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Contribution of the implementation of an alternative teaching model in the teaching of mathematics: solving arithmetic problems in primary basics

Contribución de la implementación de un modelo de enseñanza alternativo en la enseñanza de las matemáticas: resolución de problemas aritméticos en los fundamentos primarios

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Abstract
This article is the product of the research process carried out within the framework of doctoral thesis research entitled, "Alternative teaching model for the resolution of arithmetic problems in primary basic". Which seeks to provide the education system with a new alternative composed of a series of consecutive steps, with the general objective of "Strengthening the basic mathematical competencies of primary school students through a teaching model that facilitates the resolution of arithmetic problems".
Keywords: education, innovation, mathematics, teaching model, problem solving.

Resumen
Este artículo es el producto del proceso de investigación llevado a cabo en el marco de la investigación de tesis doctoral titulada, "Modelo de enseñanza alternativo para la resolución de problemas aritméticos en básico primario". Que busca proporcionar al sistema educativo una nueva alternativa compuesta por una serie de pasos consecutivos, con el objetivo general de "Fortalecer las competencias matemáticas básicas de los estudiantes de primaria a través de un modelo de enseñanza que facilite la resolución de problemas aritméticos".
Palabras clave: educación, innovación, matemáticas, modelo de enseñanza, resolución de problemas.

1. Introduction

Mathematics is fundamental to the intellectual development of children, helping them to be logical, to reason in an orderly manner and to have a mind prepared for thought, criticism, and abstraction. In addition, mathematics configures attitudes and values in students because they guarantee a solidity in their fundamentals, safety in procedures and confidence in the results obtained. All of this creates a conscious and favorable willingness in children to take action that leads to the solution of the problems they face every day. In turn, mathematics

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contributes to the formation of values in children, determining their attitudes and behavior. They serve as patterns to guide your life, a style of confronting reality logically, drives the search for accuracy in results, orients towards a clear understanding and expression through the use of symbols, strengthens the capacity for abstraction, reasoning and generalization and the perception of creativity as a value.

Similarly, mathematics teaches to think better as they develop the capacity of thought. They also help to find solutions to problems or solutions to certain complex situations in a much more coherent way. Therefore, mathematics with fundamental and essential in the education of all people. It is essential that students can understand mathematics, because in this way they will find logical and reasoned solutions to many situations of life and the mind will be better prepared to solve real problems of everyday life. It should be borne in mind that mathematics develops analytical thinking with which the ability to investigate and know the reality that life poses to each human being will develop.

Therefore, the current teaching methodologies conceive of this as the place where the teacher directs and guides students, promoting the construction of their thinking. The way to achieve this is not to give children definitions and procedures to memorize. On the contrary, it consists in challenging students to multiple and varied experiences, accompanied by meaning and meaning, that troubles them, so that, based on their own understandings, they create and apply ideas that progressively direct them to better solutions. In this process the teacher acts by offering suggestions, asking new questions, proposing new experiences that promote new relationships, opening spaces for the exchange of ideas, requiring explanations and reasons, and making suggestions for consultations. In short, stimulating and sharpening the curiosity of children, hence the importance and interest in carrying out didactic situations that promote meaningful learning, where all the elements mentioned above are mixed.

And this is where alternative teaching models come in, which provide an important flow of information that allows to describe, understand and interpret the learning teaching processes and thus reach conclusions about the extent to which students' learning is significant. A model is an anticipating reflection, which emerges from the ability to symbolize and represent the learning teaching process that students perform.

In addition, teaching or teaching models present schemes of the diversity of technical and means actions used by teachers, which allow the evolution of science, represented by paradigms in force at each time. The alternative teaching models guide the educational practices of teachers and are part of their pedagogy and teaching methodology, which are conceived as a process of "school research", that is, not spontaneous, developed by the student with the help of the teacher, which is considered as the most appropriate mechanism to favor the construction of true meaningful learning.

In this sense, higher education has been reduced to tertiary education, which responds to the skills required by the market, capitalism decides that it is relevant and the state finances those demands. In Colombia, education is organized in early childhood education, primary education, secondary basic education, and middle education; middle education can be academic or technical in nature.

For all cases, the Ministry of National Education (MEN) defines the areas or disciplines and academic standards to work in the classroom. In early childhood, teachers will engage in pedagogical work aimed at developing various dimensions of the child. For basic education the MEN through the General Education Law (Law 115 of 1994)[4] defines nine mandatory fundamental areas: Natural Sciences and Environmental Education, Social

[4] General Education Law (Law 115 of 1994)

Sciences, Art Education, Ethical Education, Physical Education, Religious Education, Humanities, Mathematics and Technology and Computer Science.

For academic middle education, the same fundamental areas of basic education plus economic sciences, policies and philosophy will be compulsory, to technical middle education training is added for job performance.

Fuentes (1997) proposes that the curriculum is the content that must be assimilated in order to achieve an objective, it is also a programmer, a work plan and study, necessary to approximate the achievement of the objectives, which is given in an influenced social context determined by social, philosophical, political, pedagogical ideas.

The context in which education is currently immersed is that of social dynamism, globalization, the political system, markets, capitalism, the religious system, and technological development, these are elements closely related to education, which generate great openness and strong educational competence at the national and international level, in this sense, educational institutions must respond to this through their curricula.

According to Salinas (1997)[5], Information and Communication Technologies (ICTs) begin to overcome the utopia of human communication exclusive to face-to-face teaching. In this sense, technological development and the union of computing, information, and communications, has enabled the emergence of other forms of teaching that facilitate lifelong learning from virtuality. The Regional Colloquium on the Future Development of Education in Latin America and the Caribbean, held in Caracas in 1980, highlights the importance of self-learning in school and non-school modalities, greater use of mass media and the development of lifelong education programs.

According to the above, current education is projected towards the formation of open curricula that are developed through the formation of learning networks, where technological advances give rise to new methodologies and strategies in the teaching - learning process. In this sense, the number of virtual campuses, online work platforms, distance learning processes is increasing, where it is simply having communication devices and good connectivity to have access to different educational options around the world.

The development of this educational modality requires the one who assumes it, high degree of responsibility, autonomy, and commitment, otherwise it can become a total failure. However, current education presents contradictions represented in the lack of elements that occur in the classroom, such as the experience of interculturality, the articulation that is established between members of the educational community and social relations in general, elements that constitute a great contribution to the formation of being, of being and knowing how to live together.

It is important to note that to think that the school is the correcter of cultural vices and inadequacies, and that with it teachers are responsible for the education and shaping of society, it is wrong, since the learning teaching process takes place in all areas, independent of the concept of formality or informality raised by Savater (2001)[6], that is to say, , the family, society and the state are responsible for the integral formation of the education, as proposed by the MEN (2002)[7] in the general law of Colombian education (Law 115 of 94).

Education must be oriented to the formation of being from the soul and morality if we want peaceful and harmonious societies, a task that effectively develops the pedagogue. Dis a position of humanization of education, the child must be recognized with his unrepeatable qualities to be formed without imbalances, strengthening his self-esteem and autonomy, otherwise he will be exposed to models provided by television,

[5] General Education Law (Law 115 of 1994)
[6] Idem
[7] Idem

street gangs, urban groups, violent groups, satanic or religious sects and many other alternative offers to education, negotiating his self-esteem.

For a family to function educationally, someone there has to resign themselves to being an adult, acting maturely and taking the reins, since there is currently a crisis of authority in the homes, Savater says, is not to command, but to help all members of the family, mainly minors, to instill in them principles and values. A loving authority that prevents the institutions from later imposing reality without affection and by force.

Contribution of alternative teaching models to mathematics

In the development of the proposal, the product of the research process developed, a didactic model for the resolution of arithmetic problems in the primary basic is proposed, which allows to answer the question What changes can occur in the development of the mathematical competencies of students of the primary basic by applying an alternative teaching model of mathematical problem solving? , on the other hand, is sought under the implementation of a model to strengthen the basic mathematical competencies of students and the development of competencies such as the ability to analyze, understand reasoning and application, as well as participation, teamwork and training of entrepreneurship.

A didactic model for problem solving will allow teachers to carry out tactically employed actions to achieve a didactic approach in the members of the educational community (students, teachers, parents), through the design of activities that maintain their interest and motivation in the area, in order to avoid distractions that lead to demotion and lack of understanding of content.

2. Methodology

It is important to consider that the methodological approach of this model is developed from the quantitative paradigm in order to ensure the accuracy and rigor required and to carry out a direct observation and evaluation of phenomena giving the opportunity to collect true data. It also defines a descriptive scope, with an experimental design and quasi-experimental level of research, aimed at the school process to understand, explore and evaluate the performance of primary basic students in arithmetic problem-solving processes. Thus, it aims to analyze the problem by proposing simple teaching strategies that help to demonstrate the strengthening of basic mathematical competencies and thus give the student the opportunity so that he can be competent in the different areas of knowledge.

The alternative didactic model developed in this research for the resolution of arithmetic problems called "MODEL RESEARCH AND RESOLUTION OF ARITMETICOS PROBLEMS" (MIRPROAR), contemplated for primary basic schooling degrees, has a structure organized by stages of development, which, in turn, are composed of steps. Implementing the model involves considering specific actions that allow the development of skills associated with each step and therefore each stage.

Considering that, the MIRPROAR model is deployed in a research field focused, at the same time, on the evolution of students' knowledge as the main actor and the performance of the teacher, each defines a particular role that one case generates a leading role and in the other a guiding and advisory role of the process.

The following describes the stages of the model:

Stage I called the "starting point" of the model includes the approach and reading of the problem in addition to the hypothesis approach, which leads to the action of reading in detail the statement of the problem situation and then consolidating the doubts or possible interpretations thereof. Likewise, a first approach is made to the problem to explain the known facts and forecast possible ways of solving and solutions to the situation. In this

way, skills such as: Remember, explore, interpret, understand texts, guess, and produce text are developed and strengthened.

Likewise, stage 2 corresponds to the "collection and analysis of information", with underlying steps associated with the search for supplementary information, analysis and understanding of the problem data, in which the student must investigate and select the relevant information related to his environment, that is, the approach of the problem is given taking into account the context of the student , with particular data which the student must find out. On the other hand, an understanding of basic concepts of mathematical logical reasoning is made. Thus, it is possible to develop and strengthen skills such as, explore, visualize, classify, analyze, process and understand.

It is this stage the family plays a fundamental role since to some extent they will provide information to the students that will allow the resolution of the problem situation.

Then, in stage 3, called the "action strategy", it comprises one of the most important moments since three steps are determined that are:

- Developing a resolution plan
- Operation selection
- Problem solving

Thus, based on the information collected, a broader framework is generated for the treatment of the problem and thus allow a greater understanding of the situation. The collected concepts are then applied and the algorithm(s) that enable troubleshooting is selected.

Similarly, an action plan is oriented with a structure that includes:

- I read the statement
- I identify data
- I underline the question
- Graphic
- I organize the data
- I perform operations

The skills that are enhanced at this stage are: Represent, plan, argue, model, make decisions and apply.

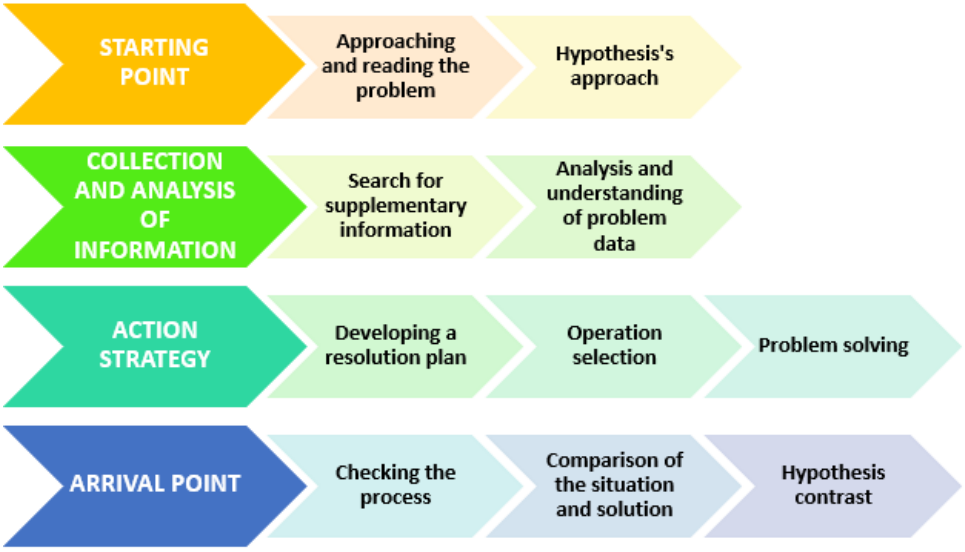
Finally, when facing the last stage of the model designated "arrival point", three corresponding steps are addressed: process verification, situation comparison and solution, culminating in the contrast of hypotheses. This stage refers to actions aimed at considering other forms of resolution of the situation, looking into the alternatives for the treatment of the situation to assist its resolution. Likewise, the space is created to compare the problem with other colleagues in small and / or large groups, already solved and are tool for the orientation of processes.

After the above, the previous knowledge is contrasted with the knowledge acquired in order to be significant, taking place the moment when the student determines whether the hypothesis raised in the approach to the problem is true or false, arguing why.

Thus, at this stage the strengthening of skills is prioritized such as: Value, check, relate, compare, internalize, appropriate, reflect, contrast, and propose.

The following figure describes the MIRPROAR model, considering each of its stages and its corresponding steps:

Figure 1
Description of the MIRPROAR model



Source: Authors

Considering that each stage proposes an action according to the process, specific roles for students and teachers are described, as well as mentioned in previous sections. On the other hand, for its implementation it was necessary to carry out a series of steps and meetings. In the first instance, a meeting was held with the rectors and teachers of the educational institutions involved, in addition to other meetings with the parents and students of these institutions, in order to make them aware of the research project and its objectives and thus obtain from them the respective consents for this purpose.

In the second instance, the data collection tools were application to both teachers and students. Already with this application, the processing and analysis of the data obtained was carried out, concluding in the need to design and implement an alternative teaching model that solves the detected problem.

Taking into account the above the research teachers worked on the design of the alternative teaching model MIRPROAR, and with the help of the teachers of each of the institutions involved, the implementation schedule of this model was also designed. The post-test was then applied and the information thrown by the post-test was processed and analyzed. The action according to each stage of the MIRPROAR model is broken down below:

Table 1

Stages and steps of the model "MIRPROAR"

Step	SKILL THAT DEVELOPS	Action	STUDENT ROLE	TEACHING ROLE
		I. STARTING POINT		
Approaching and reading the problem	Understanding texts Produce text	Careful reading of the statement and consolidation of doubts or possible interpretations thereof.	I write the data, unknowns and conditions provided for in the sections of the problem	Approach to situations in students' daily lives
Hypothesis Approach	Remember Guessing Interpret, explore Producir textos	First approach to the problem to explain the known facts and forecast	I set the precise hypotheses for solving the problem. I draft a possible procedure to solve the problem	Orient the hypothesis approach. Check Drafting.
		II. COLLECTION AND ANALYSIS OF INFORMATION		
Search for supplementary information	Explore View Classify	Selection of necessary information associated with the student's environment.	I indague data from my environment I visualize the mathematical concepts (I select the operation(s) that will allow me to deal with the situation.	It raises guiding questions that allow the student to collect the necessary information.
Analysis of problem data	Analyze Process Understand	Understanding basic concepts of mathematical logical reasoning	I acquire information and essential elements of the problem	Guidance of the information collection process and mathematical logical concepts immersed in the approach to the problem
		III. ACTION STRATEGY		
Developing a resolution plan	Represent Plan Graph	Design an action plan or strategy, going to a graphical representation and selecting the mathematical concept that allows the problem to be solved	I read the statement	Go to the process. Unbalance previous models by means of questions. Guides the use of procedures. Provides confidence Go to concrete material
Operation selection	Argue Model		I identify data	
Problem solving	Making decisions Apply concepts		I underline the question I organize the data Graphic I perform operations	
		IV. ARRIVAL POINT		
Checking the process	Rating Check Relate	Consider whether there are other alternative forms of resolution, enunciating them.	I conduct a review of the processes to find and find successes and errors in the resolution.	Review and check the processes developed by the student.
Comparison of the situation and solution	**Compare**	Compare it to other issues already resolved before.	I resort to personal situations based on experience.	It proposes similar situations whose resolution resembles. It raises situations in everyday life and highlights the importance of mathematics
Hypothesis contrast	Internalize Appropriation Reflect Contrast Propose	Previous knowledge is contrasted with the knowledge acquired to make it meaningful.	I determine whether my hypothesis is true or false, arguing why.	Guides the contrast planning of the hypothesis.

Source: Authors

3. Results

The MIRPROAR model was applied in an official educational institution, called the experimental group, with students in the third, fourth and fifth grades of the primary.

The post test is applied in the subject of mathematics, at the time of application a thorough observation is made about the attitudes and reactions of the participants to the questions of the workshop, showing that the students express greater safety and motivation.

For the final test a questionnaire similar to that used during the pre-test was used, which is designed with five problems of real situations that according to Blanco (1993, p.12) "it is about raising activities as close as possible to real situations that require the use of skills, concepts and mathematical processes", that is, problems that students relate to their experiences and that they can easily interpret. Problems with these characteristics were selected because they had an easy-to-understand language, were within reach of students' knowledge and aroused motivation for the situations raised, as they allowed them to relate them to their previous knowledge.

Thus, the results obtained about the level of development of mathematical competencies after the implementation of the MIRPROAR model are very positive. A comparison of results has been carried out by applying a post test and through the direct observation of the researcher, through which it was possible to see a statistically significant increase from the initial level of learning.

After the application of the MIRPROAR alternative teaching model and the pos test, it was possible to observe that 85% of students obtained an improvement in their learning teaching process. This highlights a 73% increase in students who solved the test well, compared to the initial test.

Therefore, the strategies and activities raised in the design of this didactic model differ from traditional actions in that they are intentionally and consciously realized. That is, they are directed by a clear idea of what they manage, in the way they will enable in educating the significant and valid foundations of learning basic mathematical operations using the resolution of arithmetic problems, based on their reality and thus be able to see them useful in their daily life and relate them to their daily life.

Therefore, the proposed activities provide for a scheme consistent with the objectives of the schools that promote them and involve mechanisms for assessing their effectiveness, efficiency, and quality against the overall purpose of forming mathematical skills in primary schoolchildren.

But, without a doubt, these kinds of proposals will not give the expected result in mathematical skills, if there is no committed teacher who serves as a bridge between the objectives and their educated, where there is reciprocity, follow-up to the advances of the students and the main thing that there is feedback. As Vygotsky quotes in his work "The Historical Construction of the Psyche. Child development and language": "In learning, the educator does most of the work preparing how to deliver knowledge, but then shares responsibility with the student."

Thus, as the student becomes more agile in acquiring knowledge, the teacher withdraws the platform on which he has built the foundations of such knowledge. The important thing is to ensure that scaffolding keeps you educating attentive, and you will notice that it changes as it develops its capabilities. The student is encouraged to learn within the limits of his development, respecting his pace of learning and taking into account his tastes and interests, that is when from all the activities designed the teacher must fall in love with tools, activities, methods, forms, means the reading ability to make it competent from it, looking, diagnosing, step by step in the middle of the process the possible difficulties to also go to specialized help if necessary or he himself attend from his doing the different cases with his difficulties to solve them and thus allowing each of his students to go down

the path of improving his mathematical process through the proposal presented, to obtain the fruit: students competent in basic mathematical skills, through the resolution of arithmetic problems.

From this path, reciprocity is visualized in the dialogue between teacher and his group of students. At first, educating models activities; afterwards, he and the students take turns the teacher's place. Students learn to ask questions in class to solve arithmetic problems applied to their reality, it is setting a significant interest or motivation; the educational sequence could consist of the teacher's modeling of strategies for asking questions, building, and building knowledge. This shows the view of Vygotsky's doctrines (1978) "reciprocal teaching consists of social exchanges and scaffolding, while students acquire the skills" (p. 175).

Likewise, the proposal presents both individual and group activities. When achieving group or collaborative work, it is possible to use shared social interactions in a pedagogical way. Various research shows that cooperative groups are most effective when each student is assigned their responsibilities and everyone must become competent before anyone can move forward.

It is necessary to make the educational community and especially students see that the development of basic mathematical skills does not constitute an obstacle in the learning teaching process in which the student interacts from the educational, family and social context; on the contrary these contexts should provide the educating of the best tools and in a significant way for the development of basic mathematical skills such as: development of basic operations, recognition of positional value, comparison of quantities, problem solving and counting; integrated into real-world situations.

This, bearing in mind, mathematics is fundamental to children's intellectual development as it helps them to be logical, to reason in an orderly manner and to have their minds prepared for criticism, thought and abstraction. Mathematics generates attitudes and values in students as they guarantee a solidity in their fundamentals, safety in procedures and confidence in the results obtained. All this creates in students a conscious and favorable willingness to take actions that lead to the solution of the problems they face every day. Mathematics teaches you to think better, as they develop the capacity of thought. In addition, they help you find solutions to problems or solutions to certain complex situations in a much more consistent way. Therefore, mathematics is fundamental and essential in the education of every person.

This didactic model will allow students to be able to understand mathematics, so that they can find logical and reasoned solutions to many situations of life and the mind will be better prepared to solve real problems of everyday life. It should be noted that, in mathematics, the analytical thinking with which the ability to investigate and know the reality that life poses to each human being develops. In turn, mathematics contributes to the formation of values in children, determining their attitudes and behavior. They serve as patterns to guide your life, a style of dealing with reality in a logical and coherent way, the search for accuracy in results, a clear understanding and expression through the use of symbols, ability to abstract, reasoning and generalization and the perception of creativity as a value.

Likewise, the use of alternative teaching models in the teaching of mathematics are so important, since it has a series of activities where its objective is the strengthening of basic mathematical skills, which will result in good results not only in this area but in others and will allow mathematics to gain an essential space and where it is based on the interests and tastes of students which will generate greater motivation and appropriation of meaningful knowledge. With each of the activities designed, the student is sought to motivate himself and at the same time strengthen his mathematical process, as well as intends to give the teacher didactic tools to cultivate these processes.

The proposal is oriented and developed from a flexible curriculum where the educating and educator are called to mean in the search for solutions that are presented to them daily inside and outside the Educational Institution since it can be adapted according to the environment and the needs that arise over time.

It seeks to show in this didactic model strategies, methodologies and tools through which students see mathematics in a creative and enjoyable way, strengthening in them the development of thought skills, taking into account their reality, context, tastes and interests, that allow them to be significant knowledge-doers and protagonists of their learning teaching process , which will lead to better results in all areas of knowledge as a direct consequence.

Similarly, this proposal is not restricted to a single group of students, but to any group of students of this educational level, from national educational institutions, since its content is striking and motivating, which points to the interests and tastes of the students.

From the above, it can be cited that, the novelty of the theoretical contribution of the implementation of alternative teaching models in mathematics, is also specified in its degree of concreteness in intervention practice. It follows that the didactic model is a tool that allows the elaboration of strategies, conceptions, methodologies, among others, that allow to direct the mathematical process from new didactic-methodological positions.

This reveals the practical relevance, operability and feasibility of the new knowledge built on the conditions of the learning teaching process, which allows students to give the importance that they must have in their learning teaching process, based on the activation of their previous knowledge, allowing the setting of individual learning goals, respecting their different learning rhythms or special needs , making them protagonists in the choice and development of each of the activities, contributing to the best management of time and therefore to elevate their autonomy and responsibility, maximizing work in the classroom, embossing activities for the house in which parents with any level of schooling can participate and support their children and finally strengthen their basic mathematical skills by linking the significant knowledge acquired with the reality of the context in which they live.

This also contributes to responding to a national, municipal and institutional objective that is to make Colombia the most educated, chía the most educated municipality in the country and educational institutions the best in external tests within the official educational institutions of the country. Because, if math processes and skills are improved in primary elementary school students this will positively affect their academic results and therefore their performance and all areas of knowledge, it will also raise the results in knowledge of third and fifth grade tests and finally the Synthetic Quality Index, an indicator by which the Ministry of National Education measures the quality of each of the country's educational institutions.

4. Conclusions

The design and implementation of an alternative teaching model for the resolution of arithmetic problems in the primary basic, if it favored the strengthening of the basic mathematical competencies of the students, since these reduced their fears and difficulties in the face of the area, by the lack of methodology in the application of steps or processes that help to solve those problems, In addition, changes were obtained in the concentration and reasoning capacity of students, their strengthened the analysis, understanding and application of mathematical operations, in the integration and active participation of the group, in the timely delivery of tasks, in attendance at classes, explanations and in group work, therefore the alternative didactic model is specifically effective in its application in the resolution of mathematical problems.

Similarly, at the end of the process there was an increase in the academic level of students, which previously focused on the basic level and is currently at the high level. This then reflects a meaningful and effective response in student learning through the application of this model.

Finally, once the steps of design and implementation of the alternative teaching model were completed, it was possible to determine thanks to the application of the post-test and the analysis of students' academic results, a quantitative increase in their grades in the area of mathematics and a significant strengthening in both the process of solving arithmetic problems and in the development of basic mathematical skills.

Recommendations

In order to further strengthen the development of basic mathematical skills in elementary school students, teachers should prepare mathematical exercises according to the context and intellectual level of students, but always focused on working through the use of some clear methodology (either that proposed in the alternative teaching model proposed in this research or another) , that allows the creation of a favorable environment in which the student experiences sufficient self-confidence, in solving a problem and that satisfactorily achieves significant progress in his learning teaching process.

On the other hand, strategies should be applied in problem solving in order to reduce the fear of mathematics; trying to avoid ununderstood jobs or exercises so as not to provoke frustration in students in the area of mathematics, otherwise it will not achieve what is expected in this, since listening to the criteria of the students will be able to provide better guidance and incentivize in them the interest and passion for the study, specifically the area of mathematics through new and innovative models.

Similarly, you can apply the model of essay, testing, error of different strategies until you find one that adapts to the needs of each group of students and that allows meaningful learning.

It is for all of the above that alternative teaching models for problem solving aim to achieve improvement and transformation in teaching processes, teachers and learning in problem solving in students that in the medium term lead them to achieve better academic results and above all, allow them to successfully face problematic situations of real life , where the exercise of your profession so requires.

Thus, the desired impact with the implementation of alternative teaching models is to overcome the difficulties presented by primary basic children in the area of mathematics, in any of its components, providing an innovative, motivating and meaningful tool for all members of the educational community.

Similarly, it is important to emphasize that problem solving is the center of teaching and learning that attracts the interest of many educators and has led to an agglomerate of research by different researchers around the world. It is regarded and appreciated as the first line of research in mathematical education. Knowing steps in problem solving, or having guiding guidelines for this, is of great importance to achieve the purposes of this activity, in view of this, that different authors exhort the mastery of models to develop the skill and master this practice, therefore it must be subject to teaching.

Finally, it is important to emphasize that the role that motivation plays in problem solving is an important and necessary condition for carrying out mathematical processes.

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