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Original article

Relations among the attitudes toward the Mathematics and the academic yield of the students

Relaciones entre las actitudes hacia la Matemática y el rendimiento académico de los estudiantes

Relações entre atitudes em relação à matemática e o desempenho acadêmico dos alunos

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ABSTRACT
Consensus exists among investigators and educators on the unit between the affective and cognitive aspects of the personality of the students. Inside the affective aspects more studied in the last years an outstanding place is occupied by the attitudes and historically it has been concerned of the educators the variables linked with the academic performance of the students. This work has as main objective to contribute to clarify the influence that exists among the attitudes toward the Mathematics of the professors and students of the career Accounting and Finances and, the academic performance of these last ones. For their realization they have been used as fundamental methods: historical-logical, modeling, documentary analysis, interviews to students and the resources of the descriptive statistics as the distributions of frequency and especially the coefficient of linear correlation of Pearson for the analysis of the results obtained in the measurement of the variables. The indicators that allow to evaluate Mathematics' professor's attitudes, have settled down as well as of the students toward this subject. When comparing the applied surveys and the academic results of the students of the second year of the and Finances in the Superior Mathematical subject II, you can infer that the attitudes toward the Mathematics and the academic yield are correlated.

Keywords: academic performance; attitudes towards mathematics; Higher education.

RESUMEN
Existe consenso entre investigadores y pedagogos sobre la unidad entre los aspectos afectivos y cognitivos de la personalidad de los estudiantes. Dentro de los aspectos

afectivos más estudiados en los últimos años, un lugar destacado lo ocupan las actitudes e históricamente ha sido preocupación de los educadores las variables vinculadas con el rendimiento académico de los estudiantes. Este trabajo tiene como principal objetivo contribuir a esclarecer la influencia que existe entre las actitudes hacia la Matemática de los profesores y los estudiantes de la carrera Contabilidad y Finanzas y el rendimiento académico de estos últimos. Para su realización se han empleado como métodos fundamentales: histórico-lógico, modelación, análisis documental, encuesta a estudiantes y los recursos de la estadística descriptiva, tales como las distribuciones de frecuencia y en especial el coeficiente de correlación lineal de Pearson para el análisis de los resultados obtenidos en la medición de las variables. Se han establecido los indicadores que permiten evaluar las actitudes del profesor de Matemática, así como de los estudiantes hacia esta asignatura. Al comparar la tabulación de las encuestas aplicadas y los resultados académicos de los estudiantes de segundo año de la carrera Contabilidad y Finanzas en la asignatura Matemática Superior II, se puede inferir que las actitudes hacia la Matemática y el rendimiento académico están correlacionadas.

Palabras clave: actitudes hacia la Matemática; Educación Superior; rendimiento académico.

RESUMO
Há consenso entre pesquisadores e pedagogos sobre a unidade entre os aspectos afetivos e cognitivos da personalidade dos alunos. Dentro dos aspectos afetivos mais estudados nos últimos anos, um lugar de destaque é ocupado pelas atitudes e historicamente as variáveis relacionadas ao desempenho acadêmico dos alunos têm sido uma preocupação dos educadores. O principal objetivo deste trabalho é contribuir para esclarecer a influência que existe entre as atitudes em relação à Matemática dos professores e alunos da carreira de Contabilidade e Finanças e o desempenho acadêmico destes últimos. Para sua realização, foram utilizados os seguintes métodos fundamentais: histórico-lógico, modelagem, análise documental, levantamento de alunos e os recursos da estatística descritiva, como distribuições de frequência e principalmente o coeficiente de correlação linear de Pearson para a análise dos resultados obtidos na medição das variáveis. Foram estabelecidos indicadores que permitem avaliar as atitudes do professor de Matemática, bem como dos alunos em relação a esta disciplina. Ao comparar a tabulação das pesquisas aplicadas e os resultados acadêmicos dos alunos do segundo ano da carreira de Contabilidade e Finanças da disciplina de Matemática Superior II, pode-se inferir que as atitudes em relação à Matemática e o desempenho acadêmico estão correlacionados.

Palavras-chave: atitudes em relação à Matemática; Educação superior; rendimento acadêmico.

INTRODUCTION

The acquisition of certain basic mathematical knowledge is essential for effective functioning in today's society. However, it is common to observe the concern of many students and teachers for inadequate school performance, for the rejection and apathy towards the Mathematics subject.

At the same time, the affective threat acquired in the different Mathematics courses explains, in many cases, this negative emotional reaction that affects the performance of students in this subject and

the use of mathematical content in their professional life.

In the last decade of the 20th century, studies and research on affective aspects of personality that can influence the Teaching-Learning Process (PEA) of Mathematics and, in general, in mathematics education increased. A special place in these works was occupied by the category: attitude.

Vera and Mazadiego (as cited in Orjuela, Hernández and Cabrera, 2019) recognize that attitudes are essential to ensure that the learning process really penetrates the student. It is not enough to have a broad and deep knowledge, as can be the case of university professors, who demonstrate and validate, among other things, with their books, conferences or publications that they dominate the area of their knowledge. However, on many occasions they do not really have the attitudes to be "good" teachers, generally because they do not take into account the importance of recognizing the individuality of each person, their needs or their perceptions about the subject matter and the object contents of study, reflection and analysis, among others.

Within the field of affect, attitude research probably has the longest history, but also the most ambiguous theoretical framework. According to many researchers (Ruffell et *al.,* 1998), one of the reasons that has hindered the development of an adequate theory is the fact that many studies have focused on the creation of measurement instruments (as has been the case of social psychology where this concept was born), and have neglected to develop a theoretical basis.

Although there is no consensus in the literature consulted regarding the concept of attitude, the systematization of the various definitions analyzed (Gómez-Chacón, 2009; Trigoso, 2019; Ursine and Sánchez, 2019; Orjuela, CP Hernández, R. and Cabrera. LM, 2019) makes it possible to establish coincidences in considering that attitudes:

- they constitute learned predispositions or an individual's tendency to respond positively or negatively to some object, situation, concept or to another person;
- they involve emotions, affections, feelings, wills and behaviors;
- they offer positive or negative feedback of moderate intensity and reasonable stability that is sometimes resistant to change.

Rosenberg and Hovland (as cited in Trigoso, 2019) stated that attitudes are latent (not directly observable), so they must be inferred from other observable responses that reflect the assessment that the subject makes of the object of interest. For this, the three components of attitude (cognitive, affective and behavioral) are taken into account.

On the other hand, according to Ursine and Sánchez (2019), attitudes are made up of different factors or components, and one cannot talk about them without considering the affective assessment made of a specific object of which we have some knowledge. It is precisely the affective evaluation and its intensity for or against the attitudinal object that is the most visible and significant of the attitudes. Therefore, when talking about attitudes, the following characteristics are usually highlighted:

- direction: it is the positive, negative or neutral assessment that the person attributes to the attitudinal object.
- intensity: is the degree to which the attitudinal object is evaluated as favorable or unfavorable.
- magnitude: it is the combination of direction and intensity of the attitude.

From the epistemological point of view (DiMartino and Zan 2002) highlighted some

important choices that the researcher must take into account about the attitude category:

- the one linked to the definition of attitude;
- that of the use of the adjective "positive";
- that related to the evaluation and measurement of learning.

The definition of attitude is an important first choice. In reality, this choice has not only been made explicit, but often has not been made, and the assessment and measurement instruments used by researchers have implicitly resulted in a continual oscillation between various definitions within a single study.

The choice of the accepted definition, whether explicit or implicit, has consequences for the selection of the evaluation and measurement instruments to be used, as well as for evaluating the coherence of these instruments.

According to Di Martino and Zan (2002), in the use of the adjective "positive" the following dilemmas are presented:

a) The "positive" refers only to *the emotional component* of the attitude (this is clearly the case where the attitude is considered only as an emotional disposition) or;

b) "Positive" refers to a *cognitive component* of attitude, for example: beliefs, which are considered "positive" in that they are shared by experts (or more often, in researchers' shared beliefs) and;

c) The "positive" is used as "the result of a positive effect", in this way it is implicitly assumed related to the *behavioral component.*

The differences in the use of the adjective "positive" imply not only dissimilar selections of evaluation and measurement instruments, but also diverse formulation of the research problem that must be addressed.

Another aspect that has been discussed in various investigations with diverse and even contradictory results is that related to the use of instruments to reveal the relationship between attitudes and learning performance. This involves the choice of important decisions. It is enough to think of the difference between the use of tests that contain complex tasks such as applications or problem solving, and tests that consist of conceptual and procedural distinctions, sometimes containing multiple choice questions.

The review of the literature shows interest and concern in analyzing the attitudes towards mathematics of all members of the educational community and at all levels of study (Gómez-Chacón, 2009; Petriz, Barona, López, & Quiroz, 2010; Casas -Rosal, Villarraga Rico, Maz -Machado and León-Mantero, 2018).

Regarding Gómez-Chacón [1](2009), this author affirms that attitudes towards Mathematics refer to the assessment and appreciation of this discipline and the interest in this subject and its learning, and emphasizes the affective component more than the cognitive and it is manifested in terms of interest, satisfaction, curiosity, appreciation, etc.

There is a wide variety of definitions about attitudes towards Mathematics that can be grouped into three large groups:

a) A "simple" definition (one-dimensional), which describes attitude as the degree of positive or negative affect associated with Mathematics (McLeod, 1992).

b) a "two-dimensional" definition, which includes the degree of affect associated with

Mathematics and beliefs in relation to Mathematics (Di Martino & Zan, 2002).

c) "Three-dimensional" definition, which recognizes three components in attitude: the degree of affect associated with mathematics, beliefs related to mathematics, and behavior related to mathematics (Ruffell et *al.,* 1998).

Attitude measurement in Mathematics has been done almost exclusively with the use of self-report scales, generally with Liker scales, understood to evaluate factors such as: like, dislike, usefulness, trust. Other studies have included narratives such as autobiographical essays on certain aspects.

From the definitions given by McLeod (1992), which has a one-dimensional approach, in this work the following definition will be assumed: *attitudes* constitute affective and volitional manifestations of the personality that an individual performs to respond positively, negatively or neutrally to an object, phenomenon, situation, concept or in relation to another person.

This positive, negative, or neutral feeling can be of moderate intensity and reasonable stability; sometimes it is especially resistant to change.

Among some investigations that focus their attention on analyzing attitudes towards Mathematics, there are those that highlight the influence of their previous knowledge (Hill and Bilgin, 2018, among others). In this work it is established that it must be taken into account that the attitude category includes as prerequisites or prior conditions aspects, both cognitive and affective, such as:

- Information that the subject possesses about the object of his attitude and it is manifested through perceptions, ideas, opinions, conceptions and beliefs;
- Assessments made on the aspect that will later assume a certain attitude.

According to the quality that both questions have for the subject, it will respond positively, negatively or neutrally to the object, phenomenon, situation, concept or person towards whom his attitude will be directed.

In addition, it has the following structure:

Affective component: it is premised on the reasons where the subject assumes his own needs and that is manifested in interests, ideals, aspirations, inclinations, desires, affections, emotions, feelings, states of mind or tension, affective tones, among others.

Volitional component: it is expressed through the will of the subject to carry out or not certain behavior based on tendencies, predispositions, predilections that induce him to act in a certain way before the object.

Once the subject assumes a certain attitude, then he is in a position to execute a specific behavioral behavior and later, in some cases, he makes evaluations of the consummated action.

In the case of attitudes towards Mathematics, this definition is particularized in the specific manifestation that the subject makes regarding the degree of affection or will (positive, negative or neutral) towards Mathematics.

It is also possible to take into account attitudes towards the teaching or learning of Mathematics those teachers or students establish when facing their study.

In the same way, it is assumed that attitudes towards Mathematics are "positive" when aspects related to the *affective and volitional components are taken into account.*

On the other hand, *academic performance* can be considered as the results obtained from the activities carried out by students, concerning a certain subject or school discipline, which are evaluated by the teacher and become a measure of the position they occupy on the scale of educational levels and modalities.

Therefore, it is intended to solve the following *problematic situation:* the need to explain the influence that exists between the attitudes towards Mathematics, of the professors and students of the Accounting and Finance career and the academic performance of the latter.

The objective of this study is to contribute to clarifying the influence that exists between the attitudes towards Mathematics of the professors and students of the Accounting and Finance career and the academic performance of the latter.

To fulfill this purpose, the following scientific questions have been established:

1. What relationship is it possible to establish between the attitudes of Mathematics teachers towards this discipline and its teaching, and the attitudes of students towards Mathematics and their learning of the Accounting and Finance career?

2. What relationship can be established between the attitudes of students towards Mathematics and their learning of the Accounting and Finance career and their academic performance in this discipline?

MATERIALS AND METHODS

The participants in this research were ten second-year students of the Accounting and Finance career of the course by meetings of the Municipal University Center (CUM) of Consolación del Sur of the University of Pinar del Río "Hermanos Saíz Montes de Oca" and their professor of Mathematics.

The dialectical-materialist method was used as a general method to guide the investigative process. The following methods were applied: historical-logical, which allowed the study of the trajectory, operation and development of the attitude category; modeling, to establish the indicators of the variables studied; documentary analysis, for the analysis of the results of the final test of the Higher Mathematics II subject; student survey, to evaluate the indicators of the attitude variables of Mathematics teachers and students towards this subject and the resources of descriptive statistics, such as frequency distributions and especially the Pearson linear correlation coefficient for the analysis of the results obtained in the measurement of the variables.

Three variables were established to be monitored and controlled in the investigative process:

AP: attitudes of the Mathematics teacher towards the subject he teaches and its teaching.

AE: student attitudes towards Mathematics and its learning.

RA: academic performance of students in the Mathematics subject.

Table 1- Indicators of the variable attitudes of Mathematics teachers (own elaboration)

VARIABLE PA	INDICATORS
Attitudes of the Mathematics teacher towards the subject he teaches and its teaching	P.1 Motivation you feel to learn Mathematics so that you are a competent teacher in your subject.
	P.2 Satisfaction you feel in teaching Mathematics by explaining the practical usefulness of the mathematical content you teach.
	P.3 State of mind presented to teach Mathematics.
	P.4 Willingness you have when facing the challenges of your work as a Mathematics teacher.
	P.5 Stimulating your students to ask questions when they don't understand an exercise.
	P.6 Interest you feel in exchanging with your students the achievements and difficulties detected in their evaluations.
	P.7 Satisfaction you feel in helping your students to solve the difficulties in learning Mathematics.
	P.8 Stimulation for students to participate actively in the classroom.
	P.9 Satisfaction you feel when advising your students how they should share their mathematical learning with their classmates.
	P.10 Interest you feel in taking into account individual differences in the current school performance of your students.

Table 2- Indicators of the variable attitudes of students towards Mathematics and its learning (own elaboration)

VARIABLE AE	INDICATORS
Student attitudes towards Mathematics and its learning	E.1 Motivation you feel to learn Mathematics so that you are a competent student in this subject.
	E.2 Satisfaction you feel to learn Mathematics by appreciating the practical usefulness of the mathematical content you learn.
	E.3 Mood that presents to learn Mathematics.
	E.4 Willingness you have when facing the challenges of your work as a Mathematics student.
	E.5 Stimulation you feel to ask the teacher questions when you don't understand an exercise.
	E.6 Interest you feel in knowing the achievements and difficulties you have presented in your evaluations.
	E.7 Satisfaction you feel at being able to solve your difficulties in learning Mathematics with the help of your teacher.
	E.8 Stimulation felt to participate actively in the classroom.
	E.2 Satisfaction you feel when you share your mathematical learning with your classmates.
	E.10 Interest you feel when knowing that your teacher takes into account your current school performance in the subject.

To measure the academic performance of the students, the results of the final test of the Higher Mathematics II subject were taken into account. For this, a qualification key was developed where an analysis and tabulation of its results can be made by elements of knowledge; the latter being understood as the minimum breakdown of all the knowledge that the student must use when solving a given exercise. The amount of knowledge should not be confused with correctly answering a greater number of questions on the same item.

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This time the final test had five questions. Each one of them was awarded a score of 20 points and these were distributed among the knowledge elements of this question; the relevance of some of these elements was taken into account when awarding the score.

The evaluation was granted in correspondence with the following table:

Table 3- Scores of the knowledge elements for each evaluative category (own elaboration)

CATEGORIES EVALUATIVE	SCORES OF ELEMENTS OF KNOWLEDGE
M	Less than 60 points
B	Between 61 and 75 points
R	Between 76 and 90 points
M	Between 91 and 100 points

When there were two weeks left to conclude the school period of the first semester of the aforementioned school year, a survey was applied to the participating students where they had to evaluate the indicators of the AP and AE variables in the following categories: negative=2, neutral=3, positive=4, highly positive=5, in correspondence to their behavior in their Mathematics teacher and themselves.

With the purpose of obtaining the highest reliability in the results and homogeneity in the interpretation of the evaluative categories granted in the different indicators of the AP and AE variables, a guide was analyzed with the surveyed students that established when one of said evaluative categories should be granted, before they filled out this instrument.

RESULTS

Once the results of the surveys were tabulated, the data obtained was processed.

Each of the 10 students surveyed evaluated the 10 indicators, both of the AP variables and the AE in the newly named categories and through statistical processing the arithmetic mean was determined in each case.

The results of these tabulations are reflected in the following table:

Table 4- Integrated results of the evaluative categories of the AP and AE variables (own elaboration)

	Estudiantes encuestados										Suma	Media aritmética
	A-1	A-2	A-3	A-4	A-5	A-6	A-7	A-8	A-9	A-10		
X=AP	4.8	5	5	4.9	4.8	4.7	5	4.4	5	5	48.6	4.86
Y=AE	3.5	3.8	3.6	4	3.8	4	4	3.2	3.4	3.8	37.1	3.71

In order to statistically be able to compare the relationships between these two variables, the Pearson linear correlation coefficient r was used, which is equal to the covariance of the two variables divided by the product of the two standard deviations, that is: $r = \frac{S_{XY}}{S_X S_Y}$ (I) where its calculation formula is:

$$S_{XY} = \frac{1}{n}\sum_{i=1}^{n}(x_i - \bar{x})(y_i - \bar{y}) \text{ (II) (covarianza de X e Y)}$$

$$S_X = \sqrt{\frac{1}{n}\sum_{i=1}^{n}(x_i - \bar{X})^2} \text{ (desviación estándar de la variable X (III)}$$

$$S_Y = \sqrt{\frac{1}{n}\sum_{i=1}^{n}(y_i - \bar{Y})^2} \text{ (desviación estándar de la variable Y (IV)}$$

Where

$\bar{X}$ es la media de los valores de X e $\bar{Y}$ es la media de los valores de Y

Once the corresponding calculations have been made, the following correlation coefficient can be obtained:

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$$r = \frac{S_{XY}}{S_X S_Y} = \frac{0.0214}{(0.1854)(0.2382)} = \frac{0.0214}{0.0432} = 0.4953 \approx 0.5$$

This tells us that there is a direct linear correlation between the variables AP and AE, but in a neutral sense, because it is at the same distance from 0 as from 1.

Similarly, it was done with the variables AE and RA

Table 5- Integrated results of the evaluative categories of the AE and RA variables (own elaboration)

	Estudiantes encuestados										Suma	Media aritmética
	A-1	A-2	A-3	A-4	A-5	A-6	A-7	A-8	A-9	A-10		
X=AE	3.5	3.8	3.6	4	3.8	4	4	3.2	3.4	3.8	37.1	3.71
Y=RA	3	3	3	4	4	4	4	3	3	4	34.0	3.4

It has been done in a similar way with the two previous variables; when carrying out the corresponding calculations, the following correlation coefficient could be obtained:

$$r = \frac{S_{XY}}{S_X S_Y} = \frac{0.1025}{(0.29)(0.5)} = \frac{0.1025}{0.145} = 0.7068 \approx 0.71$$

This tells us that there is a direct linear correlation between the variables AE and RA, but in a positive direction, because the value of r is closer to 1 than to 0.

DISCUSSION

As can be seen, there is a fairly close relationship between the AP and AE variables, but as the value of rH"0.5, any favorable or unfavorable change in one of the variables particularly that related to the teacher's attitudes can have a positive effect or negatively about the other attitude.

On the other hand, there is a very close relationship between the variables AE and RA because the value of r is much closer to 1 than to 0. This tells us that to the extent that the students' attitudes are more positive, and then it will happen that their respective academic performance will also be and vice versa.

These results show points of agreement with those obtained by Tsai &Walberg (1983), who used a sample of 2,368 13-year-old students to whom they applied, among other types of measures, a series of tests to assess their attitudes and work in Mathematics. After the pertinent analyzes they concluded that, as the groups have more positive attitudes, they improve their qualification in the subject. Likewise, the students who belonged to the groups with the best grades in Mathematics had more positive attitudes towards this discipline.

Another investigation in which its purpose differs from that carried out in this work was that of Mato and De la Torre (2009), who carried out a study in which 1,220 Peruvian students of compulsory secondary education participated.

Regarding the relationship between student performance and the attitude variable, statistically significant differences were observed in all the established categories with respect to the general attitude. However, they established the non-existence of performance differences regarding the teacher's attitude factor, perceived by the student when the students' grade is good, notable or outstanding. There are differences in the lower grades in relation to the higher ones. They also pointed out that there are significant differences in the means of the factor liking and usefulness of mathematics, with respect to all performance categories. In general, the analysis of the results indicates that attitudes and performance are correlated and influence each other.

These researchers observed that the learning of Mathematics can be affected in a positive or negative way according to the way in which the student forms his attitudes

towards it. This analysis also revealed that there are no differences in performance regarding the teacher's attitude factor, perceived by the student when the grades good, notable and outstanding are crossed.

These authors also carried out the same type of analysis to see the correlation between the performance obtained in Mathematics and each of the attitude factors (teacher's attitude perceived by the student and the student's attitude towards Mathematics). The results showed positive and significant values in all cases, so that as the grades increase, the pleasure and usefulness of Mathematics are also greater. The same happens with the teacher's attitude perceived by the student. As can be seen, the results obtained in this opportunity coincide with those reflected in this work.

In the study carried out by Petriz *et al.* (2010) participated in second and fourth semester students of the Bachelor of Administration degree at the Autonomous University of the State of Mexico. The objective was to identify patterns of relationship between attitudes and academic performance in Mathematics. The authors analyzed different components of attitudes with performance. Among the main results reported, high levels of motivation, pleasure and anxiety in Mathematics correspond to a high level of performance in this subject. Concerning anxiety towards Mathematics deserves a comment, since the result obtained can be interpreted as paradoxical. The authors mention that, although anxiety represents an unpleasant experience, it seems to play a useful role in adapting to the environment, influencing an improvement in academic performance. These results are consistent with what is expressed in this article, although it differs in that in our case the different indicators of attitudes towards Mathematics and its learning were not analyzed, but rather it was evaluated in an integral way.

Hernando, Rubio, Álvarez and Tabera (as cited in Orjuela, Hernández and Cabrera, 2019), in their research carried out in 2016, recognize that factors dependent on students and others on their interaction with the teacher intervene in university contexts, relating the issue of attitude with the right climate to improve this process. In their investigations they determined that, if the teacher's attitude is positive, affable, and respectful and motivating, among other things, then the students assimilate those attitudes that come as an example from practice rather than from the discourse itself. What is expressed here complements what is explained in this article.

Another study with other investigative purposes was carried out by Mejia, Sánchez and Juárez (2018), as they sought to compare various attitudinal aspects towards Mathematics in a sample of 393 Mexican students from two university careers: mathematics and engineering. They used two different instruments to measure attitudes, the Attitudes towards Mathematics Inventory (ATMI) and the Attitudes Mathematics Scale (EAM). The application of both tests would allow exploring more components of attitudes because, although both evaluated attitudes, in general there were differences in the factors measured by each one.

The results obtained showed that, in both groups of students, in the value factor of Mathematics, of those evaluated by the ATMI, the most positive attitudes are found, followed by liking for Mathematics. Regarding the attitudinal aspects measured by the EAM, the most positive attitudes were found in the factor of liking Mathematics. That is, liking for Mathematics turned out to be the factor that most defines students' attitudes towards Mathematics. Likewise, the authors reported that the engineering students presented the most positive attitudes in the ATMI, among them those of mechanical engineering stood out. While in the aspects measured by the EAM, the

students of the Mathematics career had the most positive attitudes. Finally, when analyzing the data obtained in the two instruments together, it was found that the participants in the Mathematics career exhibited the most positive attitudes towards Mathematics. Although the research objectives of these authors differ from those expressed in this work, it is confirmed that the relationship between the attitude towards Mathematics and the level of preparation in this discipline is important.

Another result of interest was obtained by León, C. Pedrosa, C. Maz, A. and Casas, JC (2019) in a sample of 71 students from the population of teachers in training for early childhood education, in the Faculty of Sciences of Education at the University of Córdoba, in Spain, during the 2016-2017 academic year. This study has revealed that these students value the usefulness of Mathematics for obtaining their undergraduate studies and are aware that the acquisition of mathematical content can help them practice their future profession with quality. However, the evaluations towards the pleasure and motivation factor are negative, that is, they consider it a boring subject, without interest, for which they feel fear when they face its study. What it is expressed in this research should serve to continue deepening its results with the intention of being able to transform the negative evaluations of these future teachers. Although what has been expressed in this work has not reflected qualitative aspects, it can be expressed that the students involved in this research also reflected in their surveys feeling fear when studying Mathematics.

What is explained in this article coincides with the research carried out by Segarra, J. and Julià, C. (2021) where fifth grade students of primary education in the city of Tarragona, Spain, participated in the academic period 2019-2020.

The study of the means indicated that students with a higher positive attitude have Mathematics teachers with greater self-efficacy in teaching Mathematics.

A set of questions has arisen on this topic that can be further explored in future studies:

- What can influence the choice of attitude definition?
- What criteria does the researcher use to make this choice?
- Is the selected definition in correspondence with the problem that the researcher is interested in solving?
- Is it possible to modify the attitude towards Mathematics of a subject? How?

In short, teaching actions should consider the affective and volitional aspects with a sufficient degree of importance and rigor, taking into account their proven influence, both in the processes and in the results of learning. In short, the greater the increase in knowledge, there is a favorable change in attitudes and, reciprocally, the greater the attitudes towards Mathematics of teachers and students, there is a positive increase in the mastery of mathematical knowledge.

To give continuity to the study carried out, some kind of scientific result of a practical nature could be developed, such as a didactic strategy, which would include actions aimed at perfecting, strengthening and stimulating the positive attitudes of students towards Mathematics and its learning.

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[1]This author herself refers to *mathematical attitudes*, that differ from the previous one in which these have a markedly cognitive character and refer to the way of using general abilities, such as flexibility of thought, open-mindedness, critical spirit, objectivity, among others that are important in work in Mathematics.

Conflict of interests

The authors declare no conflict of interest.

Authors contribution

All authors managed the information, reviewed the writing of the manuscript and approved the version finally submitted.