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# Mathematics: the attitude, taste and performance in this subject of the students of the bachelor's degree in Administration and Management of Small and Medium Enterprises of the Universidad Politécnica de Pénjamo

# Matemáticas: la actitud, el gusto y desempeño en esta asignatura de los estudiantes de la Licenciatura en Administración y Gestión de Pequeñas y Medianas Empresas de la Universidad Politécnica de Pénjamo

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**Abstract**

The following research has the purpose identify factors that influence the performance of students in the Licenciatura en Administración y Gestión de Pequeñas y Medianas Empresas de la Universidad Politécnica de Pénjamo in the áreas of mathematics. The attitude, the domain, the retention and enthusiasm for mathematics are some of them, which together will determine the performance and professional development of the student. The youth of the three cycles of career training were surveyed in the period September-December 2014. Finally with the information obtained and analyzed a series of recommendations that will improve the level of youth and teacher's degree in mathematics is proposed.

**Mathematics, Factors, Students, Performance, Degree**

**Resumen**

La siguiente investigación tiene como propósito identificar los posibles factores que influyen en el desempeño de los estudiantes de la Licenciatura en Administración y Gestión de Pequeñas y Medianas Empresas de la Universidad Politécnica de Pénjamo en las materias de matemáticas. La actitud, el dominio, el nivel de retención y el gusto por las matemáticas son algunos de ellos, los cuales en conjunto, determinarán el desempeño y desarrollo profesional del estudiante. Se encuestaron a los jóvenes de los tres ciclos de formación de la carrera en el periodo septiembre-diciembre 2014. Finalmente con la información obtenida y analizada, se generan una serie de recomendaciones que permitirán mejorar el nivel de los jóvenes y profesores de la licenciatura en las matemáticas.

**Matemáticas, Factores, Estudiantes, Desempeño, Licenciatura**

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## Introduction

Most of the young students have been arriving at the bachelor's degree in Administration and Management of SMEs at the Universidad Politécnica de Pénjamo with a great educational lag and deficiencies in mathematics, one of the most important subjects to develop competences related to mathematical logic, analysis, and interpretation of results. Those entering university are young people who come from different educational systems in the region. In other words, students who had different: teachers, teaching methodologies, educational environments, classroom resources, classmates, study programmes.

All these factors influence the level of knowledge acquired in that period with respect to mathematics.

Each subject provides the knowledge necessary for the acquisition of the competences that contribute to the previously established profile of the future professional. If they do not learn and acquire competence in the basic subjects, they will not be able to continue with their training, the deficiency will be notorious and will be reflected in their academic achievement.

We can see the student in the classroom willing to learn, to accept as true what the teacher teaches and to do all the necessary activities and exercises. Even so, this is no guarantee that the student will acquire the knowledge that has been previously established.

In the mathematics teaching-learning process, both the student and the teacher have a shared role in education. If one of the two fail, the transmission of knowledge and the development of competences will not be achieved.

Obviously, in an educational system, it is difficult for a student to choose to stay in a subject until he/she has mastered it completely, or to retake a subject that he/she passed with difficulty in order to reinforce and improve his/her learning.

Other aspects that prevent the student from acquiring the necessary knowledge of mathematics are:

- The predisposition of the students if they enter mathematics classes thinking that it will be difficult and most likely they will fail or simply not understand what is seen, with all that in mind the young person will not make an effort to learn, they will only pass up the opportunity to learn and resign themselves to failing.

- The time spent on the subject per day or per week influences the mastery of the topics and the reinforcement of knowledge. It is unlikely that in a one-hour classroom session it will be possible to solve enough problems and exercises for a subject to be fully assimilated. This is where the need to continue practising what has been seen in class arises. But it is observed that most students do not see the need to dedicate more time to continue practising after class.

- Bad study habits and/or lack of good ones prevent a complete or acceptable development in the subject. Being a subject that involves learning processes that take a structured logic and time to learn how to use them, it requires the student to form specific habits, something that is not observed in most of them.

- As a subject that requires practising what has been seen in class, it is counterproductive to leave an excessive number of exercises for the student to learn.

- It can generally lead to information saturation and blocking, loss of knowledge and competence related to the topic.

- Trying to take the group to the next level with exercises from a higher level, even if they are related but with a higher degree of difficulty, the student may perceive this change as frustrating because even though he/she knows the subject, he/she cannot solve the exercise due to lack of skill and knowledge of other techniques and logic.

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- The tutorials that are an option to reinforce knowledge, for most students, is an activity that is perceived as something extra or punishment, or simply something that will not give points in the subject. In terms of time, it is leaving school after class time.

- Bad experiences in relation to mathematics is an element that emotionally prevents the young person from learning, and as a result, academically speaking, it is a lag in their professional training.

Entering a more demanding environment and with a more accelerated work dynamic, generally causes an imbalance in the student's performance. Most of them graduate from slow and lax educational systems, where the workload was minimal, or it was only a matter of fulfilling the requirements to pass the subject.

As in any subject, attitude is important, both student and the teacher. If a traditionalist system continues in the classroom where the teacher only explains a concept and a procedure, followed by replication of information by the student without making sense of the knowledge that can be acquired. This leads to an atmosphere of boredom, tension, frustration, and disinterest on the part of the young student.

There are many factors or elements in an educational environment that can cause the student not to learn and miss the opportunity to acquire the relevant competences. A student who finishes his or her degree without well-developed professional competences will be a person who will find it difficult to compete against other people in the labour market. The logic developed by mathematics is a basic tool for every professional.

This problem has caused the Polytechnic University of Pénjamo and the Bachelor's Degree in Administration and Management of SMEs to face this situation year after year without being able to implement adequate and timely strategies to solve the low performance of students in mathematics subjects.

**Research question**

Is the student's attitude towards learning mathematics a relevant factor for their professional training?

What are the factors that need more attention to improve students' performance in mathematics subjects?

**Hypotheses**

$H_1$: The attitude of young students should be adequate to take mathematics subjects in the degree course in order to acquire relevant knowledge, competences and skills.

$H_2$: The factors that need to be given more attention for better achievement of students in mathematics subjects are:

- Ability to learn.

- Mathematics proficiency.

- Level of retention.

- Enjoyment of mathematics.

**Overall objective**

To generate strategies to improve student performance in mathematics in the Bachelor's Degree in Administration and Management of Small and Medium Enterprises at the Polytechnic University of Pénjamo by analysing the factors related to the subject.

**Specific objectives**

To survey the students of the three cycles of the degree to obtain a data base on those factors that are involved with mathematics.

To analyse the data collected in order to generate information that will reveal these factors and their tendency among the students of the degree course.

To choose the most appropriate actions that will have a positive effect on the undergraduate students for the development of their competences and attitude towards mathematics subjects.

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## Theoretical framework

Context about mathematics in Mexico According to the Revista de Educación y Cultura (2014) comments that in Mexico 33% of young people under the age of 18 who are about to finish their baccalaureate can only perform basic mathematical operations, while 30% are at the lowest levels of competence in science. The performance of young people is below the minimum which prevents them from continuing with higher education or successfully entering the labour market.

Reference is also made to the study by the National Institute for the Evaluation of Education (INEE) of 17-year-olds about to finish high school, called PISA Grade 12, which reveals that nationally at least one third are below level two in mathematical performance. It indicates that they can only perform very simple mathematical tasks such as reading a single value on a graph or table in which the names of variables are clearly identified; they can follow clear and well-defined instructions; and perform routine procedures following direct instructions.

Thirty-one per cent are at level 2, considered by PISA to be basic (Journal of Education and Culture, 2014). It categorises students who can only make literal interpretations of results, use algorithms, formulae, conventional or elementary procedures to solve problems with integers or extract relevant information from a single source of information.

In his work to improve mathematics education, Guzmán (2007) pointed out that it is necessary to break, by all means, the preconceived idea, strongly rooted in our society, stemming from initial blocks in the childhood of many, that mathematics is necessarily boring, useless, inhuman and very difficult.

Educational problems such as failure and low achievement can no longer be explained by classical socio-economic theories, the expelling school or authoritarianism (Petriz & López, 2010). In societies, as Palacios and Sandoval (2011) mention, they are a product of knowledge, as individuals are now required to be fluent in concepts, ideas, and abstract objects, which are not directly observable.

Science and technology require a solid training in the formal, particularly in mathematics, as it structures the mind, making it possible to tackle problems of various kinds.

*Mathematics*

The curriculum standards seek to answer the question: what mathematical content and processes should students learn to know and be able to use as they progress through their education? They are structured into content and process standards (National Council of Teachers of Mathematics, 2000). The five content standards are organised as follows: Numbers and Operations, Algebra, Geometry, Measurement, Data Analysis and Probability.

The process standards proposed by the National Council of Teachers of Mathematics in the United States are as follows: Problem Solving, Reasoning and Demonstration, Communication, Connections, Representation.

Mathematics at university level contemplates a sequence of courses related to calculus, this subject is manifested as a theory that prioritises the position that knowledge occupies in a logical chain and that emphasises the solution of routine exercises where algorithmic skills are practised, however, the ability in the mechanical application of a memorised rule does not necessarily manifest the development of thought processes linked to mathematics (Salinas, Alanís, & Pulido, 2011).

For González (2011), numerical operations involve relationships between three elements that can vary; therefore, they have a higher degree of difficulty and greater maturity in the person.

This means that in mathematics there are a large number of concepts that need to be learned intuitively, and that based on them and through rational inference, models of thought can be constructed that will generate appropriate reasoning strategies (heuristics) for the solution of mathematical problems.

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The teaching and learning of mathematics has occupied a very important place in the educational sphere and is currently being revitalised by considering that skills in this field form part of the key competences for a successful life and good functioning in society (Silva & Rodríguez, 2011). To this end, the following recommendations are made:

- Strengthen students' basic notions, pay more attention to the gaps they experience in critical conceptual knowledge, such as geometry.

- Focus pedagogical work on students constructing the basic notions and concepts of mathematics themselves, so that they become their own resources rather than recipes when solving problems.

- Pay more attention to reading comprehension and stimulate the establishment of relationships between data, as well as the generation of inferences from the situations posed.

- Implement and encourage creative ways of approaching mathematical problems. Use real problems (meaningful challenges) and clarify the type of competences to be assessed.

- Use real problems (real or hypothetical situations that are plausible for the student) that pose significant challenges and activate the student's interest and mind.

It is necessary to discourage the use of exercises that demand mechanical answers, which only require memorising an algorithm.

Días, Hernández and Hernández (1999) point out that learning the contents that are taught considers three types of knowledge: declarative knowledge that is related to knowing how to know; procedures that focus on knowing how to do and those that are linked to attitudes that refer to experiences but involve people's value judgements, although the components that have to do with attitude with respect to the two previous ones have been little attended to in the curriculum, teaching and research.

When faced with a statement, students look for a set of habitual references in the problems that allow them, on the one hand, to discover the mathematical procedure to which it refers, and, on the other hand, to decide on the most appropriate manipulation of the data contained in the statement. Here the usual mechanisms begin to be applied, and when they do not work, or work incompletely, the result is a blockage, an incoherent action, or an abandonment of the problem, comments Gómez (2002) in his studies.

Similarly, Gómez (2002) observes that in many cases, students do not recognise that what is being worked on in mathematics classes is mathematics, i.e., they are used to a mechanistic approach to this discipline, which they have been learning since primary school. But at higher levels of studies, the aim is to bring them closer to formative mathematics, from problem-solving approaches or from a cultural perspective.

This raises some unfamiliarity or perplexity, others have negative, positive reactions, although they continue to believe that this is not mathematics.

When students learn to solve problems, they must learn how to decide what to do and when to do it. If someone always tells them what to do, they will not learn these skills on their own.

> "It would be a mistake to believe that problem solving is a purely intellectual matter; determination, emotions, play an important role. A little determination, a little desire to do as little as possible may suffice for a routine classroom problem, but to solve a serious scientific problem, it takes a willpower capable of resisting years of bitter failure".

A key element for Gómez (2002) is the authority of the teacher, which is one of the images of the school, since when he poses a problem to his students, it is well posed, and the student has the necessary elements to solve it.

Chevallard, Bosch and Gascón (1997) explain that doing mathematics is a work of thought that constructs concepts to solve problems. By solving mathematical problems, mathematics as an activity introduces in many cases a fundamental component that they call mathematicising.

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Mathematics says Chevallard, (1991) is a language of its own that gives clarity to mathematical objects in order to communicate them in a precise way. For him, mathematical symbols and terms are decisive in favouring understanding.

Rejection of mathematics is not unidimensional but is lower or higher according to the type of mathematical content. There is less rejection of arithmetic and algebra, and more rejection of geometry. This is due to the forms used in the teaching of these contents, and to a certain lack of linkage between geometry programmes from one educational level to the next (Navarro & Pérez, 2002).

For several years now, changes have been made in the mathematics syllabuses of educational institutions to achieve better teaching. And for this, mathematics curricula focus on the development of student learning and competence. (Flores & Gómez, 2009). For this to be achieved, they propose that the teaching of mathematics should be based on what they call a basic culture in mathematics, in which the student should possess:

- Mathematical thinking that allows them to recognise patterns and generalise, justify results through mathematical arguments, and use representations of the same mathematical object.

- Problem-solving skills that enable them to use mathematical thinking to pose and solve problems within and outside the mathematical field.

- Competence in the use of technology that enables them to use the technologies available to them to facilitate problem solving and the acquisition of their knowledge.

- Positive attitudes towards mathematical tasks that allow them to pose problems and argue their resolution as their own responsibility that will benefit them and others.

- Human values that allow him/her to coexist better with his/her peers and the environment that surrounds him/her.

To be successful in this culture, a teaching-learning environment is proposed that allows the student to develop responsibility for the acquisition of their own knowledge, basic mathematical knowledge and competences are fostered and positive human attitudes and values are promoted (Flores & Gómez, 2009).

*Attitude*

In classrooms, greater emphasis is given to cognitive coordinates and programme content, forgetting that the primary fabric is attitudes and beliefs (Richardson, 2002). She points out that attitudes are the prior appraisals that a person makes about different aspects of reality and basically involve a person's disposition towards a given situation and imply a judgement about it. Similarly, Gómez (2000) mentions that contemporary mathematicians distinguish two approaches: that of the attitude towards mathematics and that of the mathematical attitude. The former emphasises the affective component, the latter the cognitive component. According to the author, the attitude towards mathematics is understood as a set of dispositions shown by the individual to accept or not, to become familiar or not, with certain content. It is here that the attitudinal aspect can be determined by circumstances, episodes or incidents for the configuration of a general judgement, such as the rejection of the subject.

The factors that influence attitude towards mathematics are liking, anxiety, usefulness, motivation and confidence, all of which are handled as constructs that need to be located within a theoretical model (Auzmendi, 1992).

The fact that language, which tries to situate concept formation, distinguishes reason and emotion, between thinking and feeling, and classifies the cognitive and the affective separately, allows us to speak of them as distinct, but reason and emotion cannot exist independently (Gómez I. M., 2002). He also comments on how a change in emotion or cognition produces a change in the other. This means that a student's behaviour cannot be considered as a result of one or the other, but that both have to be taken into account, since in learning situations what the student feels is considered as important as what he or she thinks, even in areas such as mathematics, where cognitive aspects are considered more important.

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About attitudes, Martínez and Oswaldo (2008) comment that they can be manifested through factors such as ideas, perceptions, tastes, preferences, opinions, beliefs, emotions, feelings, behaviours and tendencies to act. This is where they arrange them according to four attitudinal components such as:

- Cognitive component (knowing/knowing): corresponds to the load of information and experience acquired by the subject with respect to the object of his attitude and the same is manifested or expressed through perceptions, ideas, opinions, conceptions and beliefs from which the subject is placed in favour or against the expected behaviour.

- Affective component (emotion/feeling): this is expressed through emotions and feelings of acceptance or rejection of the person or situation that generates the attitude.

- Conative or intentional component (intention): is expressed by the subjects through their voluntary inclusion to perform an action.

It has the predisposition, predilections, preferences, tendencies or intentions to act in a specific way towards the object.

- Behaviour component (behaviour): is formed in the observable conduct, properly speaking, which will be conceived as a set of behaviours.

- Under the same theme, Gómez (2003) comments on two types of attitudes:

Gómez (2003) adds that due to their mathematical attitudes, subjects can be considered as attitudes that should be taken into account as an affective dimension that should characterise them, for this it is important to distinguish between what the subject is able to do (ability) and what he/she prefers to do (attitude). This can be seen in table 1.

| Category | Attitude |
|---|---|
| Attitudes towards mathematics | - Towards mathematics and mathematicians<br>- mathematicians (social aspect of mathematics).<br>- Towards mathematics as a subject.<br>- Towards certain parts of mathematics<br>- Towards methods of teaching mathematics.<br>- Interest in mathematical and scientific work. |
| Mathematical attitudes | Flexibility of thought.<br>Open-mindedness. |

**Table 1** Attitude categories when the object is mathematics

Martínez and Oswaldo (2008), cite Polya's statements Page 12 (1965, p. 80) where he comments that it would be a mistake to believe that solving a problem is a purely intellectual matter, since determination and emotions play a role.

(80) where he comments that it would be a mistake to believe that solving a problem is a purely intellectual matter, as determination and emotions play an important role. Here, affective referents are involved in the success or failure of students and teachers in the development of their tasks aimed at the production of knowledge and the construction of mathematical knowledge.

The National Council of Teachers of Mathematics (2000) published the six principles for school mathematics, which are:

1. Equity: Excellence in mathematics education requires equity; high expectations and strong support for all students.

2. Curriculum: It must be coherent, focused on relevant mathematics and well-articulated across the different levels.

3. Teaching: Effective mathematics teaching requires knowing and understanding what students know and need to learn about mathematics; and then motivating and supporting them to learn it well.

4. Learning: Students must learn mathematics by understanding it, actively constructing new knowledge from their expectations and prior knowledge.

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5. Assessment: It should support the learning of relevant mathematics and provide useful feedback to both teachers and students.

6. Technology: It is essential in the learning and teaching of mathematics. Students can develop a deeper understanding of mathematics through the appropriate use of technology.

## Methodology

To carry out this research, the following methodology will be followed:

Type of research: The present will be a descriptive and non-experimental research as only the population will be analysed without altering the variables, conditions and space that comprise it.

Universe: The Polytechnic University of Pénjamo.

Population: Students of the Bachelor's Degree in Administration and Management of Small and Medium Enterprises.

Sample: Students of the three training cycles of the degree (first, fourth and seventh semester).

Setting: The research will be carried out in the Bachelor's Degree in Administration and Management of Small and Medium-sized Enterprises.

Timeframe: September-December 2014

Instrument: Survey: The survey will be applied in writing to each student of the three semesters and will consist of 16 items with a Likert-type response scale.

Data collection: SPSS Version 18 software to divide data by term and trends in percentages; and Microsoft Excel 2010 for the generation of more specific graphs.

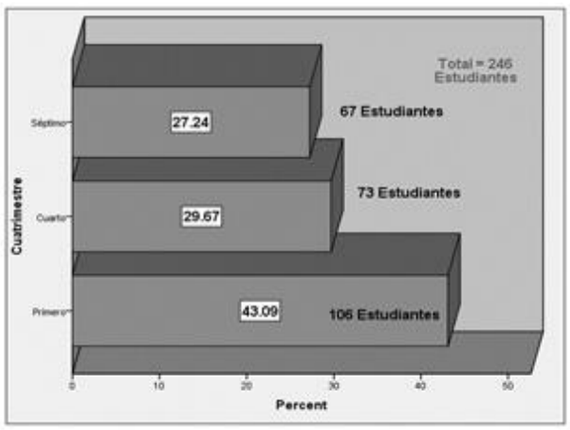
Data analysis: Percentage trends will be observed for each of the three semesters.

Results: The results will be presented in tables and graphs that specify the trends of the factors chosen for the research. The results will be used to generate strategies to improve students' performance in mathematics.

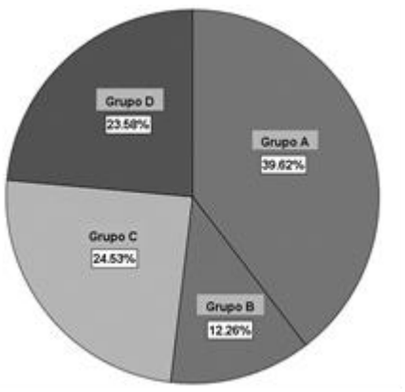
## Results

Based on the surveys applied and the trends observed, we show below the results obtained using SPSS software for the concentration and division of the data by term, as well as Microsoft Excel to visualise the information in tables and graphs.

We surveyed 246 students enrolled in the bachelor's degree in Administration and Management of Small and Medium Enterprises, which are divided as follows as shown in graphics 1, 2, 3 and 4.




**Graphic 1** Students per semester of the course September-December 2014




**Graphic 2** First four-month period

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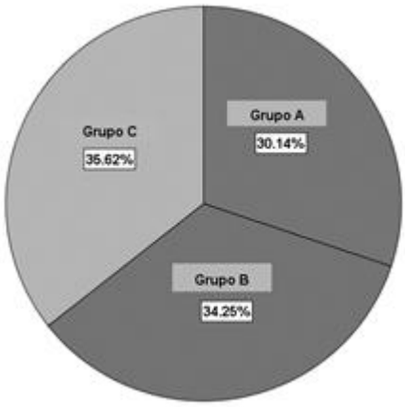
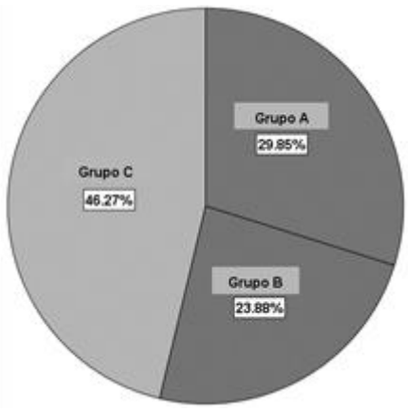



**Graphic 3** Fourth four-month period

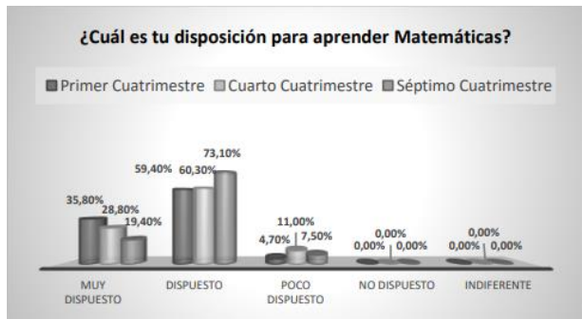



**Graphic 4** Seventh four-month period

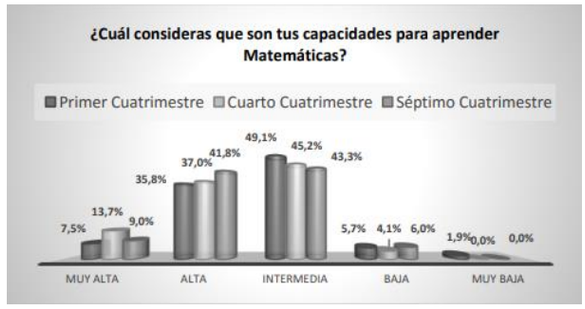
Most students are from the first semester and the least number from the seventh semester. In this degree, the first cycles of training are the ones that take the most mathematics in relation to the last four-month period.

The results of the factors taken into account for this study are shown below, due to the large amount of information generated during the analysis process.

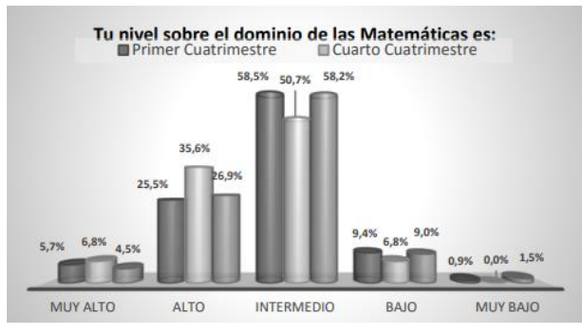

**Graphic 5** First question



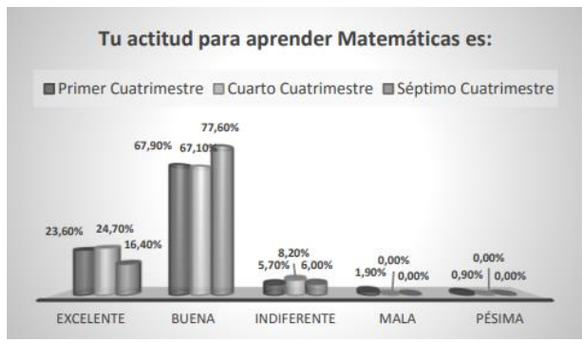

**Graphic 6** Third question



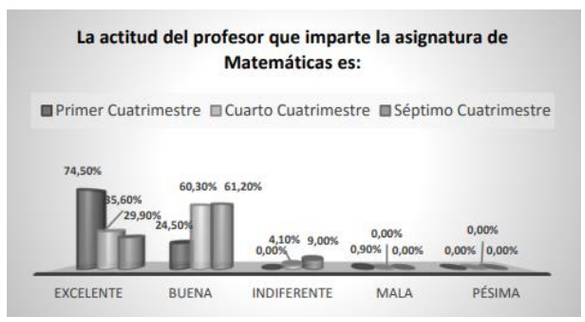

**Graphic 7** Question 4




**Graphic 8** Fifth question




**Graphic 9** Question 7




**Graphic 10** Eighth question

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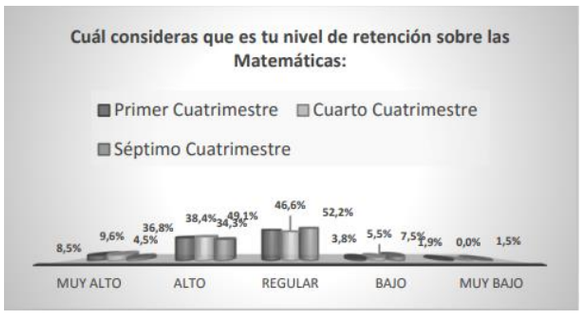
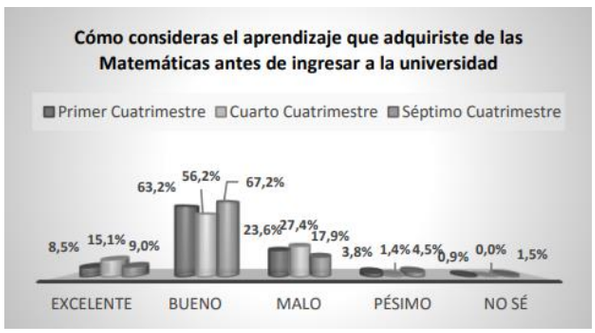
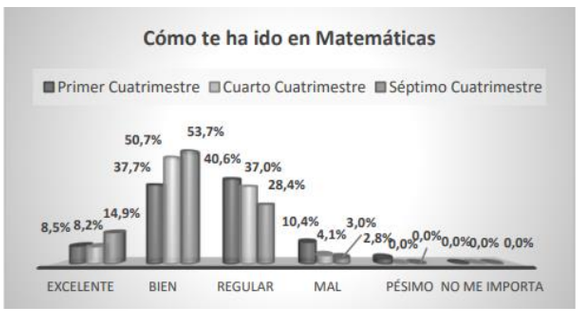



**Graphic 11** Ninth question


**Graphic 12** Tenth question

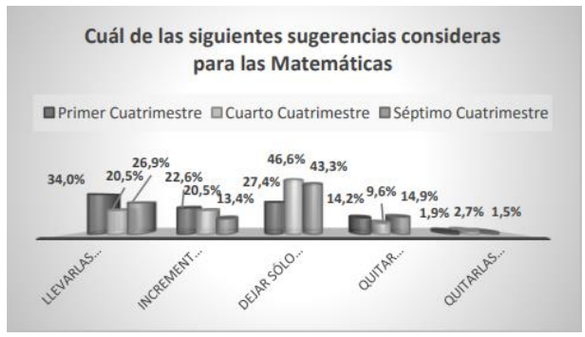



**Graphic 13** Eleventh question




**Graphic 14** Twelfth question


**Graphic 15** Thirteenth question




**Graphic 16** Fourteenth question

## Analysis

With the evidence collected from the surveys, there are results with clearly verifiable trends. Among them, it is observed that:

1. Students consider mathematics to be important mathematics both for their education and for their professional life. for their professional life.

2. They have a great willingness to learn mathematics to learn mathematics and to acquire the associated associated with it.

3. They consider themselves to have a medium-high ability and proficiency in mathematics-related subjects. related to mathematics.

4. The level of knowledge of the teachers teachers who teach mathematics subjects is high and and adequate, and that they have a good attitude and adequate, and that they have a good attitude to the subject and transmitting knowledge. knowledge.

5. The students consider that they have a good and excellent attitude towards mathematics. This helps them to be mentally prepared for the teaching-learning process, as well as to make the necessary effort to acquire the knowledge.

6. The topics seen and the evaluation system are adequate, that is, if they are oriented to what the youngsters are expected to learn and the way of grading it together with the percentage value of each evidence.

7. A large part of the student body considers that they have an average level of retention with respect to mathematics, which is an important point to consider for this research.

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8. The young people, according to their grades, consider that they have had a good achievement in this subject, since they show that they study to learn.

9. The taste for mathematics is varied among young people, i.e., among young people although they consider mathematics to be important, it is not that they consider mathematics to be important, it is not enough reason to have a taste for it. reason enough to have a liking for numbers. numbers. A percentage does like mathematics, but a similar a similar proportion only sometimes. This is another important point to consider for the research.

## Discussion

As can be seen in the results, the hypotheses raised for this research can be verified. Indeed the young people take the subjects with a good attitude. It helps them, together with the teaching-learning process, to obtain good grades and averages between 8 and 10.

The factors that have been neglected by the professor, the career and the university coincide with those proposed in the second hypothesis. It is expected that by taking them into account and strengthening them, the level, capacity and mastery of mathematics will increase. As well as the level of retention and the taste for numbers in this career. This is not easy, since it is a matter of changing a system that has not interacted much with the students in the sense of seeking that all or most of them acquire a taste for mathematics. That they have enough confidence to ask for advice, to make more effort and increase their level of knowledge, to acquire in their totality the competencies and abilities that mathematics develops in man.

*Recommendations on mathematics*

Based on the research and data collected, the following recommendations are made and shown in Table 2.

| Aspect | Recommendations |
|---|---|
| For curriculum | - Incorporate mathematical logic as a generic competency. mathematics.<br>- Incorporate as specific competencies: problem solving, reasoning and demonstration, communication, connections and representation of numbers and data.<br>- To increase the number of subjects related to mathematics throughout the career. |
| For the subject | - Add topics related to numerical logic, data analysis, reflection and decision making based on numbers.<br>- Include evidence where they are asked to make decisions based on numerical results, going through the whole process of analysis and problem solving.<br>- Include mathematical tasks that allow them to pose problems and argue their resolution as their own responsibility that will be to their benefit and to the benefit of others. |
| For the teacher | - Flexibility of thought.<br>- Open-mindedness.<br>- To make classes more reflective.<br>- Generate confidence in the student.<br>- Use examples, exercises, problems and practical cases (real or invented) that develop analytical skills and numerical logic.<br>- Open a space outside of class for permanent individual or group counseling.<br>- Join (by invitation) study groups that students generate.<br>- Search and identify and recommend resources on the web that will help strengthen the learning of young people.<br>- Reinforce the basic knowledge of the students with complementary classes to the subject. |
| For the student | - Flexibility of thought.<br>- Open-mindedness.<br>- Personalized advice.<br>- Get into the habit of solving problems outside of class and on your own.<br>- Losing the fear of making mistakes.<br>- Form study groups.<br>- To build the notions and basic concepts of mathematics by themselves. |

**Table 2** Aspects and recommendations on mathematics

## Conclusions

All the above implies a change in the teaching of mathematics, a change that has already been achieved in other parts of the world. However, it is a process, and as such it will take time and effort to incorporate it into a system that, although it has a good level, will take time to be effective.

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In mathematics, it is not only the level of a student's learning that should be of concern, but the extent to which that student requires direct teaching of each step. The experiences one has had with mathematics as a teacher and student are what dictate how it is perceived today, good, bad, indifferent. This fact is another aspect that must be considered for teaching and learning in these subjects. All this leads the teacher to raise questions in the classroom whose answer is unique, or that are solved using a certain algorithm, which must be remembered, and takes little into consideration other behaviours.

The teacher is required to develop the procedures step by step and to verify that the student understands them, creating a security of knowledge that motivates a change of attitude towards mathematics; the support and attitude provided by the teacher must be adjusted, according to the characteristics of the learning and the tasks. It is possible to achieve the change, it requires a voluntary and constant participation of the teacher, the student and support from the institution to make it happen.

**References**

Auzmendi, E. (1992). Las actitudes hacia la matemática-estadística en las enseñanzas media y universitaria. Bilbao: Mensajero.

Chevallard, Y. (1991). Dimension instrumentale, dimension sémiotique de l'activité mathématique. France: Université Joseph Fourier: Séminaire de Didactique des Mathématiques et d'Informatique de Grenoble.

Chevallard, Y., Bosch, M., & Gascón, J. (1997). Estudiar matemáticas. El eslabón perdido entre la enseñanza y el aprendizaje. Barcelona: ICE/Horsori.

Díaz, A., Hernández, F., & Hernández, G. (1999). Estrategias docentes para un aprendizaje significativo. Una interpretación constructivista. México: McGraw-Hill.

Flores, Á. H., & Gómez, A. (08 de 2009). Aprender matemática, haciendo matemática: la evaluación en el aula. Educación Matemática, 21(2), 117-142. http://redalyc.uaemex.mx/src/inicio/ArtPdfRed.jsp?iCve=40516672005

Gómez, I. (2000). Matemática emocional. Madrid: Narcea.

Gómez, I. M. (2002). Afecto y aprendizaje matemático: causas y consecuencias de la interacción emocional. Huelva: Universidad de Huelva.

Gómez, I. M. (2003). La tarea intelectual en matemáticas afecto, meta-afecto y los sistemas de creencias. Boletín de la asociación matemática venezolana, 10(2), 225-247.

González, G. (2011). Psicología del razonamiento en el aprendizaje de los números. DIDAC, 15-20.

Guzmán, M. (2007). Enseñanza de las Ciencias y la Matemática. Revista Iberoamericana de Educación (43). http://www.rieoei.org/rie43a02.htm

Martínez, P., & Oswaldo, J. (06 de 2008). Actitudes hacia la matemática. Sapiens, 9(1), 237-256. http://redalyc.uaemex.mx/src/inicio/ArtPdfRed.jsp?iCve=41011135012

National Council of Teachers of Mathematics. (2000). Principios y estándares para la educación matemática. (M. Fernández, Trad.) Sevilla: SAEM Thales.

Navarro, N., & Pérez, S. (2002). Actitudes hacia la aritmética, geometría y álgebra de estudaintes de tercero de secundaria. Manzanillo: Vl congreso Nacional de Investigación Educativa.

Palacios, E., & Sandoval, A. (2011). Línea de investigación: Didáctica de las matemáticas. DIDAC, 85-86.

Petriz, M. A., & López, R. M. (2010). Niveles de desempeño y actitudes hacia las matemáticas en estudiantes de la licenciatura en administración en una universidad estatal mexicana. Revista Mexicana de Investigación Educativa, 15(47), 1223-1249.

Polya, G. (1965). Cómo plantear y rsolver problemas. (J. Zagazagoitía, Trad.) México: Trallas.

Resnick, L., & Ford, W. (1990). La enseñanza de las matemáticas y sus fundamentos psicológicos. México: Paidós.

ISSN 2531-3002

Revista de Eduación y Cultura. (2014). Al menos un tercio de los alumnos tiene nivel básico de matemáticas. AZ. http://www.educacionyculturaaz.com/educacion/al-menos-un-tercio-de-los-alumnos-tiene-nivel-basico-de-matematicas

Richardson, V. (2002). The role of attitudes and beliefs in learning to teach. Handbook of reserch on teacher education, 102-119.

Salinas, P., Alanís, J. A., & Pulido, R. (2011). Cálculo de una variable. Reconstrucción para el aprendizaje y la enseñanza. DIDAC, 62-69.

Silva, M., & Rodríguez, A. (2011). ¿Por qué fallan los alumnos al resolver problemas matemáticos? DIDAC, 21-28.

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