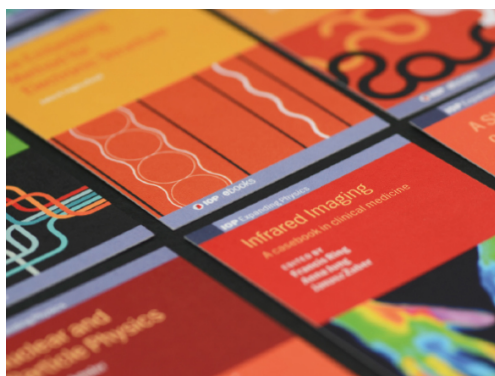


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Mathematical entrepreneurship in educational institutions

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Abstract: In the present investigation, a reflection was made on the teaching practices in the area of mathematics that entails educational institutions conducive academic spaces to generate entrepreneurial attitudes in students. These are personalized from the voices of the participants, involving the student in the development of the entrepreneurial culture and in the basic competences generated from the mathematics. The complexity present in the teaching practice becomes significant in the student when it is possible to establish an interrelation with their social, cultural, economic environment and, above all, in the proactive action that the student develops in the face of any situation in life. A new feeling that allows manifestations in students of: autonomy, responsibility, innovation, creativity and to generate in them citizen awareness.

1. Introduction

Currently globalization has led the world to experience changes in a hurry, that is how the educational system aware of this situation has decided to involve as a fundamental component in the training of students, entrepreneurship, for which is implementing strategies and chairs aimed to the integral formation of young people and to awaken in them the need and taste for creativity and entrepreneurial actions, in them the need and taste for creativity and entrepreneurial actions.

Unemployment and exclusion rates are getting higher, a worrisome situation, especially in our country, where in the last year, the economic situation of the neighbouring country, Venezuela, has caused the migration of Venezuelans on a large scale, and has caused the Colombian workforce is displaced by the Venezuelan.

The educational system, aware of its fundamental role in the formation of citizens who favor a just and equitable society, decides to implement training strategies from the basic secondary level, where the student's awareness of his or her leading role in the development of the country's economy is created, through the completion of entrepreneurial practices.

For the above, the entrepreneurship chair was implemented in the institutions, in this process new forms of education are sought, taking entrepreneurship to all areas of knowledge, among them mathematics and in this way propitiating the acquisition of significant learning and the development of the logical thinking.

Currently the teachers of this discipline seek to implement new, interesting and attractive methods for the learning of their students; however, the way of conceiving or accepting mathematics delimits or affects the activities that must be implemented in the classroom. It is important to state that mathematics is not just numbers and operations that teachers sometimes make complicated; they must be seen as paths that allow complex process of abstraction to be achieved.

This experience in Colombia shows that young people need better conceptual and methodological



tools that enable them to perform successfully in their work and new educational proposals that prepare them to safely face the challenge and responsibility of being productive for themselves and for those they surround them [1].

2. Theoretical framework

According to the guide 39, of the “Ministerio de Educacion Nacional (MEN)” regarding the culture of entrepreneurship in educational establishments, it states that its implementation in subjects such as mathematics, allow contributing with the development of different types of thoughts, which are useful for the analysis of problem situations and for the active and critical performance of students, in social and political life, [2] providing the necessary tools to make logical and accurate decisions that favor the development of citizens with a critical mentality, who help in the transformation of society. It should be encouraged because the young person expresses an analytical and persevering mental attitude before any action he undertakes; that includes dynamics and systems that allow him to look for different alternatives until reaching the solution of the present problem, in any field and situation of his life.

This research was intended to investigate and understand the relationship between entrepreneurship and practices or concepts handled by teachers from the area of mathematics. Expressing that from the mathematical education, you can empower people with entrepreneurial attitudes, who use creativity and innovation to improve teaching processes and significantly improve their learning.

From the above, the systematizing question arises: What are the teaching practices developed by teachers in the area of mathematics for the formation of a culture of entrepreneurship in the students of the secondary school?

2.1. *The importance of entrepreneurship*

Promoting the culture of entrepreneurship from basic education is fundamental and of vital importance to encourage young people to take risks, be independent, make their own decisions and have confidence in themselves, which will facilitate their future work.

Entrepreneurship refers to the ability of a person to take risks and develop a project through ideas and opportunities, always keeping in mind the time and money necessary to carry it out and having the tenacity to face the difficulties that arise in the execution of it. Encouraging and motivating children and young people to be entrepreneurs is important to promote their autonomy and improvement in life.

2.2. *Modeling an entrepreneurial future*

The only certain thing is the change, it could be thought that the development and progress of a country depends on the ability of its inhabitants to use their knowledge and skills to develop their potential, and deal with the various situations that arise, aware of this reality, the National government headed by the “Ministerio de Educacion Nacional (MEN)” presented in 2006 the Law 1014 that proposed promoting the culture of entrepreneurship in all educational establishments in the country [2].

The research was aimed at the formation of integral people with a vision of sustainable development and with the necessary skills to face the challenges and challenges of the current educational world; recognizing the sciences as a point of support to generate new knowledge, innovation and creativity as fundamental axes in the teaching and learning process.

The privileged situation of San José de Cúcuta, for being a border city, benefits the acquisition of diverse forms of knowledge, on how to be an entrepreneur, among which are those related to the commercial, economic and business formation along with the qualities referred to a person to overcome adversity. This association of knowledge must be appropriate in the pedagogical processes, which allow the dialogue between different forms of knowledge [2].

2.3. *Pedagogical strategies*

The pedagogical strategies are considered as those actions that the teacher develops to facilitate the formation and learning in the students. In this sense, it is suggested that pedagogical or teaching strategies [3]. They are all the aids that are provided to the student to facilitate and expedite the

procedure used to assimilate the given information. Namely, all those resources used by the teacher to encourage significant learning. These must be programs, designed in such a way that they encourage students to observe, analyze, express themselves, formulate hypotheses, which allow learners to seek solutions and discover new knowledge.

To this end, it is necessary for the teacher to develop activities in appropriate and pleasant environments, so that young people learn to learn, developing their ability to reflect and act upon new learning. Therefore, the teacher in the teaching-learning process must implement flexible and appropriate strategies for young people to transfer and adapt the acquired knowledge to new situations in the educational field.

In accordance with the above, it is stated that "pedagogical strategies must be directed, specifically to the mental organization and the intellectual schemes of the students" [4]. For this reason, it is essential that, through pedagogical strategies, the learner is encouraged to conduct their own learning, because the experience gained in their environment should facilitate this process, therefore, the strategies and activities that arise teacher should be derived from a thorough analysis of the methods and types of content you want to develop.

2.4. Euler project

Frequently the teaching of mathematics has been distinguished by being a process that encompasses the learning of concepts, definitions, processes and applications, where you learn through exercises, where at some point they are taken in a mechanical and memory way.

This project seeks to develop logical mathematical, scientific and technological thinking, through the implementation of pedagogical strategies that allow the student to consolidate mathematical knowledge in a meaningful way. In the same way this project aims to positively dispose the secondary student, in front of the difficulties of this science and lead them to the great world of mathematics, in what has been called "recreational mathematics"; as a proposal to develop logical thinking outside the classroom and through different spaces and / or activities that will allow the learner to feel comfortable and motivated to develop their own strategies for solving situations and therefore increase their intellectual abilities.

3. Methodology

The research is based on the qualitative paradigm, which, "focuses on understanding and deepening the phenomena, exploring them from the perspective of the participants in a natural environment in relation to the context" [5].

3.1. Phases of the investigation

In the first phase, I am heading towards the reconstruction of the experience, making a documentary analysis, with the intention of rescuing the relevant information about the activities developed by the teachers in the classroom, tending to develop and promote the culture of entrepreneurship. During the last academic year, interviews were also held to collect the voices of the participants in the creation, planning and execution of the different academic projects.

The second phase of the study was developed through the technique of participant observation, which is understood as "the systematic description of events, behaviors in the social setting chosen to be studied" [6]. The researcher must participate in a variety of activities during the period of time it deems necessary, where it is allowed to observe and determine the roles of each of the members, thus understanding their behaviors and activities [7]. To answer the question, what are the teaching practices developed by teachers in mathematics for the formation of a culture of entrepreneurship in the students of the secondary school? From the participant observation, an observation guide was established, oriented in two questions: What is the classroom interaction practices and special practices implemented by the teacher in the area of mathematics? And what entrepreneurial attitude and disposition do the students have regarding these practices?

3.2. Triangulation

The qualitative research is based on the use of several strategies to validate a phenomenon, for this multiple triangulation was performed to validate results. In this way, triangulation of data by actors was used as a strategy, which focused on time as a unit of observation and its relationship with the academic community was recognized.

4. Results

According to the results obtained, it can be shown that it is of great importance for the education of young people that legitimate opportunities for progress and prosperity are conceived, that a competitive education be developed, adapted to the needs and expectations generated by the students and their context; leading to create new innovative tools that allow you to take advantage of knowledge to positively transform your reality.

Entrepreneurship could be defined as the attitude and aptitude that human beings take to emerge and get ahead with new ideas; being an entrepreneur means "being able to create something new or to give a different use to something already existing, and in that way generate an impact on your own life and that of the community in which you live" [8].

It was observed how the contribution begins in the hands of the mathematics teachers who promote their knowledge and develop competences, through their teaching practices and didactic strategies, necessary to motivate learning and develop an entrepreneurial culture.

It was evident that for the development and strengthening of this area of knowledge based on entrepreneurship, the teacher's thinking is fundamental, more specifically its teaching practices, the contribution of experiences lived by the teachers, which are assimilated and appropriate to be applied in any moment that are required in the educational process. This allows identifying the elements that give meaning to the construction of knowledge [9], from meanings, languages and understandings of reality immersed in a culture [10]. These practices are the result of their cognitive strategies, their intervention and the positive attitude generated in their students [11].

To answer the research question: What are the teaching practices developed by teachers in mathematics for the formation of a culture of entrepreneurship in the students of the secondary school? We examined two types of practices, namely: classroom interaction practices and special practices.

The classroom interaction practices are associated with the ability of the teacher to communicate the curricular contents of the area of mathematics, develop these concepts in the classroom in such a way that the student's attitude to the situations generated in this area, you can apply the concepts of entrepreneurship to find solutions to them, without ever neglecting the role played by the teacher as a coach and facilitator in the classroom, with its purpose on the one hand teaching and learning on the other. Meanwhile, the special practices are designed to complement the training of students from the production and use of resources in entrepreneurship, the reflection of the results achieved and the evaluation of activities outside the classroom.

According to the teachers interviewed, the interactive practices in the classroom start from the creation of the area plan, curricular mesh and subject plan, which encompass the contents developed to guide their teaching practices; being these fundamental elements in the development of the formative activities, as one of the teachers manifests: "In these moments we have worked with the 7th grade students, dynamics that allow the students to relate the whole numbers with real life situations, this allows to look for recreational activities that they help to build and sometimes work through the support of technology as it has been working with PhET simulators, allowing the student to feel and see mathematics in a fun and not as complex as it has made people see".

Equally, reaching entrepreneurial attitudes allows, in the first place, the development of cognitive, emotional and social skills in the different levels of education and, secondly, these skills require knowledge and techniques to be expressed in effective behaviors or in what is called entrepreneurial skills [12].

The fact of actively participating in the construction of their knowledge allows them to develop habits, skills, attitudes and values necessary for the improvement of themselves and those around them,

said in the words of a student "is to do something on your own initiative, find a solution something, that you think you do not have. The fact that entrepreneurship bet on creativity and autonomy in the work of students is possibly generating a new type of students, "students learn to do things for themselves, they give a value and meaning to all the materials they use and they see in their daily life. By working with recyclable materials and observing that these can become mathematical games and take to activities that can help in learning, it is very motivating and pleasant to see that they use it to create different and fun things "that are capable of being at the forefront and respond to their needs from their environment.

The teaching practices applied by the teachers of mathematics have allowed to generate from the culture of entrepreneurship their own initiative and the search for knowledge not only guided by the teacher in the classroom, but the one that is presented around them, in their daily situations, allowing students to develop constancy, search for opportunities in their learning, fulfill commitments, setting goals and objectives, self-training, self-confidence, independence and creativity among others.

"Not knowing where to start and the desire to want to do things when you know what to do, is the most beautiful part of the job". The joy and enthusiasm that students place when they are developing activities in the classroom, generate positive attitudes, as one of its participants has stated and is supported by one of its teachers "Students want more, they look for more possibilities of answers, they are curious, I see students who say to the next class, I was reading and watching some videos on how to make that game and that requires one as a teacher to be better prepared, by those boys who are motivated to learn".

This was one of the reasons why the role of the teacher became fundamental in the students initiatives: "all students do not learn in the same way, all processes are not the same, just as there are very skilled students there are others who it is more difficult for him, due to the lack of motor skills, so that is where one enters to play a significant role as a teacher, to plan strategies where the students meet the basic requirements and plan activities that are in accordance with their abilities and skills".

According to the teachers interviewed, the especial practices demonstrate the situations raised after class, for example the learning results and the type of products generated by the student as a consequence, both of their cognitive and social activity, and of the teacher's actions so that happen.

The special practices allow to consolidate the processes in front of the activities immersed in the project, strengthening in the student the capacity to give solution to their personal, social and sustainable development needs; as one of its teachers expresses it. They can understand the man-nature relationship that exists, the fact of using some recyclable resources allows students to perceive the problem that is occurring due to global warming and the importance of knowing how to separate and distribute garbage at home, as these can be reused or recycled by anyone, many times becoming the livelihood of many families who live on that".

The establishment of a social interrelation between the participants and the project leads to a collective behavior and an entrepreneurial attitude "in some cases the accumulation and sale of things that they recycle to collect funds for their degree party has been generated in eleventh grade students".

These practices constitute an opportunity for the student to materialize their entrepreneurial attitudes and skills, and bring new ideas to reality, giving favorable results as one of the teachers expressed it. When one of the project activities was carried out, mathematical fractals students became artists, the application of geometric concepts is inescapable, their lines, curves and strokes are excellent, keeping in mind the dimensions to which these fractals are taken that are 6 square meters, they are really quite large; finalizing this in a large exhibition where parents observe these works which are exposed by their authors and because they are not sold.

In the same way, another teacher pointed out: "at least when they build these fractals, they are fully involved in that work, in the end they learn and they are learning that remain forever", thus creating an impact on their own life and of your community. In this way, the special practices showed that in the secondary education levels institutional environments are favored so that the student develops entrepreneurial attitudes in different contexts and learning scenarios.

5. Conclusions

From the development of the project was generated, as a learning for the educational community, the following pedagogical principle: entrepreneurship becomes significant in the student when it is possible to establish an interrelation with their social environment, in other words, when learning by doing. This relationship can be found in different fields such as economic, social, artistic, cultural and mathematical as it has been evidenced.

When analyzing about the teaching practices developed by the mathematics teachers in secondary education, in relation to classroom and special interaction practices, the recognition of a good part of the academic community about the conception that is held about the culture of entrepreneurship; directed to diverse experiences of leadership and attitude for the personal improvement and of its context.

However, it is necessary to train the teacher in front of topics on entrepreneurial culture, related in all areas of knowledge as an integrating part of the great knowledge that must be acquired for the future teacher. A new feeling with teaching practices manifests itself in the student when he develops: autonomy, safety, responsibility, being creative, learning to do, learning to learn, avoiding personal situations and context and generating public awareness.

Finally, these training needs led to the creation of pedagogical material to work with students. in this way, the members of the department of mathematics and technology built the "entrepreneurship cards", in digital format, which made it possible to approach the contents and concepts of the entrepreneurship culture in a didactic way.

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