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Article

Playfulness: a strategy to reduce apathetic behavior in mathematics learning

Lúdica: estrategia reductora de conductas apáticas en el aprendizaje de las matemáticas

Yulieth Caamaño Rojas*
Enoelia García Florez*

Abstract

Mathematics is a demanding scientific discipline that requires the application of logical reasoning and argumentation for problem solving. This implies the need to increase the attention level of students and prevent them from being trapped by abulia and indifference. Therefore, the objective of the research consisted in designing a strategy based on playfulness, reducing apathetic behaviors for the learning of this important subject. The materials (instruments) for data collection were: observation guide of students' attitudes and an interview guide to record situations, indicators, observable behaviors and the degree of affectation. The method was action research, the approach was qualitative and the paradigm was constructivist. Preliminary results declared the existence of a relationship between apathy and quality of mathematics learning, however, a clear tendency to behavior modification was found.

Keywords: Playfulness, apathetic behavior, strategy, learning.

* Master's Degree, Postgraduate in Education, Iberoamericana Corporación Universitaria, Colombia, ycaamano@ibero.edu.co, https://orcid.org/0000 -0001-8926-3197

* Master's Degree, Postgraduate in Education, Iberoamericana Corporación Universitaria, Colombia, egaci51@ibero.edu.co, https://orcid.org/0000-0001-7161-7567

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Resumen

Matemáticas es una exigente disciplina científica que requiere de aplicación del razonamiento lógico y argumentación para la resolución de problemas. Esto implica la necesidad de incrementar el nivel atención de los estudiantes y evitar que sean atrapados por la abulia e indiferencia. Por consiguiente, el objetivo de la investigación consistió en diseñar una estrategia basada en la lúdica, reductora de conductas apáticas para el aprendizaje de esta importante asignatura. Los materiales (instrumentos) para la recolección de los datos fueron: Guía de observación de las actitudes de los estudiantes y una Guía de entrevistas para registrar las situaciones, indicadores, conductas observables y el grado de afectación. El método fue investigación acción, el enfoque fue cualitativo y el paradigma, el constructivista. Los resultados preliminares declararon la existencia de una relación entre la apatía y calidad de aprendizaje de las matemáticas, no obstante, se encontró una manifiesta tendencia a la modificación de conducta.

Palabras clave: Lúdica, conducta apática, estrategia, aprendizaje.

Introduction

Education is the fundamental basis for the formation of human resources and the platform for the integral development of nations. In fact, it is undergoing important transformations worldwide in terms of processes, technological resources, strategies and opportunities for inclusion. Hence, information and communication technologies, globalization and education represent a trilogy in the new social order as resources to promote change capable of leading humanity towards an emerging digital knowledge society (Carrasco, and Villero, 2021).

In this sense, the promotion of change gives a twist to the teaching-learning processes in a world where turbulence, uncertainty and complexity play a leading role. These realities are relevant to the evaluation of mathematics education. The 1970s and 1980s provoked heated debates about the values and anti-values of the trends that were emerging towards an intense search for appropriate ways to address new challenges of mathematics education by the international mathematical community." (Ozámiz, 2021)

Therefore, the imperative of conceiving and studying mathematical sciences also implies redefining pedagogy, didactics and the vision

of mathematics as a tool for the professional field and everyday life because the knowledge of this subject and its application are omnipresent (Vásquez et al. 2021). Currently, the pedagogy of mathematics tends to demand changes due to virtual scenarios and should be used to strengthen the potential of teaching and learning (Vásquez et al. 2021).

From this perspective, Mathematics acquires a special value in the integral formation of people because it is a strategic ally to understand and interpret the world reality and the social, economic and family spheres through signs such as wealth, poverty, development and stagnation. Undoubtedly, this area of knowledge plays a valuable role in the establishment and progress of society. The teaching-learning process of mathematics constitutes the primary socializing channel for the communication and appropriation of knowledge, skills, relationship norms, behaviors and values to strengthen the bonds between students and teachers (Pérez, 2021).

The above shows that education is a set of cognitive and epistemological actions that is complex in each of its components and acts. In this regard, Muñoz and Guerrero (2021) agree that "it is essential to contemplate all the elements involved in the processes of planning, pedagogical performance, monitoring, educational evaluation and feedback" (p.7) while Mero (2022) warns that a rethinking of educational policies, better management direction and the implementation of new methodologies for teaching and learning in scenarios where educational innovation is the protagonist are inevitable.

Scientific theories related to the acquisition and implementation of knowledge open a range of alternatives that in the field of education become methods and strategies through pedagogical sequences to sensitize the receiver of the message about the importance and usefulness of knowledge in terms of the requirements of their training. Thus, the strategy allows the teacher to dialogue and reflect in order to identify performances and attitudes (Camargo and Bolaños, 2022).

(Rodriguez et al; 2020) because assertive communication is important during the act of transmitting ideas so that the receiver can clearly understand what the sender is expressing" (Bernal et al; 2022, p.8). (Bernal et al; 2022, p.8). Therefore, communication is the

determining component in the teaching-learning process because it is the action and relationship between its actors. Ineffective communication can trigger apathy and aversion towards the teacher's discourse and the subject.

In view of the above, apathetic behavior is considered to exist when the student exhibits behavior characterized by the following indicators: lack of interest, lack of motivation, detachment from the need to learn, lack of attention, loss of affection to take advantage of the teacher's explanations, low self-esteem, present in the school environment, but with a lost mind, restlessness, anxiety, frequent non-attendance, poor school performance and isolation from the group.

Based on this description, it is imperative to turn to the meaning of the word apathy: Real Academia Española (2023) defines it as "Impossibility of mood, laziness, indolence, lack of vigor or energy. It is also a disorder of motivation characterized by a quantitative decrease in goal-directed behavior (López and Dóriga, 2015). The conclusion emanating from these definitions coincides in that apathy is the disconnection of emotion, thought and action.

The same educational reality forces to investigate apathy as a manager of disruptive behaviors that threaten the normal course of the student's training and the teaching function. As opposed to apathy, Guischca, and Murillo, (2018) express: "Playful techniques become creative and recreational strategies for in-depth learning because normally what students learn by playing they hardly forget" (p. 25). The teacher of the future must be able to facilitate the understanding of mathematical objects, demonstrate convincing knowledge not only of that subject, but also of the didactics, pedagogy and epistemology of this important science (Maninat, 2020), because teaching is not precisely a process of information transfer, but rather to implement appropriate environments for the learner to be the constructor of his knowledge (Freire, 2006).

The review of research on the subject allowed us to detect that most students do not enjoy the pleasurable experience of learning, since they are trapped by apathy. The teaching of mathematics should be developed in an atmosphere of creativity and innovation where playful strategies are used in the search for meaningful learning (Jiménez and Mendoza, 2022). The teacher has the opportunity and simultaneously the challenge of explaining mathematics in an

interesting and fun way to foster the growth of knowledge in that science (Africano, 2021).

The problems with the didactics of mathematics point to the need to cultivate a global awareness for the strengthening of the teaching of this science in order to face the challenges posed in the path of sustainable development (Lavigne, 2021). The problem has transcended so much that in Colombia the construction of a regime of truth has proliferated, which has functioned as a referent of the educational discourses on the teaching of mathematics, which has proliferated the idea that the learning of this discipline is an exclusive area for those who are intelligent, together with the presence of fear as an existential category in mathematical experiences (Garzón, 2020).

Then, it is necessary to introduce inductive changes to optimize teaching and make adjustments according to current demands (Álvarez and Hernández, 2022). These initiatives allow learning to be interactive, productive, with relevance of communication and social relations (Bravo and Gómez: 2020). In this line of action, playfulness contributes to the development of action, decision, interpretation and socialization (Paredes and Terán, 2020). And as an added value, the perception of didactics in the teaching of mathematics reaches its level of liking or rejection in relation to the motivation radiated by the teacher (Quintanilla, 2020).

The articulation of cognitive aspects with the playful factor in order to reduce negative behaviors that block learning, such as anxiety and uncertainty (Parra and Pizarro, 2022). In this direction, it is feasible to implement playful strategies that help to solve problems and motivate the participation of students individually and in groups (Castañeda et al; 2019), understanding that playfulness motivates to focus attention, facilitating learning (Villacis and Morocho, 2020). Similarly, it triggers positive effects on oral communication providing favorable elements for meaningful learning (Arana (2021), since where playful strategies are implemented and reinforced with ICT technological tools, students show greater willingness to learn, improving their attitude towards particular school habits (Fajardo et al., 2022).

However, (Gascón, 2018) warns:" Despite these advantages, it must be taken into account that the use of ICT in this subject does not mean the absence of conceptualization, but that they serve as a

support to achieve a better understanding" (p.11). This warning incites to value more intensely the usefulness of ICT in terms of playful strategies for the teaching-learning of Mathematics, since it is feasible to accelerate and increase school performance through connectivity due to the attractiveness of technological tools for students.

Related to these comparative advantages, Carrillo (2022) assures that "playfulness favors imagination and is a pleasant situation for the acquisition of new knowledge". (p.8) Playfulness as an educational tool encourages the initiative of learning by doing for the development of fundamental competencies for the strengthening of the educational and social process through a series of aspects such as observation, analysis, intuition and decision making. (Gallardo: 2018). These attempts have their foundation in playful strategies to facilitate situations and innovative for teaching and learning channeled by the pleasure of doing things and achieving reciprocal satisfaction. López; (2019) argues: "detecting the cause of school problems related to mathematics is important to establish solution mechanisms and apply the appropriate corrective measures so that students improve their learning in the area of mathematics" (p.8).

The findings of constructivist theory showed that playfulness generated positive energy and was seen as an alternative to incorporate it into didactics. Vygotsky, Montessori and Piaget, (cited by (Bello et al. 2022). These scientists highlighted the cognitive and pedagogical foundations of active learning in play. The first considers that play is an action for the evolution of the child that leads to proximal development, the second holds that it is assimilation of elements of reality, and Montessori positions the idea of play/play in the educational spectrum, expanding the bases of learning, confidence, security and friendship in the child.

Play is an indispensable activity for the cognitive, communicative, affective and social progress of the human being, in view of the fact that it supports the development of the basic functions of psychic maturation (Domínguez: 2015). It is a process of assimilation that recognizes the meaning of things as a result of relationships (Torres, 2019). In addition, motivation is reflected in children in the act of learning and they feel identified with the class (Estupiñán, 2021). Identified with these advances, Rivera and Villegas (2022) consider that the application of epistemology facilitates the definition of

knowledge, its validation and construction following more scientific than speculative criteria. These criteria have been reinforced with playfulness to propitiate learning styles so that students fall in love with mathematics. In conclusion, playfulness arises as a need for socialization as indicated by the constructivist theory and its insertion in education has generated added epistemological and cognitive values in the construction of knowledge.

Materials and methods

The data collection materials consisted of a Scale of Affecting Apathetic Behavior in Students, an Interview Guide and a Consistency Matrix. The practical and methodological usefulness of the first instrument was to record observations of student behavior to describe situations, indicators, observable behaviors and the degree to which negative attitudes affect students with apathetic behavior. For this purpose, a progressive ascending rating scale (1.2.3.4) was proposed, which served as an indicator to measure the degree to which apathy affects students.

On the other hand, the interview guide was prepared with the purpose of interviewing the students who made up the population under study in order to record their opinion regarding the subject of mathematics. The structure of the instrument consists of statements (questions) and a dichotomous YES-NO scale. The reason for which it was decided to design this model was to avoid digressions and doubts in the students at the moment of answering each of the questions. The aforementioned instrument contains a battery of 10 questions focused on determining the reaction of the interviewees to the subject.

The guiding criteria for the development of both instruments were based primarily on a support strategy for collecting information according to the characteristics of the research. The instruments present a simple, understandable and feasible structure for application, since they do not cause confusion in terms of modifications, corrections and extensions, if necessary.

Finally, a Consistency Matrix was constructed, not to collect information, but to guide the direction of the research in attention to the data, assuming the coherence and relationship of the key aspects of the research as title-problem relationship, data-results and

observations-indicators The method was action research, the approach was qualitative and the paradigm was constructivist. The methodology implies a set of procedures, techniques and resources for the elaboration of any research.

Accordingly, in qualitative research it is appropriate to approach the problem without formulas, but rather with an intentionality focused on contextualized reality, where the subjects to be investigated are considered key to the solution of the problem (Mujica, 2022). Linked to the above, this method is inductive and descriptive (Álvarez, 2011, p. 10).

This methodology reconciles various techniques to obtain information to learn about people's behavior (Piza, et al. 2019). It emphasizes on the mechanisms of action to transform or improve situations that are not beneficial to the human being and focuses more on the reality experienced by the person than on the data that the information obtained may yield.

This method proposes an ontological, epistemological and methodological basis that guides the researcher to orient his object of study and to evaluate the findings in terms of reality and knowledge (Colmenares, 2012). The procedure for analyzing the information collected is discourse analysis, a technique for ascertaining the opinion of the population involved in the research.

Results

Situations are descriptors that highlight apathetic behavior. To specify the level/degree of affectation, a measurement scale was designed that ranges from 1 to 4. 1 (very low) 2 (low) 3 (worrying) 4 (very worrying). The scales function as trend markers about the degree of affectation of apathetic behavior in students. Each situation has its indicators, the behavior detected and the scale of affectation. The results obtained through the Affectation Scale in the situations showed that in Demotivation only (2.4%) is in grade 4, (2.7%) in grade 3 while (45%) in rank 2 and (49%) in the lowest grade, while in Difficulty in following instructions concatenated to the indicator Lack of attention, the results state that 43% is located in grade 1 while 17% in grade 2, 22% in grade 3 and 18% in a condition of very worrying.

In terms of self-doubt, taking the self-esteem factor as an indicator, it was found that (26%) are at level 1 (low), while (23%) are very low, while (21%) are worrying and (30%) are very worrying. Next, the general trend leads to affirm that the results confirm that (77%) of the students are in the very low level, while (15%) attend classes regularly. The degrees of worrying reflect (6%) and very worrying (2.34%).

Regarding Individualism, the results showed that there is no intentionality to individualism that affirms the presence of socialization problems. The (92%) do not practice this behavior, since individualism is located in grade 2 (very low), (5%) low and 2% in the worrying category, while (1%) is visualized as very worrying. The Rejection of Mathematics indicated that (12%) feel a low rejection of the subject, as opposed to (8%) who are reluctant to be receptive to explanations, while (35%) are in the worrying category and (45%) are in the very worrying category due to their refusal or rejection of learning the subject.

Non-compliance with their duties. The results indicated: low (23%) very low (21%) and worrying in non-compliance (24%) while in the position of very worrying (32%). Refusal to change this situation is represented in the resistance to change or modification of behavior from apathetic to positive and productive behavior in relation to the subject Mathematics. In this regard, it was found that 73% consider the need to improve their behavior. Therefore, the resistance to modify behavior is low. Sixteen percent (16%) show a very low level of refusal to change.

On the other hand, the fact that (8%) are reluctant to change their behavior is a cause for concern. The (3%) remain indifferent to the proposal to change from negative to positive behavior, which is seen as very worrying.

School Performance in this situation (15%) of the students have been obtaining grades above the average on the basis of 10 points, which is the maximum grade. As opposed to (12%) who achieved grades with a performance above 6.5 points while (32%) obtained a deficient performance below the minimum passing grade and (41%) presented grades below the fourth part. That is, 2.5 points down. Based on the results, it is possible to deduce and verify that the general performance of students affected by apathetic behaviors does

not meet the expectations of the efforts made by the teacher to meet the cognitive requirements of the students.

Finally, with regard to the Participation situation, whose indicator is intervention during the development of the class. With respect to the participation category, which is an important unit of analysis associated with school performance and the academic behavior of the student in the development of the class, it was found that participation is low in relation to the number of students. The results obtained indicate that the participation rate is relatively low with a slight projection to increase. (33%) low, (13%) very low (27%) worrying and (20%) very worrying.

The analysis of the results derived from the observation guide on attitudes of students with apathetic behaviors shows that the opinion of the informants/interviewees was respected in order to give balance, reliability and guarantee of veracity to the results. The technique for analyzing the results is qualitative by extracting messages and meanings from the interviewees. This type of analytical technique highlights the social, emotional and behavioral characteristics of the individuals rather than the numerical data. According to the results obtained, it was found that mathematics generated cognitive and affective feelings in the students. In each of the situations there is a high probability of a tendency to modify apathetic attitudes to assume positive behaviors towards Mathematics.

This expectation is related to the potential of increasing the participation rate in quantity and quality because there is a manifestation declared by the interviewees that marks a path towards achievement motivation, however, the conviction arises of the need for positive reinforcement for the facilitation of behavior related to the construction of strategies for students to become aware of the importance of fulfilling academic obligations to increase attendance rates and academic performance.

The results obtained are indicators to analyze the importance of the proposed change in the students. It is assumed that behavior modification incorporates and integrates new elements that contribute to invigorate performance in terms of performance and positive identification with the discipline of Mathematics. In conclusion, participation becomes one of the academic tools that provides students with reasoning capacity, autonomy and the

possibility of contrasting their knowledge with that of the teacher and their classmates.

The analysis that emerges from the results is a light for the understanding of the problematic reality experienced by students trapped by apathetic behaviors. Hence, direct participation, integrating efforts, is an effective action to face the detrimental problem for the educational process and all the actors involved in it. The results obtained from the Interview Guide indicated the following:

1.- Do you like Mathematics? (27%) answered that they do not like Mathematics, while (73%) declared that they DO like Mathematics.

2.- How often do you miss mathematics classes? The results confirmed that 73% (73%) regularly attend their classes as opposed to 27% who observed irregular attendance.

Do you think that the teacher should change the way he/she teaches Mathematics? The results showed that the students interviewed have confidence in the didactics exercised by the teacher. In fact, 63% considered that the teacher should not change his way of explaining, although 37% expressed that he should use another pedagogical strategy.

Do your parents ask you about your homework? The data reported that (80%) of the students responded that their parents do not ask them about their homework, while (20%) stated that their parents are aware of their school obligations. What do you like to do in mathematics classes? The results obtained showed significant differences, since (30%) of the students said that they do not understand anything, (17%) said that they spend their time doing sums, and (13%) said that they spend their time doing number soup and other entertainment.

6 Have you sought a person to explain Mathematics to you? However, (70%) stated that they have not requested support from other people to reinforce their knowledge in the subject. 7.- Do you actively participate in mathematics classes? (30%) do not participate in class, while (13%) are reluctant to do so, while (23%) participate eventually and (33%) responded that they always participate in mathematics classes.

What do you like about the Mathematics teacher in class? (17%) of the respondents said that the teacher is fun, (30%) stated that they do not like anything about the teacher, (7%) said that she brings prizes

to motivate the class. Finally, (33%) indicated that they like the way she explains the class and (13%) of those interviewed abstained from expressing an opinion.

9.- Do you like working in a group? the results indicated that (40%) like to carry out their academic responsibilities in a group setting; however, (60%) stated the opposite. How do you feel about Mathematics? (33%) of the respondents said that they did not understand, (20%) expressed that they are afraid of the subject, while (37%) stated that they like Mathematics when they play and (10%) refrained from making a value judgment.

However, the analysis of these results leads us to consider the following, if playful strategies are implemented to reduce apathy and improve communication among teachers.

Discussion

The results indicate what is happening in reality and are scientific foundations for determining causes and consequences of a problematic situation. They are also markers of trends in research because they warn of the potential of problems other than the one being studied. In this case, a problem associated with apathetic behavior and its impact on mathematics learning was investigated.

The discussion of the results shows the importance of continuing to investigate the pedagogical criteria that have been put into practice for the teaching of this important scientific discipline, which historically has caused problems for students at different levels and modalities of the educational system.

Therefore, it is imperative to open spaces for debate in order to substantiate and produce convincing, satisfactory and congruent answers to determine why in this subject there is a proliferation of apathetic behaviors evident in rejection, aversion, fear, indifference, desertion and poor school performance. The results obtained are similar to other research that served as background to this study. In those studies, it was pointed out that these behaviors symbolize a constant that is progressively acquiring a complexity in the student mass.

Therefore, the results show that the situation is detrimental to the quality of education and that it simultaneously calls into question the professional performance of the teacher as manager of the

mathematics course. The creative function of the teacher and the imagination of the student are buried when the floodgates are not opened to release the rigidity with which mathematics is being taught, since there is still a strong anchorage in the routine and the didactic tradition that is combined with the teaching pattern used by teachers characterized by teaching as they learned. This reality indicates that the debate on the didactics of mathematics should be serious, productive and permanent in order to avoid the morbidity of apathetic behaviors.

If there is awareness of the situational reality, this is already an important step to internalize the existence of the problem. The teacher's authority is a prerequisite for taking the initiative to address the problem. This same disposition is also the responsibility of the students because they represent the affected population. That is why the contribution of the research, according to the results obtained, shows the potential for behavioral changes; however, this is not enough; it is necessary to concretize the possibilities with concrete, observable and evaluable facts.

On the other hand, these results lead to discussions regarding the didactics used by the teacher to teach Mathematics, as well as the learning styles put into practice by the students, which is directly connected to individual differences. The significance of this research is a contribution to education in the area of Mathematics, which is one of the subjects where students have historically had lower academic performance compared to other subjects.

If strategies of a ludic nature are applied for didactic purposes to increase the quality and quantity of learning, it is possible that the student loses the fear and aversion he feels for the subject and identifies more with it. The new knowledge derived from the research leads to the imperative of promoting a pedagogical transformation of this science without sacrificing its contents and objectives.

The results obtained highlight that the critical nodes or neuralgic situations affecting the 30 students (population) summarize apathy, indifference, lack of attention, difficulties with the understanding of instructions and the interpretation of basic equations in Mathematics. Consequently, activities were designed to help students improve their knowledge acquisition processes and value the importance of mathematics.

The most representative findings of the research are summarized in the feasibility of new attitudes of students affected by apathetic behaviors, since the tendency of the results indicated a closer approach to demonstrate positive behaviors. Likewise, it is important to highlight that students are victims of the rejection that the discipline of Mathematics and the rigidity of didactics have been experiencing.

It was found that in the process of reviewing the specialized literature on problems inherent to apathetic behavior, it is recommended to build alternatives such as playfulness to awaken attention, stimulate creativity and link the student with the contents of the subject. If strategies of a ludic nature are applied, it is possible that the student loses the fear and aversion he/she feels for the subject and identifies more with it. The new knowledge derived from the research leads to the imperative of promoting a pedagogical transformation of this science without sacrificing its contents and objectives. The results obtained highlight that the critical knots or neuralgic situations that affect the 30 students (population) summarize apathy, indifference, lack of attention, difficulties with the understanding of instructions and the interpretation of basic equations in Mathematics.

It should be added that the reasons that justify the research focus on the need to take advantage of the benefits offered by the dynamics of a playful nature to give a different direction to an exhausted pedagogy, to a didactics of low functionality and to those decontextualized strategies that are disconnected from the knowledge society and the technological vanguard.

According to the reality addressed, weaknesses were found that potentially become threats that negatively impact the academic performance of students and the normal development of classes. In summary, the results obtained, the research consulted and the theories referenced are motivating factors to continue researching on the topic of apathy in mathematics learning and playfulness as a strategy to reduce apathetic behaviors.

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