

# Magic, Humor and Creativity in the Classroom to Enhance Mathematical Thinking

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**Abstract:** The research project, Magic, humor and creativity in the classroom to enhance mathematical thinking is a didactic strategy that allows deep reflection in the classroom, to enhance mathematical thinking in students, using humor and magic as activators of creativity, taking creativity from the child's relationship with the context. When the student is stimulated thinking and creativity solves mathematical problems and problems of situations of daily life, with this strategy it is intended to propose models that contribute to provide propitious and meaningful spaces based on a mathematical training not only cognitive, but reflective, responsible, updated, critical and coherent, that goes beyond the contents, from a contextualized reality. With the purpose that the student develops skills of imagining, proposing and transforming, thus having the ability to devise something new to solve a specific mathematical situation in an innovative and different way, capable of analyzing situations of everyday life, drawing their own conclusions that allow them to understand, understand, evaluate, question and make sense to what surrounds him, in order to act more intelligently, developing socio-emotional skills, and at the same time from mathematics to form competent citizens who bring significant changes to society.

**Keywords:** Mathematical Thinking, Creativity, Humor and Magic

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## 1. Introduction

To train students into mathematically competent citizens, they must master the processes, competencies and procedures required in the five types of mathematical thinking, which are coherently interrelated. According to Llinares S (2011). "the mathematical thinking of students involves identifying relevant aspects and interpreting them to make sense of them and to be able to make decisions for action, [1]" according to Molina (2006) "mathematical thinking is the intellectual activity through which man understands, understands and gives meaning to what surrounds him [2]". Developing mathematical thinking is a challenge for the Ministry of National Education, it is a problem that arises at the national, departmental and municipal levels, as is the case of the municipality of Gameza in the Juan José Reyes Patria Educational Institution, it is an official and rural institution, based on the constructivist pedagogical model.

For the research was taken a population and sample of 21 students of the third grade, the diagnosis made in the school context was detected poor performance in: test results, the

synthetic index of national education, Students do not have mastery of the basic standards of competencies in the area of mathematics, there is no understanding and interpretation of the process of the five types of Mathematical thinking.

Teachers, through talks, affirm that students do not have the responsibility to do homework and extrapresencial work, elementary students are poorly prepared in the areas of mathematics and therefore there is dropout in sixth grade. All these problems are enclosed in the question where the research is focused: How to develop mathematical thinking through a didactic proposal mediated by creativity in third grade children of the Juan José Reyes Patria Educational Institution in the municipality of Gameza? There is a need to implement didactic actions and strategies to resume learning in the area of mathematics, which goes beyond the contents from a contextualized reality. Therefore, the mathematical thinking project is being developed in elementary school, the state of the art was realized by triangulation of data, taking contributions from: Jean Piaget, Sigmund Freud, Taylor, Edward de Bono, Cantoral, Molina, Llinares, Gardner, Csikszentmihalyi, among others. Seeking to answer the

research question, therefore, the general objective is to develop mathematical thinking through a didactic proposal mediated by creativity in third grade children of the Juan José Reyes Patria educational institution of the municipality of Gameza in the department of Boyacá. By taking creativity from the child's relationship with the context, when the student is stimulated thinking and creativity will be proficient in creating and solving mathematical problems and problems of life situations.

According to Csikszentmihalyi (1988), "Creativity does not occur inside the head of people, but in the interaction between a person's thoughts and a sociocultural context [3]", for Elliott (1981) creativity is taken into account in mathematical processes, "the mathematician, faced with a problem, tries, errs, attacks again with another scheme and in general needs a great imagination and creativity [4]". The methodology used: qualitative approach, type of action research, taken from the Elliott model, critical social paradigm, using instruments such as: direct observation, talks with professors where they relate their practices, questionnaires, application of diagnostic and performance tests, collaboration of doctors Salvador LLinares and Ricardo Cantoral by email, have made Great contributions to this project. Keep records and compile information in audio, video, and field journal. The didactic strategy was elaborated taking into account the educational context and the diagnosis of the problem identified. The activities were designed to be carried out in the phases of socialization, intervention, follow-up and monitoring, in each of these phases coordinated strategic actions are developed, allowing: knowledge, reflection and interaction.

The consolidation of the clear and precise diagnosis of the problems of the educational institution, the elaboration of a didactic strategy mediated by creativity, and the beginning of the implementation of the strategy, in order to achieve the proposed objective. In the strategy to activate creativity, humor and magic will be used. Conde (2010) Magic as a pedagogical tool has great intellectual value. By teaching magic to children we develop their sense of observation and appreciation. We discipline their mind and body, enhance creativity and imagination and it is an excellent tool to overcome shyness [5]".

### **1.1. General Objective**

Enhance mathematical thinking through a didactic proposal mediated by magic. Humor and creativity, in third grade children of the educational institution Juan José Reyes Patria of the municipality of Gameza in the department of Boyacá country Colombia.

### **1.2. Specific Objectives**

Make a clear and safe diagnosis characterizing the problem of poor performance in state tests in the Educational Institution.

Develop a didactic proposal taking into account the educational context and the diagnosis of the problem

identified.

Implement a didactic proposal to enhance mathematical thinking mediated by magic, humor and creativity.

Evaluate the didactic process mediated by creativity before, during and after.

### **1.3. Theoretical References**

For the development of the research project, theoretical references are taken into account from the definition of mathematical thinking, for Cantoral (2005) the "concrete operational thinking" establishes that logical thinking acts through operations and mathematical thinking on number and space [6]. For Molina (2006) mathematical thinking is part of a scientific field in which mathematical concepts and techniques arise and are developed in the resolution of tasks [2]. LLinares, (2010) states that mathematical thinking is the intellectual activity through which man understands, understands and gives meaning to what surrounds him.

"Students' mathematical thinking involves identifying relevant aspects and interpreting them to give them meaning and be able to make decisions for action. [7]", Pérez and Gardey. (2011) define mathematical thinking in the systematization and contextualization of mathematical knowledge, it is developed from knowing the origin and evolution of the concepts and tools that belong to the mathematical field. [8]. Mathematical thinking, therefore, includes knowing how a concept or technique has been formed. In this way, the person knows his inherent difficulties and discovers how to exploit its use properly.

From the Ministry of National Education MEN, Basic Standards of Competencies selects advances in the development of competencies associated with the five types of mathematical thinking (numerical, spatial, metric, random and variational). Quality education is a fundamental and social right that must be guaranteed for all. It presupposes the development of knowledge, skills and values that make up the whole person.

The project focuses on problems in mathematics education, which is a social reality that should focus on teaching practices and student learning. The studies carried out on mathematical thinking are taken into account in the project, characterized by international, Latin American and national studies. In the mid- twentieth century, Jean Piaget conducted studies on the way adolescents reason, Piaget (1985) in Piaget's studies on logic and epistemology proposes that "logical thinking acts by means of operations on propositions and mathematical thinking is distinguished from logical thinking because it deals with number and space [9]". The research focuses on developing skills in students to interpret and understand the mathematical contents, LLinares (2010) "to look with meaning" the mathematical thinking of the student involves identifying relevant aspects and interpreting them to make sense of them and to be able to take decisions for action [10]". Cantoral (2002) emphasizes the importance of teacher didactics, "In the school system, the concern is based on teaching and in its measure, school activities are designed without understanding the learning

factors in mathematics [11]".

### **1.3.1. National**

Luque (2002) this author takes into account creativity in mathematical processes, "the mathematician faced with a problem, rehearses, errs, attacks again with another scheme and in general needs a great imagination and creativity [3] ". It is a reality that the social image towards mathematics and mathematics teachers is very negative. For a large sector of society, mathematics is difficult, useless and incomprehensible. Daily, students make decisions about their future life based on the phobia of mathematics, the Ministry of National Education in document No. 3 cites the Five Types of Mathematical Thinking. The Ministry of National Education in the curricular guidelines of mathematics proposes, "know- how in context" to be competent in mathematics requires effectiveness and efficiency in mathematical thinking, which is subdivided into five types of thinking: numerical, spatial, metric or measurement, random or probabilistic and variational, which relate and articulate with each other, and have common conceptual elements.

Thinking and number system For the development of this thinking, the Ministry of National Education in the curricular guidelines, activities should focus on the understanding, use and meaning of numbers, operations and their relationships with numbers, and the development of different techniques of calculation and estimation, the use of addition operations, Subtraction, multiplication and division. With pedagogical and progressive accompaniment, students can achieve the construction and progress of knowledge and mastery of numerical thinking, Spatial thinking and geometric systems Spatial thinking is the set of cognitive processes through which mental representations of objects in space are constructed; It is important the relationships between objects in space and the location and relationship of the individual with respect to them. The study of geometry is related to art, decoration, design and construction of craft and technological objects, physical education, sports, dances, work with two-dimensional and three-dimensional objects, geometry is a tool for the exploration and representation of space.

### **1.3.2. Spatial Thinking and Geometric Systems**

Spatial thinking is the set of cognitive processes through which the mental representations of objects in space are constructed, and the location and relationship of the individual with respect to them. The study of geometry is related to art, decoration, design and construction of crafts and technological objects Physical education sports dances, working with two- dimensional three-dimensional objects, geometry is a tool for the exploration and representation of space.

### **1.3.3. Metric and Metric Systems and Measurement Systems**

It refers to the understanding of measurement quantities and the flexible use of metric or measurement systems, metric thinking is related to natural and social scientific disciplines, citizenship skills, care for the environment,

giving special importance to these magnitudes that are closely related to aspects of the student's social life.

The child has to be accompanied and motivated by the teacher The child will develop skills and abilities where he feels the need to change, to be creative and critical of his environment to create new things and generate ideas The child has to be motivated The context is important for him to develop this ability.

There are many techniques that have been developed to stimulate the production of ideas and creative skills that are of great importance in the classroom. Creative people are needed to give solutions to new ideas but that these take an order and systematization. Develop communication skills that will be reflected in their orality and constructive criticism. Learn at their own pace and in the way they want, where the teacher is there to help provide solutions to problems that cannot be solved and to be an idea-forming guide, where these ideas and dreams of children become reality. The classroom must allow favorable conditions to stimulate the creativity of children, it is where this potential must be developed. The project takes creativity from the child's relationship with the context, as stated by Csikszentmihalyi (1988) "Creativity does not occur inside people's heads, but in the interaction between a person's thoughts and a sociocultural context [3]". Luque Arias (2002) where he takes into account creativity in mathematical processes, "the mathematician, faced with a problem, tries, errs, attacks again with another scheme and in general needs a great imagination and creativity [12]".

Ausubel (1963) "The creative personality is one that distinguishes an individual by the uncommon quality and originality of his contributions to science, art, politics, etc. [13]" (Psychologist and pedagogue. It emphasizes novelty and value. Freud (1963): "Creativity originates in an unconscious conflict. Creative energy is seen as a derivation of sublimated childhood sexuality, and that creative expression results from the reduction of tension [14]", Piaget (1964): Creativity constitutes the final form of children's symbolic play, when assimilated into their thinking [15]" (Epistemologist, psychologist and biologist. Recognized for his theories on cognitive development and intelligence). Taylor (1971): "Creativity involves a variety of processes and perceptions aimed at altering and reorganizing a significant part of the environment according to the person's own patterns or structure of needs, hypotheses, judgments, and perceptions, providing an alteration that is unique or uncommon and relevant to the problem. The intellectual process that results in the production of ideas, both new and valuable [16]." De Bono, (1992) Creative thinking. The power of lateral thinking for the creation of new ideas [17]". The strategy Humor and mathematics will work on humor, as an activator of creativity. Pelayo (1984) says: "the joke develops the child's sense of humor, with a developed sense of humor, the child will live in a positive mood with good humor and vice versa, because it is a virtuous circle. With a positive attitude, the child will be more willing to enjoy any pleasurable and playful activity. With a developed sense of

humor, the child will also develop his critical sense, his common sense, his imagination, his creativity and improve his personality [5]". The classroom must allow favorable conditions to stimulate the creativity of children, it is where these potentialities must be developed so that there is a mastery and management of five types of mathematical thinking. Conde (2016). "Education is magic. Magic is illusion and illusion is the true engine of life [5]" With magic, mathematical situations are proposed so that the student discovers its procedure and possible solutions through research, observation and experimentation and identifies the didactic characteristics of magic as a means to promote the learning of numerical thinking, metric and spatial. The teacher will perform tricks, magic is very useful for students to be attentive and curious, look for ways to discover the trick, begin to investigate where things appear and disappear. Why do they change? In the mind of the child questions are asked and begins to investigate critical thinking that expands until it reaches the production process, posing problematic situations. Conde (2016)" educational magic also develops mathematical logical thinking The teacher must have creative qualities, offer an innovative and unforgettable environment that each learning is a magical moment for the student [5]", Suarez (2010) "the magical act must be thought based on its audience; Especially when it comes to children they should prepare fantastic games, with stories, implements and striking and overwhelming effects, never to forget [18]." Conde (2014) "The magic through these words, manages to open the minds of children and educators towards knowledge and education. Magic is a motivating and hilarious element for children and adults and this allows them to develop their skills, abilities and competences without hardly realizing it and in a totally playful way [5]".

## 2. Methodology

The research has a qualitative approach, inductive method, social critical paradigm. Referring to Paulo Freire, it aims to link the learning process with the real social use of knowledge as a tool (empowerment). Critical pedagogy seeks to confront students and teachers with the problems of the objective reality in which they live and develop; Therefore, the fundamental source for the selection of content is the social reality itself in close relationship with the community where the school is located.

Freire (1979) "Critical action is praxis, which moves between reflection and action [19]", the instruments used for the collection of information: Direct observation; type Action research taken from the John Elliott model, direct contact with the object of study,

Analysis of the Synthetic Index of Educational Quality, state tests of recent years, tests of the material received from Dr. Salvador Llinares (personal communication, May 30, 2017) this material was carried out to adapt it to the diagnostic test.

Analysis instruments were used to obtain a clear diagnosis of the problem, characterizing in the Synthetic Index of

Educational Quality, several instruments were applied to validate the diagnosis.

Elaboration and implementation phase. A didactic proposal mediated by creativity was elaborated taking into account the educational context and the diagnosis of the problem identified, the previous knowledge, potentialities and attitudes of the students.

To assess research processes, it will be carried out between phases before, during and after, taking into account self-assessment and co-evaluation; These interventions will help to identify the contributions generated by each of the instruments applied to make improvement plans.

## 3. Results and Discussions

Se made a clear and safe diagnosis characterizing in the Synthetic Index of Educational Quality, for this diagnosis the tests were applied: surpass with el knowledge, the tests saber of the years 2014, 2015, 2016 and 2017.

Testswith adaptations of the material of Dr. Salvador Llinares, where it was possible to diagnose that students: do not construct or describe numerical and geometric sequences, do not classify or organize the presentation of data, do not locate objects based on instructions concerning direction, distance and position, do not establish correspondence between objects or events or patterns or measuring instruments, They do not use operations or properties of natural numbers to establish relationships between them in specific situations, they do not solve or formulate multiplicative situations. One of the strengths in some of the students knows mechanically how to add and subtract, but they do not know the processes and their usefulness in problematic situations that are presented to them, the results of reports of low academic performance in the area of mathematics.

A didactic proposal mediated by magic, humor and creativity was developed, taking into account the educational context, the diagnosis of the problem identified, the previous knowledge, potentialities and attitudes of the children.

A didactic classroom was created where we find the corner of mathematics with material prepared by the children and the teacher, in this we can find novel artifacts such as: the yapay and the multilego, wooden instruments to facilitate the learning of the basic operations these created by the teacher. The project was socialized to the educational community.

## 4. Conclusions

By implementing the strategy mediated by magic, humor and creativity, favorable teaching and learning environments are built to improve the development of mathematical thinking, with the purpose of contributing to education and true learning of mathematics, forming happy children. With new ideas, with the ability to think critically and creatively, developing mathematical thinking to become a mathematically competent citizen, with the mathematics classroom students contribute to creating an environment

where they experience meaningful learning and discover their own learning. The strategy offers the necessary tools to face internal and external tests and achieve better academic results.

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