

Proposal for the implementation of methodological strategies for the development of mathematical logical reasoning in third year high school students



Propuesta de implementación de estrategias metodológicas para el desarrollo del razonamiento lógico matemático en los estudiantes de Tercer Año de Bachillerato

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Abstract

Logical mathematical reasoning is a powerful tool that can be applied in various areas of life, from solving everyday problems to making important decisions. Its application helps us develop fundamental cognitive skills and face challenges more efficiently. The objective is for students to recognize that numbers, operations and figures are interrelated contents and processes that are present in everyday life and that it is necessary to develop skills to expand their reasoning capacity. The present research is of a descriptive documentary type, and is based on the strategies of the constructivist theory of learning, where Piaget states that the individual acquires his knowledge from the preliminary information he already possesses and from the interaction with the environment in which he develops. The results of the qualitative diagnostic evaluation of the students at the beginning of the 2023-2024 school year are discouraging. We can conclude that the students show difficulties, lack of interest and lack of motivation in solving the exercises.

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Keywords: reasoning, strategies, methodology, learning.

Resumen

El razonamiento lógico matemático es una herramienta poderosa que se puede aplicar en diversas áreas de la vida, desde resolver problemas cotidianos hasta tomar decisiones importantes. Su aplicación nos ayuda a desarrollar habilidades cognitivas fundamentales y a enfrentar los desafíos de manera más eficiente. El objetivo es que los estudiantes reconozcan que los números, las operaciones y las figuras son contenidos y procesos que se interrelacionan entre sí y están presentes en el día a día y que es necesario desarrollar habilidades para ampliar su capacidad de razonamiento. La presente investigación es de tipo documental descriptivo, y se basa en las estrategias propias de la teoría constructivista del aprendizaje, donde Piaget plantea que el individuo adquiere su conocimiento a partir de la información preliminar que ya posee y de la interacción con el medio en que se desenvuelve. Los resultados de la evaluación diagnóstica, de tipo cualitativa, realizada a los estudiantes al iniciar el periodo lectivo 2023-2024 son desalentadores. Podemos concluir que los estudiantes demuestran dificultades, desinterés y desmotivación en la resolución de los ejercicios.

Palabras clave: razonamiento, estrategias, metodología, aprendizaje.

Introduction

Logical reasoning and mathematical reasoning are two types of thinking that share some similarities, but also present significant differences. Logical reasoning refers to the ability to analyze and evaluate arguments and propositions to determine whether they are true or false. It is based on principles of logic and is used to solve problems in different areas of knowledge. On the other hand, mathematical reasoning focuses on the application of mathematical concepts and procedures to solve specific problems.

According to (Zurbano, 2014) one of the main differences between the two types of reasoning is that logical reasoning is used in a wide variety of areas, while mathematical reasoning is limited to problems involving mathematical concepts and operations. In addition, logical reasoning focuses on the evaluation of arguments and propositions, while mathematical reasoning focuses on the application of mathematical concepts to solve problems. according to (Accinelli Gamba & De la Fuente-García, 2013) although both types of reasoning

share some similarities, there are significant differences in their application and focus.

For (Rodríguez Cáceres et al., 2021) mathematical logical reasoning is an important skill that can be improved with practice and dedication. Among the strategies to improve mathematical logical reasoning that we have found are:

Have a good understanding of the fundamental concepts and principles of mathematics. This includes basic operations, algebra, geometry, probability.

Solve a variety of math problems on a regular basis. Start with simple problems and gradually increase the difficulty. Problems can be found in math books, specialized websites or even mobile applications.

It is important to learn different strategies for solving mathematical problems, such as decomposing a problem into smaller parts, identifying patterns, or using diagrams and graphs.

Logical mathematical reasoning leads to critical and analytical thinking, so it is important to know how to carefully analyze information and evaluate different possible solutions.

Try to learn from our mistakes, i.e. analyze our mistakes and understand why we have made a mistake. This will allow us to identify the areas in which we need to improve and to avoid making the same mistakes in the future.

Materials and methods

(Puga Peña & Jaramillo Naranjo, 2015). the present research is initial and exploratory. We consider that it is the first scientific approach to a real problem that has not yet been addressed or has not been sufficiently studied and the existing conditions are not yet determinant. What we are trying to do is to highlight the fundamental aspects of the problem of the low development of mathematical logical reasoning and to find the appropriate procedures to elaborate a subsequent research and to have results that allow us to open lines of research and to proceed to their consequent verification.

For (Isabel Núñez-Peña et al., 2015) the material available is an initial qualitative diagnostic assessment. The questions are structured, i.e., they contain true or false, multiple choice, completion and problem-solving items. The contents evaluated

correspond to subjects of the second year of high school, i.e., they are prerequisite subjects for the next level.

Results

Both the diagnostic evaluation and the obtaining of results were carried out by the teacher of the subject. Since it is a qualitative test, the following rubric was used:

- Master the required learning.
- Achieves the required learning.
- Close to reaching apprenticeships
- Does not achieve the required learning.

Seventy-five percent of the students evaluated have major difficulties in problem solving, whose resolution is based on an adequate use of mathematical logical reasoning. This warrants an early intervention to discover the students' strengths and weaknesses.

Discussion

It is necessary to implement appropriate strategies to foster the ability to understand concepts and establish relationships, stimulate creativity in the elaboration of mathematical models, construction of tables from the collection of information. However, the development of mathematical logical reasoning should begin at an early age, when the child begins to interrelate with the objects around him (Piaget). George Polya, a great mathematician of the twentieth century, proposed the methodology of problem-based learning (PBL) whose purpose is to guide the search and exploration of solutions to problems. It is necessary to encourage curiosity and experimentation in problem solving.

In the short time that we have interacted with the students, we have noticed a certain lack of interest. It is a priority for students to acquire skills such as: understanding abstract concepts, the ability to reason, and establishing relationships between concepts.

Logical mathematical reasoning requires constant practice. The more we practice, the better our ability to solve mathematical problems logically and efficiently.

Implementing a new methodology is a challenge for both the teacher and the students. It may seem more of an obstacle than a challenge, however, the opinion of the students was very positive, they firmly

believe that it was an excellent experience, that they would repeat it, they would recommend it for other courses. In addition, they feel that they learned more and in a better way.

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