EVOLUTION OF MATHEMATICS AT CRU LOS SANTOS: QUANTITATIVE STUDY OF FOUR DECADES OF ACADEMIC ACTIVITY

EVOLUÇÃO DA MATEMÁTICA NO CRU LOS SANTOS: ESTUDO QUANTITATIVO DE QUATRO DÉCADAS DE ATIVIDADE ACADÊMICA

EVOLUCIÓN DE LA MATEMÁTICA EN EL CRU LOS SANTOS: ESTUDIO CUANTITATIVO DE CUATRO DÉCADAS DE ACTIVIDAD ACADÉMICA

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ABSTRACT

This study analyzes the academic evolution of the School of Mathematics at the Los Santos Regional University Center (CRU) over forty years of institutional history. Through a quantitative and descriptive approach, various indicators related to academic activity are examined, such as student enrollment, graduates, academic offerings, faculty output, and participation in academic projects. Data were obtained from a graduate survey, institutional records, academic reports, and administrative documents corresponding to the study period. The results identify trends in enrollment growth, the strengthening of mathematics education, and the school's contribution to the academic development of the regional center. Furthermore, the analysis highlights the fundamental role of mathematics in scientific and professional training within the region. This work provides an institutional overview that contributes to understanding the historical evolution of mathematics education at the Los Santos CRU and offers insights for future academic planning.

Keywords: Mathematics. Higher Education. Academic Indicators. Institutional Evolution. Quantitative Analysis.

RESUMO

O presente estudo analisa a evolução acadêmica da Escola de Matemática do Centro Regional Universitário (C.R.U.) Los Santos ao longo de quarenta anos de trajetória institucional. Por meio de uma abordagem quantitativa e descritiva, examinam-se diversos indicadores relacionados à atividade acadêmica, tais como matrícula estudantil, formandos, oferta acadêmica, produção docente e participação em projetos acadêmicos. Os dados foram obtidos a partir de pesquisas com egressos, registros institucionais, relatórios acadêmicos e documentos administrativos correspondentes ao período de estudo. Os resultados permitem identificar tendências no crescimento da matrícula, no fortalecimento da formação matemática e na contribuição da escola para o desenvolvimento acadêmico do centro regional. Ademais, a análise evidencia o papel fundamental da matemática na formação científica e profissional dentro da região. Este trabalho oferece um panorama

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institucional que contribui para compreender a evolução histórica do ensino de matemática no C.R.U. Los Santos e fornece elementos para o planejamento acadêmico futuro.

Palavras-chave: Matemática. Educação Superior. Indicadores Acadêmicos. Evolução Institucional. Análise Quantitativa.

RESUMEN

El presente estudio analiza la evolución académica de la Escuela de Matemática del Centro Regional Universitario (C.R.U.) Los Santos a lo largo de cuarenta años de trayectoria institucional. A través de un enfoque cuantitativo y descriptivo, se examinan diversos indicadores relacionados con la actividad académica, tales como matrícula estudiantil, egresados, oferta académica, producción docente y participación en proyectos académicos. Los datos fueron obtenidos a partir de encuesta a egresados, registros institucionales, informes académicos y documentos administrativos correspondientes al período de estudio. Los resultados permiten identificar tendencias en el crecimiento de la matrícula, el fortalecimiento de la formación matemática y la contribución de la escuela al desarrollo académico del centro regional. Asimismo, el análisis evidencia el papel fundamental de la matemática en la formación científica y profesional dentro de la región. Este trabajo ofrece una radiografía institucional que contribuye a comprender la evolución histórica de la enseñanza de la matemática en el C.R.U. Los Santos y aporta elementos para la planificación académica futura.

Palabras clave: Matemática. Educación Superior. Indicadores Académicos. Evolución Institucional. Análisis Cuantitativo.

1 INTRODUCTION

Mathematics education in Panama has been a subject of constant reflection due to the need to improve academic results in this area and foster a better understanding and application of mathematics in society. The School of Mathematics of the CRU Los Santos, began operations in 1983, according to an interview conducted by Magister Edwin Díaz Gálvez, first director of the CRU Los Santos and first professor of the school of mathematics in the University Extension of Las Tablas. "This mathematics school was opened with the purpose of training professionals in the field of mathematics and has played a fundamental role in strengthening mathematics education in the region," Diaz said. It has not only contributed to the training of mathematicians, but also has a direct impact on the teaching of mathematics at the local and national level. However, the presence of this school and its influence on mathematics education in the province of Los Santos and in Panama in general are still aspects that require further analysis. This study aims to reflect on the presence of the School of Mathematics in the province of Los Santos and its contribution to mathematics education in the country.

2 STATEMENT OF THE PROBLEM

Mathematics is a fundamental discipline for the scientific, technological and economic development of contemporary societies. In the field of higher education, mathematical training not only contributes to the strengthening of logical and analytical thinking, but also supports the development of multiple areas of knowledge and scientific innovation. In this context, the study of the evolution of the academic units dedicated to the teaching of mathematics allows us to understand the processes of professional training, the institutional dynamics and the impact of these structures on the academic development of universities.

Various studies have indicated that the analysis of academic indicators such as student enrollment, graduates, academic performance, and teacher participation is a key tool for evaluating the quality and functioning of university programs. In particular, academic performance and student participation are considered relevant indicators to understand the development and effectiveness of formative processes in mathematics (Wijaya et al., 2023).

Likewise, recent studies have shown that institutional, pedagogical, and contextual factors influence the dynamics of mathematics programs in higher education. For example, the literature indicates that the availability of specialized teachers, academic working conditions, and professional development opportunities significantly influence the consolidation and sustainability of mathematics areas in universities (Solis-Rodríguez, 2025).

In this sense, the historical and quantitative analysis of academic units allows us to identify trends in their growth, transformation or stagnation over time. According to research on university systems, the study of institutional indicators such as enrollment, graduation rates, and academic structure contributes to understanding how higher education institutions evolve and how they respond to social and educational demands (Taylor et al., 2019).

Despite the relevance of these analyses, in many Latin American university institutions there is still a limited systematization of historical information on the development of their schools or academic departments. This situation makes it difficult to understand the institutional trajectory, the identification of achievements and challenges, and the generation of inputs for academic planning and strategic decision-making.

In the case of the School of Mathematics of the Los Santos Regional University Center, its academic trajectory extends for approximately four decades of operation. During this period, the school has contributed to the training of professionals, the development of teaching activities and the strengthening of mathematics education in the region. However, the information regarding its institutional evolution such as the behavior of enrollment, the number of graduates, teacher participation and other academic indicators has not been systematized in a comprehensive way in scientific studies that allow analyzing its development over time.

Faced with this situation, the need arises to carry out a quantitative analysis that allows describing and understanding the evolution of the School of Mathematics of the C.R.U. Los Santos during his forty years of academic career. This analysis will allow the construction of an institutional x-ray based on data, contributing to the historical knowledge of the academic unit and providing relevant information for the planning and strengthening of the teaching of mathematics in the university context.

In this context, the following research questions are raised:

- How has the academic activity of the School of Mathematics of the CRU Los Santos evolved throughout its forty years of operation?
- What trends can be identified in institutional indicators such as student enrollment, number of graduates, and faculty development during this period?
- What aspects characterize the academic trajectory of the School of Mathematics of CRU Los Santos in terms of its institutional development?

3 JUSTIFICATION

The School of Mathematics of CRU Los Santos represents the main key player in the training of human resources in the field of mathematics in the region. The need to investigate

its impact lies in the fact that mathematics education is a fundamental pillar for the development of critical thinking, problem solving and decision-making in various areas of social, political and economic life. Through this study, we seek to understand how the training received in this school contributes to the quality of mathematics teaching at the educational levels of the province of Los Santos and Panama. In addition, it is intended to identify possible areas for improvement and promote the strengthening of the School of Mathematics, ensuring its role as a key actor in the country's educational process.

4 OBJECTIVES

4.1 GENERAL OBJECTIVE

- To evaluate the academic evolution of the School of Mathematics of the C.R.U. Los Santos for forty years and its contribution to the improvement of mathematics education in Panama, through the study of institutional and academic indicators.

4.2 SPECIFIC OBJECTIVES

1. To analyze the impact of the training received at the School of Mathematics on graduates and their contribution in their respective fields of work.
2. To analyze the perception of graduates about the quality of academic training at the School of Mathematics of CRU Los Santos.
3. To explore how the presence of the School of Mathematics has influenced the development of mathematics education in the province of Los Santos.
4. Identify areas for improvement in the School of Mathematics to strengthen its impact on mathematics education at the regional and national levels.

5 THEORETICAL FRAMEWORK

1. The Role of Mathematics in the Development of a Region

Mathematics is more than an academic discipline; it is a fundamental tool for the social and economic progress of any community. As Lynn Arthur Steen (2001) points out, mathematical literacy is a basic need for citizens of the twenty-first century, who must be able to interpret data, understand statistical models, and make informed decisions in an increasingly quantitative world. The ability to apply logical thinking and problem-solving skills is crucial in sectors as diverse as technology, finance, and engineering (National Research Council, 2002). In the regional context, a solid background in mathematics equips professionals with the ability to innovate and contribute to the development of the local economy, boosting competitiveness and creating solutions to community challenges.

2. History and Evolution of Mathematics Education in C.R.U. The Saints

The C.R.U. School of Mathematics Los Santos has played a crucial role in the training of professionals in the region, adapting to educational and labor needs over time. Their curricula reflect a constant evolution, moving from teaching focused on theory to a more applied and problem-solving oriented one (Mathematical Society of Costa Rica, 2018). Analysis of founding documents and review of its historical curricula reveal how the school has responded to changes in the labor market and global trends in higher education, demonstrating its commitment to academic relevance and excellence. This study seeks, precisely, to x-ray the result of this effort through the performance of its graduates.

3. The Role of the Mathematics Graduate in Society

Mathematics graduates have a highly valued professional profile in various fields. Beyond teaching, which has historically been their main job opportunity, they are inserted in areas such as data analysis, finance, research, and information technology (American Mathematical Society, 2019). Their ability to model complex problems and critical thinking make them valuable assets to any organization. When evaluating the work of the School of Mathematics, it is essential to examine to what extent its graduates contribute to society with these skills and how their training aligns with the demands of the current labor market.

4. Mathematics education in higher education

Mathematics plays a fundamental role in academic and scientific training within higher education, due to its contribution to the development of logical, analytical and critical thinking. In this context, mathematics education is not only oriented to the transmission of disciplinary content, but also to the strengthening of cognitive competencies necessary for problem solving in various fields of knowledge. According to Artigue (2011), mathematics education has established itself as a field of research that analyzes the processes of teaching and learning mathematics, as well as the institutional and social factors that influence these processes.

Likewise, mathematical training at the university is linked to the preparation of professionals capable of facing the scientific and technological challenges of contemporary society. In this sense, Rico (2012) points out that research in mathematics education has contributed to understanding the complexity of training processes and to improving educational practices at different levels of the education system, including higher education.

5. Academic Indicators in Institutional Analysis

The analysis of academic indicators is an important tool for evaluating the functioning and development of higher education institutions. Variables such as student enrollment,

graduation rate, teaching staff, and academic offer allow us to identify trends in the evolution of educational programs and their impact on professional training.

According to Taylor, Marmolejo, and DeLuca (2019), the use of institutional indicators allows us to understand the performance and evolution of university institutions, facilitating decision-making and strategic planning. These indicators provide quantitative information that contributes to assessing the growth, sustainability and quality of academic programmes.

In the case of academic units dedicated to the teaching of mathematics, the analysis of these indicators allows identifying patterns in student training, teacher participation and the consolidation of study programs. In addition, these analyses facilitate the identification of strengths and areas for improvement in institutional development.

6. Contemporary Perspectives in Mathematics Education

Current research in mathematics education has broadened its focus to consider not only the cognitive aspects of learning, but also the social, cultural, and institutional dimensions that influence mathematics teaching. From this perspective, mathematics education is understood as a complex process that involves multiple actors and contexts.

Valero (2017) argues that the learning of mathematics should also be analyzed from a socio-political perspective, recognizing the role played by educational institutions in the construction of mathematical knowledge and in the formation of critical citizens. Similarly, Cantoral et al. (2013) highlight that mathematics education must be understood within a social and institutional framework that influences the production and transmission of mathematical knowledge.

In this context, the study of the historical evolution of mathematics schools or departments within universities allows us to understand how academic practices, institutional structures and dynamics of professional training in the field of mathematics have developed.

7. Institutional Studies and Academic Historical Analysis

The historical analysis of academic units is an important strategy for understanding the development of higher education institutions. This type of study allows us to identify transformations in the academic offer, changes in student enrollment and the growth of the teaching staff, as well as their impact on professional training.

In particular, studies based on quantitative indicators facilitate the construction of a comprehensive vision of institutional development, allowing the analysis of the evolution of academic activities over time. These analyses contribute to documenting the trajectory of the academic units and to generating relevant information for the planning and strengthening of educational programs.

In the case of the School of Mathematics of the Los Santos Regional University Center, the analysis of its evolution over forty years represents an opportunity to understand its contribution to the academic development of the regional center and to the strengthening of mathematical training in the region.

6 METHODOLOGY

This study followed a quantitative and descriptive approach, using a survey-type research methodology. A questionnaire was applied to graduates of the School of Mathematics of CRU Los Santos in order to obtain data on their perception of the quality of the training received, its impact on mathematics education and its contribution to society. The total population of graduates is 210; but despite the fact that the ideal sample of 137 graduates was not reached, for reasons such as: the lack of updating of contact information of the graduates, the low response rate in online surveys, and the limitations of time and budget, the sample was made up of a representative group of 75 graduates who have worked in different educational and professional areas. Data collection was carried out through an online form (Google Forms), which allowed answers to be obtained efficiently and safely. The results were analyzed quantitatively using descriptive statistical tools to identify trends and patterns in participants' responses.

Type of Research

The research was developed within the framework of a descriptive and exploratory research, since it sought to describe and analyze the current reality of the influence of the School of Mathematics in the province of Los Santos and at the national level, without intervention or manipulation of variables, and did not seek to generalize the results to the entire population of 210 graduates. Likewise, the study has a non-probabilistic approach, which is why the sample was not selected at random, but was based on the available graduates who met the participation criteria; and with a quantitative cut, since numerical data were collected, which allowed obtaining results on the impact of the training on graduates and their perception of educational quality.

7 ANALYSIS OF RESULTS

The Cru Los Santos School of Mathematics in real figures from 1g83 to 2023

Table 1

Graduates

Género	Cantidad
Masculino	**102**
Femenino	**108**
Total	**210**

Table 2

Undergraduate projects

Tipo de trabajo	Cantidad
Tesis	**52**
Monografías	**230**
Total	**282**

Table 3

Thesis by area

Área	Cantidad
Matemática Pura	**16**
Matemática Aplicada	**11**
Matemática Educativa	**25**
Total	**52**

Table 4

Monographs by area

Área	Cantidad
Matemática Pura	**0**
Matemática Aplicada	**0**
Matemática Educativa	**230**
Total	**230**

The following results presented are based on a sample of 75 graduates who were surveyed online, after having validated the instrument to be applied using expert validation, therefore, the findings are applicable only to this group.

A. GENERAL INFORMATION

It presents an overview of the graduates of the School of Mathematics of the CRU Los Santos, analyzing various aspects such as gender, graduation generation, academic index, employment status, and areas of specialization. This analysis provides a comprehensive

understanding of the profile of the graduates, highlighting their academic and work trajectories, as well as their interests in continuing their education, both in the field of mathematics and in other areas.

Table 5

Gender of graduates

Género	Frecuencia
Masculino	35
Femenino	40
Total	75

Figure 1

Source: Authors' elaboration based on the data obtained from the survey applied to graduates within the framework of this research.

There is a greater female representation among the surveyed graduates, although the difference is not very significant, with 6.66% more women (53.33% vs. 46.67%). The results show a balanced gender distribution in the surveyed graduates of the School of Mathematics, with a slight female majority.

This suggests a good level of inclusion of both genders, which could be highlighted as a positive aspect in terms of diversity and equity in the institution.

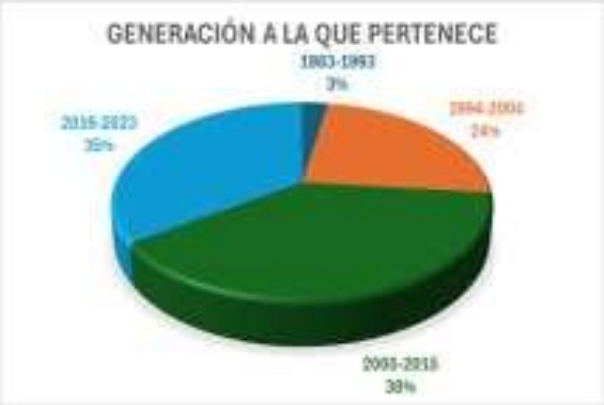
Table 6

Generation to which it belongs according to the range of years

Año de Promoción	Frecuencia
1983-1993	2
1994-2004	18
2005-2015	2G
2016-2023	26
Total	75

The data show a positive evolution in the number of graduates, especially between 1994 and 2015, with a stabilization in recent years. This reflects the strengthening of the School of Mathematics of CRU Los Santos and raises the importance of maintaining strategies to ensure sustainability and growth in future promotions.

Figure 2



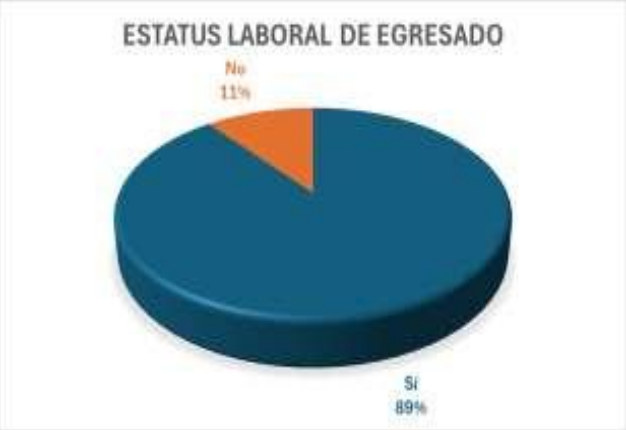
Source: Authors' elaboration based on the data obtained from the survey applied to graduates within the framework of this research.

Table 7

Graduate's employment status as a teacher

Trabajo	Frecuencia
Sí	**67**
No	**8**
Total	**75**

Figure 3



Source: Authors' elaboration based on the data obtained from the survey applied to graduates within the framework of this research.

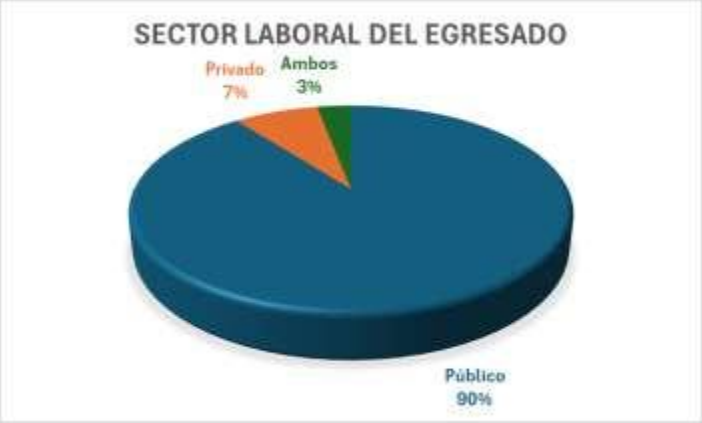
Table 8

Graduates' Labor Sector

Sector	Frecuencia
Público	60
Privado	5
Ambos	2
Total	67

The results show that most of the surveyed graduates of the School of Mathematics of the CRU Los Santos work as teachers. This reflects that the School of Mathematics contributes significantly to the strengthening of the education sector, particularly in areas where teaching mathematics is essential. This suggests that the training offered responds well to the labor demand of the education sector in the region.

Figure 4



Source: Authors' elaboration based on the data obtained from the survey applied to graduates within the framework of this research.

The results show a clear preference for the public sector among the surveyed graduates employed with 60 graduates (89.55%) working in the public sector, evidencing that most graduates find job opportunities in state institutions, such as public schools or government agencies.

The public sector is the main employer of the surveyed graduates of the School of Mathematics, which reflects an alignment of academic training with the labor demand of this sector. This underscores the importance of public education as the predominant workplace for graduates in the region.

Table 9

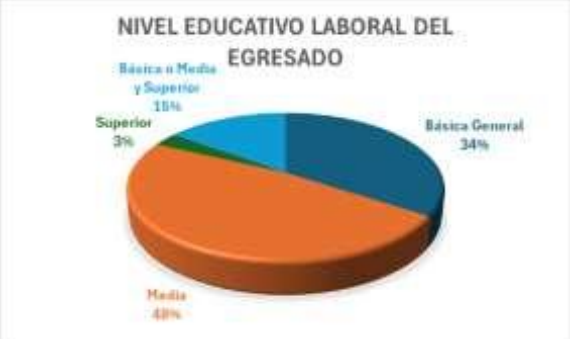
Graduate's educational level

Nivel educativo	Frecuencia
Básica General	23
Media	32
Superior	2
Básica o Media y Superior	10
Total	67

The results indicate that most of the surveyed graduates work as teachers at basic and secondary educational levels, with less presence in higher education.

Most of the surveyed graduates of the School of Mathematics of the CRU Los Santos contribute to the strengthening of basic and secondary education, with a lower presence in higher education. This suggests that the academic program responds mainly to the labor demand of the educational levels prior to university.

Figure 5



Source: Authors' elaboration based on the data obtained from the survey applied to graduates within the framework of this research.

Table 10

Specialization in Mathematics after graduation

Realización de Estudios	Frecuencia
Sí	51
No	24
Total	75

Figure 6

Source: Authors' elaboration based on the data obtained from the survey applied to graduates within the framework of this research.

The results show that a significant proportion of the surveyed graduates seek to continue their academic training after graduation.

68% of the surveyed graduates who completed specialization studies show a significant commitment to continuous training, highlighting the importance of promoting opportunities for specialization and access to advanced programs. However, the 32% who do not suggest the need to identify barriers and promote academic development alternatives that the doctorate has a minimum representation. This shows considerable interest in professionalization, but also highlights the need to expand opportunities and support to reach more advanced levels of study, such as doctorates.

Table 11

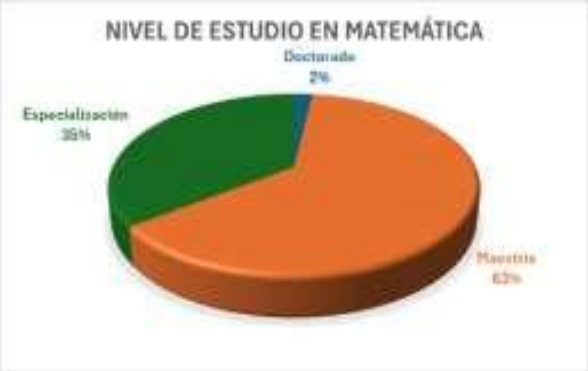
Level of studies in mathematics

Nivel	Frecuencia
Doctorado	**1**
Maestría	**32**
Especialización	**18**
Total	**51**

The data show that the surveyed graduates who have continued their academic training in Mathematics are mostly concentrated at master's levels with 32 graduates (62.75%) who have reached this level, being the most common. This suggests that the master's degree is perceived as an accessible and valuable option for professional development in Mathematics.

Most of the surveyed graduates who continue their academic training do so at master's or specialization levels, while

Figure 7



Source: Authors' elaboration based on the data obtained from the survey applied to graduates within the framework of this research.

B. IMPACT AND CONTRIBUTION OF THE SCHOOL OF MATHEMATICS

It addresses the impact and contribution of the School of Mathematics of CRU Los Santos in the training of its graduates and its influence in the educational and professional field. Key aspects such as skills development, job placement in the education sector and other related fields are examined, as well as opportunities for specialization and the role of graduates in the promotion of mathematics in the region. This analysis seeks to highlight how the school has strengthened both the educational quality and the professional profile of its graduates.

Table 12

Quality of the mathematical training received at the School of Mathematics of CRU Los Santos

Nivel de calidad	Frecuencia
Excelente	**44**
Buena	**26**
Aceptable	**5**
Regular	**0**
Deficiente	**0**
Total	**75**

Figure 8

Source: Authors' elaboration based on the data obtained from the survey applied to graduates within the framework of this research.

The majority of the graduates surveyed positively value the mathematical training received at the School of Mathematics of the CRU Los Santos, with an outstanding proportion of 58% considering the education as excellent. These results suggest that the school meets quality expectations

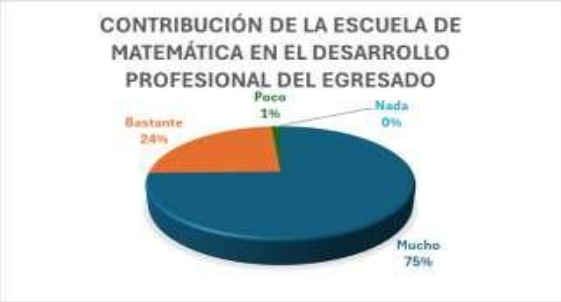
educational, although it is important to continue evaluating and improving areas that can increase the satisfaction of all students.

Table 13

Contribution of the School of Mathematics of CRU Los Santos in the professional development of the graduate

Nivel de contribución	Frecuencia
Mucho	**56**
Bastante	**18**
Poco	**1**
Nada	**0**
Total	**75**

Figure 9



Source: Authors' elaboration based on the data obtained from the survey applied to graduates within the framework of this research.

The results show a strong positive perception of the contribution of the School of Mathematics of CRU Los Santos in the professional development of its graduates with 74.6%, which indicates a strong correlation between the training received and professional success in the educational or work environment.

Most of the graduates surveyed perceive that the School of Mathematics has played a crucial role in their professional development, highlighting the effectiveness of the training in preparing them for the workplace. These results underscore the school's success in meeting the professional expectations and needs of its graduates.

Table 14

Contribution of graduating from the School of Mathematics of CRU Los Santos with the improvement of the quality of personal and family life

Nivel de contribución	Frecuencia
Sí, mucho	**60**
Sí, algo	**13**
No mucho	**2**
No, en absoluto	**0**
Total	**75**

Figure 10

Source: Authors' elaboration based on the data obtained from the survey applied to graduates within the framework of this research.

Most of the surveyed graduates perceive that training at the School of Mathematics of CRU Los Santos has had a significant positive impact on improving their personal and family quality of life. This highlights how education not only impacts professional development, but also has beneficial effects on the overall well-being of graduates.

C. APPLICATION OF KNOWLEDGE IN THE EDUCATIONAL AND LABOR FIELD

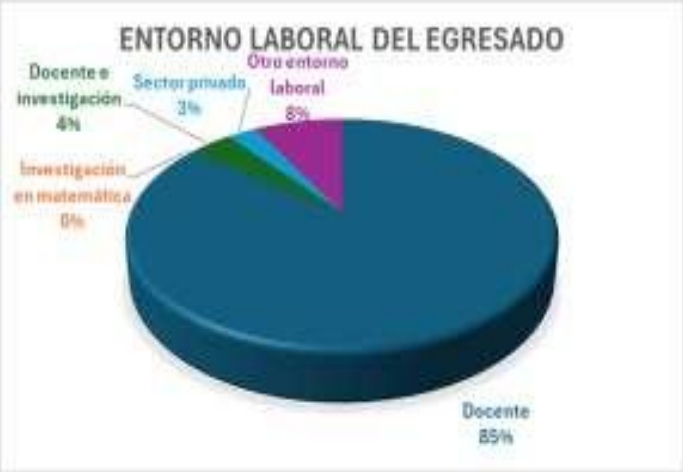
It focuses on the application of the knowledge acquired in the School of Mathematics of CRU Los Santos, analyzing how graduates have transferred and used their mathematical skills in the educational and labor field. The influence of training on the quality of teaching is explored, as well as its impact on professional development and the improvement of the quality of life of graduates. This analysis provides a vision of the effectiveness of the training received and its relevance in the daily practice of graduates.

Table 15

Type of work environment where the graduate works

Tipo de entorno	Frecuencia
Docente	**64**
Investigación en matemática	**0**
Docente e investigación	**3**
Sector privado	**2**
Otro entorno laboral	**6**
Total	**75**

Figure 11



Source: Authors' elaboration based on the data obtained from the survey applied to graduates within the framework of this research.

Most of the surveyed graduates of the School of Mathematics of the CRU Los Santos work in the educational field, mainly in teaching. This highlights the strong relationship between academic training and job opportunities in teaching, while participation in research and other job sectors is more limited.

Table 16

To the extent that he was present in the training at the School of Mathematics of the CRU Los Santos, "teaching how to teach mathematics"

Nivel de medida	Frecuencia
Siempre nos enseñaron	**44**
Algunas veces nos enseñaron	**21**
Muy poco nos enseñaron	**G**
Nunca nos enseñaron	**1**
Total	**75**

Most of the surveyed graduates consider that training in "teaching to teach mathematics" was significantly present in their education, highlighting that the School of Mathematics of CRU Los Santos has adequately integrated pedagogy into its curriculum. However, there is a small group that perceives that pedagogical teaching was not so constant or deep, which could be an area to be reinforced in the future.

Figure 12

Source: Authors' elaboration based on the data obtained from the survey applied to graduates within the framework of this research.

D. OPINION OF THE PRESENCE OF THE SCHOOL OF MATHEMATICS IN THE REGION

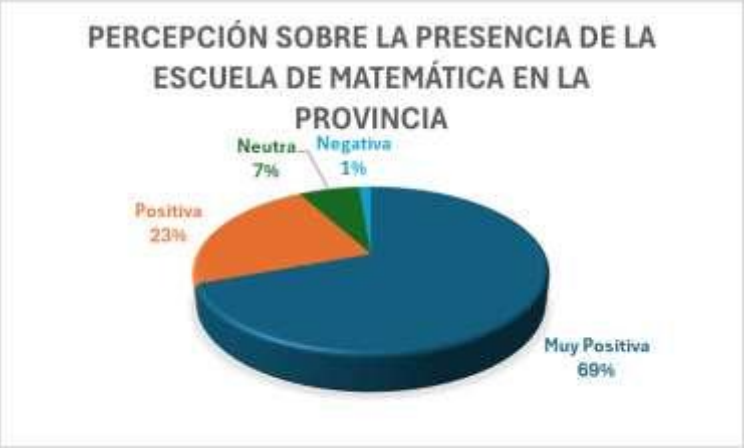
It focuses on the opinion of the graduates on the presence and impact of the School of Mathematics of the CRU Los Santos in the region. Through various questions, it is analyzed how graduates perceive the relevance of the institution in the educational and social field, as well as its contribution to local development. This analysis provides insight into the influence of the school in the community and its role in the training of trained professionals in the field of mathematics.

Table 17

Perception of the presence of the School of Mathematics of the CRU Los Santos in the province

Nivel de percepción	Frecuencia
Muy Positiva	**52**
Positiva	**17**
Neutra	**5**
Negativa	**1**
Total	**75**

Figure 13



Source: Authors' elaboration based on the data obtained from the survey applied to graduates within the framework of this research.

The general perception of the presence of the School of Mathematics of the CRU Los Santos in the province is mostly positive, with a strong assessment of its impact on the community. This data highlights the recognition of the school as a key institution in the training of professionals in the region.

Table 18

Perception of the improvement of mathematics education in the province of Los Santos, with the presence of the School of Mathematics

Nivel de percepción	Frecuencia
Si, de manera significativa	**55**
Si, en cierta medida	**17**
No mucho	**3**
No ha tenido impacto	**0**
Total	**75**

The results show a very positive perception about the impact of the School of Mathematics of the CRU Los Santos in the improvement of mathematics education in the province. 73.33% believe that the presence of the school has significantly improved mathematics education in the province, which underscores the great impact that the institution has on the quality of local education.

Most of the graduates perceive that the School of Mathematics of the CRU Los Santos has had a significant impact on the improvement of mathematics education in the province, highlighting its crucial role in the strengthening of mathematics teaching in the region. This highlights the importance of the institution in local educational development.

Figure 14

Source: Authors' elaboration based on the data obtained from the survey applied to graduates within the framework of this research.

Table 19

Impact at the national level on mathematics education that has been had with the presence of the Mathematics School of the CRU Los Santos

Nivel de impacto	Frecuencia
Sí, de manera significativa	**43**
Sí, en cierta medida	**27**
No mucho	**4**
No ha tenido impacto	**1**
Total	**75**

Figure 15

Source: Authors' elaboration based on the data obtained from the survey applied to graduates within the framework of this research.

The majority of the surveyed graduates perceive that the School of Mathematics of CRU Los Santos has had a significant or moderate impact on mathematics education at the national level, which highlights its relevance in the educational field beyond the province of

Los Santos. This data highlights the role of the school as an important actor in the improvement of mathematics teaching in the country.

8 DISCUSSION

The results obtained from the questionnaires applied to the graduates revealed that most of the participants consider that the academic training received at the School of Mathematics of the CRU Los Santos was highly satisfactory and contributed significantly to their professional development. A significant percentage of the graduates mentioned that the training received allowed them to work in different educational sectors, both in primary, secondary and higher education, and in applied areas of mathematics. In addition, many highlighted that the school has had a direct impact on the improvement of mathematics teaching in the province of Los Santos.

Regarding the perception of the school's presence in the region, the graduates agreed that the School of Mathematics of CRU Los Santos has been a key element in the promotion and development of mathematics in the province, contributing to the strengthening of mathematics education in Panama. However, opinions have also emerged that suggest the need to improve teaching resources and infrastructure to optimize teaching-learning processes.

9 CONCLUSIONS

The School of Mathematics of CRU Los Santos has proven to be an institution of great value for the training of professionals in the field of mathematics and has had a significant impact on mathematics education in the province of Los Santos and in Panama. The graduates of the school have been fundamental in the improvement of mathematics teaching in their respective fields of work. However, it was noted that there are areas for improvement, especially in the updating of study programs and in the expansion of continuing education, which would allow the institution to maintain its relevance in an ever-changing academic and professional world. In this sense, it is recommended that the School of Mathematics of CRU Los Santos strengthen and diversify its training programs and continue promoting the development of mathematics in Panama to continue contributing to the educational progress of the country. This study is a first step and we hope that future studies with greater resources will attempt to survey a larger and more representative sample of graduates.

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