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Didactic Materials for the Development of Mathematical Thinking in Students of the General Educational Unit ´´Eloy Alfaro´´ of the Chone Canton

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***Abstract*---*The research was based on the use of teaching materials for the development of mathematical thinking in the students of the General Educational Unit ´´Eloy Alfaro´´ of the Chone Canton. The results of the research carried out through a survey are shown as a way to project educationally the use of teaching materials for the development of mathematical thinking. It is intended to show that education in a society that is in constant change, and the growth of people and in the educational field. The purpose of this degree work is to help progress in mathematics through the use of teaching material that supports students to actively participate in class time for first-year high school students, starting from what mathematics is to the importance of teaching material. The objective was to determine the incidence of teaching materials as a methodological tool for the development of mathematical thinking in students, the research has a qualitative, and quantitative approach; in addition to the analytical and synthetic methods and the historical one. The technique applied was a survey to analyze and interpret the results of the use of teaching materials. The result was that the use of teaching materials helps the development of mathematical thinking and better learning. It was also observed that students learn more easily and effectively*.
Keywords*---*development, didactic, materials, mathematical thinking.

Introduction

The present research was based on contributing to the use of teaching materials for the development of mathematical thinking in the students of the General Educational Unit ´´Eloy Alfaro´´ of the Chone Canton, the results are shown through a survey applied to the first-year Baccalaureate students as a way to improve education and raise logical-mathematical abilities. This research is of vital importance because it aims to help students improve their learning of mathematics through the use of teaching materials and develop logical-mathematical thinking (Payadnya & Atmaja, 2020).

We can see students who can find various solutions and participate in mathematical solutions of certain topics such as functions and equations. The teacher innovates every day in new knowledge and therefore in new didactic resources that help transmit knowledge, leading the student to significant learning, taking into account the first experiences that he has taken from his environment, some with greater knowledge and others very limited learners, this is where the teaching material and the teacher's knowledge play an important role since the material must be

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used according to the topic to be discussed and above all guiding which is the key concept that will enhance the learning process. taking in the realization that the human being throughout his life always remains in a process of discovery (González-García et al., 2019; Costel, 2015).

In this sense, Morales (2012), states that teaching material is understood as the set of material means that intervene and facilitate the teaching-learning process. These materials can be both physical and virtual, they assume as a condition, awakening the interest of the students, adapting to their physical and psychological characteristics, in addition to facilitating the teaching activity by serving as a guide; Likewise, they have great virtue of adapting to any type of content (p.10).

Ausubel (2002) states that, for learning to be meaningful, it is necessary that the subject (boy or girl) be predisposed towards learning and that the teaching material has logical significance so that it can be linked with ideas that are found within the domain of human learning capacity (p.169).

Teaching materials are essential and constitute pedagogical support that reinforces the teacher's performance, optimizes the teaching-learning process, motivates and awakens the interest of students, facilitates the articulation of theoretical content with practical classes, and contributes to the development of skills, mathematical skills, and logical thinking. All these factors allow us to search for new alternatives for educational improvement which suggest considering a new didactic scheme that facilitates the teaching-learning process (Hwang et al., 2006; Merkley & Ansari, 2016).

Materials and Methods

The applied methodology has a qualitative approach, it allowed us to investigate, analyze, and understand the concepts of didactic materials and the analysis of the alternative preconceptions of the students in the development of mathematical thinking. This type of research studies didactic phenomena according to Quintana (2012). where it states that education has to do with human actions, where the reality that is going to be analyzed is studied in its natural context that characterizes learning difficulties, taking into account that education has to do with human actions.

Some quantitative contributions were valued, as indicated by Hueso & Cascant (2012), based on the use of statistical techniques to know certain aspects of interest about the population being studied, such as the collection of information through surveys and the analysis of the data through descriptive statistics, the study phenomenon was characterized, applying the heuristic method, to find and solve a problem; the inductive method, because in the course of information processing new concepts were introduced to perceive the results with a certain level of generality. As Tamayo et al. (2017) indicate, the researcher sees the setting and the people from a holistic perspective, trying to understand them within their frame of reference. The documentary method was used by reviewing texts and articles according to the study topic (Martínez, 2004). The population studied was 200 students from the ´´Eloy Alfaro´´ General Educational Unit of the Chone Canton, of which 36 first-year high school students were randomly selected.

Analysis and Discussion of the Results

The results shown are the data obtained from the questionnaire designed to know the prior knowledge that the first-year high school students of the ´´Eloy Alfaro´´ General Educational Unit of the Chone Canton had, where the students bring mental models to the classroom with that explain the world: they are simple causal models, since “all events have a cause.” They are their “common sense” models or spontaneous thinking (Galagovsky et al., 2001), which are also called ideas.

Education, as a fundamental process in the lives of men, involves constantly learning and unlearning. It consists of a variety of resources and strategies that facilitate and produce learning in the subject. For this reason, educational institutions allow access to teaching materials for teachers to use in the classroom, in such a way that it promotes a more dynamic and effective education. In this way, the implementation of said materials in school processes entails a transmission of knowledge. From this dynamic, the student is authorized to interact more practically and playfully with the knowledge required in their training (Ribosa & Duran, 2022; Shih et al., 2008).

In this same sense, there is currently talk of more dynamic learning with infants, since their greatest attraction is play, therefore, the motivation and planning of classes should revolve around it, that is, seeking to, through play and interaction with teaching materials, the student acquires the skills required in their training process. Current pedagogy has a diversity of didactic elements to put at the service of teaching in the transmission of new knowledge; However, the lack of these elements in educational work is evident, because the pedagogical practices generated by

teachers are rooted in traditional pedagogical models that, in most cases, are limited to chalk, the voice and the board (Sinaga & Setiawan, 2022).

Teaching materials fulfill very important functions within the teaching-learning process since they contribute to students achieving mastery of specific content, and, therefore, access to information, and acquisition of skills, abilities, and strategies, as well as the formation of attitudes and values (Mena et al., 2023).

With the teaching materials, the purpose of teaching and the expression of a pedagogical proposal is pursued, since they teach, they also guide the learning of the students, presenting and grading the contents and activities, transmitting updated information on the subject of the course, posing problems, encouraging questioning and group discussion. They are related to the teaching-learning processes, therefore, it is possible to point out the following phases:

Motivate learning: Educational materials fulfill this function when they arouse interest and maintain the activity; This occurs when the material is attractive, understandable, and is related to the students' previous experiences, their sociocultural context, and their expectations.

Promote the achievement of competencies: Through the appropriate use of materials by participants in the teaching-learning process, based on observation, manipulation, and experimentation among other activities, they exercise abilities that allow them to develop competencies, corresponding to the areas of the curricular program.

The meaning of didactic educational resources has been called in various ways, such as: didactic supports, didactic resources, and educational media. According to Morales (2012), a teaching resource is understood as a set of material means that intervene and facilitate the teaching-learning process.

This research, with the objective of analyzing, the use of teaching materials for the development of mathematical thinking in students begins without questioning the use of these materials in students, these will be addressed in the first year of high school class, where it is assumed that these were reviewed in high school. The concepts analyzed and applied are: Teaching materials, games, technology, visual material, and group activities (Kargar et al., 2010; Demirel et al., 2015; Wilson et al., 2013).

Concepts Analyzed and Questions Applied

First-year high school students were asked through structured questions. The first theme was related to the use of teaching materials, showing results in Table 1.

Table 1
Teaching materials considered most effective for developing critical thinking in students

Alternatives	Frequency	Percentage (%)
A. Textbooks	10	25
B. Board games	8	20
C. Digital resources (apps, videos)	6	15
D. Practical activities	16	40

As can be seen, the students surveyed were aware of the teaching materials, noting that the highest percentage was aware of them in answers A and D. The answer given was evident: 40% answered literal D, the vast majority of the group, did not have a clear concept about teaching materials. In the case of the question related to games, the answers are shown in Table 2.

Table 2
Type of game you think best stimulates logical thinking

Alternatives	Frequency	Percentage (%)
A. Strategy games (chess, checkers)	9	22.5
B. Card games	11	27.5
C. Problem-solving video games	7	17.5
D. Role-playing games	13	32.5

As can be seen, the students have responded to 4 aspects related to the questions, the largest number of responses were related to role-playing games, demonstrating the knowledge acquired in the classroom. We asked what your

opinion is about the use of technology in the classroom to promote creative thinking. The results of the responses given by the students can be seen in Table 3.

Table 3
Opinion on the use of technology in the classroom to promote creative thinking

Alternatives	Frequency	Percentage (%)
A. Very favorable	17	42.5
B. Favorable	8	20
C. Neutral	5	12.5
D. Unfavorable	10	25

As can be seen, the response given indicates that 42.5% answered literal A, demonstrating in this case that most of the group is clear about the concept of using technology in the classroom to promote creative thinking and only 25% do not have it. the use of technology in the classroom to promote creative thinking, demonstrating that the knowledge that a considered percentage of those surveyed have is not adequate. Table 4 shows the responses selected by the students surveyed related to the type of visual material that they consider most useful to facilitate learning.

Table 4
Type of visual material that they consider most useful to facilitate learning

Alternatives	Frequency	Percentage (%)
A. Infographics	9	22.5
B. Flowcharts	4	10
C. Educational videos	21	52.5
D. Interactive presentations	6	15

As seen in the results obtained in the question related to what type of visual material is considered most useful to facilitate learning, 52.5% of the students answered literal C, most of the group are clear about the concept, 22.5% answered literal A, 10% answered literal B and 15% answered literal D, the latter three are not clear about the concept. As the last example of knowledge obtained by the students, it was related to the role group activities play in the development of collaborative thinking, showing the results in Table 5.

Table 5
The role that group activities play in the development of collaborative thinking

Alternatives	Frequency	Percentage (%)
A. Fundamental	13	32.5
B. Important	18	45
C. Little relevant	7	17.5
D. Irrelevant	2	5

As can be seen from the response given by 45% of the students answered literal B and 32.5% answered literal A, most of the group is clear about the concept of what role group activities play in the development of collaborative thinking, 17.5% and 5% are not clear about the concept of what role group activities play in the development of collaborative thinking. The questionnaire was applied to the 40 first-year high school students, and most of them were not clear about the concepts analyzed.

Conclusions

The study reaffirms that teaching materials are essential tools in the educational process, especially in the teaching of mathematics. Its proper implementation can transform teaching practices and foster a more effective and attractive learning environment. The need for continuous training for teachers is emphasized, thus ensuring a sustained improvement in educational quality. This analysis provides a clear view of how teaching materials positively

influence the development of mathematical thinking, suggesting specific areas for future research and improvements in educational practices.

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