Collaborative Learning In The Perception Of Mathematical Competencies Of Students In An Educational Institution – Morropón, 2023

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Abstract

The collaborative learning approach sought to determine its influence on the perception of mathematical competencies of students in an educational institution – Morropón, 2023. The research was framed in a quantitative approach of experimental type and quasi-experimental design with a control and experimental group, being the population students of the secondary level of regular basic education. To collect the information, the questionnaire was applied to a non-probabilistic and intentional sample of 14 students for the control group and 14 students for the experimental group. The instrument developed to collect the data showed a reliability of 0.945 using the coefficient by Cronbach's alpha and a validity of 0.921 using Aiken's V of the expert opinion. The results obtained showed that 100% of the students showed a high perception of mathematical competencies with a Student's T significance of 0.000 (p < 0.05) lower than the parameter, in favor of the experimental group. In this way, confirming that the collaborative learning program influences the perception of mathematical competencies, and in each dimension of the problem variable, on the contrary, the control group 0.00% of students has high achievement.

Key words: Collaborative Learning, Perception, Mathematical Competencies.

1. Introduction

In recent years, countries have sought to implement educational policies that promote skills and competencies in students. The horizon is to prepare young people who leave school with knowledge, skills and attitudes to respond competently and assertively to changes in society. To promote a positive perception of mathematical skills in students is to get them to interact actively, to make positive decisions, to practice autonomous learning, to solve situations in various ways using mathem[1]atical knowledge, etc., managing to prepare future professionals with the tools and emotions that the world of work demands of them.

At the global level, various programs and projects have been implemented with the intention of promoting work on competencies in secondary school children. Since 1997 and 1999, with the assistance of the Organisation for Economic Co-operation and Development (OECD), the Programme for International Student Assessment (PISA) has been implemented to assess education systems in several countries. This program, since 2000, has evaluated 15-year-old

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students in mathematics, reading comprehension and science skills, seeking to analyze information about the skills, knowledge and attitudes to solve situations that require the management of information and above all the skill or experience to reach the solution (Rico, 2007). On the other hand, in 2001 the Tuning Curricular Redesign Project was undertaken, with the purpose of promoting understanding, skills and knowledge, which at the end of the learning process must be demonstrated by the students. In this project, specific competencies that involve the elements of the area under development are considered, such as: content, knowledge and skills, and generic competencies that are not directly related to the area, but respond to social aspects (Salinas & Néstor, 2007). Likewise, for the purposes of the products in international evaluations of mathematical knowledge, many institutions sought to rethink their curricula to provide preparation and certification by competencies where the young people who graduate can enter the world of work have sufficient skills for their professional success, as is the case of the Inter-American Center for Research and Documentation on Vocational Training Cinterforn (Labarca, 2003).

In the face of the accelerated change in society and technology, the leaders of nations consider the development of competence essential for young people to develop efficiently in the globalized world (Kipper et al., 2019). Despite the efforts made by several countries to promote a competency-based curriculum in the classroom, from the first levels of education, these have not yielded the expected results, probably due to a negative way of perceiving mathematics. On the contrary, the best results have been shown in higher education (Guzmán, 2019). The OECD (2019) with regard to the achievement of competencies noted that only five countries obtain positive results in mathematical competencies. Teaching methods of repetition, mechanization or decontextualization are deficient because they generate little creativity and low autonomy. The biggest challenge is to work on activities that put mathematical knowledge into practice in various situations and contexts (Alsina & Mulá, 2022). It should be noted that, in rural areas, learners have greater difficulties in achieving competencies due to the negative perception they have of it, so they are not very participative and lack confidence in the development of mathematical problems (Córdoba, 2020).

In our country, the governing body, the Ministry of Education (MINEDU, 2016), after articulating various educational policies with the different sectors, implemented the National Curriculum for Basic Education (CNEB) by competencies and capacities where it is intended that schoolchildren achieve autonomous, creative, participatory and collaborative learning based on values. In this sense, since 2015 these competencies have been evaluated, throughout the world, showing in the PISA evaluation of 2018, a small advance from the beginning, so that Peru climbed to 64th place out of 77 countries evaluated, this result shows a small advance, but not enough due to the negative perception of students for science. We are still below what we want, with the worst scores in rural areas.

In the region, it has been verified that achievements in the area of mathematics do not reach the desired range. The results for the year 2019 of the census evaluations of the learner (ECE), according to the guide of the Regional Government of Piura (2019), show that 37.61% of the students are positioned in the range of satisfactory, in mathematical competence, this means that more than 50% of the students do not solve problems that involve numerical relationships, This percentage is accentuated in rural areas. At the local level, the problem of the negative perception of competencies affects academic achievement. Since most students neglect the areas of science because they consider them tedious and difficult to understand. After having analyzed the problems of the educational center, the general problem was formulated: how does collaborative learning influence the perception of mathematical competencies of students in an educational institution – Morropón, 2023? And considering the specific questions, for this problem, the following: how does collaborative learning influence the perception of

competence solves problems of quantity?, how does collaborative learning influence the perception of competence solves problems of regularity, equivalence and change?, how does collaborative learning influence the perception of competence solves problems of form, movement and location? And how does collaborative learning influence the perception of competence solves data management problems?

Therefore, the research is explained in its practical aspect, providing as evidence an instrument to measure the perception of mathematical competences in secondary school students. The social convenience is remarkable, it attends to the problems that surround the educational center and provides methods that help to strengthen collaborative learning. The methodological justification is consolidated because the experimental work contributes with a collaborative work program, for the improvement of perception, compared to mathematics. The theoretical contribution favors to enlarge the knowledge that compares the theories of collaborative learning, learning by discovery, meaningful learning through hypothesis testing, analysis and statistical evaluation.

Within this framework, the general intention was formulated: to determine the influence of collaborative learning on the perception of mathematical competencies of students in an educational institution – Morropón, 2023. Likewise, the particular goals of the study of students of an educational institution – Morropón, 2023 were proposed: to determine the influence of collaborative learning on the perception of competence solves problems of quantity, to determine the influence of collaborative learning on the perception of competence solves problems of regularity, equivalence and change, to determine the influence of collaborative learning on the perception of competence solves problems of regularity, equivalence and change, to determine the influence of collaborative learning on the perception of competence solves Problems of shape, motion, and localization and determining the influence of collaborative learning on the perception of competence solves problems of data management and uncertainty. Finally, it was proposed to test whether collaborative learning influences the perception of mathematical competences of students in an educational institution – Morropón 2023, and whether collaborative learning influences the dimensions of the perception of mathematical competences.

2. Objectives

2.1 General objective

To determine the influence of collaborative learning on the perception of mathematical competencies of students in an educational institution – Morropón, 2023.

2.2 Specific objectives

- ➢ Determining the influence of collaborative learning on the perception of competence solves quantity problems.
- ➢ Determining the influence of collaborative learning on the perception of competence solves problems of regularity, equivalence, and change.
- ➢ Determining the influence of collaborative learning on the perception of competence solves problems of shape, movement, and location.
- ➢ Determining the influence of collaborative learning on the perception of competence solves data management problems and uncertainty.

3. Methodology

3.1 Type and design of research

3.1.1 Type of research

According to the methodology used, the scientific work was characterized by being experimental in nature, since the independent variable was deliberately manipulated (Galarza, 2021) and at the application level (CONCYTEC, 2018) where a collaborative learning procedure was applied to understand its effect on the dependent variable. Essentially, it has a quantitative approach, since after data collection, the information is subjected to numerical measurements and statistical observations for hypothesis testing (Hernández et al., 2014). Seeking to explain the consequence generated by the executed proposal on the logical skills of schoolchildren.

3.1.2 Research design

Its research design was quasi-experimental and included two work groups, a control group and an experimental group, having applied pre-test and post-test in both groups (Hernández & Mendoza, 2018), in order to answer the questions of the questionnaire. It should be noted that these types of designs are distinguished by the intentional intervention of one of the variables with the aim of knowing the effect it generates on the other, with the researcher assigning the working groups. The diagram is as follows:

Experimental Group: O1 x O2

Control Group   O3 -- O4
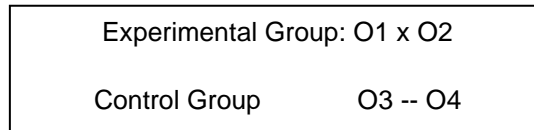
In which:
X = experimental variable or independent variable
O1: Represents the pre-test to the intervention set.
O2: Represents the post-test to the intervention set.
O3: Represents the pre-test to the control set
O4: Represents the joint post-test control

3.2 Population, Sample, Sampling and Unit of Analysis

3.2.1 Population

A population is defined as a set of units of analysis with similar characteristics (Martínez, 2012). The members of the scientific work were made up of students from the secondary level of regular basic education enrolled in the educational center "San Juan" in the district of Santo Domingo, as inclusion criteria has been considered the students enrolled according to school age, between the ages of 16 and 17 years. As exclusion criteria, it has been foreseen that students from outside the educational institution or who are not in the degree program do not participate, according to the enrollment list.

Grades & Sections	1°	2°		3°		4°		5°		Total
	Or	To	B	To	B	To	B	To	B	
	29	14	16	13	14	14	13	14	14	**141**

Table 1. Number of students enrolled in the 2023 school year from 1st to 5th grade

Note: Tuition Payrolls 2023

3.2.2 Sample

To measure the influence of the program on the perception of mathematical competencies, 28 units of analysis have been included, involving school-age students in the 5th grade of sections "A" and "B" of basic secondary education. 14 students were assigned to the intervention team and 14 students to the observation-only team.

5°		Total
To	B	
Control group	Experimental group	
14	14	**28**

Table 2. 5th Grade Students: Control Group and Experimental Group
Note: Tuition Payrolls 2023

3.2.3 Sampling

The sampling was non-probabilistic, in view of the fact that the researcher intentionally included 5th grade high school students for convenience by assigning the participants to an experimental group and a control team.

3.2.4 Unit of analysis

After defining the work teams, the 5th grade students of sections "A" and "B" were estimated as units of analysis, who were administered a program to measure their perceptions of mathematical competencies.

3.3 Data collection technique and instruments

The survey technique was used to collect the data. It is defined as the data collection method that includes the procedures and actions that the researcher performs to obtain, analyze, and process the information that leads him to answer the proposed question and the demonstration of the hypothesis (Hernández & Duana, 2020). The instrument for collecting the information was the questionnaire consisting of a series of questions on the variable that is measured and responds to the problem statement and hypotheses formulated (Sánchez, 2020). In the present study, the instrument was made up of 24 indicators assuming an ordinal Likert scale of 5 rating criteria, this scale allows us to assess the perception of the variable (Canto et al., 2020).

The test is a tool that helps collect information to validate or disprove the hypothesis. The pre-test is important to verify the effect that collaborative learning generates on the perception of mathematical competencies before the execution of the program, this information is collected in both groups. The post-test helps to observe the effect generated by the execution of the collaborative learning program, providing the scientific arguments for the verification of the hypothesis.

No.		
1	**Technique**	Survey
2	**Instrument Type**	Questionnaire with 24 items
3	**How to apply**	Face
4	**Objective**	Collect information for the analysis of the study variables.
5	**Author**	Mg. José Víctor Macalupú Ipanaqué
6	**Users**	Students in the 5th grade of secondary education.
7	**Duration**	60 minutes

8	**Measuring Scale**	Ordinal

Table 3. Instrument data sheet

Validity: it has been carried out by 5 experts, doctors in education. Having processed the judges' assessments using the V for Aiken. This coefficient is a way of quantifying the validity of the content, it allows to scientifically support the opinion of the experts on the instrument used in the collection of the information. The range that will consider the relevance of the item on a content goes from 0 to 1, where one means an excellent agreement among the judges (Merino & Livia, 2009). Being the equation for processing opinions:

$$V = \frac{\bar{X} - l}{k}$$

In which:
$\bar{X}$ = Represents the average of the expert judges' ratings.
l = Represents the minimum value on the instrument's rating scale.
k = Represents the range (difference between the maximum and minimum value of the scale).
According to the equation, the conclusions of the expert opinion have a validity of 0.921, indicating that the instrument is suitable for application.

SUMMARY	CLARITY	COHERENCE	RELEVANCE
Dimension 1	0.889	0.956	0.922
Dimension2	0.911	0.911	0.922
Dimension 3	0.933	0.933	0.944
Dimension 4	0.856	0.933	0.956
Total	0.894	0.933	0.936
Total, General	0.921		

Table 4. Expert rating according to Aiken's V

Reliability: Reliability refers to the internal consistency of the instrument with respect to the results. Cronbach's alpha is a statistical measurement that indicates the degree of reliability of the test, with the interval being from 0 to 1, considering 1 as an optimal value (Domínguez et al., 2018), which indicates that the reliability of the instrument is good. For the instrument applied, an index of 0.945 of Cronbach's alpha coefficient was obtained, for this reason, the instrument complies with the required parameter.

4. Results
The results have been carefully worked on, taking as references the purposes and hypotheses formulated in the research. To this end, an educational program was proposed consisting of 14 learning activities under the dimensions of Johnson and Johnson (1999), who considers

responsibility, cooperation, communication, teamwork and self-evaluation as actions that favor collaborative learning.

Within this framework, the impact of the program was analyzed through the collection of information through questionnaires to the control and experiment groups, who were surveyed at the beginning of the execution of the proposal and at the end of it with the evaluations corresponding to the observation and experimental units. The information collected in these two actions was used to test the specific and general hypotheses. The processing of the information began with descriptive statistics, presenting the scores of the dependent variable and its dimensions in graphical tables. After descriptive statistics, inferential statistics were used to analyze the mean difference and their significance.

The evaluations obtained in the information collection instruments, before the application of the program, are shown according to the dimensions in each of the statistical tables. To this end, the information resulting from the descriptive statistics is presented as follows:

Pre-test	Experimental group		Control group	
Solve quantity issues	fi	%	fi	%
Casualty	8	57,1	4	28,6
Stocking	6	42,9	10	71,4
Loud	0	0,0	0	0.0
Total	14	100%	14	100%

Table 5. First dimension: Perception of competence solves quantity problems according to the study groups of the pre-test

Total   14100%   14   100%
Table 5 shows the results of the study on the influence of collaborative learning on the perception of competence solves quantity problems, and the results of the pre-test showed that 8 students, equivalent to 57.1% of the experimental group, had a low perception. In the control group, 4 students, equivalent to 28.6%, showed low acceptance. In addition, 6 students, or 42.9% of the experimental group, were placed in the middle level, and 10 students in the control group, equivalent to 71.4%, reached the medium level, likewise, it is evident that 0% of the participants, of both groups, are located at a high level. This table shows that before the development of the program there is no student who achieves a high level in accordance with the dimension.

Post test	Experimental group		Control group	

Solve quantity issues	fi	%	fi	%
Casualty	0	0,0	5	35,7
Stocking	0	0,0	9	64,3
Loud	14	100,0	0	0.0
Total	14	100%	14	100%

Table 6. First dimension: Perception of competence solves quantity problems according to the study groups of the post-test.

The results of the study on the influence of collaborative learning on the perception of competence solve quantity problems are shown in Table 6. In the result of the post-test, the proportion of students in the experimental group who achieved a high level was 100% of the students, after the application of the program. On the other hand, no student, equivalent to 0% of the students in the control group, achieved a high perception of this ability, in addition, 35.7% and 64.3% of the control group were placed on the low and medium scale, respectively, highlighting that this group was not exposed to the work with the study proposal.
The conclusions show that there is indeed a significant influence of collaborative learning on the first dimension.

Pre-test	Experimental group		Control group	
Solves problems of regularity, equivalence, and change	fi	%	fi	%
Casualty	10	71,4	6	42,9
Stocking	4	28,6	8	57,1
Loud	0	0,0	0	0.0
Total	14	100%	13	100%

Table 7. First dimension: Perception of competence solves quantity problems according to the study groups of the post-test.

Table 7 presents the conclusions of the research on the influence of collaborative learning on the perception of competence, which solves problems of regularity, equivalence and change, whose results of the pre-test indicated that 10 students, equivalent to 71.4% of the experimental group, had a low perception. In the control group, 6 students, equivalent to 42.9%, had a low perception. In addition, 4 students or 28.6% of the experimental group were placed on the medium scale and 8 students of the control group, equivalent to 57.1%, reached the medium scale, likewise, it is evident that 0% of the participants, from both groups, were placed on the

high scale. This table shows that before the development of the program there is no student who achieves a high level in accordance with the ability.

Post test	Experimental group		Control group	
Solves problems of regularity, equivalence, and change	fi	%	fi	%
Casualty	0	0,0	5	35,7
Stocking	0	0,0	9	64,3
Loud	14	100,0	0	0.0
Total	14	100%	14	100%

Table 8. Second dimension: Perception of competence resolves problems of regularity, equivalence and change according to the study groups of the post-test.

The results of the study on the influence of collaborative learning on the perception of competence solve problems of regularity, equivalence and change are shown in Table 8. In the result of the post-test, the number of students in the experimental group who achieved a high level was 100% of the students, after the application of the program. On the other hand, no student, equivalent to 0% of the students in the control group, achieved a high perception of this ability, in addition, 35.7% and 64.3% of the control group were located at a low and medium level respectively, highlighting that this group was not exposed to the work with the study proposal.
The conclusions show that there is indeed a significant influence of collaborative learning on the second dimension.

Pre-test	Experimental group		Control group	
Solves problems of shape, movement, and localization	fi	%	fi	%
Casualty	8	57,1	5	35,7
Stocking	6	42,9	9	64,3
Loud	0	0,0	0	0.0
Total	14	100%	13	100%

Table 9. Second dimension: Perception of competence resolves problems of regularity, equivalence and change according to the study groups of the post-test.

Table 9 presents the conclusions of the research on the influence of collaborative learning on the perception of competence, which solves problems of shape, movement and location, whose results of the pre-test indicated that 8 students, equivalent to 57.1% of the experimental group, had a low perception. In the control group, 5 students, equivalent to 35.7%, had a low perception. In addition, 6 students or 42.9% of the experimental group were placed on the

medium scale and 9 students of the control group, equivalent to 64.3%, reached the medium scale, likewise, it is evident that 0% of the participants, from both groups, were placed on the high scale. This table shows that before the development of the program there is no student who achieves a high level in accordance with the third dimension evaluated.

Post test	Experimental group		Control group	
Solves problems of shape, movement, and localization	fi	%	fi	%
Casualty	0	0,0	4	28,6
Stocking	0	0,0	10	71,4
Loud	14	100,0	0	0.0
Total	14	100%	13	100%

Table 10. Third dimension: Perception of competence solves problems of shape, movement and location according to the study groups of the post-test

The results of the study on the influence of collaborative learning on the perception of competence solve problems of form, movement and localization are shown in Table 10. In the result of the post-test, the number of students in the experimental group that achieved a high scale was 100% of the students, after the application of the program. On the other hand, no student, equivalent to 0% of the students in the control group, achieved a high perception of this ability, in addition, 28.6% and 71.4% of the control group were placed on the low and medium scale respectively, highlighting that this group was not exposed to the work with the study proposal.
The conclusions show that there is indeed a significant influence of collaborative learning on the third dimension.

Pre-test	Experimental group		Control group	
Solves data management and uncertainty issues	fi	%	fi	%
Casualty	11	78,6	7	50,0
Stocking	3	21,4	7	50,0
Loud	0	0,0	0	0.0
Total	14	100%	14	100%

Table 11. Fourth dimension: Perception of competence solves data management and uncertainty problems according to the pre-test study groups.

Table 11 presents the conclusions of the research on the impact of collaborative learning on the perception of competence, which resolves problems of regularity, equivalence and change, whose conclusions from the pre-test indicated that 11 students, equivalent to 78.6% of the experimental group, had a low perception. In the control group, 7 students, equivalent to 50.0%, had a low perception. In addition, 3 students or 21.4% of the experimental group were placed

on the medium scale and 7 students of the control group, equivalent to 50.0%, reached the medium scale, likewise, it is evident that 0% of the participants, of both groups, were placed on the high scale. This table shows that before the development of the program there is no student who achieves a high level in accordance with the fourth dimension evaluated.

Post test	Experimental group		Control group	
Solves data management and uncertainty issues	fi	%	fi	%
Casualty	0	0,0	4	28,6
Stocking	0	0,0	10	71,4
Loud	14	100,0	0	0.0
Total	14	100%	13	100%

Table 12. Fourth dimension: Perception of competence solves data management problems and uncertainty according to the post-test study groups

The results of the study on the influence of collaborative learning on the perception of competence solve problems of data management and uncertainty are shown in Table 12. In the result of the post-test, the number of students in the experimental group who achieved a high scale was 100% of the students, after the application of the program. On the other hand, no student, equivalent to 0% of the students in the control group, achieved a high perception of this ability, in addition, 28.6% and 71.4% of the control group were placed on the low and medium scale respectively, highlighting that this group was not exposed to the work with the study proposal.
The conclusions show that there is indeed a significant influence of collaborative learning on the fourth dimension.
After the presentation of the tables for each dimension with the respective frequencies, the general analysis of the study is presented according to the descriptive statistics.

Pre-test	Experimental group		Control group	
Perception of mathematical competencies	fi	%	fi	%
Casualty	11	78,6	8	57,1
Stocking	3	21,4	6	42,9
Loud	0	0,0	0	0.0
Total	14	100%	14	100%

Table 13. General measurement: Perception of mathematical competencies according to the pre-test research groups

Table 13 shows the influence of collaborative learning on the perception of mathematical competencies as a result of the pre-test, i.e., prior to the execution of the plan, that 11 students, 78.6% of the experimental group and 8 of the same students, representing 57.1% of the control

group, have a low perception of mathematical competencies. while 21.4% corresponding to 3 students in the experimental group and 6 students with the equivalent of 42.9% in the other group are located in the medium scale, while no student corresponding to 0% has a high perception, before the application of the experimental activities of the program.

Post test	Experimental group		Control group	
Perception of mathematical competencies	fi	%	fi	%
Casualty	0	0,0	6	42,9
Stocking	0	0,0	8	57,1
Loud	14	100,0	0	0.0
Total	14	100%	14	100%

Table 14. General measurement: Perception of mathematical competencies according to the groups of the post-test research

The results of the study on the influence of collaborative learning on the perception of competence solve problems of data management and uncertainty are shown in Table 14. In the result of the post-test, the number of students in the experimental group who achieved a high level was 100% of the participants, after the application of the program. On the other hand, no student, equivalent to 0% of the students in the control group, achieved a high perception of this ability, in addition, 42.9% and 57.1% of the control group were placed on the scale of low and medium respectively, highlighting that this group was not exposed to the work with the study proposal. The conclusions show that there is indeed a significant influence of collaborative learning on the perception of mathematics.

5. Discussion

The verification of the program called "Collaborative learning in the usefulness of mathematics" has been carried out with 14 learning sessions, the same ones that, after the experiment, the information was collected, through the post-test, for the validation of the hypotheses and verification of the achievement of the objectives. The derivations have been processed considering descriptive statistics and inferential statistics, whose post-test and pre-test results for the experimental and control group showed a normal distribution with non-significant coefficients ($p > 0.05$); therefore, in effect, the general hypothesis test as specific were carried out with the parametric Student's T statistic, in order to examine whether there are statistically significant differences between the teams.

It should be noted that, when determining the influence of collaborative learning on the perception of competence, solves problems of quantity, the results of the problem variable before the development of the proposal for the experimental team were that 57.1% of the students have a low perception of mathematical competences and 42.9% have a medium perception and no students have a high aperception. With respect to the control group, the statistical tables show that 28.6% of the students have a low perception and 71.4% show their perception is medium, as well as the experimental group 0 students maintain a high perception of mathematical competences.

After the execution of the proposal denoted collaborative learning in the usefulness of mathematics, the post-test responses revealed that 100% of the experimental students achieve a high perception of the competence solves quantity problem, on the contrary, the control team

0% of the units of analysis are located at this level, evidencing that 35.7% and 64.3% achieve scores in the low and medium levels respectively. Regarding the inferential statistics according to Student's T, it is evident that the results of the research reveal an average distinction of 12.214 between the intervention team and the control team, with a significant numerical divergence in favor of the experimental team; In addition, there is a significance scale of 0.000, where ($p < 0.05$), which verifies that this level is within the admitted value, thus rejecting the null hypothesis and admitting the alternative hypothesis, consequently: "Collaborative learning influences the perception of mathematical competence solves problems of number of students in an educational institution – Morropón 2023".

Solving quantity problems refers to the approach of numerical notions where the definition of numerical sets, properties and solution strategies and communication of results must be considered (MINEDU, 2016). In relation to this, a collaborative learning program has been worked on, as a strategy to carry out activities in small groups in order to maximize student learning and achieve better levels of thinking, with learning being meaningful (Sierra & Robles, 2021). In this sense, perception, such as the availability to understand the form of a situation presented, contributes to students being available to work, emphasizing mathematical competencies (Gutiérrez, 2012). For Cruz (2020), perception is accepting, understanding and appreciating a situation presented in a good or bad way. In this sense, the practice of competencies in the subject of mathematics requires problem solving, with numerical content, which becomes an inconvenience because it leads to reflection, understanding the solution and proposing and executing a strategy (Gutiérrez, 2012).

Similarly, Pinzón (2019), in a study in Colombia, concluded that mathematical competencies are indeed strengthened when the work is cooperative, demonstrating that 96% of those evaluated obtained a better performance and change of attitude towards the area of mathematics, as a result, students feel more motivated after working, in the classroom, with the paradigms of collaborative learning. This result corresponds to those obtained in this research, so collaborative learning improves the perception of mathematical skills.

Solving problems of regularity, equivalence and change allows us to generalize equivalences and the change of magnitudes to find unknown values considered unknown by means of mathematical rules (MINEDU, 2016). Determining the influence of collaborative learning on the perception of competence solves problems of regularity, equivalence and change in the collection of information from the pre-test for the experimental team, it was obtained that 71.4% of the respondents have a low perception of mathematical competences and 28.6% show a medium perception and 0% students their high perception. In parallel to the control group, the statistical values were that 42.9% of the students have a low perception and those who show a medium perception are 57.1%, as in the experimental team 0 students maintain a high perception prior to the application of the program.

With the application of the collaborative learning project for the usefulness of mathematics, the conclusions of the post-test showed that 100% of the students of the experimental team achieved a high perception of the competence solved problems of regularity, equivalence and change, on the contrary, in the control group 0% of those investigated have a high perception, Meanwhile, they only reach an average perception with 63.4% and 35.7% showing a low perception of this competition.

In the verification of the conjecture, the results of the study using the T Student tool report a dissimilarity of 12.714, in particular for the experimental team and control team, with a statistically relevant positive difference in favor of the experimental students; Likewise, there is a significance scale of 0.000 where ($p < 0.05$), which proves that this value is in the range of what is allowed, by which, the null hypothesis is refuted and the alternative hypothesis is admitted, inferring that "collaborative learning influences the perception of competence solves

problems of regularity, equivalence and change of students from an educational institution–Morropón 2023".

The results correspond to what Johnson and Johnson (1999) state, where the component of collaborative learning, such as cooperation, allows students to support each other for a positive perception and achievement of learning. These resources can be internal, such as skills and knowledge, which are visible, and non-observable resources, such as motivation, self-concept and personality characteristics, emotions, attitudes, and external resources such as interaction environments, which must be appropriate and pleasant (Coll, 2007).

Attitudinal competencies or knowing how to be is the disposition or perception that the student shows regarding the learning of mathematical competencies, which positively influences their logical reasoning, leading the student to reflect and analyze the elements of a problem with numerical data (Pabón, 2021). Similar to the results in Panama, Córdoba (2020) found that 89.2% of those investigated were altitudinally favorable to solving mathematical problems with active methodologies, while Romero (2021), in the city of Huacho after the application of an experiment on cooperative learning, managed to get 75% of students to achieve evaluations up to 16 for the positive perception of the success of mathematical skills. These values give firmness to the achievements of collaborative learning.

Solving problems of shape, movement, and location where learners must understand the movement of things with geometric characteristics of perimeter, area, and volume requires the student to demonstrate their internal competencies (MINEDU, 2016). When determining the influence of collaborative learning on the perception of competence solves problems of shape, movement and location, the information obtained in the pre-evaluation for the experimental group reveals that 57.1% of respondents show a low perception of this mathematical competence; 42.9% show a medium perception and 0% students their perception is high, compared to the control team the indices in the statistical tables show that 35.7% of the students have a low perception and those who achieve an average perception are 64.3%, as well as the application group in the pre-test, 0 students maintain a high perception of it.

Therefore, in the program's work on collaborative learning in the usefulness of mathematics, the post-test values in the tables show that 100% of the students in the experimental group achieve a high perception of competence in solving problems of form, movement and location, compared to the control group 0% of those investigated achieve a high perception. Meanwhile, they reach 71.4% of medium level and 28.6% of low perception of the competition.

The results by means of the T Student statistic, for the competence solves problems of movement and location, achieves an average contrast of 12.6433 between the experimental students and the control students, certifying a statistically significant disparity in favor of the experimental team; being the significance scale of 0.000, where ($p < 0.05$), verifying that the value is within tolerance, thus rejecting the null hypothesis, for this reason, the alternative hypothesis "collaborative learning influences the perception of competence solves problems of form, movement and location of an educational institution–Morropón 2023" is admitted.

The solution of the mathematical problems of this competence often lacks dynamic strategies, developing problems in an isolated way that do not contribute to the construction of learning in a positive way (Palacio & Vergara, 2019) It is worth mentioning that an education in competencies recognizes the learning experiences for the construction of significant knowledge, the same that students require to make use of in their daily practice (Torres & Loerit, 2005). Collaborative learning is a gradual process that generates a favorable interdependence when learning with others (Aguerrondo & Vaillant, 2015), that is, while learning in teams, students show an attitude of trust.

In relation to the same, in Lima Aponte (2022), at the conclusion of the application of a collaborative learning program, 85.7% of students improved their learning and built solid bonds of friendship, cooperation and positive self-esteem. These results are consistent with those obtained.

Solve problematic situations of data management and uncertainty by marking the concepts of randomness, obtaining information, representation and organization in statistical graphs (MINEDU, 2016). A led to determine the influence of collaborative learning on the perception of competence, solves problems of data management and uncertainty, collecting as results in the pre-tests of the experimental group that 78.6% of the respondents have a low perception of this mathematical competence; 21.4% show a medium perception and 0% students their perception is high, when comparing with the students of the control team it is obtained that 50.0% of the students have a low perception and those who achieve an average perception is the other half of the sample, as well as the experimental students in the pre-test, 0 students maintain a high perception of solving problems in statistical tables and graphs.

Meanwhile, after the execution of the program on collaborative training in the usefulness of mathematics, the conclusions of the post-test in the tables show that 100% of the students in the experimental group achieve a high perception of this competence, on the contrary, of the students considered for the control, none of them reaches a high perception. Meanwhile, they reach 71.4% of medium level and 28.6% of low perception of this competition.

In deductive statistics for hypothesis validation, the results of the experiment using the T Student statistic provide an average contrast of 12.571 for experimental students and control students, sharing a significant difference in favor of the experimental group; where the significance level is 0.000, where ($p < 0.05$), which proves that the score is within the acceptable value, rejecting the null hypothesis. Due to what has been said above, the alternative hypothesis is approved, proving that "collaborative learning influences the perception of competence solves data management and uncertainty problems of an educational institution– Morropón, 2023".

Positive perception contributes to the success of mathematics, so it depends on how each individual individually perceives the area, creating a favorable or unfavorable attitude (Belbase, 2010). The same ones that lead us to understand and judge the various situations for their solution, including mathematical attitude and self-efficacy, as well as the affective factors that help to solve problems with numerical content, the student being persevering and not being ready to abandon the tasks assumed with commitment, possibly due to a good perception (Öztürk et al., 2020).

In accordance with the answers obtained in the study, we have that Pérez (2022), in Lima, in an experimental group, for the improvement of learning. It found that 56% of this group achieved better evaluations, completing that cooperative learning effectively affects the promotion of mathematical competencies when they are perceptually positive. In the same city, Ecos et al. (2020), when relating collaborative learning with mathematical competencies, found a significance of ($p<0.01$) lower than the parameter of ($p<0.05$), as was the finding. The theoretical framework and results presented in the background underpin the results of the study. The positive perception of competencies guides the student to combine and use resources to solve a problem situation involving numerical properties (Niss, 2002), solving situations involving numerical elements is not to the liking of many, so the confidence, communication and motivation of the teacher is fundamental. The sum of specific results converges to the achievement of the general objective, which consisted of determining the influence of collaborative learning on the perception of mathematical skills, obtaining as global results in the previous evaluation of the research, that 78.6% of the students in the experimental group have a low perception of this mathematical competence; 21.4% show a medium perception and 0% students their perception is high, when contrasting with the control group it is obtained that 57.1% of the students have a low perception and those who achieve a medium perception is 42.9% of the sample, as well as the experimental team in the pre-test, 0 students maintain a high perception about solving probability problems.

Thus, the execution of the program on collaborative learning in the usefulness of mathematics, the statistical conclusions of the post-test show that 100% of the students in the experimental group achieve a high perception of mathematical competences, unlike this, in the control team none of the investigated reach a high perception, On the other hand, they are at the middle level with 57.1% while 42.9% of students show a low perception of mathematical skills.

The justification of the research hypothesis by means of the Student's T statistic assumes a mean difference of 50,143 between the experimental and control participants, showing a statistically significant difference in favor of the experimental group; likewise, there is a significance of 0.000 where ($p < 0.05$), which corroborates that the scale obtained is positive and is considered within the standard value, rejecting the null hypothesis, therefore the alternative hypothesis is verified, demonstrating that indeed "collaborative learning influences the perception of mathematical competencies of students in an educational institution – Morropón 2023".

The studies carried out in similarity to the problem variable perception of mathematical competencies do not show much research, deducing that collaborative learning does indeed contribute to the improvement of learning (Acosta et al., 2022). Learning is constructed in a significant way when teachers work on collaborative didactic strategies and students perceive an attitude of participation (Prada et al., 2021), that is, much more is learned when learning activities are developed through the exchange of ideas working as a team with their peers, than individually (Parentelli, 2020 and Gunawardena et al., 1997). Also, problem solving is facilitated when the student has a good perception of it, feels motivated to work with responsibility, leadership, confidence, in constant communication, generating positive self-esteem (Aguerrondo & Vaillant, 2015).

6. Conclusions

At the end of the process of programme implementation and analysis of the information, it is stated that:

It was determined that 100% of the students in the experimental team achieved a high perception of mathematical competencies, after developing the collaborative learning program in the usefulness of mathematics, while 57.1% of the students in the control group were located at the medium level and 42.9% at the low level. Likewise, a significance of 0.000 is achieved where ($p < 0.05$) value is lower than the accepted standard. So the hypothesis was proven.

It was determined that 100% of the members of the experimental team achieved a high perception of the competence solves problems of quantity, after the development of the collaborative learning program in the usefulness of mathematics in the students of the fifth grade of the educational institution "San Juan", on the contrary, the students of the control group are located at the middle level with 64.3% and 35.7% show a low perception of this competence. The significance of the experiment is 0.000, where ($p < 0.05$) is lower than the accepted standard. Thus proving the hypothesis.

It was determined that 100% of the students had a high perception of competence in solving problems of regularity, equivalence and change, while the control group only achieved the average level with 64.3% of the students and the other part showed a low perception. The significance obtained was 0.000 where ($p < 0.05$), after the execution of the collaborative learning program on the usefulness of mathematics in fifth grade students. So the proposed hypothesis was tested.

It was determined that 100% of the units of analysis of the experimental group showed a high perception of the competence solves problems of shape, movement and location, in contrast the control group presented medium and low perception with 71.4% and 28.6% respectively,

at the end of the execution of the approach called collaborative learning program in the usefulness of mathematics in 5th grade students. A significance of 0.000 was obtained for this competency, where ($p < 0.05$) value was lower than the accepted standard. Corroborating the proposed hypothesis.

It was determined that 100% of the students have a high perception of the competence solves problems of data management and uncertainty at the end of the programming called collaborative learning program in the usefulness of mathematics in the 5th grade students, significantly improving their perception in the experimental students, compared to the control students who showed a medium perception with 71.4% and low of 28.6% of the respondents, achieving a significance of 0.000 where ($p < 0.05$) value lower than the accepted standard. Thus, the hypothesis is demonstrated.

7. Recommendations
After the analysis, it is recommended to:
The directors of the Local School Management Units and the directors of the decentralized institutions must consider the program in the curricular plans of the teachers for the good academic performance of the teachers.

The person in charge of the educational center where the experiment was developed must promote the results of the collaborative learning program in the usefulness of mathematics at the level of the district of Santo Domingo and the Piura region in order to implement it in the different schools.

Specialists from the different instances of school management must train and accompany teachers in the programming and use of school activities with collaborative learning so that active strategies contribute to the improvement of learning.

The school leaders in the district are required to implement the programme at all levels of regular basic secondary education.

That in a possible research expand the number of participants for both the number of students of the experimental team and the control team.

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