

The Game as a Didactic Object in the Teaching of Mathematics: A Case Study at the Manuel German Cuello Gutiérrez Educational Institution in the City of Valledupar

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Abstract

In this article, the authors propose a series of games, aligned with the secondary education curriculum, which is part of a master's and undergraduate thesis at the Popular University of Cesar, which sought to determine how to introduce the game in the teaching of mathematics. The main objective of the article is to identify the potentialities of games in the development of mathematics classes, so it is structured in two parts; The first two chapters introduce what the game is about, the benefits it brings, etc. While the remaining chapters exemplify the use of play in the different stages of mathematics learning. There are various approaches or pedagogical trends considered: the creation or modification of materials by teachers; the development of analytical thinking; the active role of students; as well as the interest of the mathematics games presented and their playful role that favors the interest and attention of the students. All these approaches converge towards a single purpose, the development of logical-mathematical thinking through motivating and attractive situations for students. Mathematical games are activities that encourage students to make decisions, based on calculation, verification or reflection in their own environment and that start after the participation of the same, personal progress, fun and practical experience.

Keywords: Mathematics Teaching, Play, Pedagogical Practices, Transversality of Teaching.

Introduction

In the teaching of mathematics, the concept of 'play' cannot always be considered in a positive way, although play is on the border of the serious, the sacred and the formal (GRANADOS & CABALLERO...). Thus, the use of play as a didactic object presents the following problems, among others: 1– That it can be interpreted almost as a 'deception' of the students, by presenting playful situations but whose specific purpose is only learning, when for the student-adolescent the logical thing is to play for the sake of playing, with an exclusively playful purpose. 2– Through certain dynamics of games or activities we can strengthen some misconceptions that students may have in the field in question. Based on these premises, this paper has addressed a different methodological strategy in terms of the theoretical framework. A search was carried out in different sources for questions of specialized journals and other articles of different kinds related to play, didactic methodology and other topics in which the increasing interest of teachers when it comes to proposing new methodological proposals in their classrooms is evident. The intention has been none other than to collect the scientific work carried out in each area in order to serve as a guide and demonstrate that the practice of play as a methodological proposal is simply a demonstration that it continues to be effective.

We must propose methodological proposals in which students build their own knowledge. In the specific case of mathematics, you must discover in order to internalize this content presented through play. This situation allows them to manipulate, experiment, build, question, make mistakes and correct them, involves and motivates them, makes the didactic session enjoyable and entertaining, avoiding purely algorithmic sequences that have sometimes characterized the teaching of mathematics for decades (Surmay Mesa & Cero Hurtado, 2023).

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Theoretical Foundations of the Game in Education

It is here that the great importance of play in education is manifested, since with it the student acquires knowledge and skills, learns to live together, accept the rules and respect others. Because of this, playful activity is obviously a factor of vital importance for the proper development of people and the adjustment of the individual to their sociocultural environment (Venegas Álvarez & Proaño Rodríguez..., 2021). The first dimension that is highlighted when talking about play is educational. Play, after all, arises spontaneously among children in all environments and at all ages. Therefore, it is not surprising that interest in gambling was late in the professional and scientific field of education. No one realized the effectiveness of the game to educate; on the contrary, play was considered an enemy of education, a useless activity because it did not lead to the achievement of the supposed educational objectives intended through programmed activities (Alacid Polo, 2023).

In order to characterise play, it is first necessary to understand in what sphere it appears, and it is clear that its natural field is that of leisure, which is defined by regulated time and space whose occupation is free of coercion and the pressures derived from responsibilities (Molina Bedoya & Aguirre Cardona..., 2023). Consequently, play occurs in the interest of the individual himself, as an activity that is pleasurable as well as useful for the continuation of the species. It is also useful for the adaptation of the human being and for the diagnosis of possible emotional and intellectual dysfunctions; Therefore, because it organizes the individual, determines his interests, highlights his abilities and evolves in the field of personal and social evolution, psychologists throughout history have been interested in his internal mechanisms.

The Game as a Didactic Tool

On the one hand, the game has the ability to motivate the student, making the class more attractive. We must not lose sight of the fact that learning is a fundamentally active act, and play favors this aspect of learning (Gómez, 2024). In the game, the student experiments, investigates, thus becoming the protagonist of the learning process. Mathematics does not have to be a feared and hated subject, if instead of the expository method the playful method was used. But play, by itself, does not necessarily lead to learning, but is a first-rate didactic instrument in many learning activities. In physical education, literature, language, foreign language, music, plastic arts, social sciences, natural sciences, early childhood education... In all areas, we have to take into account the place and the type of game as part of the curriculum.

We must consider the game as a didactic tool, and for this we must notice some issues as consumers of games. In many aspects that will directly influence the student. The importance of play lies in its ability to attract like a magnet, it is its ability to motivate. Although play disguises the seriousness of the purpose, it maintains the student's activity and makes contact with the subject pleasant. The enjoyment during the game does not lie so much in the values that the student acquires directly, but in the rewards interposed in the game. The game has many rules and has characteristics that constitute clearly defined orders that are admissible to the students. The transmission of content becomes more effective if it involves playful experiences. Play favors socialization among students, in the same way that it occurs among members of a group. (Ríos Ayala & Montenegro Barreto..., 2022)

Types of Games in Mathematics Teaching

Enrique Basurto García classifies the different ways of teaching through play into four types, according to their influence on the teaching-learning process: a) functional; b) propositional or systematic; c) functional at a higher level; and d) student development. Let's see for each classification the didactic strategies that are presented in the teaching of mathematics. According to the first, games serve by themselves to achieve the objectives, and the same thing happens to the other types of teaching as in play, that is, the learning process is pleasant, meaningful and, therefore, links the subject in a functional way with his cognitive process. (Roa et al.)

The second type has a precise purpose; It can illustrate, consolidate, activate previous learning or prepare future learning. The different types of strategic teaching are also presented (Medina-Gorozabel and Giler-

Medina, 2023). The third is not only related to mathematics and occurs within the framework of the so-called "general psycholinguistics"; that is, it is not only played to exercise logical skills or apply certain mathematical procedures, but it can also serve the broader development of intellectual abilities (Jiménez et al., 2024). The fourth type was the one that frequently classified the content of each discipline that he called the "ordinary games". He states that mathematical games are one of the sources of ordinary games, since play is a means of learning for the child, since he can prepare by exercising the rule before applying it, play when he has not yet been able to assimilate reasoning and analyze reasoning, since the mechanism of the game is perceived in an evident way. As he says, "play is very hardworking" not because the child works by playing, as educators often claim, but because what you imagine yourself playing is much more locomotive (González and Sánchez, 2023).

Board Games

Board games are an excellent recreational resource, which enable the understanding and learning of mathematics. In general, various methodological possibilities are presented, although the proposed games are based on their spontaneity, immediacy and ability to establish relationships with learning objectives; that is, the teacher selects the most suitable game for each situation, considering: on the one hand, the underlying theoretical framework or, in other words, the attitude that the game tries to promote or reinforce with respect to mathematical knowledge. On the other hand, the playful component, as this, together with the hidden curriculum, is the main argument in favour of games. (Muñoz Bolaños, 2022)

Cubo Scene, a multicultural game. - This game was created during the course for a project related to the curriculum of the subject of applied mathematics. Its preparation was easy and pleasant thanks to the collaboration of the colleagues and its final result exceeded expectations. Proposed as a traditional game of the goose, it was expanded and different tourist destinations were introduced, starting from different cities, as can be seen in the following figure. For this reason, we want to show it to teachers so that they can make various contributions (including the change of a city if it is not well placed) and, above all, to see its viability. Therefore, we leave it with the basic structure of the goose and a little work for its adaptation according to the ages. (Ávila Borrillo, 2022)

Digital Games

A large number of video games are strategic and some are essentially mathematical, thus being able to be used to support interesting teaching-learning situations. All mathematical logic is essentially strategic, so the possibilities of educational games in the digital environment have been investigated, especially through specific developments. Let's identify some possibilities. A large number of computer games rely on combinatorial development, especially solitaire games, such as Spider solitaire, or other games such as chess or Go. Chess, for example, encourages spatial thinking: mental geometry. In the case of Go, logical-mathematical intelligence, naturalistic intelligence and bodily-kinesthetic intelligence are also worked on, due to the fact that the game involves a hand-to-hand with the opponent. Another set of games that can be used to work on mental calculation are arcade or fast action games, as they allow or even require precise and fast arithmetic calculation. There are also other interactive games that pursue the manipulative functionality of handling numbers: those of ant mazes, or Pandora's box games, where the concept of fraction and multiple is strengthened, or games that pose situations that require thinking. (Steven & Rincón, 2023)

Role-Playing Games

Role-playing is a technique that is usually linked to a mathematical situation rather than to a simple known game, so we must talk about two main subtypes: simulation games and role-playing games: Simulation games are those that require students to assume a role within a game, where a mathematical situation is posed and a series of operating rules are established that the student must comply with according to the role he or she has had to play. They are an effective way to motivate students if they are allowed to put their decision-making and improvisation skills into practice during development. They can be actor/viewer, in which a small number of students play the role by enunciating their characteristics to the rest of the

group, or actor/actor, who play each other without the need for viewers. Role-playing games refer to the assumption of characters, because it is the character who marks the decisions that the player can make and that will resolutely condition the success or failure of that player, so saying that the character is going to do this or that flees from reality. Today, no character in an electronic game is beyond the control of the player, who can decide what actions and in which direction to take them. There are a wide variety of role-playing games on the Internet, but among the most popular are Dungeons & Dragons, which is one of the most popular role-playing games. None of the four levels brings any novelty. It is a game in which players play characters, who perform feats that bring them experience rewards and take them to the next level, defeat monsters, complete quests or perform any type of task. (Arguello et al.2024)(Chávez et al.2023)

Benefits of Play in Mathematical Learning

The use of games, in general, and board games, in particular, in mathematics and in its teaching has numerous benefits, since it is one of the recreational activities that provides the most satisfaction, cognitive motivation and intellectual growth. If we add to this its specific didactic application in mathematics, the use that can be made of the game is extraordinarily interesting. In mathematics, and from all points of view (argumentative, strategic, cognitive, instrumental, attitudinal, etc.), the introduction of play has been explored over the years, as it is considered a powerful didactic resource that has great power to generate, maintain and consolidate mathematical strategies and concepts. (Afonso Expósito, 2021)

Play is a first-rate didactic resource in the teaching of mathematics; This is recognized by the pedagogical theory Transmission of previously elaborated knowledge, which defends the use of playful materials for the development of different mathematical procedures. Among them, gambling. In turn, different studies have proven the effectiveness of different playful materials in the acquisition and development of the most diverse geometric concepts. The use of play in mathematics and in its teaching has numerous benefits, since it is a recreational activity that provides more satisfaction, cognitive motivation and intellectual growth.

Development of Cognitive Skills

The puzzle is a logical game in which some elements must be arranged according to the restrictions imposed such as: number of elements, color, shape, etc. Initially, it corresponds to a predictive activity, which relies on the mechanisms of availability in search of a solution, based on the activation and flexible appropriation of the material. The child must constantly ask himself to find an appropriate strategy; To regulate their argumentation, to consider some general principles of the spatio-temporal logic associated with games such as the checkerboard and the towers of Hanoi, as well as to interpret and predict the process in which the solution is found. Solving the puzzle involves an intellectual effort that is associated with creative thinking. The problem that segments, the path that points and the effort that the thinker deploys, is the product of his own logical creation, it is the essence of creative thought, in all scientific and mathematical activity, putting into play the development of a particular set of skills. (Carrillo Vásquez et al., 2022)

Meaningful learning requires the activation of prior knowledge structures (Delgado-Cobeña et al., 2023). In this puzzle assembly and solving technique, its intrinsic mechanisms and cognitive effectiveness are given by the activation of such previous structures, seeking a content that contains them and allowing this to be subsequent to the fulfillment of the own and explicit objectives to be achieved. The detailed analysis of its cognitive efficacy from the psychogenetic point of view and at a general level, it will be observed how it can give a strong impulse to the exponential maturation capitalization of the schools of implicit wisdom, guiding the process of obtaining explicit knowledge from the constituents of the previous schools, specifically foci, subfoci, techniques, subtechniques of know-how, combination, skill, ability and increase in quality from the axiological and heuristic point of view and in quantity from the places that recover the processes of internalization or cognitive capital.

Promotion of Creativity

Another benefit to highlight from the use of games is the possibility of encouraging students' creativity. In experimental work using cutting-edge equipment, subjects said that creativity was greatest when they shaped

a problem-solving task into a similar game, or when they performed conventional playful tasks. To make games possible, students usually have to use alternative resources, and this usually encourages creative and improvisational skills on their part, which encourages curiosity and the desire to solve problems. The students, therefore, participate in the game. (Lucio et al.2025)

If the games are effective in trying to get students interested and paid attention to the activities, once engaged, we suggest that they will participate more in the activities in order to encourage the activities to be effective. For example, it has been argued that failure to achieve a goal shows the student that he or she does not really understand the topic, which activates anxiety. Ironically, games stimulate student participation, and by providing failures that are in no demonstrable quantity, they cause an increase in anxiety and, by it, attention. Therefore, the purpose of teaching and play would also not only be to teach the subject itself, but also to start from a group of rules and integral resources proposed by the games investigated, to promote in students attitudes of participation, attention and autonomy in the classroom, that is, to motivate students to learn as a procedure that requires effort, rather than promoting the understanding and meaning of conceptual contents in a dogmatic way. Therefore, the achievement through games of student learning and interest and satisfaction with teaching would act outside the hitherto classic scope of authoritarianism.

Improved Motivation

The greatest motivation for students. Here it is enough to highlight the fact that we are using a game. In addition, games provide: development of logical thinking.

Logical thinking is essential for daily life and more specifically for learning mathematics. However, obtaining this skill is not easy and requires methodical learning. Games, by working with logic, are configured as an ideal means to achieve this goal. Cultivation of imagination and intervention. (Diaz-Molina & Alay-Giler, 2023)

The practice of games allows us to escape from the image of mathematics as an exact, rigid and immovable science to accustom the student to the development of logical thinking through flexible and dynamic structures. Games entail a series of rules that must be respected, thus establishing a clear framework of coexistence and respect for the opponent. They facilitate the learning of mathematical content.

Students learn while playing, capturing their attention as it is not a monotonous and boring activity. Access to mathematical content appropriate to their level of development.

Most of the games are sequential, graded in difficulty. The choice of one game or another will depend on the content that is most appropriate to the level and age of the students. Adaptation to the logic of each student. (Bravo et al.2021)

Due to the characteristics of the games, which require the realization of strategies and decision-making, students will be able to determine their degree of involvement and participation in their development, so that their adjustment to their logic will enhance their self-esteem, creating an environment of friendly competition.

Challenges in Implementing Play in the Classroom

It is necessary to take into account the challenges related to the implementation of play in the classroom in a more systematic way and with a greater impact on the teaching of mathematics. These challenges could be presented under three key categories of challenges to be faced by teachers: the first, of a methodological nature, alludes to difficulties in finding adequate spaces and instances for the incorporation of play in teaching, and of course, in reconciling these activities with the curriculum of each subject. Games usually demand a source of inspiration or creative initiative, which allows the teacher to find a way to encourage certain activities oriented by a particular purpose. (Lovos et al., 2021)

The second category of challenges corresponds to the frictions and resistances, both of students and of teaching peers, that emerge in response to the didactic proposals of play. The former, linked to divergences or incompatibilities between the game and the classroom, and to the role of its subject par excellence, "playing the learner", for example: aversion to play, denial of usefulness as a didactic activity due to an alleged opposition between the playful and the serious. The latter are related to educational or school guidelines, conceptions about the curriculum or about classroom control and discipline, which hinder or prevent a neat work with games and the attraction of adding them to the curricular proposal. In this sense, teachers manifest a reluctance or impossibility to conceive of playful activities in formal learning spaces, "reserved" for teaching and work linked to the "nourishment" of knowledge itself. In relation to this, there are also difficulties expressed by teachers regarding the conception of play as a beneficial resource for learning.

Educator Resistance

In the field of educational practice, it is common to observe negative attitudes on the part of mathematics teachers towards the implementation of games as a didactic strategy. Mathematics educators of different ages, educational levels and school contexts show a notable resistance to considering mathematical games as central elements in the teaching and learning processes within their classrooms. Among the reasons given to justify this resistance, several can be highlighted. On the one hand, there is still a deep-rooted belief that mathematics is, by nature, a rational and deductive discipline, which implies that the approach to this type of content must necessarily be analogous. In this sense, games are perceived as lacking the characteristics that define mathematical science, being considered frivolous, random and unreflective situations, thus assigning them a playful character antagonistic to the rigor associated with mathematics (Cruz-Gurumendi et al. 2024). Resistance to integrating games into math teaching not only limits students' potential to interact with concepts in meaningful ways, but also perpetuates a traditional approach that can be unengaging and unmotivating. Therefore, it is essential to explore strategies that allow educators to rethink their vision of the use of games in the classroom, highlighting the benefits that this methodology can bring to the learning process. The incorporation of playful dynamics in the teaching of mathematics should not be seen as an obstacle, but as an opportunity to enrich learning and foster a more inclusive and participatory educational environment.

This reflection focuses on the perception that exists in the educational field regarding the vast didactic potential that games can offer, as well as on the fundamental role that the teacher must assume to promote reflective mathematical work among students. It is pertinent to point out that, historically, the educational system has prioritized written tasks in the process of acquiring knowledge and skills, leaving the use of alternative resources on a secondary or tertiary level, among which mathematical games occupy a prominent place. In the last decades of the twentieth century, driven by a constant and significant development, multiple proposals for educational games have been included in the manuals of various publishers. This inclusion has led to the union of educators from different stages and areas of knowledge with those games that, although they were not initially conceived for this purpose, have sufficient richness to be used to strengthen certain cognitive skills.

Resource Limitations

A problem encountered in educational institutions has been the issue of space and its conditioning, so it has been quite difficult to try to adapt it to the requirements of the development of a dynamic and active educational process, which promotes in students the necessary experimentation, application and interrelation of what they have learned, in pursuit of motivation, creativity and, above all, the achievement of a significant quality in learning. In particular, I consider that the development of playful-mathematical projects, rather than marking limitations, is important to highlight that progress is made gradually, with a multidisciplinary approach and establishing relationships with the established curricular contents. (Garcia)

Given the possibilities of this type of work, it is feasible to consider the in-depth study of a topic that positions the student in a situation of protagonism, where he interacts with his environment and the concrete reality, he will be able to assimilate the concept raised as his own and significant. As trainers, we

must promote, in a mediated pedagogical way, instances that allow the active internalization of knowledge by the learner. Certain shortcomings regarding material resources and the lack of innovation in the search for them can be considered a limitation when designing this proposal; but at the time of starting the project, it will allow you to inquire about the available technologies, the way they learn, the advantages of performing certain procedures, etc. As an educational agent, the means must be discovered in their favor to transform this situation recognized as limiting into a possibility.

Strategies for Integrating Games into Teaching

For a game to be truly useful in a learning process, the teacher must direct the attention of the students not to it, but to the mathematical problem that the game poses. Therefore, the teacher must apply some learning strategies; The main known strategies are:

Cooperative Learning Strategy: Some students exceed their performance when they participate in cooperative work activities. • Comprehension-Based Strategy: Teachers propose activities or problems of a level of complexity that requires students to advance in their competencies. • Project-Based Learning Strategy: In general, project-based work places students' activities in more significant contexts, which is more conducive to functional and applied learning processes. • Learning Strategy Based on Constructivism: The constructivist perspective is a way of understanding learning processes that conceives students as builders of their own knowledge, a process during which students organize and reorganize their personal experiences with new information, new information that will be meaningful to students if it can be related to their previous knowledge or if it responds to the emergence of a need specific about it or an upcoming learning situation. (Sarmiento et al. 2023)

In addition to the above strategies, the following classroom activities can be taken into account: interviewing, observation, surveying, and making a pedagogical diary. The implementation of any of these strategies and activities in the realization of the games can help students and their teacher to provide feedback on specific mathematics content, while the game encourages students to learn autonomously.

Design of Recreational Activities

In this methodological work proposal, play takes on a main role by using it as a didactic object to reach students. Not just any type of game can be used to achieve the objectives of this learning that we want to carry out: in this proposal, different types of games with different objectives are used. We will take into account the three indicated in the regulations on the matter, from which we take the conception of equal opportunities in the process of instrumental socialization as our own. (González & González)

For its development and application to the proposed activities, the characteristics that all playful materials for the explanation and teaching of mathematics must have been followed, that is: a.- Instrumental character b.- Operative nature c.- The clarification of game rules d.- The presence of some specific utility for learning. The priority objective is to create a positive attitude towards the discipline in the student, while achieving, above all, a motivation that makes them make an effort, given the contribution that the game in turn offers them: we bring the content to be transmitted to the student through the game; you don't have to force it at all for learning. It is the first, and clearly the most important, of the advantages of any playful technique, compared to others. In addition, it has effects and benefits to the other objectives that are pursued, that is, its presence, thus being stimulating or rewarding, makes the student's interest be covered, while the intentionality, not observed by him, is dispersed or forgotten. It is done by forgetting it, in general, in an attitude of a certain passivity, although there is a certain effort involved.

Selection of Appropriate Games

Whatever the game proposed, it is important that it fits the children's mathematical skills. Likewise, the child's interests and previous experiences should not be forgotten, and an appropriate challenge should be proposed that generates curiosity. Regarding the approach to the game, three different ones are mentioned: propositional and logical, based on systematic logical and mathematical thinking; non-propositional and

non-logical, based on playful-spontaneous thinking; and finally, propositional and logical-inductive, aimed at posing open problems that encourage logical thinking and the discovery of programs and algorithms. (Mendoza et al.2023)

Within semi-structured games are rounds, songs, riddles, jokes, among others. With them you can work: counting, writing, reading numbers and exercising memory. The round is mentioned: The snake to learn or consolidate the concept of number from 1 to 40. The striped snake for decimals from 0.1 to 0.9 and the throated snake to learn fractionals. A game-based learning strategy with algebraic material is presented for the teaching of basic operations with proportion values in primary school. Participants are provided with a series of problems related to a specific situation; for example, to work on addition in proportion, quantities and some questions are provided: How many colors in total? How much for each coil? For each color? The aim is that, in small groups of 3 to 4 students, they formulate the problem by stating and writing an algebraic expression that they must try to solve in a limited time to make it possible to share them. We can alter the conditions to turn them into subtraction problems, in a simple way, without having to change the arrangement of the material or the situation posed.

Case Studies on the Use of Play in Mathematics

The experience carried out at the I.E. Manuel German Cuello Gutiérrez educational institution in the municipality of Valledupar, in the department of Cesar, is developed within the framework of the Master's thesis in Education for sociocultural development, offered by the Popular University of Cesar and which in one of its specific objectives, framed an undergraduate thesis of the Bachelor's Degree in Mathematics of the same university. in which specific interventions are designed aimed at students at risk of academic failure. The learning difficulties presented by our students, added to the personal experience of the authors in relation to the use of the game in the mathematics classroom for purely aerobic purposes, have led to consider whether the implementation of the game could open a new way for the teaching of mathematics for didactic purposes. At first, the framework for experimentation with play (pretend play, role-playing, etc.) in the mathematics classroom seems today completely valid to satisfy the need to present authentic problem situations to our students. It is from these genuine situations that a proposal for the evaluation of one's own learning, characteristic of all, begins. Specifically, from the top-down refoundation or from a new perspective that deviates from traditional models: innovative or that creates a school. Moreover, the mere existence of genuine problematic situations in everyday life should at least pose a challenge to individuals. However, evidence shows that despite genuine situations addressing real problems, these alone do not solve one of the main challenges posed by traditional learning problems.

Evaluation of Learning through Play

The evaluation of learning through play can be understood from two opposing points of view: the one that is not in favor of the participation of games in the evaluation and the one that does promote it by giving it a primary role. Faced with this situation, the best thing to do is to move forward, experiment and make proposals that allow us to verify the greater or lesser advantage of the use of play in the evaluation of learning in general and particularly in the area of mathematics.

Having examined the data obtained from the survey carried out on groups of students on the topics under evaluation, it seemed to us that the results obtained do not provide much information for the topic at hand, it is explained by the fact that the mere "coincidence" that the students have solved a topic only implies "learning", and that is not of interest. For the sake of developing our topic, we have considered "learning" as solving a problem or obtaining a result, including translating certain content from one language to another, e.g., $x + y = z$. The coincidences obtained imply an improvement in the results, but they are not indicative of our subjective opinion in relation to the topic that concerns us in this research, nor of ours as those responsible for the subject. We continue to consider that the students who do not obtain these matches have not learned, since from our consideration we have verified that they have not applied the desired rule. On the other hand, they also apply the "bad" rule, that is, they do not learn the resolution of this issue and the only thing we would achieve would be to increase the accumulation of rules to which we alluded earlier.

Conclusion

In conclusion, and finally, the design and implementation of the didactic unit "Mathematics in Play" has demonstrated its ratification of the institution's mission. Through it we seek to promote autonomy in the field of mathematical thinking in secondary school children, which translates into the acquisition of habits, attitudes and procedures related to mathematical learning. These habits are as follows: observing and analyzing the properties and relationships of mathematical objects that surround them in everyday life; formulate hypotheses; search for and select information; and graphically represent mathematical objects; Communicate, justify and argue their hypotheses, ideas and solutions to problems in progression in logical and mathematical learning. All the work is based on the interests and needs of the children, which motivates and encourages them to know and discover mathematics. For these reasons, we firmly believe that play is a good methodological strategy in which mathematics enters as a foundation for children to develop and acquire habits, attitudes and initiatives that will allow them to face real-life problems, deal with and act with reality in an appropriate way, work individually or in groups and focus their activity on mathematical activities.

The objectives pursued have been demonstrated and satisfactorily achieved, from my point of view and with regard to the evaluation measures and instruments that I have used. After analyzing the data from the initial and final evaluation, it was concluded that the development of this didactic unit has contributed to the resolution of certain problems detected in the development of the teaching and learning process in the area of mathematics, such as: the projected decrease in the acquisition of numerical concepts and the difficulties in understanding the corresponding calculation processes and algorithms, which has an unfavorable impact on the learning of school mathematics in secondary education.

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