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Evaluation Of The CUANTRIX Program In Public Basic Education Schools In Mexico City (2019-2022)

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Abstract

Due to the success of the CUANTRIX program, on the development of computational thinking, logical-mathematical thinking, and programming, the Federal Education Authority of Mexico City (AEFCM) decided to incorporate it in 2019 to its public schools. To do so, it relied on Televisa Foundation and its partners for its implementation in primary and secondary education during the period 2019-2022. This article presents the results, with more than 2000 subjects in relation to the theoretical-methodological proposal of the training, the efficiency of the implementation processes and the impact of the program in schools during the referred period. The participants give visibility to the strengths of the program and the areas of improvement necessary for its scalability.

Keywords*:* Teacher training program, logical thinking, programming, educational technology.

1. Introduction

In different studies it has been found that there is a relationship between the enthusiasm and mastery of teachers, with the achievement and persistence of students (Miranda and Sánchez, 2018); and, currently, where the pandemic has caused an educational situation that is difficult to compare with anything experienced before, teachers have found themselves facing an unprecedented challenge in their technological training and in the development of the necessary skills to face this situation. reality.

Teachers recognize the importance of ICT in teaching-learning processes and the relevance acquired in times of pandemic (Ferrada-Bustamante et al., 2021), but they feel that they do not have formal preparation to act in virtual education environments. (Arancibia et al., 2020).

CUANTRIX is a project of the Televisa Foundation that seeks to generate opportunities through Computer Sciences so that every year thousands of children and young people learn to program.

Attracted by the good results it was having in other regions, in 2018, the Federal Educational Authority of Mexico City (AEFCM) decided to incorporate this program in its public basic education schools. For this reason, it relied on Fundación Televisa and its partners, Fundación UNETE and Code.org , for the tailored design of the curricular program and the training plan that would begin in September 2019.

This is an initiative that is situated in the normative political frameworks, theoretical framework and pedagogical framework as follows:

a) Normative policy . The third constitutional article safeguards the Right to Education and establishes that education must be oriented towards the harmonious development of all the students' faculties, it will be comprehensive and will educate for life. With the aim of developing cognitive, socio-emotional and physical capacities in people that allow them to achieve their well-being. The CUANTRIX program contributes to the development of students' cognitive abilities and faculties through the use of technology, while considering an approach that promotes the development of socio-emotional skills in a transversal manner.

This program responds to the commitment to contribute to the right that every person has to enjoy the benefits of the development of science and technological innovation. Teachers, as fundamental agents of the educational process and social transformers, must access a comprehensive system of training, training and updating.

CUANTRIX represents an effort to meet the educational objectives established by the New Mexican School (NEM), according to the General Education Law (2019, Art. 2) , and guarantee the development of programs and public policies that make this constitutional principle of right to education of the youngest through access to ICT and digital learning.

b) Theoretical. The three key concepts on which the theoretical framework pivots: computational thinking, teaching programming in childhood and learning with and in robotics are present in the digital competence frameworks used as reference.

In the plan of activities proposed in the different courses, within the UNESCO digital competencies framework (2019), the development of skills is promoted from the use policies promoted by the schools that have been involved in the program: (i) the acquisition of basic knowledge, its application and developed knowledge society competencies; (ii) teaching enhanced by ICT, the resolution of complex problems and their self-management; (iii) the application, transfer and transformation of digital skills to specific situations; (iv) organization and literacy from the development of team activities and the professional learning of teachers from networking, promoting the teacher as an innovative agent.

From the Society for Technology in Education, the National Information and Communication Technology Standards (NETS) have been designed for teachers and students (ISTE, 2022). The CUANTRIX activity plan promotes these competencies for teachers through the establishment of learning and reflection goals, the support and empowerment of students to improve teaching and learning; inviting students to contribute and participate responsibly in the digital world; dedicating spaces for teacher-student collaboration to improve educational practices, share resources and ideas, and solve problems; designing new activities and meaningful learning environments for students; facilitating learning by using technology to support student achievement and using the information and data collected to drive instruction and personalize education.

In the case of students, technology seeks their active role in the choice, achievement and acquisition of skills related to learning objectives; recognizing the rights, responsibilities and opportunities of living, learning and working in

an interconnected digital world; critically evaluating resources and constructing knowledge, producing creative artifacts from the development of meaningful learning experiences and developing and using strategies to understand and solve problems.

Finally, from a national perspective, the Digital Skills Framework is taken as a reference (SCT, 2019). The CUANTRIX program identifies a series of specific actions: generating collaboration mechanisms between the members of a work team; include vulnerable groups as a priority, promoting inclusive and equitable education; strengthen physical spaces for digital inclusion to encourage investment in infrastructure in areas with less connectivity; develop a training and education plan according to the needs of teachers in terms of computational thinking and programming and transfer the delivery of knowledge to online virtual spaces.

c) Pedagogical. The pedagogical framework for the teacher training program focuses on: adult learning, teacher digital competence, the socio-constructivist approach to learning, situated and meaningful learning, the didactic approach, instructional design, interdisciplinarity and attention to educational diversity and inclusion (SEP, 2017; 2019a; 2019b; 2020).

The final proposal aims to encourage reflection about the programs, encourage students to design their own programs and stimulate confidence by promoting critical reflection and collaborative work through the detection of errors.

For its connection with the curriculum, learning activities have been designed in which the thematic contents of the program for each grade are recovered, while

metacognitive skills are developed for teamwork, creativity, innovation, critical thinking. and the socio-emotional aspect among others (Fundación Televisa, 2021).

For implementation, manuals have been designed for each academic grade, with "Lessons" in which the didactic sequences configured according to the following are detailed: title, summary, purpose, timing, objectives, preparation for the teacher and the student teams. , teaching resources and learning activities. In addition, on the CUANTRIX website (2021) you can find orientation videos, communities of teachers who share experiences, and tutorial videos.

From the final technical reports of 2019, 2020 and 2021 (SEP-UNETE, 2020; 2021; 2022), it is clear that the training plan is presented to teachers in an itinerary from 1st to 6th of primary school and 1st to 3rd of secondary school. in the basic, intermediate and advanced profiles.

In the first school year 2019/2020, basic level courses were offered from 1st to 6th grade of primary school. In the year 2020/2021, the basic and intermediate level courses from 1st to 6th of primary school and the basic level course from 1st to 3rd of secondary school, in addition to a specific robotics course for secondary school. In the year 2021/2022, the complete itinerary was offered from 1st to 6th grade of primary school and the basic and intermediate levels of secondary school courses, in addition to the robotics course.

A modular and object-oriented virtual learning environment was developed on Moodle, which offers different possibilities for didactic communication, since its structure is based on social constructivism: academic administration, progress

indicators, formation of study groups, general information , collaborative work, diversity of content and formats. On this platform they have tutorials for monitoring and control of deliveries, and academic management and administration.

To pass the course, the teacher must present evidence of having carried out the different activities (photographs or digital documents), and upload the files to the platform in the corresponding section.

The first year, the modality used for advising teachers was 100% in-person, however, due to the circumstances derived from the Covid-19 pandemic, the following two years the modality had to be 100% virtual, through the platform , with some specific visits to the centers. The virtual environment from the beginning favored the transfer from one modality to another. Therefore, we could speak of a hybrid model of online training with face-to-face meetings in a variable proportion from one course to another due to the effects of covid-19.

To know the impact of the investment made and to be able to know the strengths and areas for improvement of the CUANTRIX program, once the training itinerary that the first teachers began in 2019 has been completed, the AEFCM requests, through the Ibero-American Chair of Education of the Organization of Ibero- American States (OEI) of the University of Alcalá de Henares (UAH), a comprehensive evaluation of the work developed.

The problem of the research is to know how efficient the training of primary and secondary education teachers in public schools in Mexico City has been in the CUANTRIX program.

This article presents the results of the evaluation of the CUANTRIX program in relation to the theoretical-methodological proposal of the training, the efficiency of the training implementation processes and the impact of the program on schools during the referred period.

2. Research objectives

The research carried out has as objectives:

a) Evaluate the CUANTRIX program based on the training provided to educational figures to propose alternatives that allow efficient implementation in basic education schools in Mexico City.

b) Evaluate the impact of the implementation of the program in basic education schools in Mexico City from 2019 to 2022.

3. Method and materials

For the development of the study, the Government of Mexico City has participated in an active and coordinated manner, through the AEFCM and the Organization of Ibero-American States (OEI) through the Ibero-American Chair of Education of the University of Alcalá de Henares. (UAH) in Spain. The research has been descriptive, with a mixed quantitative and qualitative research methodology.

A total of 7,327 primary and secondary education figures belonging to public schools in Mexico City have been trained, and another 5,300 educational figures have been identified as beneficiaries.

For the selection of the sample, it has been taken into account that the participants know the program and have been involved in it in some way:

educational leaders, experts, trained teachers, students of trained teachers, families of students of trained teachers.

2,061 educational figures belonging to the following groups participated in the research: 3 educational leaders, 1 national expert, 3 international experts, 2 experts from the CUANTRIX Program, 4 training coordinators, 28 trainers, 30 education supervisors, 88 basic education managers , 580 basic education teachers (primary and secondary), 1,322 students/families. This sample represents approximately 10% of the people involved in the project.

A review of the literature has been carried out, regarding the annual reports on the training plan for the years 2019, 2020 and 2021 and various sources of information have been collected and analyzed, using techniques such as interviews and surveys with various instruments. evaluation: interviews with educational leaders; to academic experts (Annex II); CUANTRIX experts (Annex III) and questionnaires to the training coordinators and trainers; to the supervisors and directors of basic schools; to the participating teachers (Annex IV); and, to the students and families in whom a Likert scale, with ascending scores from 1 to 5, was used in many questions.

The validation of the data collection instruments was carried out by expert judgment, with the opinion of up to three experts in all cases. The interview scripts and questionnaires were shared, leaving space for the experts to give a numerical rating on the relevance of the question and make appropriate observations. For the mixed analysis, variables (for quantitative analysis) and codes (for qualitative analysis) have been defined that have allowed the

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information to be triangulated and consistent conclusions to be drawn. The different areas are presented as general categories in both cases and are summarized in Table 1.

Table 1. Summary of variables and codes used in the analysis

Category	Quantitative analysis Variables	Qualitative analysis Codes
Context data	ID	Professional profile
	E-mail	Education level
	Profile	Experience
	Age	
	Gender	
	Studies	
	Experience	
	Level	
	Degree	
	Zone	
	Town hall	
	School	
Program	Validity	Validity

QUANTRIX	Validity	Consistency
	Viability	Chance
	Chance	Development of teacher competencies
	School resources	Development of student competencies
	Spaces and resources	Classroom Resources
	Spaces and times	Relationship with the curriculum
	Computational thinking	Help manage the pandemic
	Programming	
	Logical-mathematical thinking	
Training and monitoring	Course	Improve organization, schedules or duration
	Years	Discrepancies with the online modality
	Sufficient objectives	Insufficient resources

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Contents	Quality
Methodology	Adapt to different contexts
Face-to-face modality	Need for adaptations
Line Mode	Improves teacher qualifications
Teacher learning	Gratitude
Development of teaching skills	More qualified trainers
clear materials	Commitment
Sufficient materials	Expand connected activities
Trainer	Expand disconnected activities
Device	Motivation
Connectivity	Good internal communication
Classroom	
Furniture	
General duration	
Number of sessions	
Duration of sessions	

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	Course Quality	
	Trainer Competencies	
	Trainers Methodology	
	Personalization	
	Resolution of doubts	
	Number of supervised trainers	

Source: self made

For the design and validation of the evaluation instruments, the breakdown of the evaluation proposal prepared by the AEFCM team in August 2021 was used as a basis. This document specified areas, sources of information and guiding questions as axes on the to build the different instruments (Annex I). From there, the proposal was adjusted to specify the indicators and generate the items for the different profiles of the participants.

To calculate the correlations of the quantitative variables, the Pearson correlation coefficient was used. Correlations have been calculated between all the variables that appear in the instruments, but only the results of the most significant correlations are presented.

To analyze the results, we have worked with the MAXQDA (2022) tool , a specific software for the analysis of mixed methods, and the Excel application.

4. Results

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Regarding the results obtained from the research, reference is made to the profile of the educational figures referenced as educational leaders, academic experts and

CUANTRIX experts who have contributed to the research, including the head of the Federal Educational Authority of the City. of Mexico, Mr. Luis Humberto Fernández Fuentes. The most striking results are presented regarding:

a) The profile of the participants

In the selected sample, all age ranges are represented and it is observed that the team of trainers of the CUANTRIX program is young.

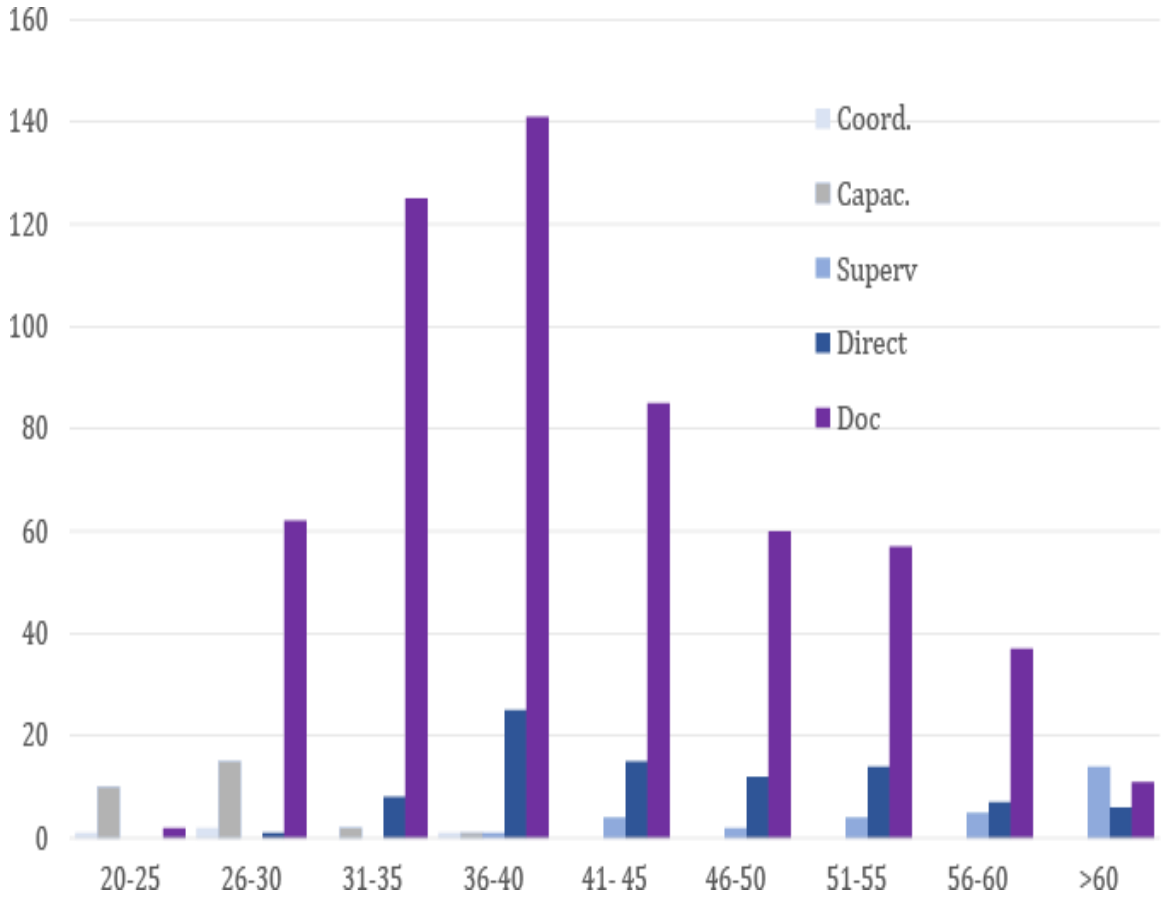

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Figure 1. Age ranges of teaching professionals in the analyzed sample Source: self made.

Among the participating teachers, 91% are primary school teachers, compared to 9% who are secondary school teachers.

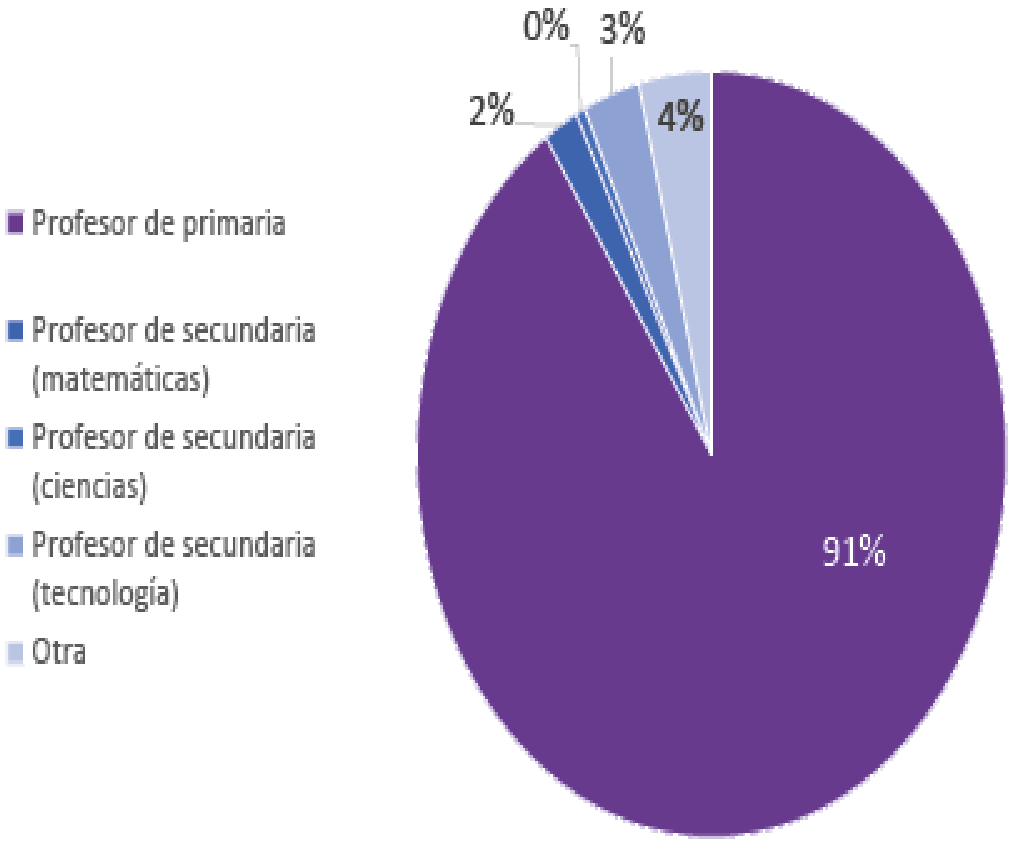

Figure 2. Teachers who participated in the study Source: self made.

Of the 1,322 respondents who responded to the student and family

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questionnaire, the profile they respond to is not discriminated against, but rather the courses to which they belong.

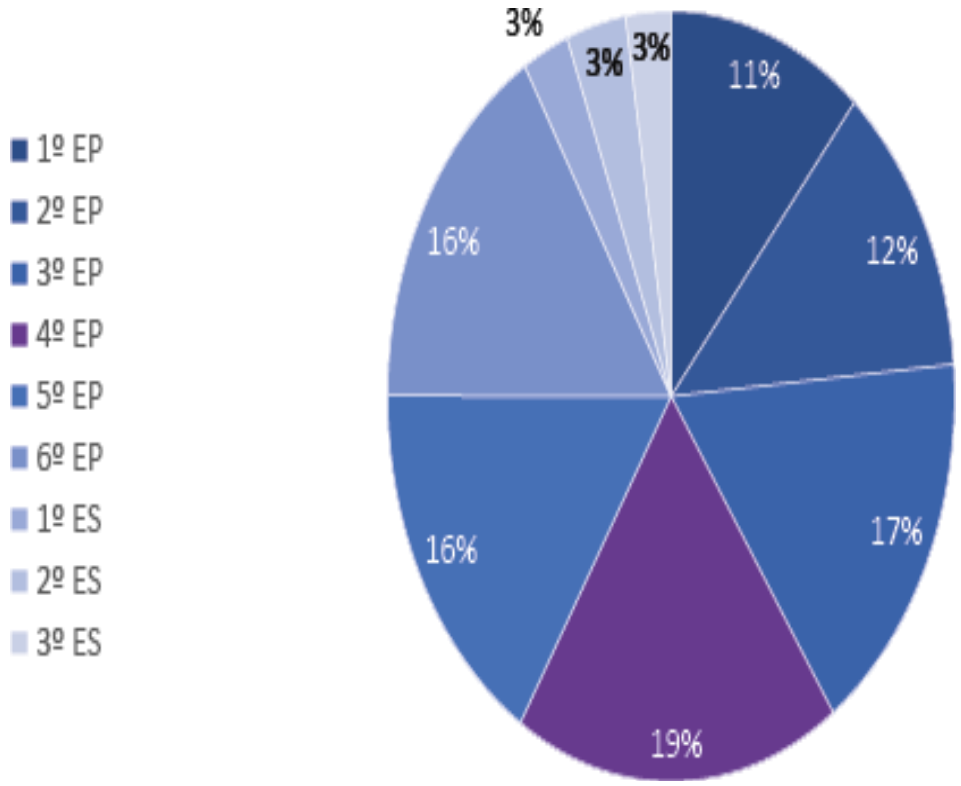

Figure 3. Students/families who participated in the study

Source: self made.

b) About the CUANTRIX program

For the evaluation of the CUANTRIX program, the opinions of educational leaders, academic experts, CUANTRIX experts, coordinators and trainers responsible for training, and supervisors and directors of basic education schools

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have been taken into account.

From the opinions of the leaders it is clear that the CUANTRIX program is valid and consistent and, above all, that it has a strong relationship with the curriculum and that it has contributed positively to the management of the pandemic, since it

has allowed the development of digital skills of the teachers who were necessary at the time that in-person activity was interrupted in basic education schools.

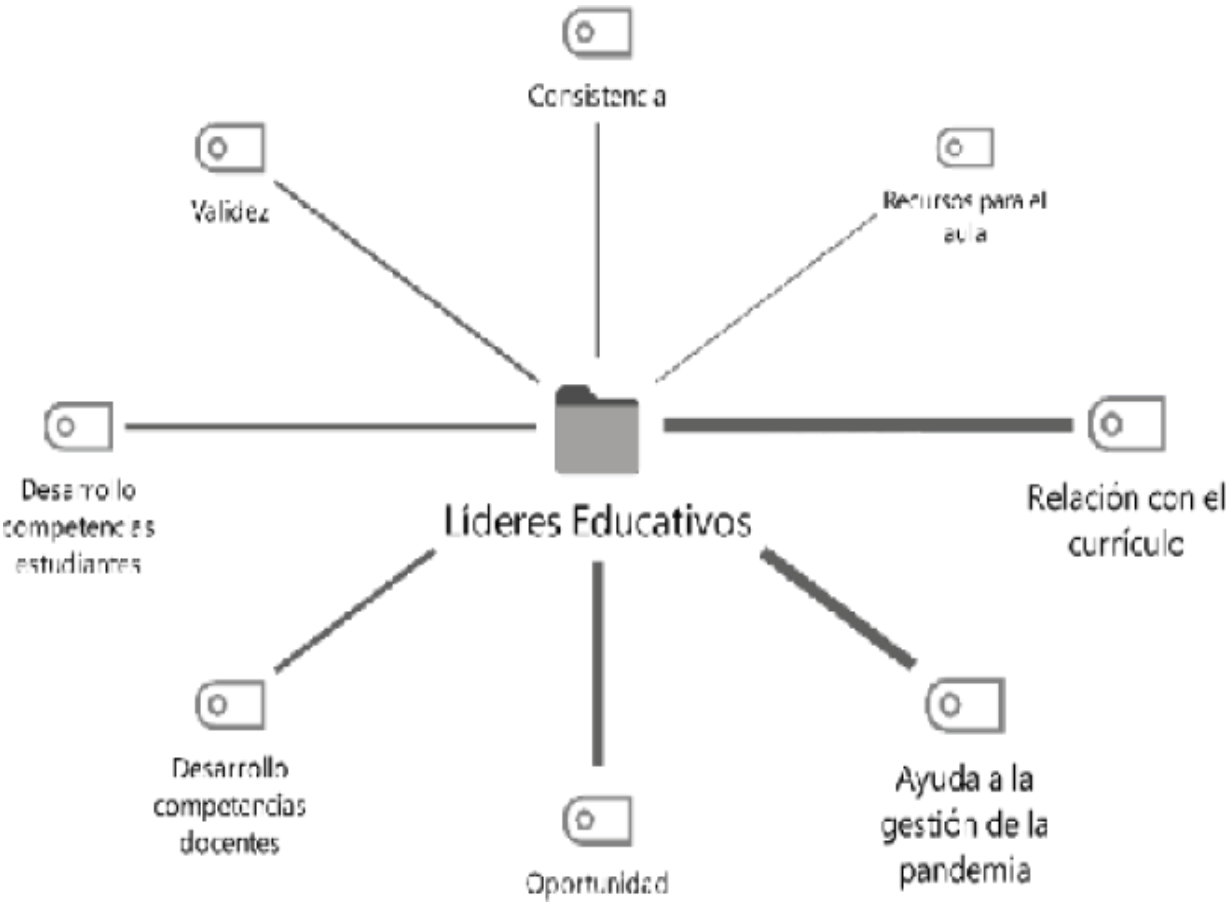

Figure 4. Opinions of educational leaders about the CUANTRIX

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program Source: self made.

For their part, academic experts speak out, above all, in favor of the consistency and validity of the program, and how it positively contributes to the development of the skills of students and teachers.

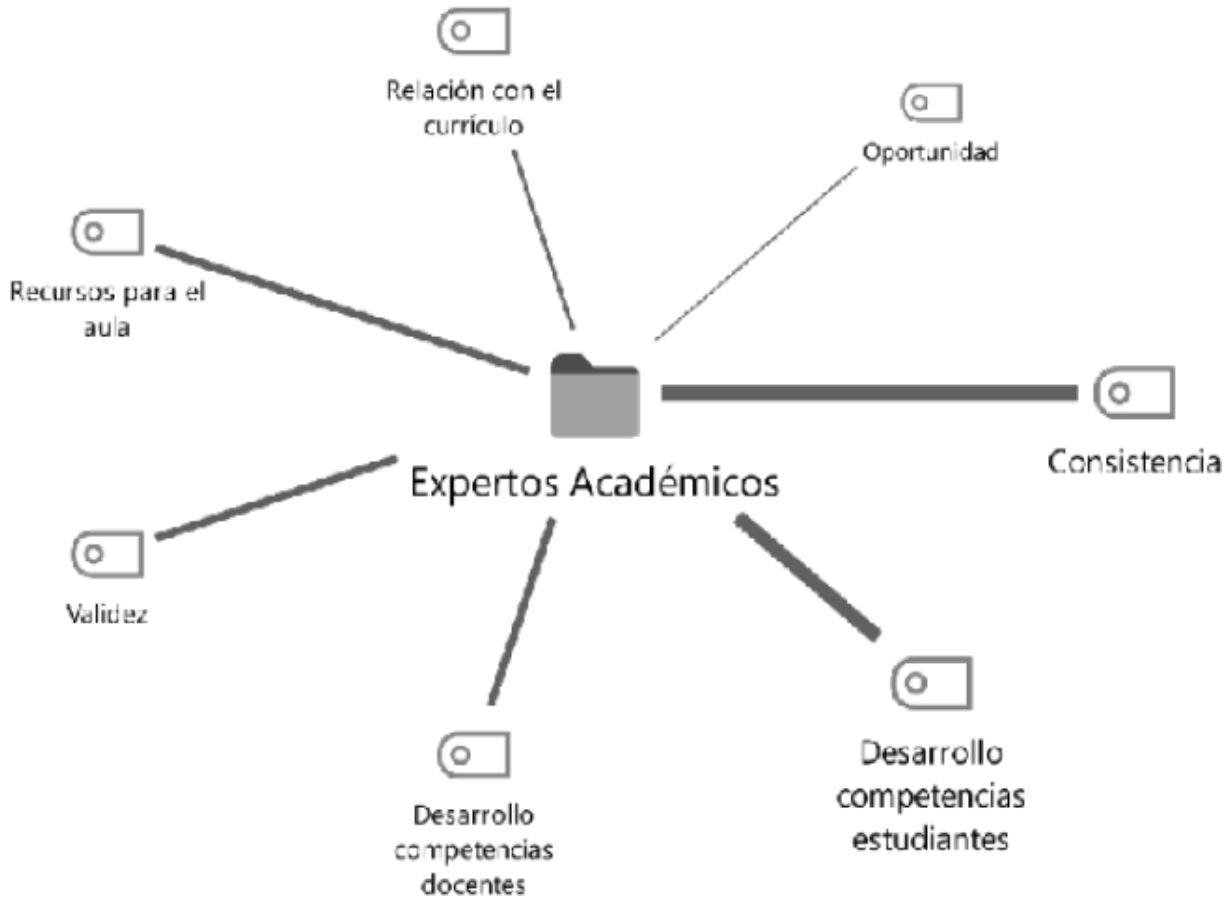

Figure 5. Opinions of academic experts on the CUANTRIX program Source: self made.

From the interviews carried out with CUANTRIX experts, in addition to the above, what stands out is the importance they give to their relationship with the

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curriculum and the amount of classroom resources offered, all of this in favor of the development of students' skills. and the teachers.

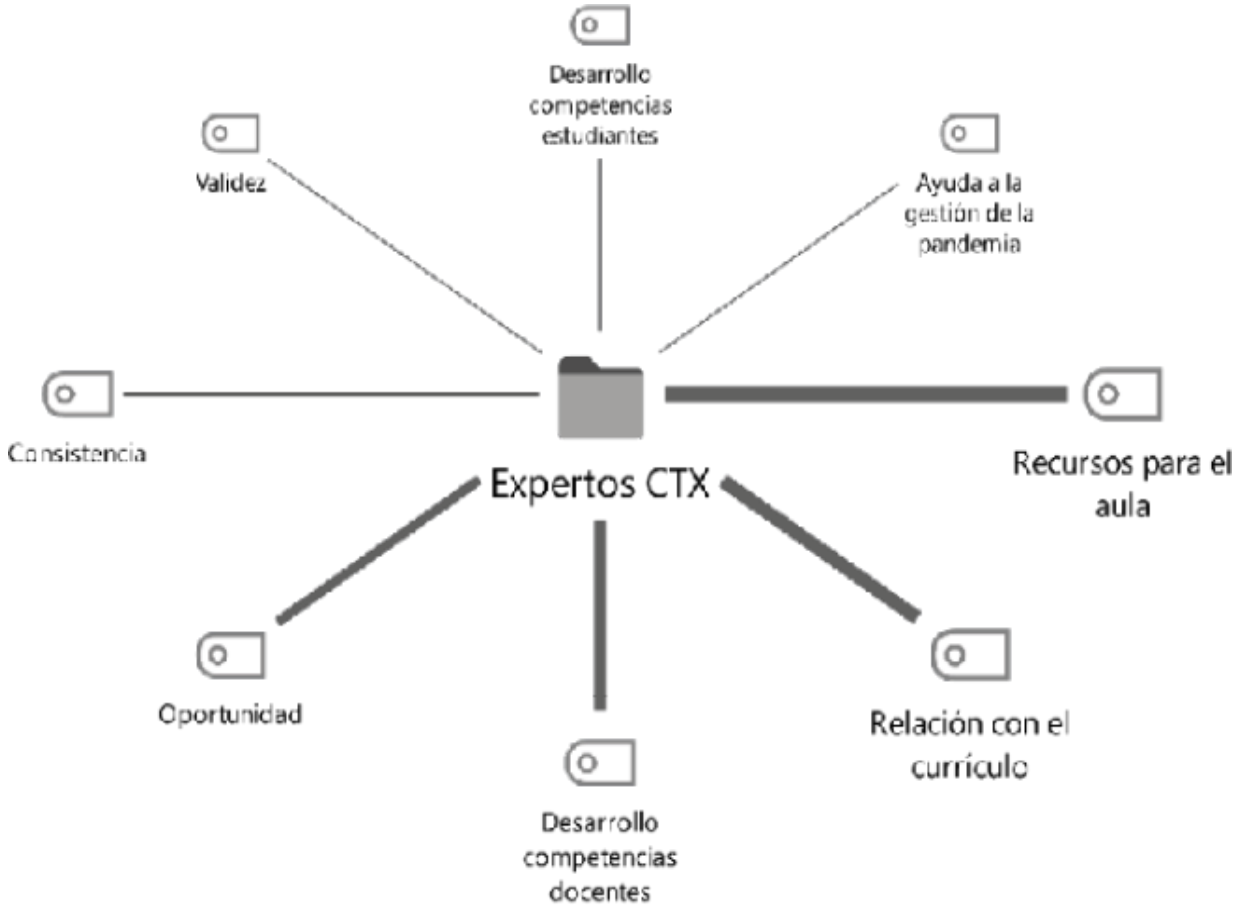

Figure 6. Opinions of CUANTRIX experts about the program Source: self made.

The coordinators and trainers ratify their conviction in the program by having scored almost the maximum 5, the validity and validity of the program contents, as well as its ability to develop computational, logical-mathematical thinking and programming skills in the participants. .

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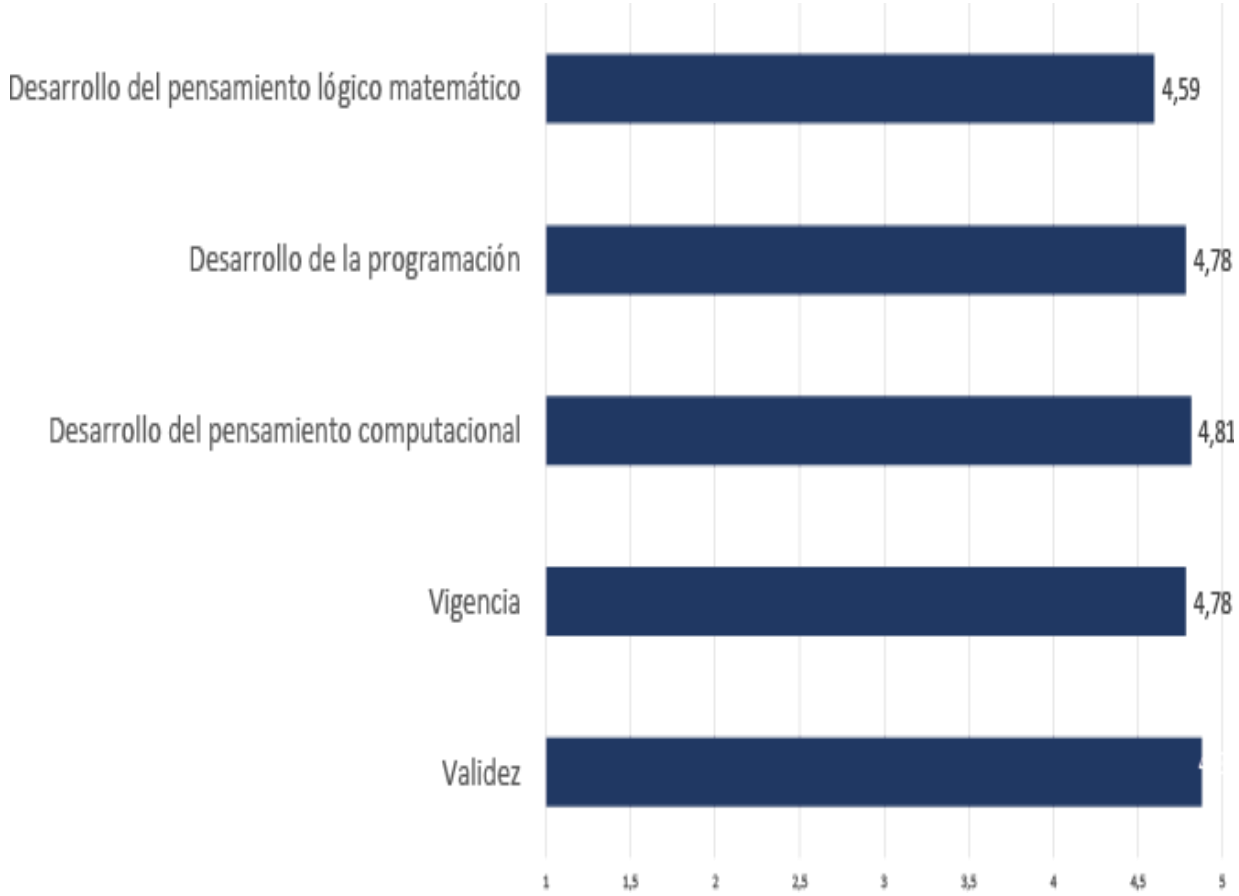

Figure 7. Opinion of coordinators and trainers about the CUANTRIX program Source: self made.

Regarding feasibility, opportunity, spaces and times and resources available for the implementation of the program, supervisors and managers have obtained an average of less than 3 in all of them.

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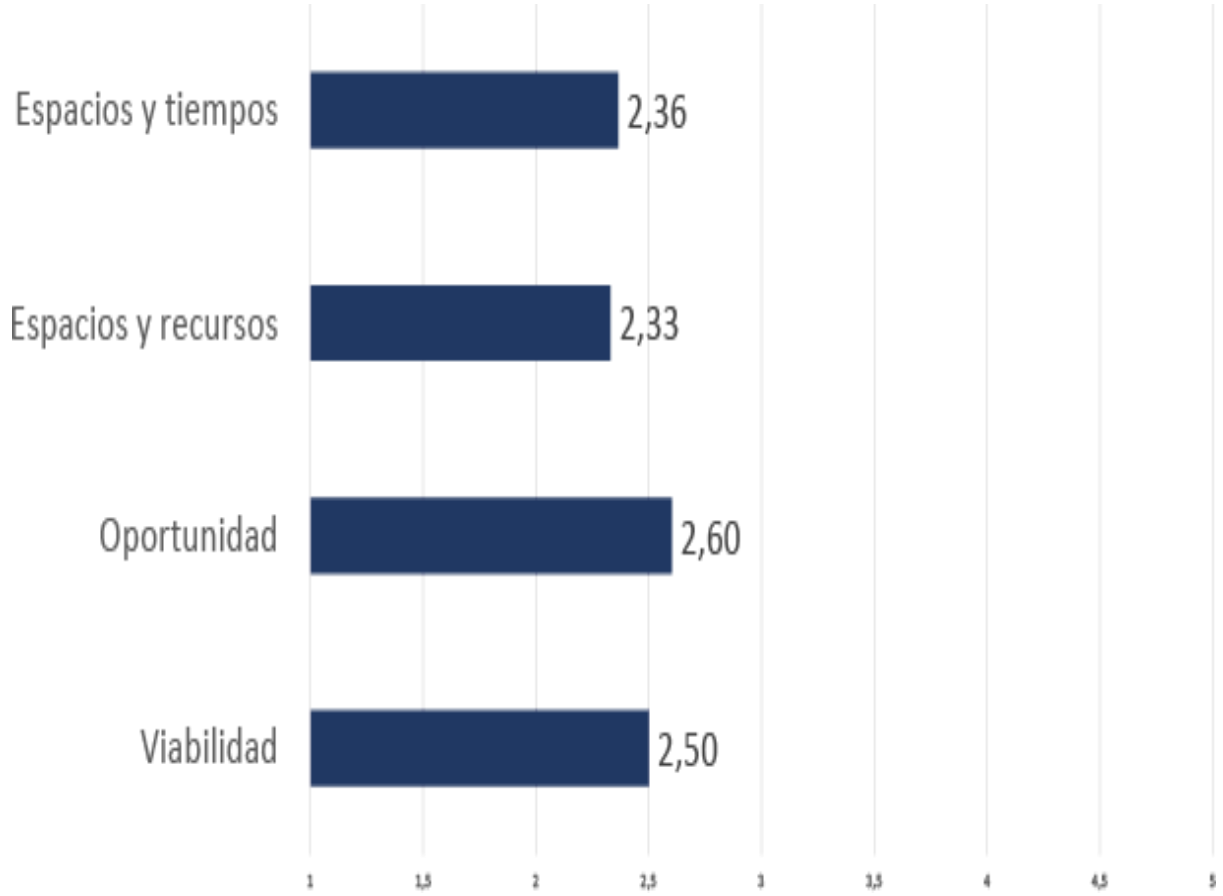

Figure 8. Opinions of supervisors and managers about the CUANTRIX program Source: self made.

Regarding the resources and equipment that the schools had to be able to successfully implement the program, the supervisors and directors stated that 56% had an Internet connection, 53% had a Media Classroom and 48% had an Internet connection. one projector per classroom. Only 8% say they have computers for a group or class and 9% have specific material for the robotics course.

The comments of the respondents about the program, as seen in Figure 9, are

positioned in favor of the opportunity that the CUANTRIX program represents for

the development of teachers' digital competencies and, consequently, digital skills. of his students.

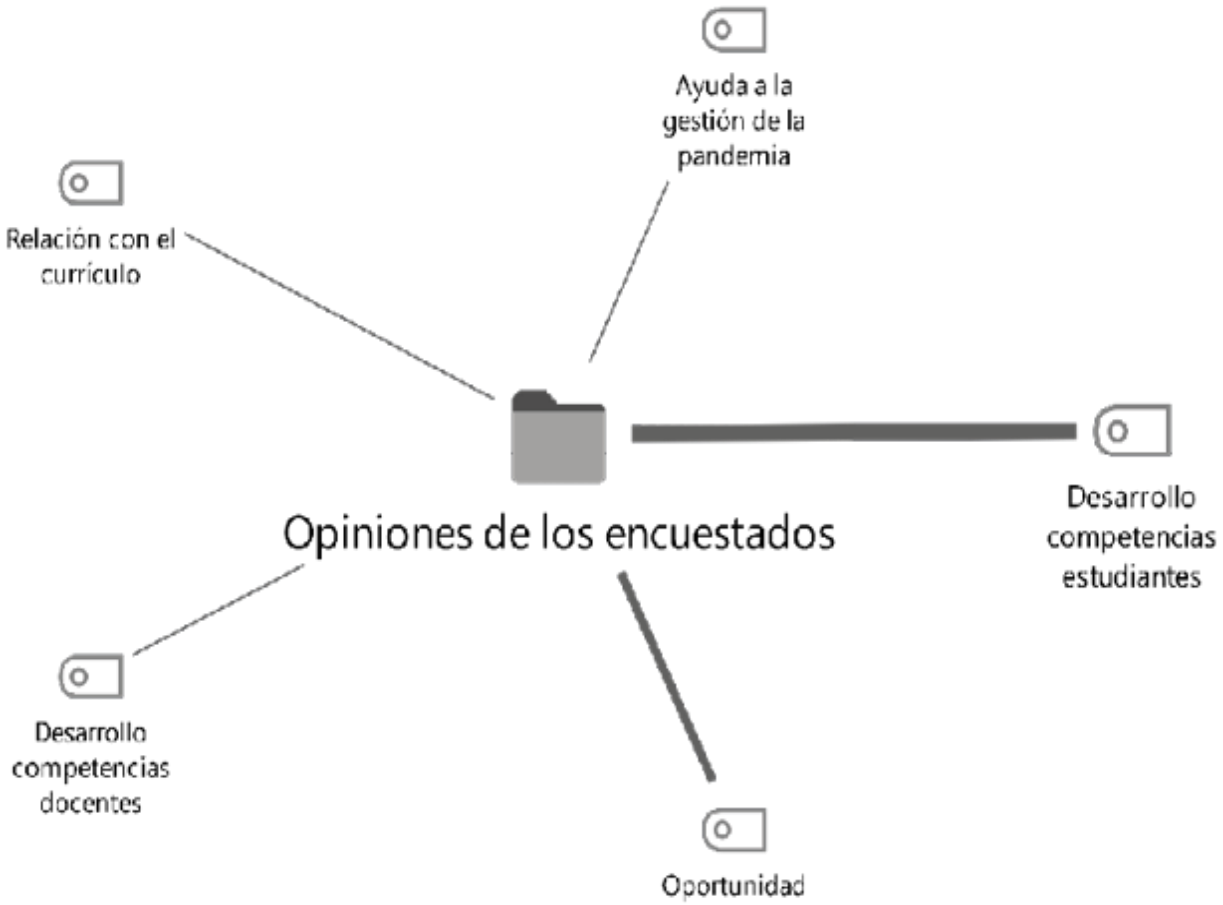

Figure 9 . Respondents' comments on the CUANTRIX program

Source: self made.

c) About the training plan for educational figures.

For the evaluation of the CUANTRIX training plan, the opinions of the

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coordinators and trainers, and of the teachers themselves who have participated in the courses, have been taken into account.

Among those surveyed there is representation of teachers of all courses, although unevenly.

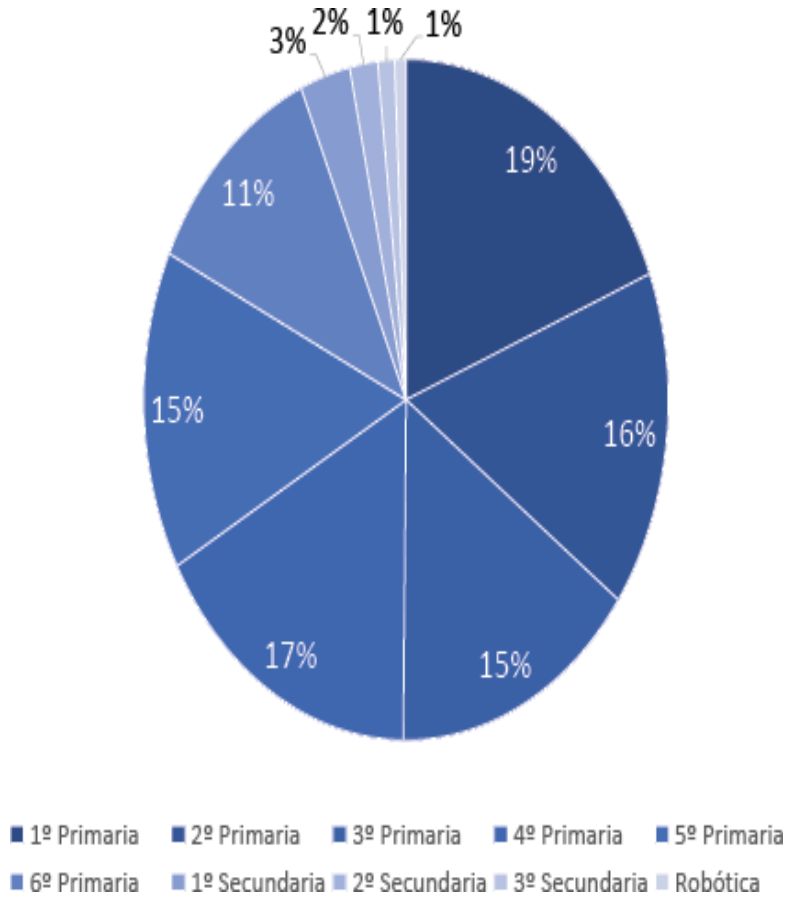

Figure 10. Participation of teachers of the different courses Source: self made.

Teachers have participated differently in the courses that were held during the first quarter of the different years since the training plan began: 2019, 2020 and 2021.

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Table 3. Teacher participation by school year

Year 2019	195	Face-to-face modality
Year 2020	181	Virtual mode
Year 2021	472	Virtual mode

Educational leaders recognize the difficulty of training due to the pandemic. They affirm that they needed different adaptations, and that they were attended to in the most efficient way possible. The quality of the training program and the high degree of commitment of the teachers stand out.

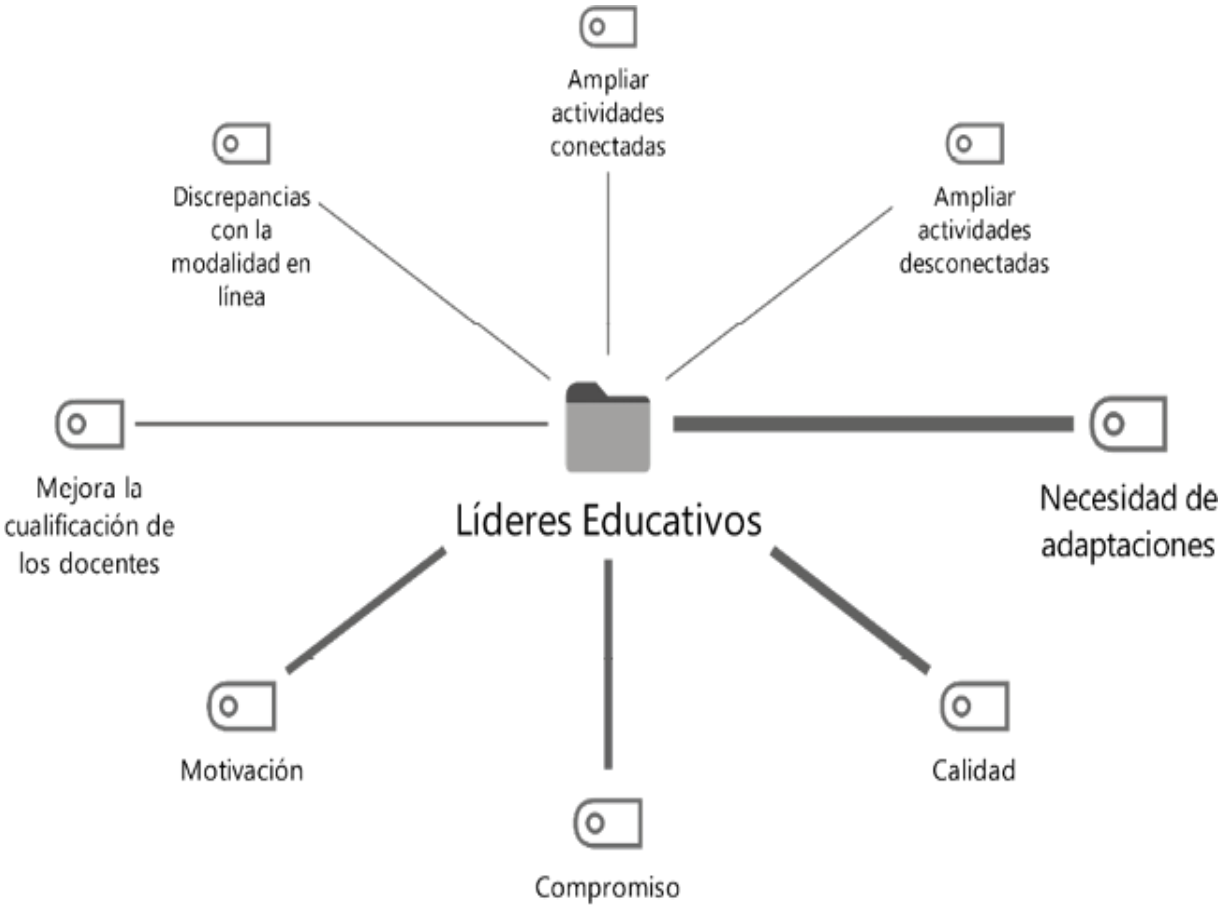

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Figure 11. Opinions of educational leaders about the training Source: self made.

The vision of the leaders coincides with the vision of the experts in the program, due to its quality and the challenge that managing the training plan has posed with the Covid-19 pandemic. The difficulties that many of the teachers presented when

moving to the online modality and the need to have qualified trainers specifically to work with teachers are recognized.

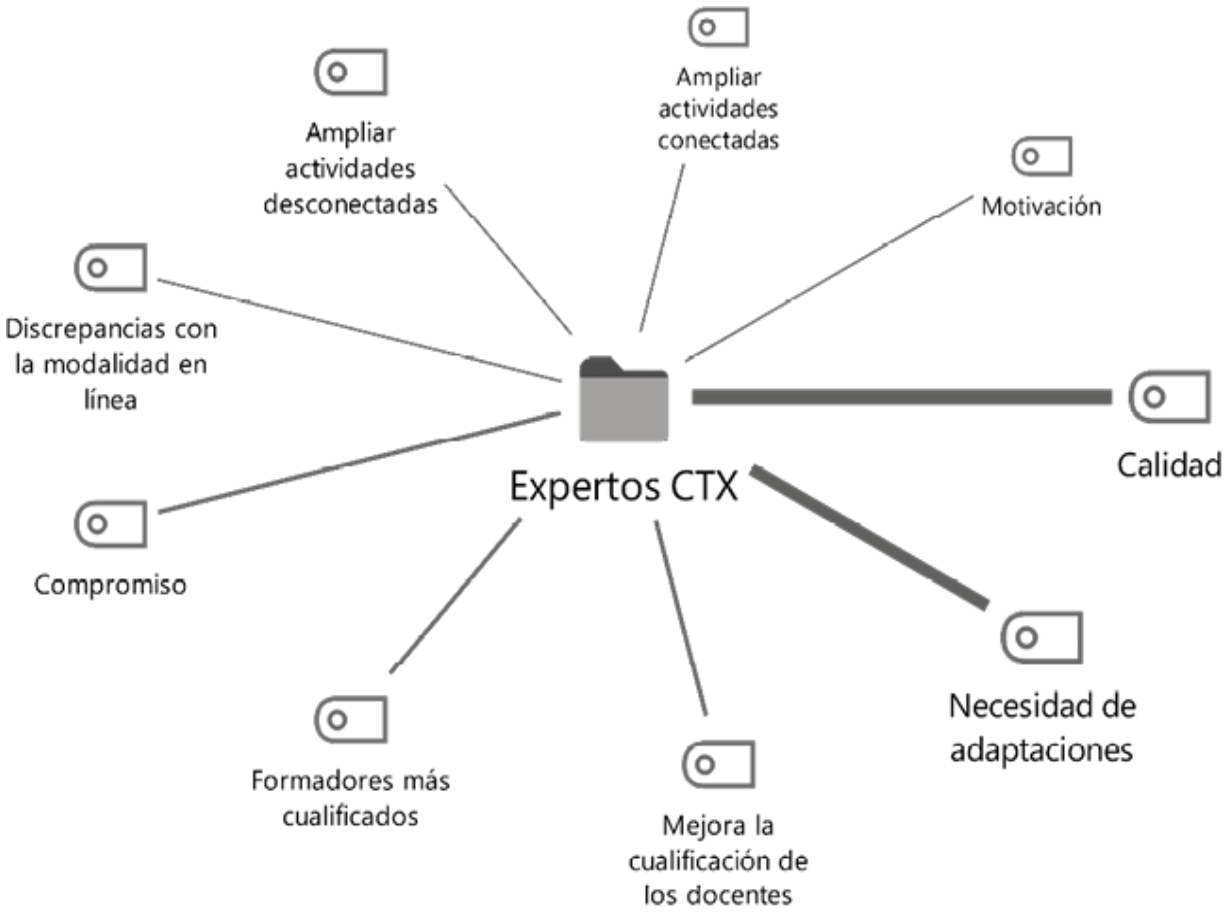

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Figure 12. Opinions of CUANTRIX experts on the training

Source: self made.

Regarding the evaluation of the development of the training, the coordinators and trainers obtain favorable averages for the program.

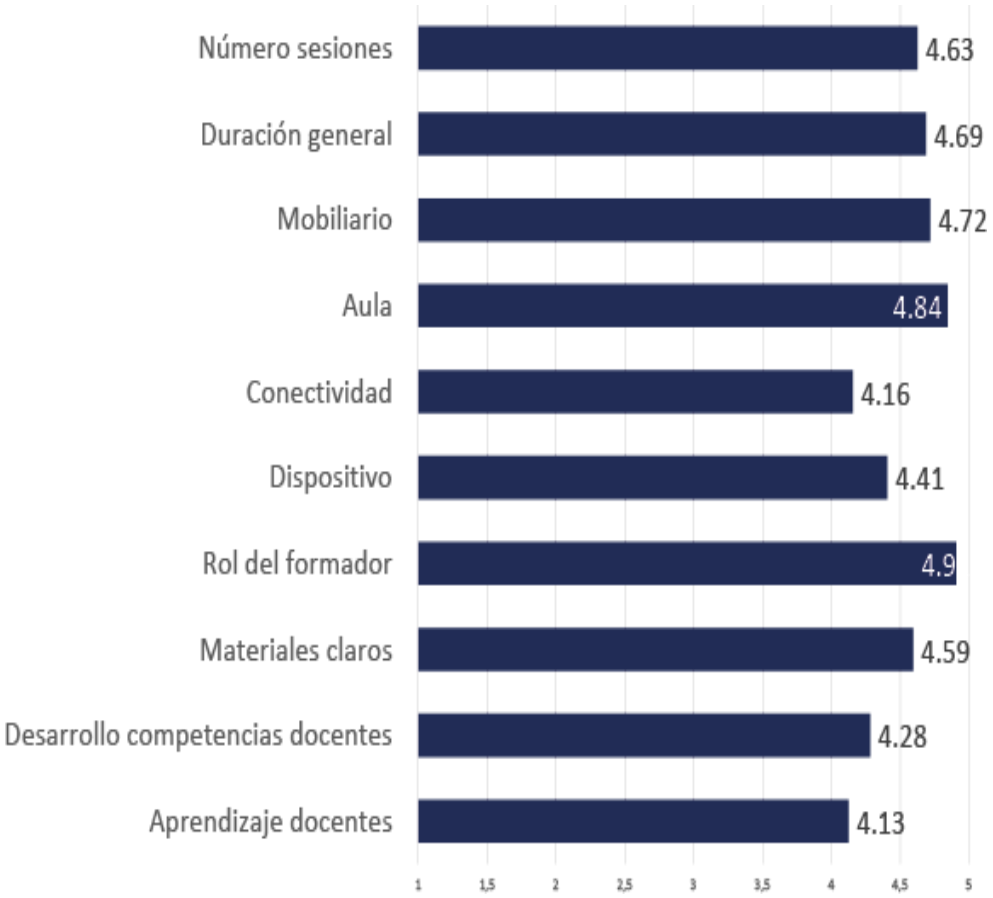

Figure 13. Evaluation of the coordinators and trainers on the training Source: self made.

The teachers' assessment is lower, although in all cases higher than the average value 3.

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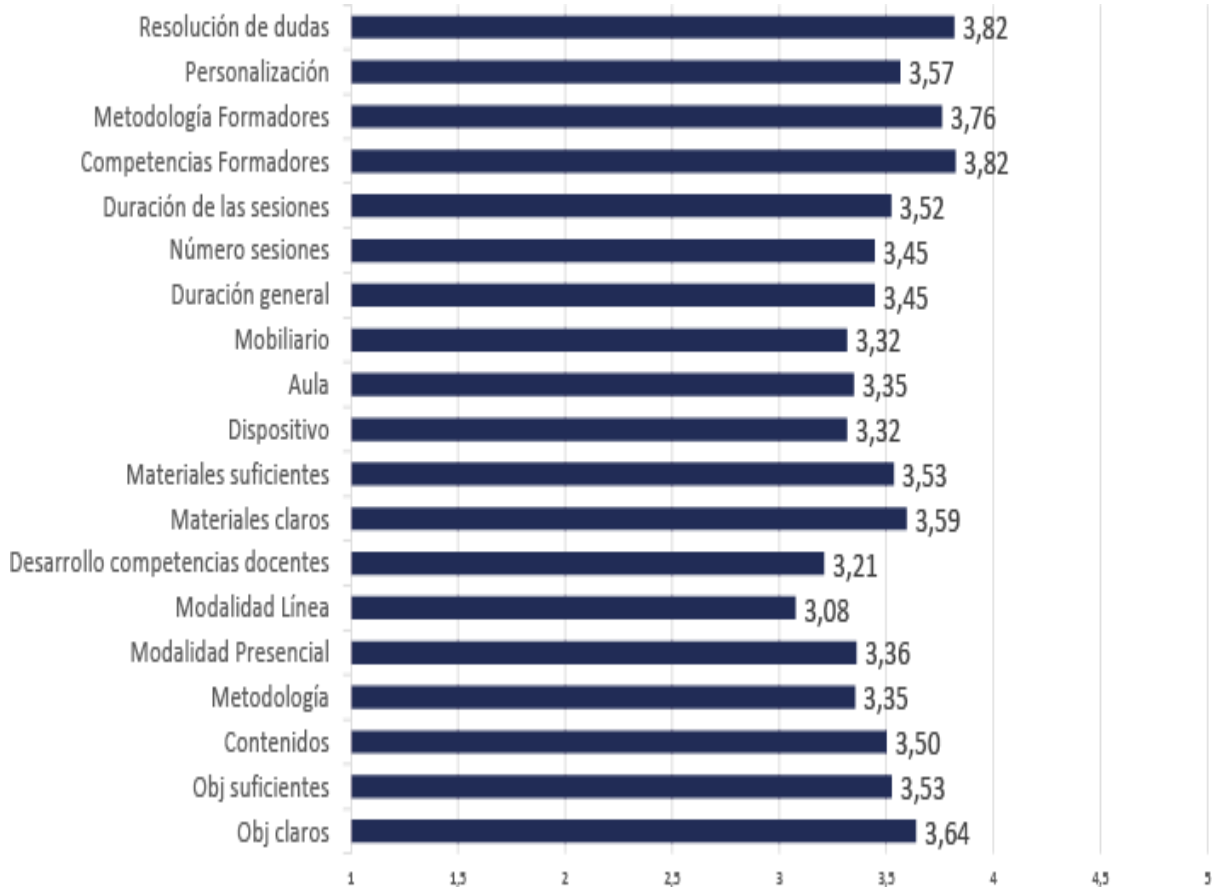

Figure 14. Teachers' evaluation of the training Source: self made.

In the opinions and comments made by those surveyed, a unanimous request is made to improve the organization, schedules and times in which the courses are taught. There is a preference towards the in-person modality to the detriment of the virtual one and a request to improve communication and monitoring in the classroom, already with students. The convenience of adapting materials and resources to different contexts is also insisted on.

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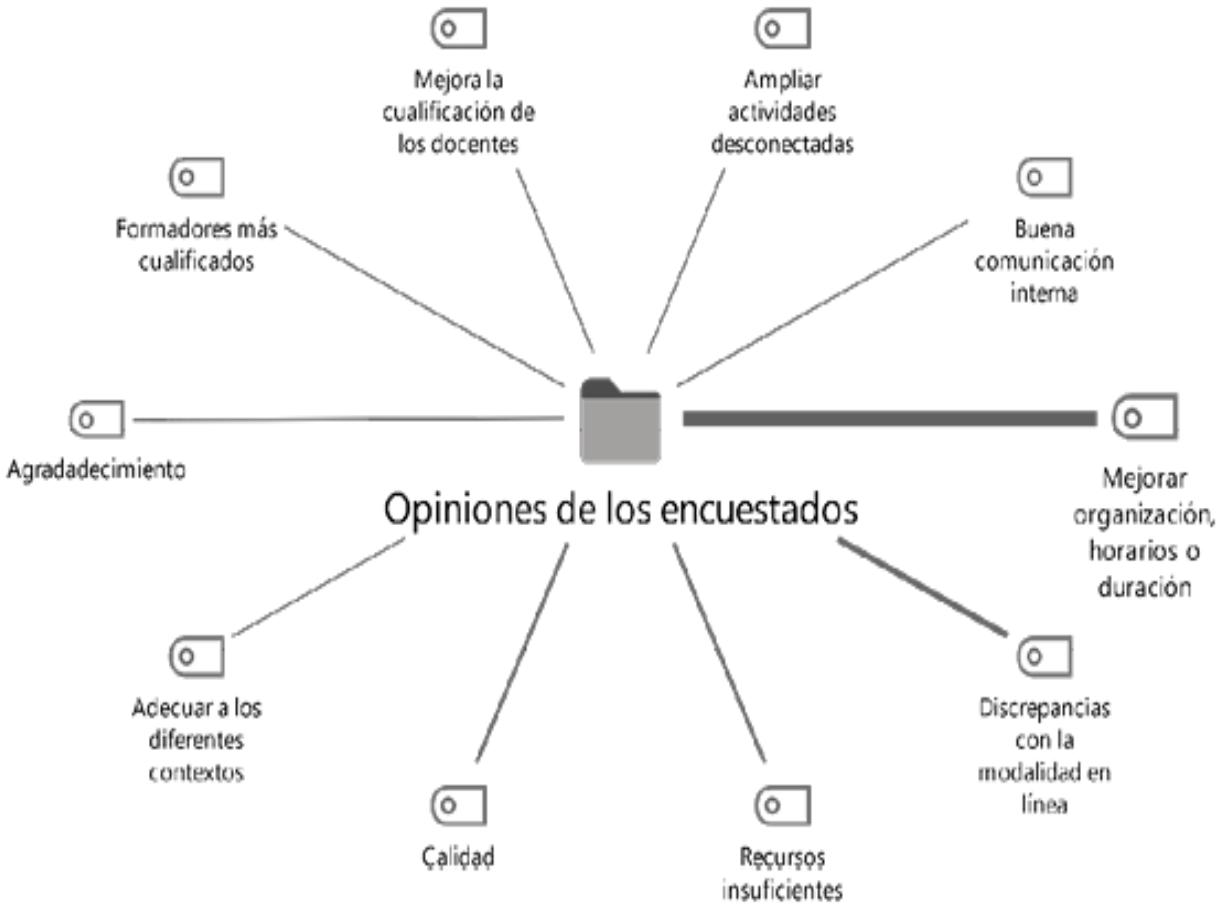

Figure 15. Comments from respondents about the training Source: self made.

Finally, trainers and teachers have rated the training plan out of 10. The score obtained is as follows: trainers 9.34 and teachers 6.67.

d) About the impact on schools

To analyze the impact on schools, the opinions of educational leaders, CUANTRIX experts, supervisors and managers, teachers and students or their families have been taken into account.

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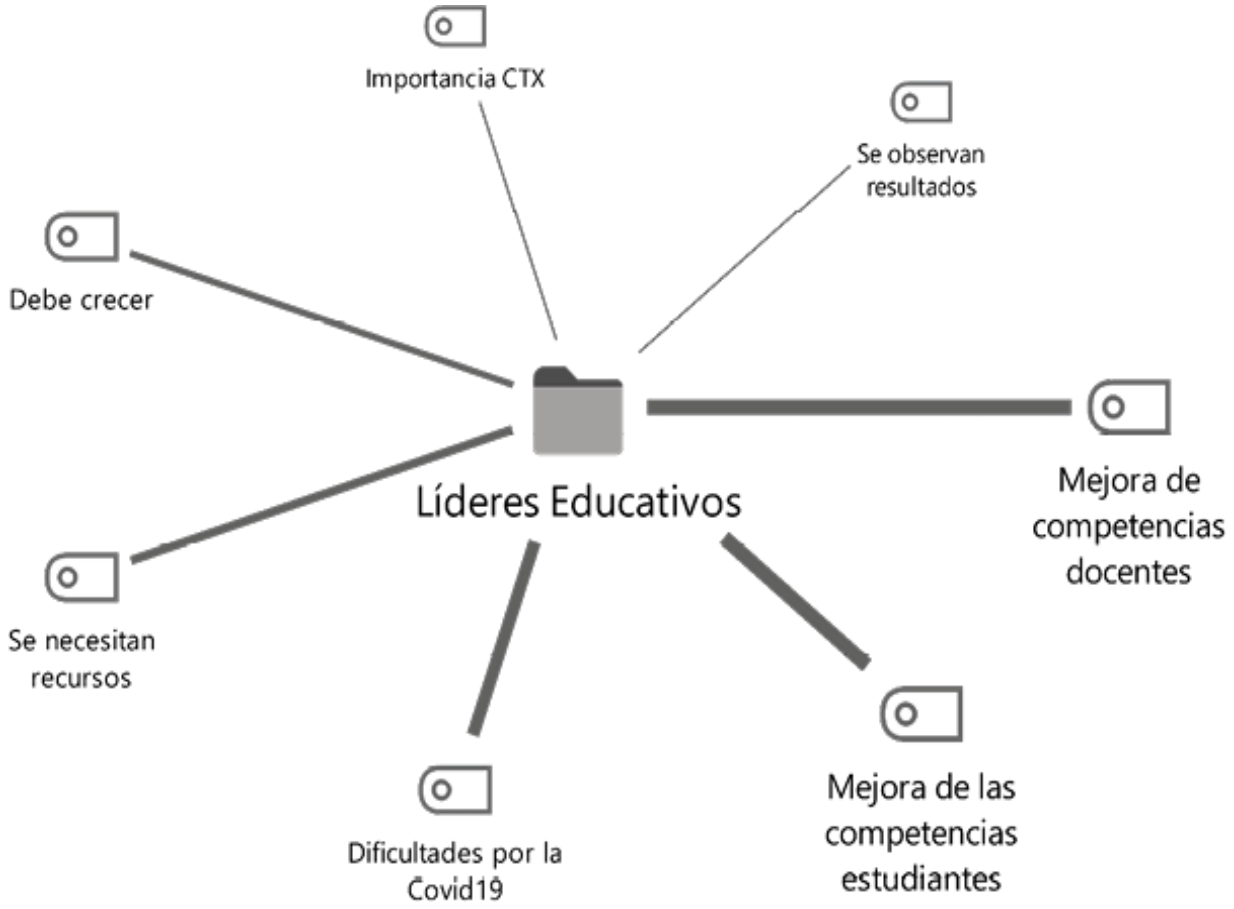

Figure 16. Opinions of educational leaders on the impact on schools Source: self made.

Educational leaders reaffirm the importance of the program because it improves the digital skills of teachers and students. They are convinced that the program must be developed and recognize that resources are needed for educational centers.

CUANTRIX experts recognize the importance of meeting the needs of centers in terms of technological resources, because they consider that, without them, the

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efforts made may lose value. The context derived from the pandemic reorients the centers' priorities towards socio-emotional issues, which is why it is important to manage and distribute resources effectively.

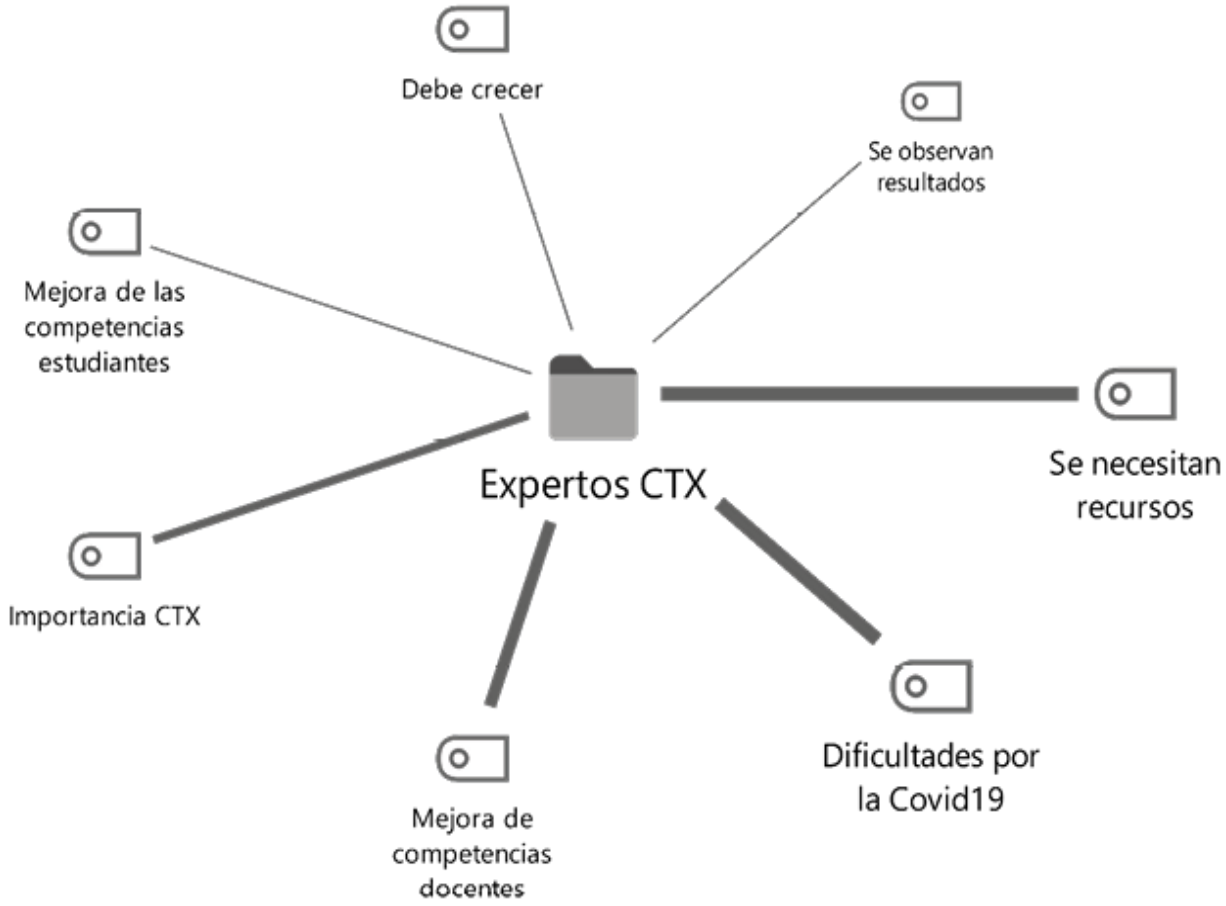

Figure 17. Opinions of CUANTRIX experts on the impact on schools Source: self made.

According to the supervisors and managers surveyed, 76% dedicated 1 to 3 hours per week, compared to 12% who acknowledge not having carried out activities with students, almost always justified by the lack of resources at

school or difficulties derived from the pandemic situation. .

For the implementation and monitoring of the program it was necessary to adapt different organizational aspects of the school. Supervisors and directors recognize that 45% maintain active communication with their teachers and students. 17% have freed their teachers from other activities so that they can dedicate themselves

to the program. 37% recognize the initiative of the teachers themselves who, after receiving the training, made contributions to their teams.

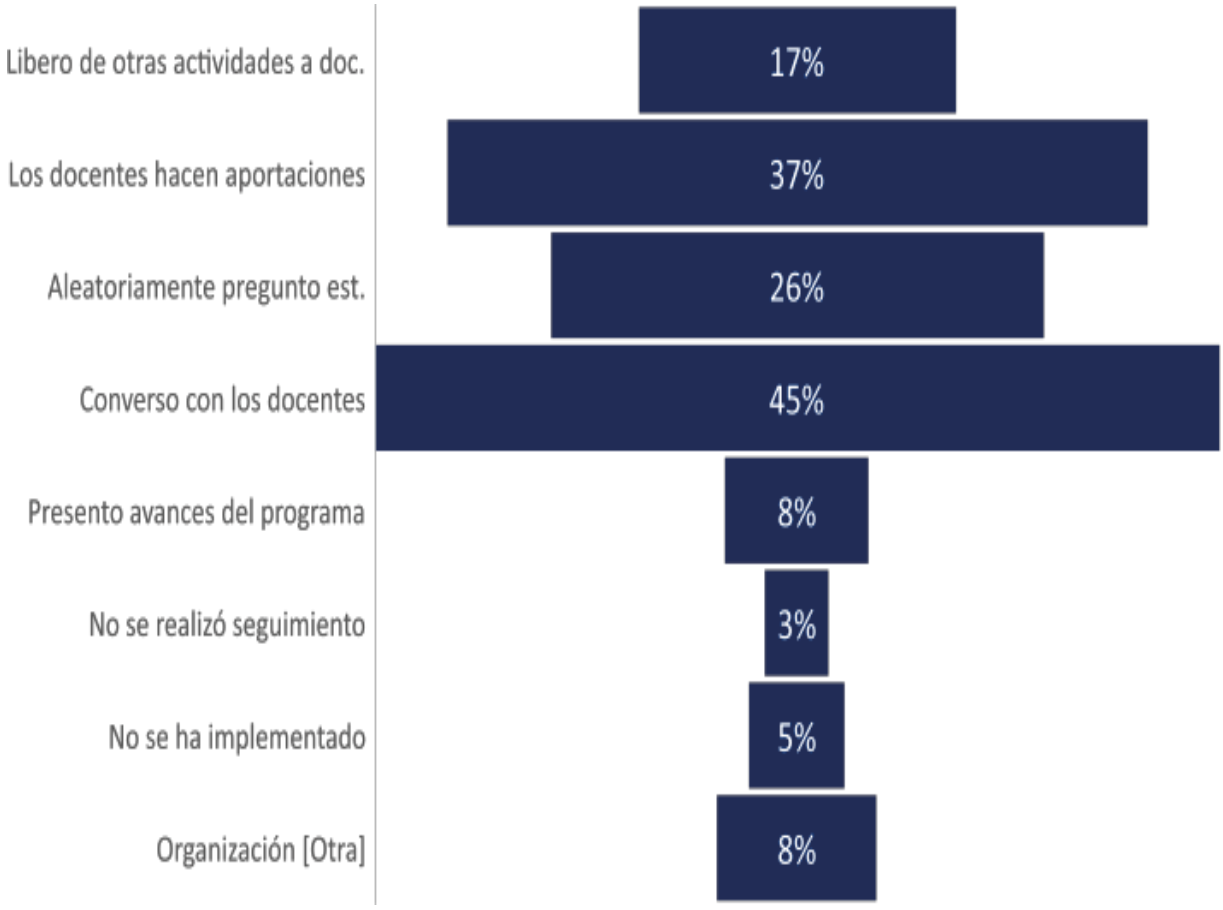

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Figure 18. Organizational measures for impact in schools Source: self made.

The teachers who were trained were the ones who got involved and developed the program in their schools. 66% took the program activities to their classrooms, with their own groups. 23% shared materials with other classmates, 17% acknowledged that the teachers themselves helped each other, and 19% acknowledged not having carried out activities with the students, usually justified by the lack of resources at school or difficulties derived from Covid-19.

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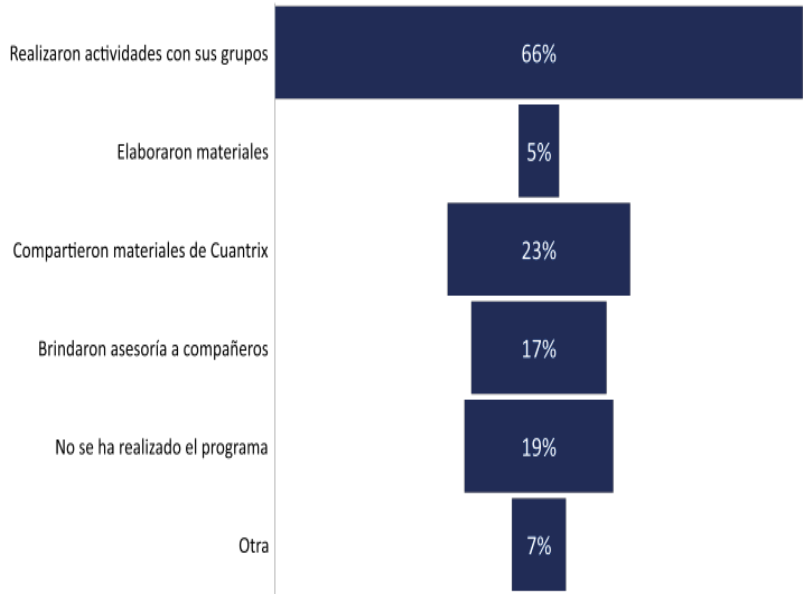

Figure 19. Types of activities for impact in schools
Source: self made.

The interest that, according to supervisors and managers, it has aroused in families and families is 2.39 and 2.71 out of 5, respectively.

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The teachers have assessed the impact of the program in relation to different items: application of the program by the teachers, mastery, improvement, use and impact of CUANTRIX by the students. Figure 20 shows the averages obtained in each of them.

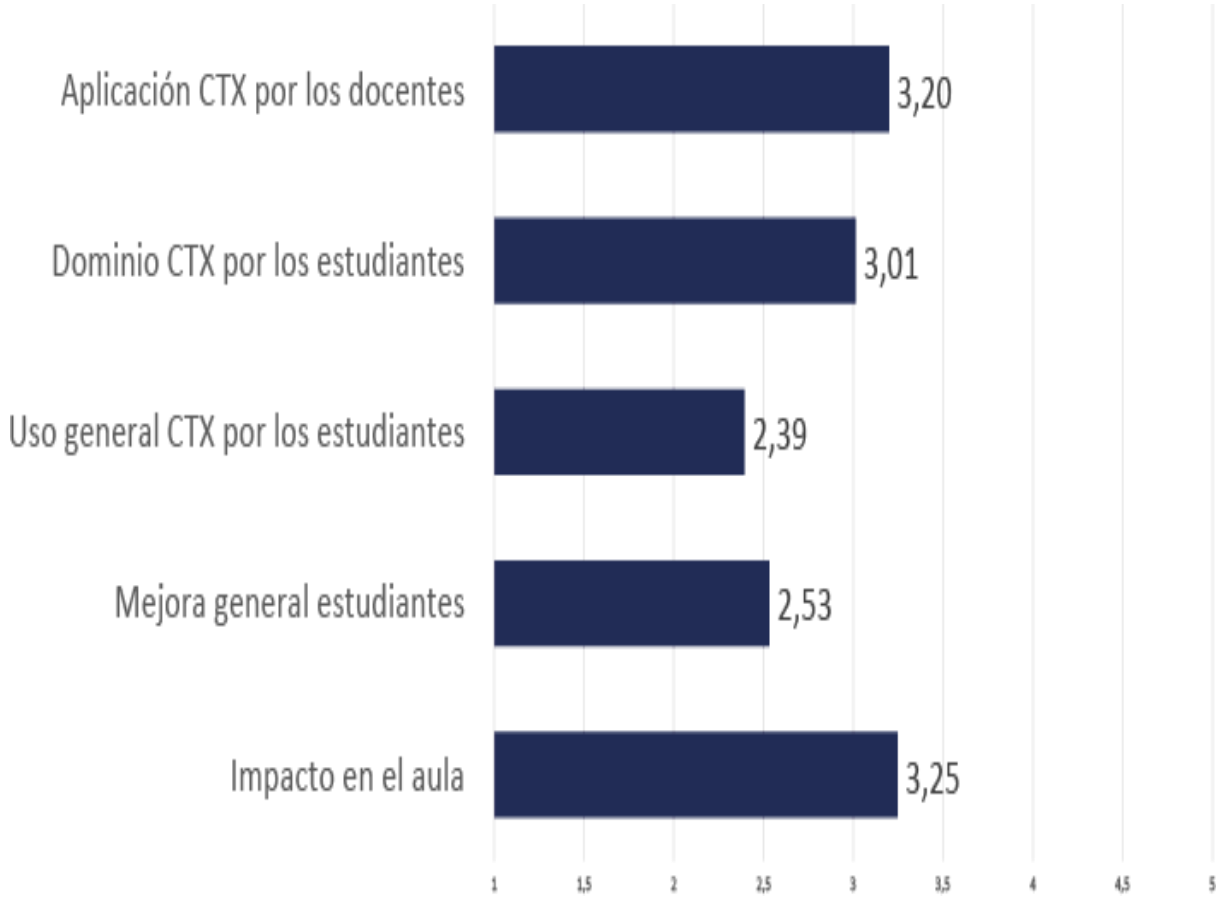

Figure 20. Teachers' assessment of the impact on schools Source: self made.

Students or their families, however, have a more positive perception of the program than their teachers and state that they have seen improvements in the

children's knowledge and skills in mathematics and science.

Figure 21. Student or family assessment of the impact on schools Source: self made.

The opinions and comments made by respondents reflect that more resources are required to equip schools, which would improve the digital skills of teachers and students.

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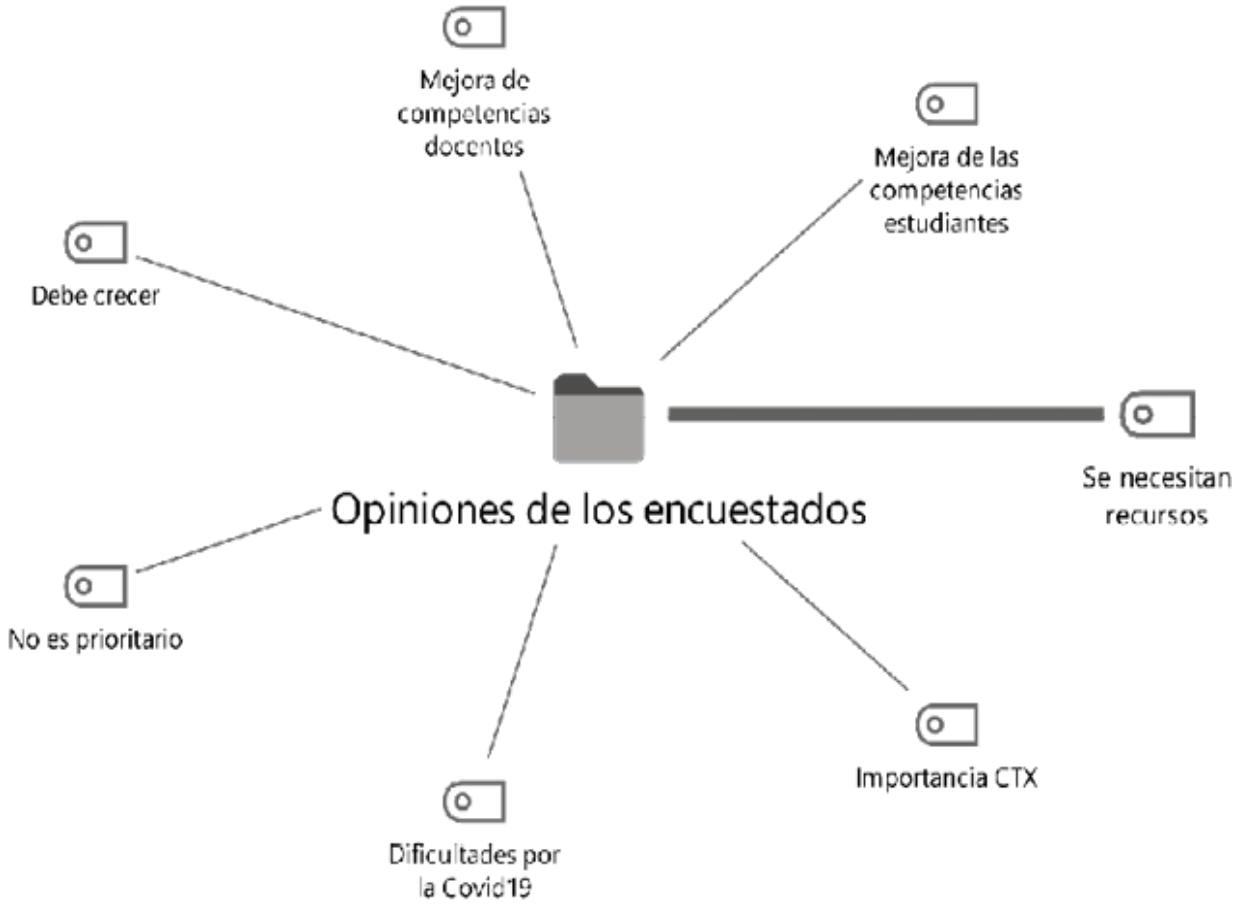

Figure 22. Opinions of respondents about the impact on schools

Source: self made.

On a scale of 1 to 10, the CUANTRIX program has obtained the following scores: supervisors and managers 6.02, teachers 6.54, and families 7.18.

e) Correlations and concurrences

Regarding the correlations between the variables as part of the quantitative analysis, the coordinators and trainers stand out: the development of computational thinking with programming (0.87) and the teachers' learning with the trainer's skills (0.749).

Of the supervisors and managers, the correlations of: the opportunity of the program with the viability for development in schools (0.88), having spaces, resources and times for its implementation (0.83), the importance of the program with its quality (0.75) and the interest of students and their families (0.82).

Of the teachers, the correlations of: the connection between objectives, contents and methodology (0.83, 0.86 and 0.79) stand out; the opinion about the materials, that they are sufficient and clear (0.79); the quality of the courses with the objectives and contents offered (0.76 and 0.79); the qualification of trainers with personalization, answering questions, etc. (0.89, 0.78 and 0.80); the improvement of students if they use it (0.84); the mastery of students if teachers apply it (0.76).

Of the students and their families, the correlations stand out between: the general improvement with the development of logical-mathematical thinking and programming (0.83 and 0.80) and that teachers apply it in the classroom with the improvement of the students (0 ,77).

In relation to the concurrence of the codes, the relationship of the CUANTRIX program with the curriculum stands out and how it connects with the importance, development and improvement of the digital skills of teachers and professors. This relationship with the curriculum offers, through its manuals, resources for the classroom and gives consistency and quality to the training.

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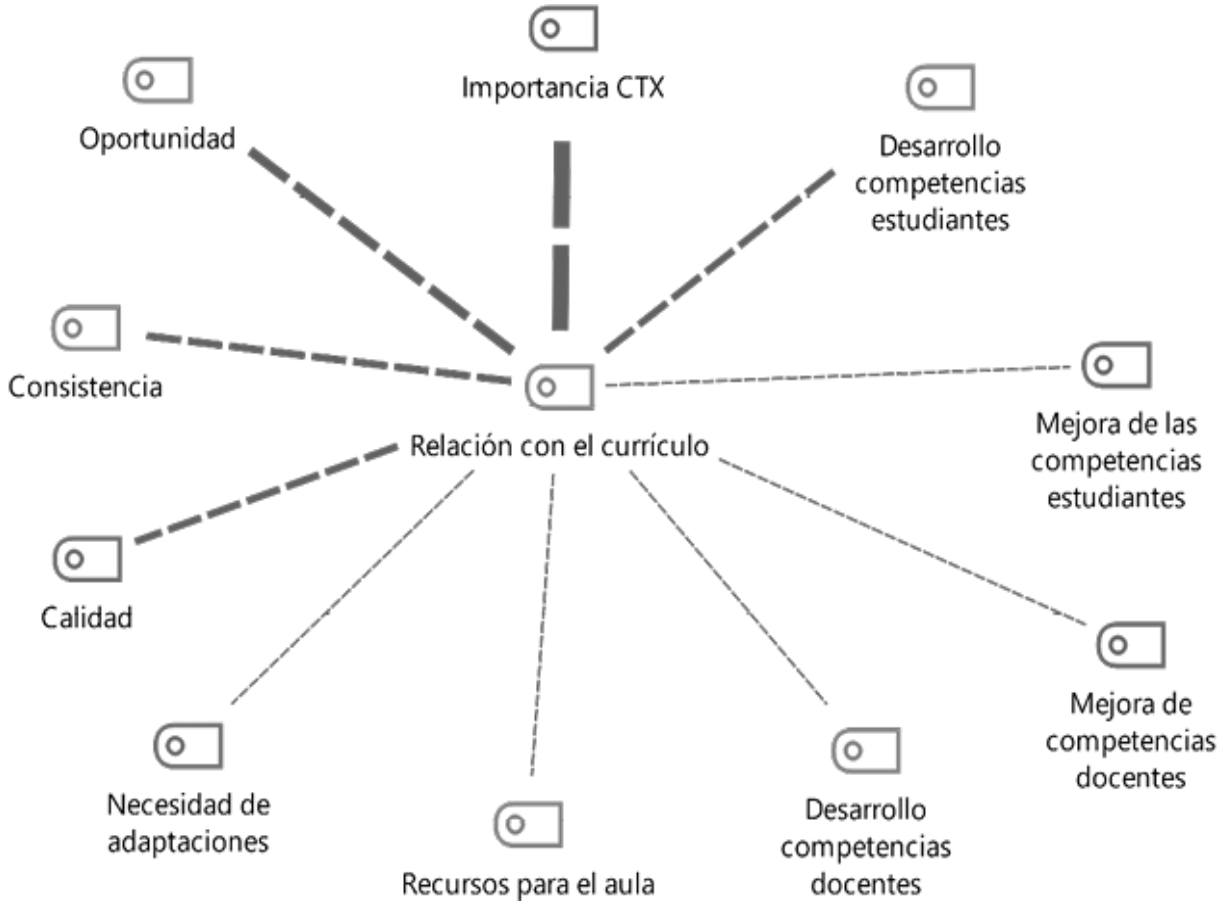

Figure 23. Code concurrences on the CUANTRIX program Source: self made.

Finally, according to the results reflected on the training, it is proposed that they be better organized and that there be in-person follow-up in schools, to understand the lack of resources that teachers have.

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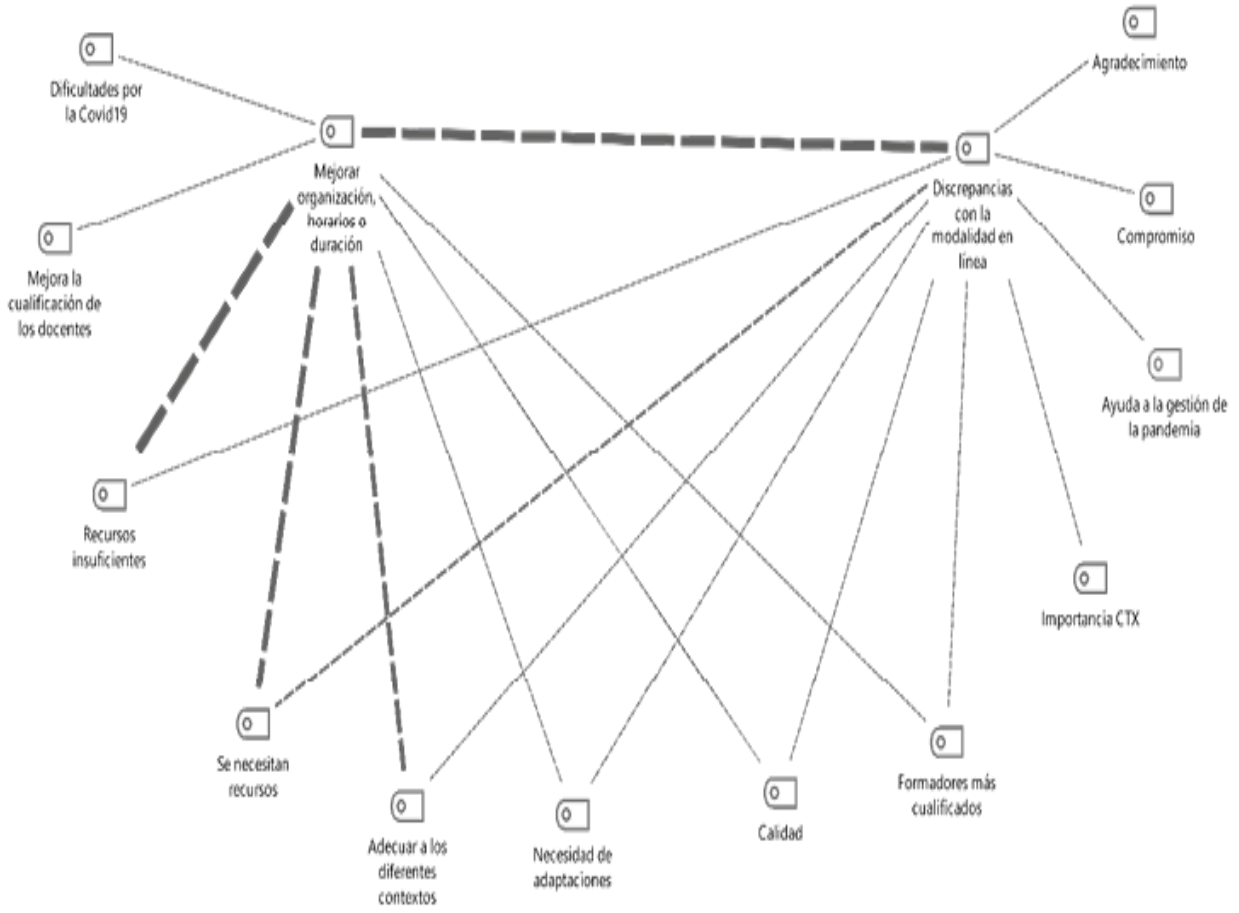

Figure 24. Co-occurrence of codes on training Source: self made.

5. Discussion

Computational thinking and programming are being progressively introduced into compulsory education curricula in many Latin American countries with the intention of increasing their quality standards, something that poses new challenges for their educational systems. One of them is to implement efficient strategies within the framework of their public policies for the development of competencies and skills typical of the digital era (Vázquez et al., 2019).

On the other hand, the debate on computational thinking in education is centered on the definition of a conceptual framework that guides its integration into the curriculum at various stages (Adell et al., 2019). Addressing it as a basic, transversal and contextualized competence allows us to draw new learning ecologies from a socio-constructivist perspective (Valverde et al., 2015).

The analysis of the results draws in a clear and precise way the conclusions of the work developed from 2019 to 2022 from the CUANTRIX program and presents it as a solid and viable proposal for the scalability of computational thinking and programming in Mexico.

a) About the CUANTRIX program

From the objective of evaluating the theoretical-methodological proposal of the CUANTRIX program, it is concluded that the program is powerful and has aroused great interest in the educational community.

Above all, its connection with the curriculum and its organization by stages and courses that favor its implementation in the classroom from the organizational model that prevails in basic education in Mexico City is attractive.

To do this, now that the contents and work methodology are known, it would be necessary to design a strategic plan from which the needs of the schools can be analyzed to effectively provide them with the appropriate resources.

b) About the training plan

From the objective of evaluating the effectiveness and efficiency of the training implementation processes for educational figures and the results obtained, it is

concluded that the participants positively recognize the quality of the program and its potential.

The efforts made are appreciated taking into account the circumstances derived from the pandemic that forced the replacement of an in-person training plan with a virtual model.

The efforts of the trainers to present the opportunities of the program in these times of digital transformation of schools are positively valued.

As an area for improvement, it is requested to review in depth the organizational proposal for the training and the communication model with teachers.

The request to make training schedules more flexible to make them compatible with the school day and family conciliation is unanimous. Likewise, it is necessary to establish a support plan in schools with students by specialized personnel.

c) About the impact on basic education schools .

From the objective of evaluating the impact of the implementation of the program in the basic education schools of Mexico City, it is concluded that the program has been attractive and relevant for the students and families who have been able to participate in it.

The immediacy with which some of the teachers who have participated in the training have implemented it in the classroom stands out. It seems reasonable to think that using the activities in the manuals for teacher training accelerates the process. However, as a proposal for improvement, teachers ask for the materials to be adapted to the contexts of the centers.

Finally, the most commented aspect in all the questionnaires refers to the need to provide technological and organizational resources to schools, which are currently experiencing the return to face-to-face education after more than a year and a half enduring virtual education.

Supervisors and managers recognize the need to address the socio-emotional aspects of students and teachers that are a priority over other curricular challenges.

Finally, reiterate the positive assessment of the importance of the program by all educational figures and their willingness to continue with the CUANTRIX project.

6. Conclusions

From the discussion of the results, a set of recommendations is generated that could facilitate the efficiency and scalability of the CUANTRIX program in public basic education schools in Mexico City.

91% of the trained teachers are from primary school and only 9% from secondary school, so it would be important to continue the program in secondary education by increasing training for professionals at this stage.

To make the vision of the CUANTRIX program reach the entire educational community, it is proposed to review and adapt the means of dissemination and dissemination, as well as the message of what is intended.

Likewise, it would be interesting to include initiatives to encourage the participation and recognition of achievements by teachers and students as agents of innovation, and centers as innovative institutions.

It is necessary to design specific strategic plans that allow the distribution of resources under criteria of educational equity and inclusion.

A review of the organizational model of the training seems to be a priority, as well as the review and updating of the materials and resources that are being used to adapt it to the reality of the centers. It is enriching to have the participation of teachers who have been involved in the implementation of the CUANTRIX program in educational centers, whose vision at this time takes on a relevant value.

Finally, in order to support and promote the implementation plan of the CUANTRIX program in schools, it is necessary to diagnose their needs and articulate a resource equipment plan based on them, at the same time as programming a subsequent monitoring plan for teachers. to implement the program, so that teachers can become familiar with activities such as videoconferencing, which are rarely used (Ruiz del Hoyo et al., 2021).

Likewise, it seems convenient the presence, in the centers, of specialists who are participating in the training of teachers, as mentor figures to promote adequate implementation with students.

In short, it is important that in the next steps to be undertaken, all educational figures are involved and their opinions and participation are counted.

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