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# *¿Por qué no estudiar matemáticas?*
# *¿Why not study math?*

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**Resumen:** El pensamiento matemático representa un componente muy influyente en prácticamente cada uno de los aspectos de la actividad humana. Actualmente en nuestra sociedad las Matemáticas no gozan de una gran aceptación; a pesar de ser muy útil, tienen fama de difícil y casi todos evitamos situaciones que impliquen un razonamiento matemático, que vaya más allá de las operaciones básicas. El objetivo esencial de este trabajo es motivar el estudio hacia las matemáticas, en las personas y sobre todo en los estudiantes que se ven obligados a acercarse a ella, a partir de algunas consideraciones dadas.
**Palabras clave:** Pensamiento matemático; Matemática; Desarrollo Tecnológico.

**Abstract:** Mathematical thinking represents a very influential component in practically every aspect of human activity. Currently in our society, Mathematics does not enjoy a great acceptance; despite being very useful, they have a reputation for being difficult and almost all of us avoid situations that involve mathematical reasoning that goes beyond basic operations. The essential objective of this work is to motivate the study of mathematics, in people and especially in students who are forced to approach it, based on some given considerations.
**Keywords**: Mathematical Thinking; Math; Technological development.

## Introduction

At present, it is impossible to speak of technological development and the computerization of society without mathematics. These are fundamental for the development of humanity, so much so that, from ancient times to our times, valuable contributions have emerged that have allowed a rapid growth of scientific and technical progress.

We are all aware that the computer has invaded many aspects of daily life: medicine, computerized animation, mechanism control, data analysis, transaction verification and security, process simulation, etc., but the structural bases that allow it to the computer to do what it does, are complex mathematical theories of information, of fluid and gas mechanics, of computational geometry and many more.

If we stopped to think about the design of computers, mobile phones, means of transport, the internet and all the existing technology, we could conclude that without mathematics none of this would be possible, however, despite the benefits that the human being can obtain from them, it is worth thinking: Why is there so much rejection of this science?

Many have been the works that focus in this same direction, trying to encourage its study and at the same time to argue the reason for this rejection, for example: in (Houzel, 1977), it is addressed as one of the main causes and that influences in its reputation as "difficult", its cumulative nature: a new concept can only be understood if the previous concepts on which it is based have been well assimilated, so that, if any individual has gaps in learning in the early years of schooling, that affects you for the rest. When it comes to learning, if something is not understood, the learning will be superficial and the memory of him will not last long, he will not be able to assume the new concepts that are explained to him, and his contact with mathematics will end up being unpleasant.

At the same time, in (Comap, 1998) this question is answered by referring to the fact that the rejection is given by society's ignorance of the work of mathematicians, whose responsibility falls on themselves, because any attempt to diffusion of mathematical activity and any attempt to change what this author calls matephobia has had no relevance.

## Development

Mathematics, both historically and socially, is part of our culture and individuals must be able to appreciate and understand it. It is evident that, in our society, within the different professional fields, a greater mastery of ideas and skills is necessary, since tables, graphs and formulas that demand mathematical knowledge for their correct appear more and more frequently in the information handled. interpretation.

It can be said that mathematics is the language in which the pages of science are written (Courant & Robbins, 1971), it deals with describing and analyzing quantities, space and shapes, changes and relationships, as well as uncertainty, components that are present in all aspects of each individual's life, in their work, in their daily work, in the media, etc.

Therefore, we must be prepared to adapt effectively to the continuous changes that are generated, and then: **Why not study mathematics?**

Motivating the study of this science is a primary objective of this research, since the number of students who reject mathematics grows every day, reason that allows us to affirm that it is a social problem that is in contradiction with the current technological development of mathematics society, because although it is true that ICTs have invaded all spheres of society, it should be true that mathematics enjoyed great popularity today and it is not, for these reasons it is essential that a change of thought is achieved in the society and especially in students who greatly reject this science.

**The math. Importance.**

**What is Mathematics?**

We will answer this question by citing Courant's definition of Mathematics: "Mathematics is a science that has as its object the spatial forms and quantitative relationships of the real world" (Courant & Robbins, 1971, p. IX). We add that, in addition, it allows us to develop mathematical abilities: reasoning and demonstration, mathematical communication and problem solving.

The practical importance of mathematics in science is indisputable. In the hands of the scientist, Mathematics must allow to assimilate the data and understand the phenomena.

In the hands of the engineer, it is the tool that makes it possible to build a numerical or qualitative model whose analysis will allow making decisions, designing artifacts and controlling processes effectively and reliably.

Let us point out that there are still other complementary visions of mathematics (Houzel, 1977): its cultural aspect, its importance in teaching as a vehicle for rational thought, its importance for understanding the daily world, its intellectual game aspect. Mathematics is at the same time the science of the exact and the calculus of the probable.

It generates in people the ability to think abstractly, find analogies between various phenomena and create the habit of facing problems.

As a cultural value, it expands the cultural universe of the individual as it develops reading habits and perfects investigative skills.

She can explain and predict situations in the world of nature, economically and in terms of her social role in some way, mathematics encourages us to have a better organization, also to learn techniques or forms so that we can have an idea and develop methods that help us when making decisions.

**History, an essential factor in mathematics.**

History provides us with a magnificent guide to frame the different themes, the problems from which the important concepts of the matter have arisen, it gives us insight into the reason that has led man to deal with them with interest.

The history of mathematics (Bell, 1985), highlights the cultural dimension of Mathematics and its notable impact on the History of Thought, allows us to know the issues that gave rise to the various concepts, intuitions and ideas from which they arose, the origin of the terms, languages and singular notations in which they were expressed, the difficulties they involved, the problems they solved, the scope in which they were applied, the methods and techniques they developed, how they forged definitions, theorems and proofs, the connection between They to forge theories, the physical or social phenomena that they explained, the spatial and temporal framework in which they appeared, how they evolved to their current state, with what cultural issues they were linked, as well as the daily needs that they solved.

Teaching is not just a vocation or a profession, it can also be an art,

and there is no doubt that the knowledge of the History of Mathematics with its sublime and glorious moments and its dark and wasteful periods, decisively influences the teacher's spirit and his attitude towards Mathematics itself. For the teacher, the study of the History of Mathematics is an important element in his self-training, as well as one of the main sources of inspiration in the orientation of teaching activity. The teacher who is aware of History, in addition to taking advantage of the historical legacy to enrich his teaching activity, by knowing and understanding the difficulties of the contents taught will manifest a prudent, cautious and patient attitude and will find suggestions and support that facilitate the introduction of new concepts.

As Bell said: "No subject loses as much when divorced from its history as mathematics" (Bell 1985, p.54).

At the same time, Kline affirms: "The surest way to combat the dangers that threaten our fragmented science may be to get to know the achievements, traditions and objectives of Mathematics in the past, in order to direct research in fruitful ways" ( Kline, 1992, pp. 15-16).

**No to math**

It is very common to hear from students: I am bored with mathematics, I do not like mathematics, my teacher does not teach well, I do not understand mathematics, learning mathematics is very difficult, among others.

One of the main causes of the demotivation of the study of mathematical science are determined by the way and form of mathematics teaching (Guzmán, 2007), all of which in one way and another have this responsibility must be able to transmit these knowledge in a clear and coherent way to the point of bringing it to a level of understanding accessible to all students. Hence, many mathematicians consider that the difference between loving or hating mathematics lies in the quality and motivational capacity of the teacher or teachers with whom their learning begins.

Other causes are due to the little knowledge of its application, as there is no disclosure of these social impacts in the general population, it is not enough for the scientific and research community to reveal their results and contributions in specialized journals, debate sites and Internet pages to which a certain segment of society access, but we all generally need to know what is happening with mathematics, what is done with mathematics in scientific centers and poles, in universities, because only in this way mathematics It will take on the role it really has in society throughout its history and not the one we want to give it.

Let us encourage and encourage the study of mathematics in a more practical way, where the student sees his day to day reflected, we give to our society, what seems hidden and not all of us can understand with the naked eye or with a simple analysis, let us teach everyone and to each of our fellow men how to use mathematics.

**Some advantages of studying mathematics**

A graduate of the mathematics career can work in the area of finance, since the knowledge acquired throughout the career allows him to work alongside economists or accountants, being able to obtain a job in banking or financial entities, as well as in consultancies that provide advice. The mathematician can travel to different places to improve in certain areas or learn new ways of handling already known theories. In this way, they can participate in colloquia, seminars or exposition of new theorems, either as spectators or as exhibitors.

On the other hand, you can also find jobs in the scientific field, especially some laboratories, because it is usual for mathematics professionals to excel in research on different topics such as health and many can focus on more biological issues. Mathematicians handle algorithmic topics perfectly and with great experience that help in many studies on chromosomes or the functioning of organisms, as well as in the search for medicines to alleviate or cure diseases.

Mathematicians work in companies and educational or research institutions, teaching and applying numerical and statistical methods for analysis, problem solving, and modeling.

**Applications**

Today we are surrounded by artifacts, which make our daily activities at home, work, school or our social environment more and more comfortable, fast, safe and / or efficient. But have we ever wondered why they work so well, fast, reliable, secure, etc.? Almost all of us would answer: for the great technological advances, but exceptionally we would listen: it is for mathematics. Let's look at some examples in detail (Pineda, 2009):

- **Biomedical:** In medicine it is increasingly common to carry out studies that involve some type of image and every day the techniques to capture images are improving, for example, of what is known today as tomography. In this process, in addition to the technology involved, efficient, fast and reliable algorithms are required to analyze the data generated by the device and produce an image from which we can interpret health or disease. The mathematics used to generate this image is very sophisticated and is continually being updated to improve the results. Similar methods are used in programs that analyze a preoperative state and predict a result when submitting the patient to

surgery, these programs are increasingly common in cosmetic surgeries where the patient can see the possible results of a surgical intervention of this nature. There are currently some interventions that are performed by robots, these virtual surgeons are designed with a high participation of mathematicians who with the help of various actors: surgeons and engineers collaborate so that the movements of the robot-surgeon are precise and reliable and thus be able to put in their hands a patient.

Since 1980, mathematical models of the human immunodeficiency virus (HIV), the virus that causes AIDS (Acquired Immune Deficiency Syndrome), have been built. Several mathematical approaches fit into the process of modeling HIV immunology. Statistics traditionally served as the greatest tool and still play an important role in understanding the dynamics of this disease at all levels.

- **Telecommunications**: In telecommunications, it is imperative to transmit data between two places efficiently, quickly and safely. This requires the design of algorithms that invariably meet these three requirements, for example it is useless to send a message that is very fast but arrives incomplete or damaged (fast but not efficient), nor is it useful to send a message that arrives flawless but takes several months in reaching your destination (efficient, safe but slow); Even if the sending of my message has the first two characteristics, it is useless if anyone finds out about its content (it is not safe). We surely appreciate this every time we use our debit card at an ATM; we want our money fast, without failures and without anyone else being able to access my data. These characteristics are repeated almost in all electronic transmissions. The tools used in the design and implementation of algorithms require considerable math work.

When a user uses a mobile phone, he does not know the amount of scientific and technological contributions behind this little gadget: telecommunications, computing, signal processing and mathematics. There is a lot of mathematics and algorithms behind mobile telephony. The first ones constitute the theoretical support of all the stages in the treatment of the information, which makes possible a telephone communication from a mobile. It is up to the second, algorithm, to convert these results into effective and efficient protocols. Let us remember that all the data transmitted in a mobile radio network are numerical (packets of 0 and 1 of a certain

length, which contain the information). And that the great difference with classical telephony is that these packets are transmitted by Hertzian waves, not by cable.

- **Meteorology:** When a citizen sees and hears the weather information on the television news, he does not think for a moment that he is facing an extremely delicate matter, a multidisciplinary problem, in which several sciences intervene: chemistry, physics, computer science and also mathematics. In preparing the numerical weather forecast, the atmosphere is divided into boxes with a square base of certain dimensions, in the centers of which the meteorological parameters are determined: pressure, wind speed, humidity, cloudiness ... Starting from an initial state of the known atmosphere, all possible data is supplied to powerful computers that, together with the laws of physics, will dictate how time will evolve.
- **Computer Security:** The secret of the credit cards lay in an encryption method that involved a very large N number, hundreds of digits, which is the product of two immense prime numbers. Thus, the security of our cards was guaranteed by a couple of large prime numbers, given the practical impossibility of decomposing N into factors, in those years (in France N had then 97 digits). With the dramatic increase in the computing power of computers, it was necessary for security reasons to increase the number of N digits (in 2002 N numbers with almost double the numbers were used). Cryptography, the science of encoding and decoding, is a thriving part of mathematics today.

Another example of daily life in which Mathematics is used is to program video games, since you need to know physical laws and have the ability to create algorithms. For example, Cartesian axes are used to make games or to program in two dimensions, for a three-dimensional view, the Z axis would also be used, in addition to the X and Y.

- **Production:** The solid preparation in the areas of basic science, especially in mathematics, enables the engineer to perform in the agro-industrial work, allows him to contribute to the productive matrix in which scientific and technical knowledge are applied, and combine the resources of capital, labor, energy and inputs, to give it added value in: The production of raw materials of agricultural, livestock, hydrobiological

and forestry origin; the application of technology in the harvest, post-harvest and storage of raw materials, through the use of packaging, packaging that facilitates its transport and distribution in good conditions; industrialization, through conservation and transformation processes, to obtain quality food and non-food goods; the marketing of the products.

Obviously, a deep work of social awareness is needed so that people value and positively accept mathematics and an adequate teaching process that includes effective and fun methods to successfully promote their study among the new generations and develop attitudes in students in favor of mathematics.

The task of making the meaning of the activity that the mathematical community is carrying out in an affordable way to reach a wide segment of society is something inescapable if we intend for our culture to progress properly and will surely contribute to breaking the false concept that we have. Around mathematics, it will provide essential tools for many activities in the professions of the future and will encourage the role of mathematics today to be adequately valued and unquestionably achieve a mathematical culture at the height of these times.

## Conclusions

Reaching the conclusion that mathematics is important in our daily life and that it plays an essential role in the development of humanity and science in general is a fact, however, it is not that reality that prevails in our times and for that is worth asking:

How to adapt to global technological improvements and changes, having a society without a mathematical culture?

How to achieve a truly sustainable and sustainable process of computerization of society?

How to carry out an adequate and safe cybersecurity policy?

How to face the foolish challenge that today's world proposes to science with accelerated technological development, not to mention mathematics?

How can we become a country of men of science if every day the number of men who dedicate themselves to this noble and sacrificial activity is less and the number of students who are inclined to study this specialty is less and less?

These questions serve as a starting point to begin an arduous work aimed at promoting the study of this valuable science without which the development of humanity would not have been possible.

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