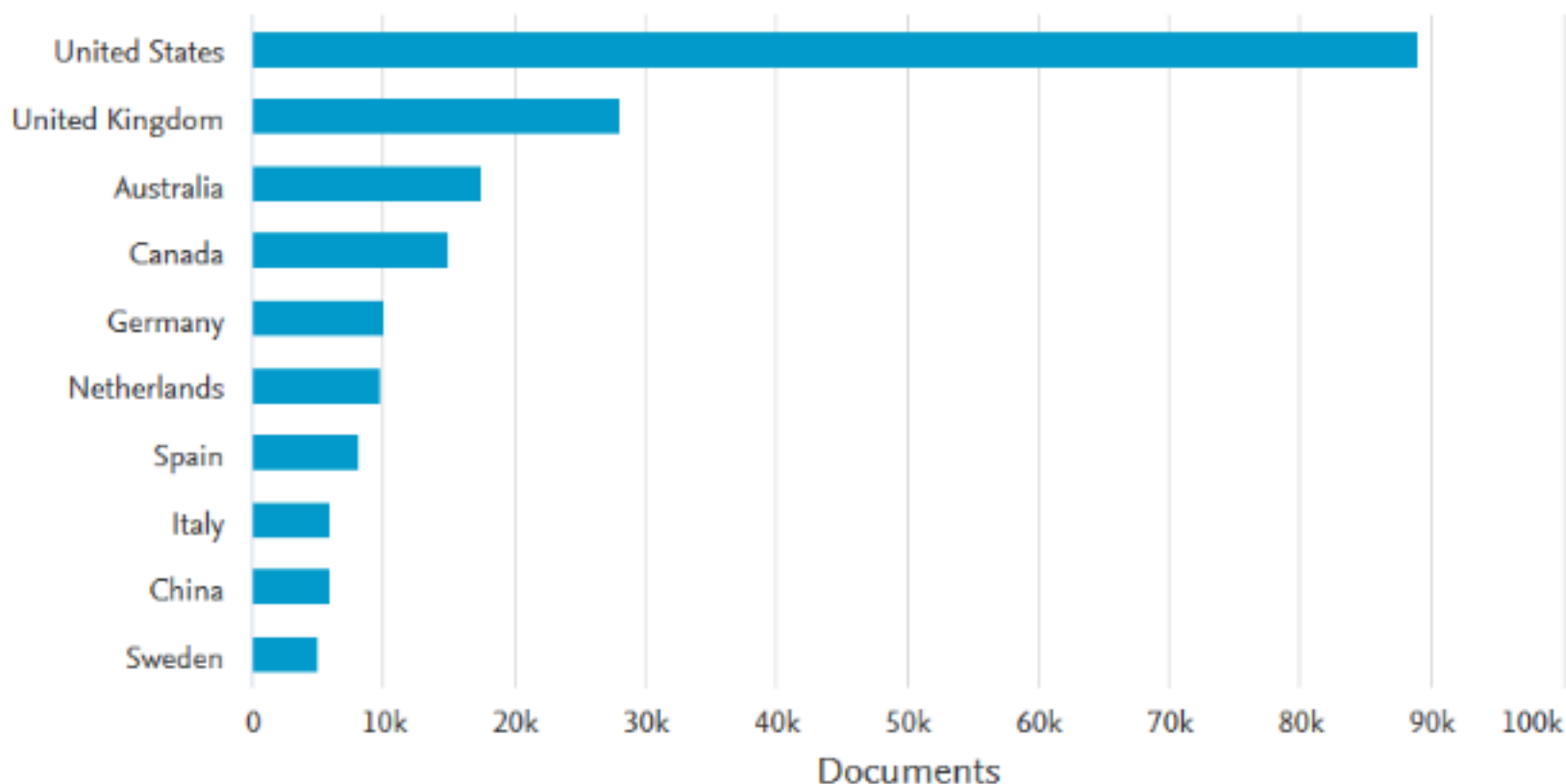
From this, it can be seen that the education system is a current topic as shown by the rising graph.

**Figure 2**

Number of documents per country. Scopus

## Documents by country or territory

Compare the document counts for up to 15 countries/territories

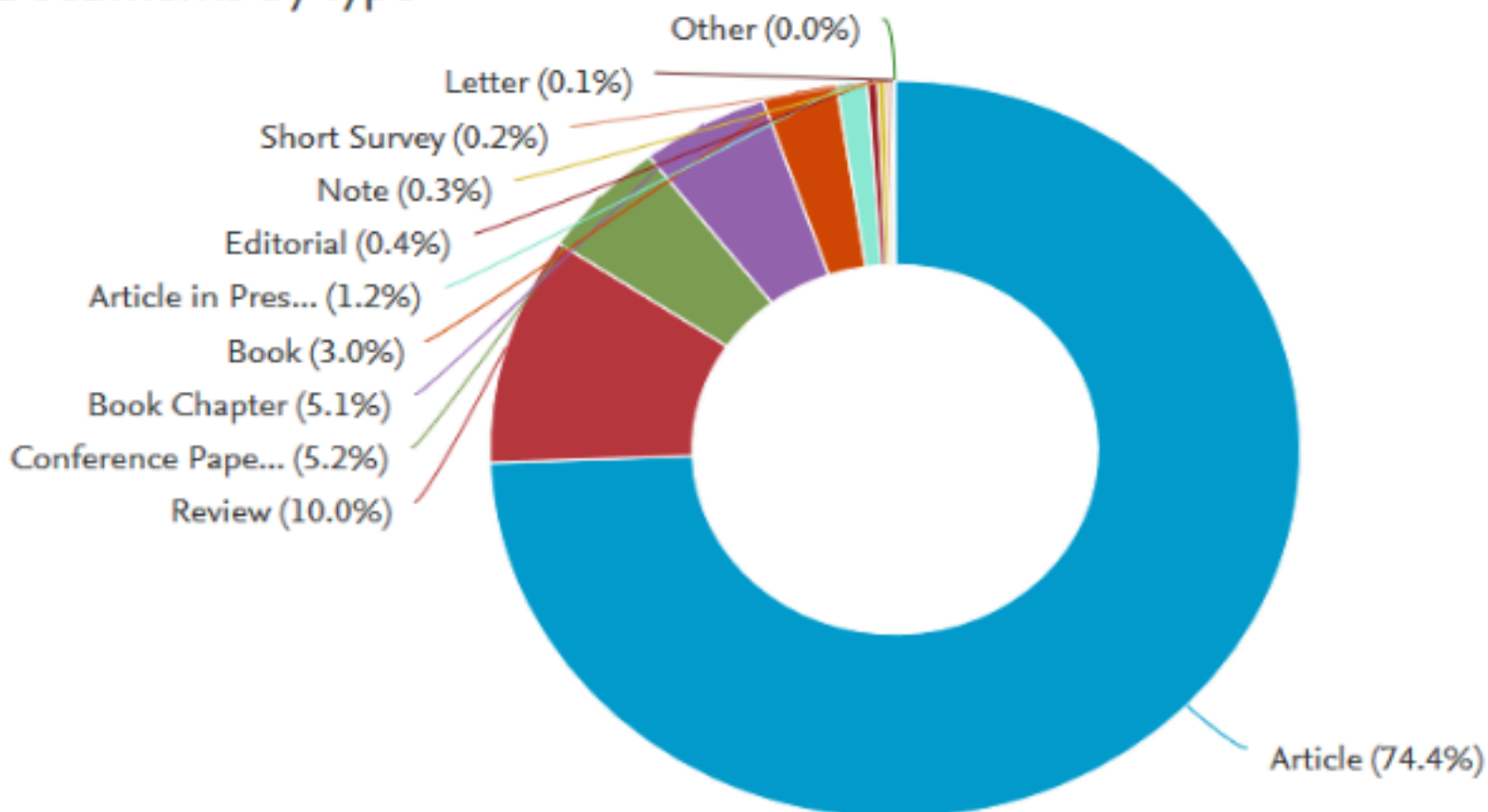


Likewise, figure 2 shows the countries where more articles are published on these topics. In Figure 3, we can see that 74% of the publications on this issue are scientific articles in indexed journals, 10% are review articles, about 5.2% are articles of conferences and international congresses and 5.1 % are book chapters.

**Figure 3**

Type of article on the subject of the assessment of the education system . Scopus

## Documents by type



### 2.1 Assessed competences in standardized tests

From the bibliographical consultation we obtained that in the standardized competences of mathematics the following criteria are evaluated:

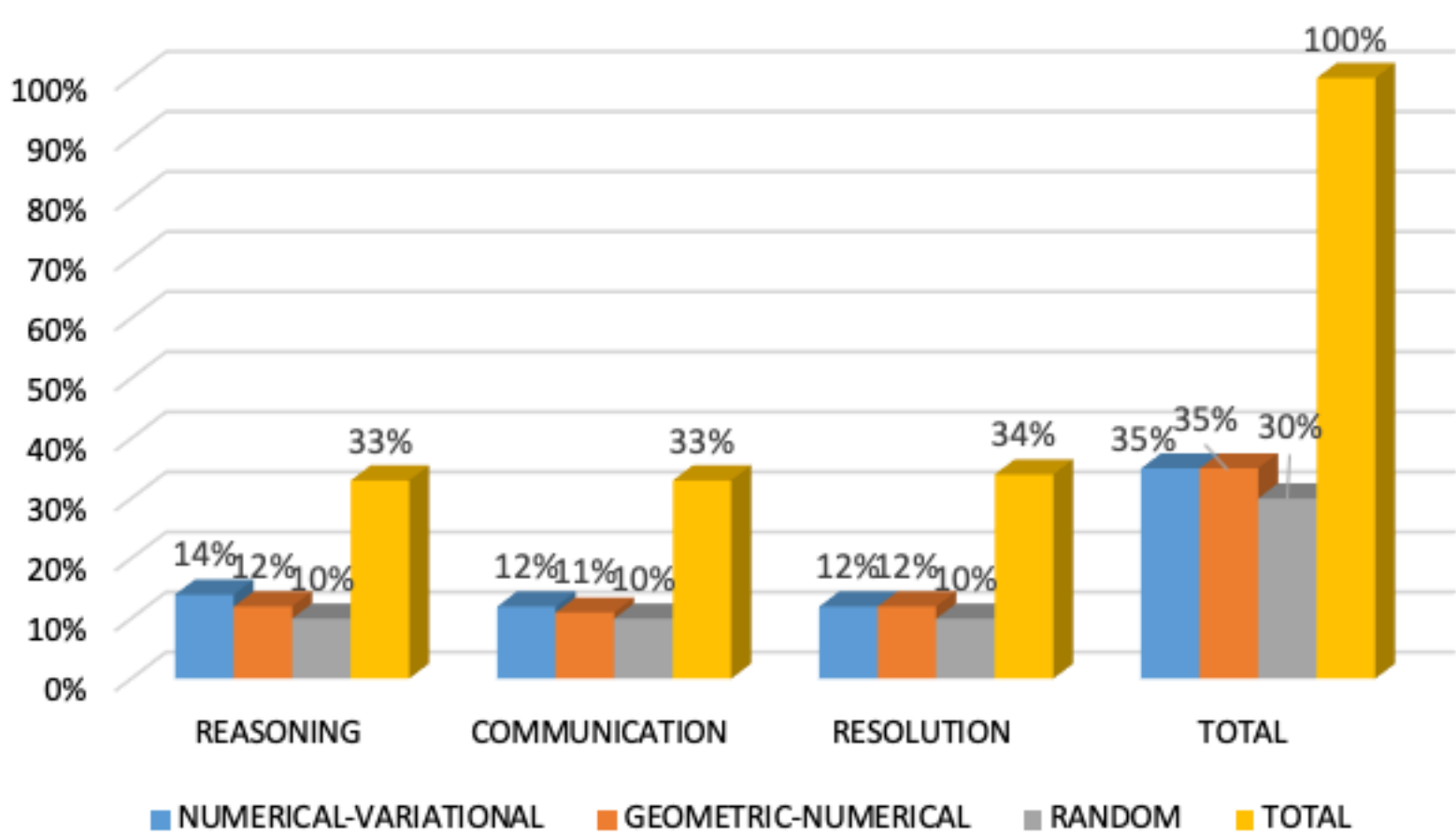
**Table 1**

COMPETENCIES		COMPETENCIES	
<b>Communication</b>	It refers to the student's ability to express ideas, interpret, use different types of representation, describe mathematical relationships, etc (Adams, D., 1993), (Darling-Hammond, L., 1994)	<b>Numerical-Variational</b>	It corresponds to aspects associated with numbers and numbering, their meaning and structure of the numbering system, among others (Popham, W. J., 2000), (Decristan, J., 2015).
<b>Reasoning</b>	It is related to the ability to account for the how and why of the paths that are followed to reach conclusions, etc (Popham, W. J., 2000), (Noaman, A. Y., et al 2017)	<b>Geometric-Metric</b>	It is related to the construction and manipulation of representations of space objects, the relations among them and their transformations, etc (Minima, E. L., et al 2018), (Campbell, C. M., 2015)
<b>Resolution</b>	It is related to the ability to formulate problems from situations inside and outside of mathematics, develop, apply different strategies and justify the choice of methods and instruments for problem-solving, etc ( Voogt, J., 2017), (Augustin, T., et al, 2015)	<b>Random</b>	Corresponds to the representation, reading and interpretation of data in context ( Voogt, J., 2017), (Augustin, T., et al, 2015).

### 3. Results

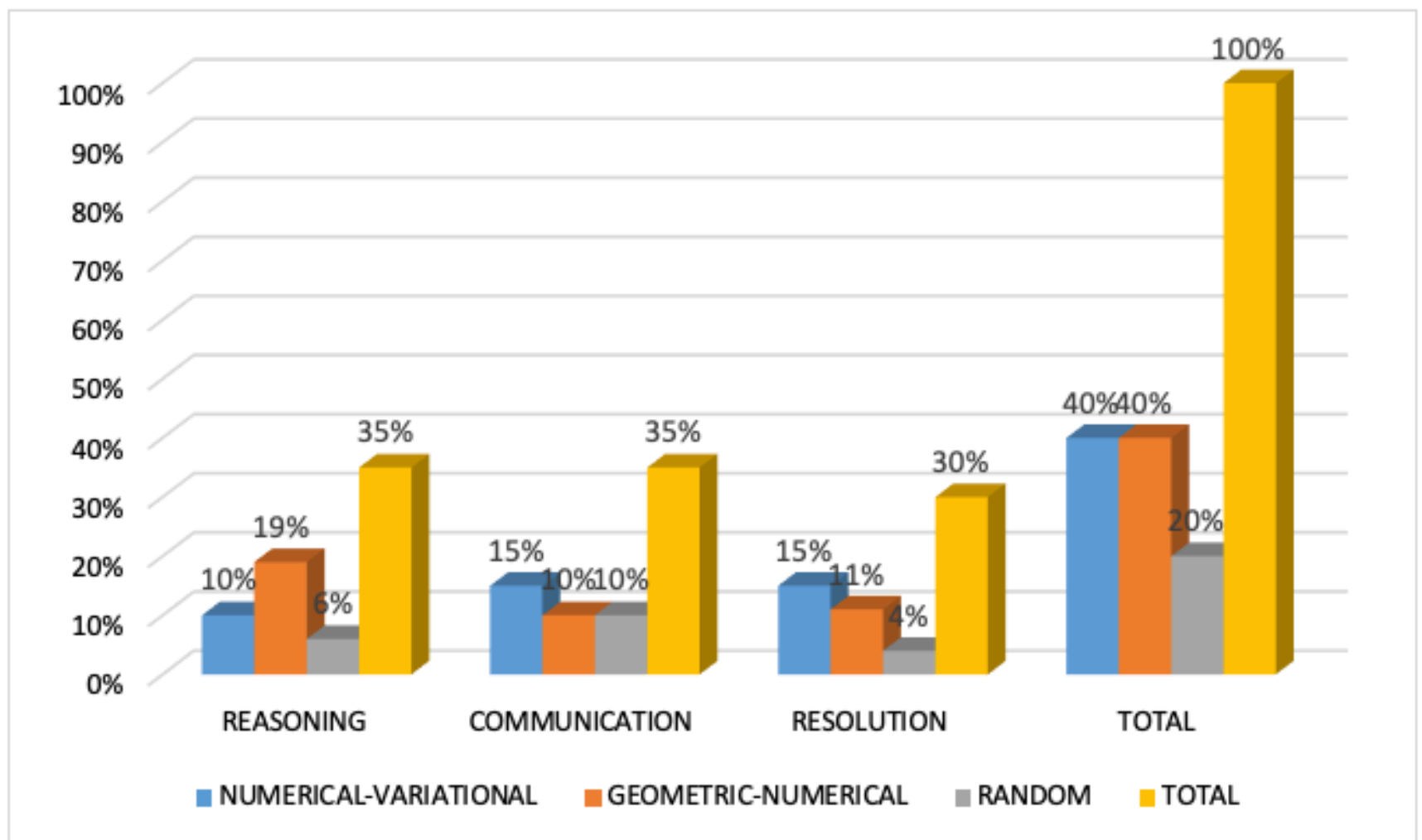
The task for those who develop standardized performance tests is to create an assessment tool that, with a handful of elements, produces valid interpretations based on standards of a student's status with respect to a substantial part of the content. The tests that do the best job of discriminating among students are those which were correctly answered by approximately half of the students. The developers avoid the elements that are answered correctly by many or by very few students. As a result of carefully sampling the content, and concentrating on the elements that best discriminate among the students, these test creators have produced efficient assessment tools which provide relative comparisons of content command in the subject area of mathematics between a particular student and students across the country. Assuming that the national normative group is genuinely representative of the nation as a whole, educators and parents can make useful inferences about students. From this relationship, the following percentage distributions arise from questions in the tests.

**Figure 4**  
 Mathematics test questions distribution  
 percentage – 3rd grade. Author

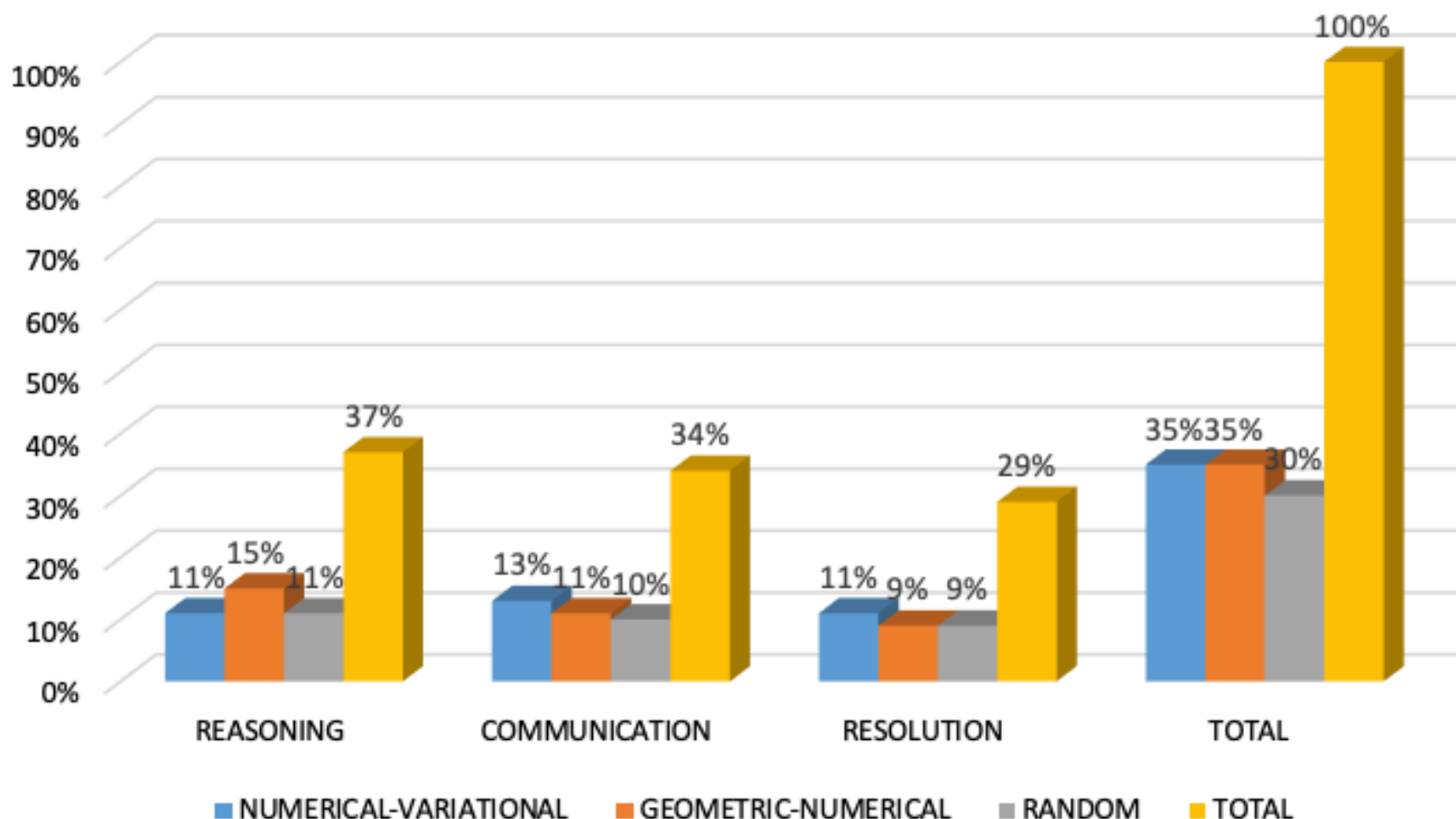


For example, if a standardized 45-item test in mathematics assigns 15 items to basic Information technology, 15 items to geometry, and 15 items to algebra, it might be possible to obtain a rough idea of a student's average strengths and weaknesses in those three topics of mathematics (Minima, E. L., et. al 2018), (Campbell, C. M., 2015). However, most of the time, these tests contain very few elements to allow meaningful comparisons within the subject's areas and the students' strengths and weaknesses (Augustin, T., et al, 2015).

**Figure 5**  
Mathematics test questions distribution percentage - 5th grade. Author



**Figure 6**



The second type of useful inference that can be based on standardized performance tests entails a student's growth over time in different subject areas (Voogt, J., 2017), (Augustin, T., et al, 2015). For example, let's say that a child is given a standardized performance test every three years. It can be seen that the percentile performance of the child in most subjects is relatively similar in each test, but the child's percentiles in mathematics seem to decrease drastically in each subsequent test. That is useful information to be able to measure its evolution. That is the reason for the adoption of this standard in Colombia.

## 4. Conclusions

The education system in Colombia has shown many essential changes over time, taking into account the technological advances that constantly generate challenges for students and teachers with the implementation of ITC (Information Technology and Communication) by the Ministry of National Education (MEN). Some of these changes have been beneficial for society and for the educational institutions as well.

Access to education has been a priority in Colombia, with ambitious policies that seek to increase the number of enrolled students in all levels of schooling and above all, to bring free quality educational services to every place of the country. Better guidance of the Colombian Ministry of National Education regarding the assessment of results in learning processes has led to major education reforms, which have influenced the activities that teachers perform inside and outside the classroom as well as the educational institutions of a quality assessment system.

Better management and better distribution of funds have set the foundations to have a more effective system that meet the needs of such a diverse country. National consultations on educational reforms have aroused a strong commitment in society to improve the country's education system.

Evidently, Colombia has had difficulties with the results of international tests which have placed the country in low rankings, taking into account the promise of the previous government to become the most educated country in Latin America. This challenge has not helped to improve the results of tests, especially the PISA test which is administered by the Organization for Co-operation and Economic Development (OECD).

The government's negligence is noticeable with regard to the investment budget in

education that allows advancement in learning processes and improvement of the quality of the education system in the country. However, in 2019 the government investment for education will be of 5.8% for a total of \$ 37.4 Billion, and educational reforms that have revolutionized the system will continue to make progress in research projects and participation of society, to improve all learning processes for children, and young people in the country.

At the Educational Institution " Los Negros " in Algeciras, pedagogical strategies have been carried out inside and outside the classroom, improving student's mathematical competencies such as:

- Reasoning and argumentation; among them are communication, representation, and modeling.
- Creating and problem-solving and their transversal components: numerical-variational, geometric and random.

These strategies are implemented for the purpose of improving the performance levels and thus obtaining greater assessment results in the SABER tests for third, fifth, ninth, and eleventh grades in order to place the institution in the highest academic ranking.

The learning of mathematics is specifically associated with the development of a set of skills related to:

- Standardized procedures: It includes the development of skills that are put into play to learn diverse procedures and methods that allow the constant use of instruments, the performance of calculations and estimations, the application of formulas and conventions that, subsequently, become routine algorithmic procedures.
- Problem-solving: It includes the development of skills such as identification of the unknown and estimation of its order of magnitude, searches and comparison of solution paths, data and solutions analysis, anticipation and estimation of results, systematization of the trial and error, application and adjustment of models, and statements formulations.
- Structuring mathematical concepts: It includes the development of skills such as particularization, generalization, searching for patterns and regularities, integration and knowledge synthesis, logical chain arguments, the distinction between assumptions and conclusions. The relationships between the different topics and concepts are also incorporated, and some background relating to some of their historical evolution.

One of the main objectives of these tests, is to contribute to the improvement of the quality of education, by means of implementing assessment annually, to measure the development of the basic competencies and the basic duties of learning in the students in primary school, basic secondary school, and mid-secondary school, as a follow-up of the quality of the educational system in terms of teaching and learning processes.

The results of the SABER test and the analysis of processes that influence these tests, allow educational institutions, municipal and departmental secretaries, the Ministry of National Education and society, to identify knowledge, skills and values that all students develop during the learning process in official or private educational institutions, without taking into account social, economic and cultural conditions, to define new educational reforms that define improvement plans in their respective areas of educational processes.

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