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Methodological Strategy for the Teaching of the Pythagorean Theorem in the eighth grade of the Institution Monseñor Jaime Prieto Amaya

Estrategia metodológica para la enseñanza del Teorema de Pitágoras en el grado octavo de la Institución Monseñor Jaime Prieto Amaya

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Palabras clave

Matemáticas, estrategias metodológicas, contextualización, interdisciplinaria, aprendizaje significativo.

Resumen: Esta investigación cuantitativa experimental con enfoque descriptivo el cual se desarrolló en un periodo de tiempo de un año con la participación de la docente del área de matemáticas y una totalidad de 120 estudiantes que cursaban el grado 8°, surgió debido a las dificultades que presentaban los educandos en la aplicación del teorema de Pitágoras en la vida cotidiana.

Debido a esto surgió la necesidad de plantear estrategias metodológicas para la contextualización de la enseñanza del Teorema de Pitágoras y de esta manera, lograr una mejor comprensión respecto a este concepto; por ello, se indagó con los estudiantes a partir de un pre - test de conocimiento previo el cual permitió evidenciar los ritmos y estilos de aprendizaje.

Tras esta búsqueda de información se pudo corroborar que los estudiantes se sentían más a gusto cuando las clases se realizaban fuera del aula; de esta forma, las actividades eran más vivenciales y significativas, lo que permitió relacionar el teorema de Pitágoras de manera transversal con áreas como la educación física, en cuanto a la identificación del triángulo rectángulo en diferentes espacios de la cancha, medidas y distancias; por otro lado, en relación con el área de artística en la formación de triangúlalos rectángulos a partir del origami y la forma de hallar sus medidas para la creación estas figuras.

La construcción de este conocimiento pudo comprobarse a través de la aplicación de un pos test el cual arrojo como resultado un mejoramiento en la comprensión sobre el uso práctico del teorema de Pitágoras en diferentes contextos.

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Keywords

Mathematics, methodological strategies, contextualization, interdisciplinary, meaningful learning.

Abstract: This experimental quantitative research with a descriptive approach, which was developed in a period of time of one year with the participation of the teacher of the mathematics area and a total of 100 students who were in grade 8, arose due to the difficulties that the students presented. students in the application of the Pythagorean theorem in everyday life.

Due to this, the need arose to propose methodological strategies for the contextualization of the teaching of the Pythagorean Theorem and in this way, achieve a better understanding regarding this concept; For this reason, it was investigated with the students from a pre - test of prior knowledge which allowed to show the rhythms and styles of learning.

After this search for information, it was possible to corroborate that the students felt more comfortable when classes were held outside the classroom; In this way, the activities were more experiential and significant, which made it possible to relate the Pythagorean theorem in a transversal way with areas such as physical education, in terms of the identification of the right triangle in different spaces of the court, measurements and distances; on the other hand, in relation to the artistic area in the formation of triangles the rectangles from origami and the way to find their measurements for the creation of these figures.

The construction of this knowledge could be verified through the application of a post test which resulted in an improvement in the understanding of the practical use of the Pythagorean theorem in different contexts.

Introduction

The Pythagorean theorem is one of the most common topics in secondary education and one of the least understood, since students fail to recognize its usefulness and applicability in different situations, problems in different contexts; taking into account that their teaching is also carried out in a traditional and little experiential way, for this reason it was sought that this concept approached in a didactic and meaningful way.

Herrán (2015) states that it should continue to be investigated in training and self-training for the creativity of the student, teachers and researchers with the purpose of expanding areas of collective consciousness and responding to indicators in education and innovation as well as to solving problems of the society and the explosion of scientific knowledge from student training processes. This explosion of scientific knowledge that progresses by eliminating error requires changes in their mental structures, training in and for the generation of scientific knowledge; It is also required changes in the curricula of educational institutions, that science adheres to pedagogy, where intellectual knowledge and social capacity are constituted in an educational one, in such a way that educational institutions undertake the task of promoting creativity, of teaching knowledge through a reflective response that redirects their practices, linking the student not only as a passive being, but as a being with potentialities, competencies and abilities that it must exploit and associate with what is taught; In order to do this, he must know him, characterize him and evaluate all his potentialities (Vergel, Martínez, Nieto, 2016).

In this sense, it was sought to implement methodological strategies that allow the learning of the Pythagorean Theorem in students, in order to identify their study habits and develop thinking skills that allow students to analyze and deepen the knowledge imparted by the educator in a way.

comprehensive, leaving behind rote learning. The research was not intended to build a new theory but to generate a change in the way in which students build their own knowledge against the Pythagorean Theorem, which consists of learning a formula and then applying it mechanically depending on what the statement requires . With the teaching of the Pythagorean Theorem in eighth grade, they wanted to promote a change in the ways of teaching an education limited to few changes, because it ignores the support that playful strategies represent. As a result of this little advanced education, the gaps and weaknesses of eighth grade students in handling the subject are notorious, since they simply recognized it as a formula, ignoring its real meaning, for this reason it was necessary to promote an adequate study of the Theorem Pythagoras, since it would allow the mastery of the concept in the future, facilitating its understanding. In addition, it would allow the knowledge and application of right triangles and angle measures to solve different problems (Campo and Ladino, 2015). since they simply recognized it as a formula without knowing its real meaning, for this reason it was necessary to promote an adequate study of the Pythagorean Theorem, since it would allow the mastery of the concept in the future, facilitating its understanding. In addition, it would allow the knowledge and application of right triangles and angle measures to solve different problems (Campo and Ladino, 2015). since they simply recognized it as a formula without knowing its real meaning, for this reason it was necessary to promote an adequate study of the Pythagorean Theorem, since it would allow the mastery of the concept in the future, facilitating its understanding. In addition, it would allow the knowledge and application of right triangles and angle measures to solve different problems (Campo and Ladino, 2015).

This problem led to the implementation of methodological strategies by the teacher in teaching the Pythagorean Theorem for eighth grade students applying pre-test and post-test, confronting previous knowledge and knowledge acquired from the implemented strategies, leading the teaching and learning outside the classroom, contextualizing the subject with the practice of sports, finding distances, measuring spaces, etc., of which it was possible to identify the weaknesses and strengths presented in the students, among them the mechanization of the formula and the lack of understanding as to the application of the subject in question.

Methodology

The type of research that was carried out was experimental and the method used was descriptive, since the effect produced by action or manipulation of one or more independent variables on one or more dependent variables was analyzed, this led to the analysis of facts, the revision of concepts existing data, the description of data and the characterization of the study phenomenon.

Research Phases

Within the framework of the research design, and in order to establish a scheme that facilitated the development of the work, the research was structured in the following phases or stages:

Phase 1. Bibliographic review and construction of the theoretical framework. The bibliographic review was used as a strategy to enrich knowledge about the project by searching for research related to the topic, in this case that were related to the search categories that are: the contextualization of the Pythagorean Theorem and motivation of the students. Furthermore, this consultation process made it possible to build the necessary theoretical framework. This led to the construction of data collection tools.

Phase 2. Sample selection. In this phase, the eighth grade students (3 grades - a total of 120 students) from the Monsignor Jaime Prieto Amaya Institution were used as a sample.

Phase 3.Design of the tools for the collection of information. For the information gathering process, two tools were chosen which were the field diary, test and methodological strategies for teaching the Pythagorean Theorem.

Field diary: Notebook where everything that was observed was recorded, allowing to systematize experiences carried out by the object of study, managing to obtain a record of information that would then be analyzed for the preparation of the results; In carrying out the field diary, aspects chosen to carry out a non-participant observation were taken into account, which consisted of observing the situation without participating in it.

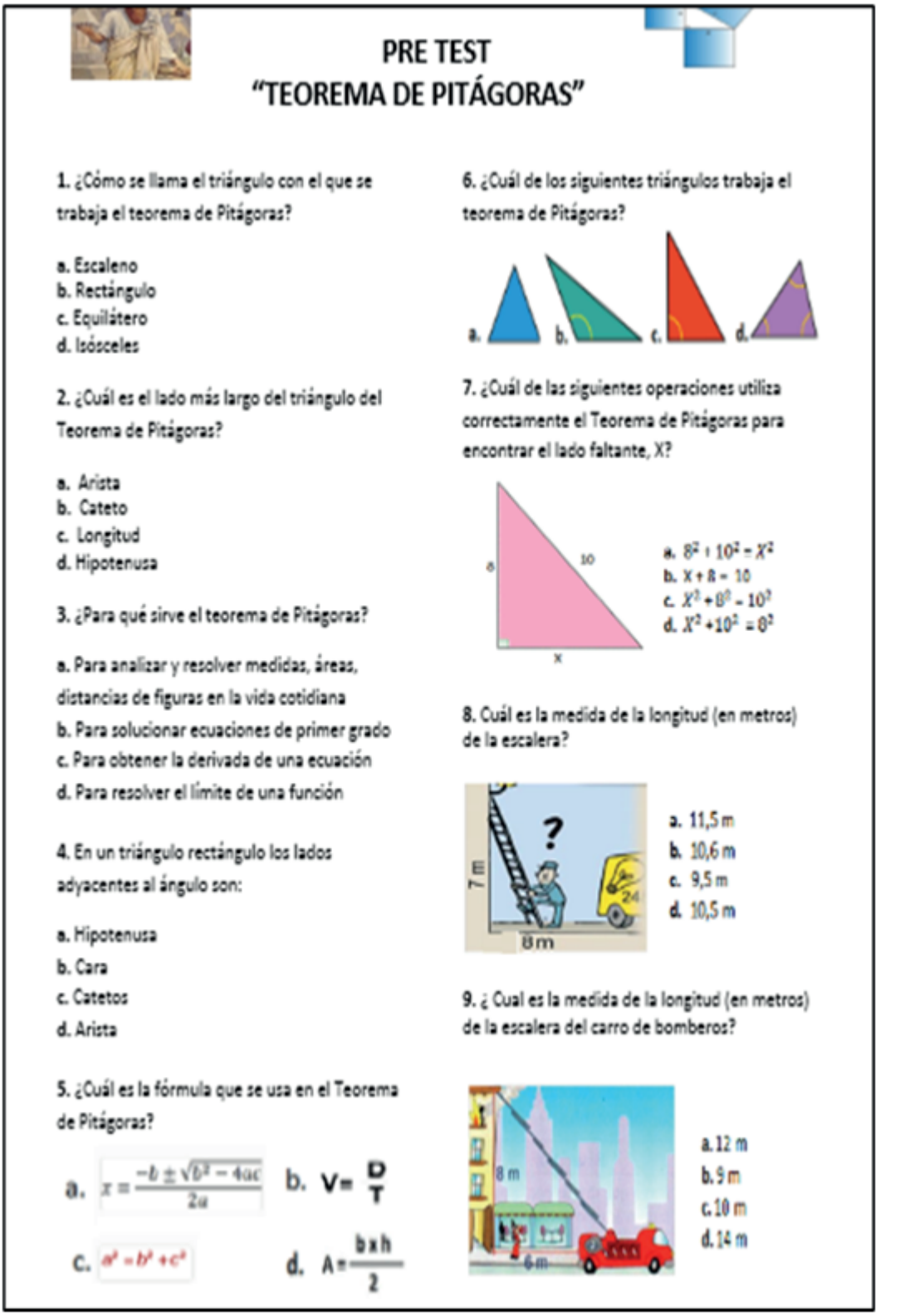
Test: A questionnaire was made of questions about the Pythagorean theorem in order to demonstrate the previous knowledge that students had about the subject, and then implement strategies that allowed them to contextualize it.

Methodological strategies: They are all those workshops, games, activities and relationships with the environment which allowed the learning of the Pythagorean theorem to take place in a contextualized way, these strategies had to do with the application of a test where previous learning of the students was evidenced, then With these data, the exit to the context was made in which they were asked to identify situations where they found the right triangle since it is the one worked on in the Pythagorean Theorem and in this way the students began to relate; After that they were presented with situations where it was necessary to apply the Pythagorean theorem and find a useful answer in that situation; such as: (three students were waiting for the bowling ball pass, They were located in the shape of a right triangle and two of them had already made the pass, there was only one left to do so and he needed to know what distance he should calculate; and this was one of the situations where they could identify the utility and applicability of the Pythagorean Theorem).

Results

Analyze geometry preconceptions in eighth grade students of the Monsignor Jaime Prieto Amaya Institution

To achieve this objective, a pre-test was applied in which the students were able to demonstrate the knowledge and learning that each one had about the Pythagorean theorem and some basic concepts of geometry, the analysis of each of the answers given by the students to identify where they were failing.



PRE TEST
"TEOREMA DE PITÁGORAS"

1. ¿Cómo se llama el triángulo con el que se trabaja el teorema de Pitágoras?

a. Escaleno
b. Rectángulo
c. Equilátero
d. Isósceles

2. ¿Cuál es el lado más largo del triángulo del Teorema de Pitágoras?

a. Arista
b. Cateto
c. Longitud
d. Hipotenusa

3. ¿Para qué sirve el teorema de Pitágoras?

a. Para analizar y resolver medidas, áreas, distancias de figuras en la vida cotidiana
b. Para solucionar ecuaciones de primer grado
c. Para obtener la derivada de una ecuación
d. Para resolver el límite de una función

4. En un triángulo rectángulo los lados adyacentes al ángulo son:

a. Hipotenusa
b. Cara
c. Catetos
d. Arista

5. ¿Cuál es la fórmula que se usa en el Teorema de Pitágoras?

a. $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ b. $V = \frac{D}{T}$

c. $a^2 = b^2 + c^2$ d. $A = \frac{b \times h}{2}$

6. ¿Cuál de los siguientes triángulos trabaja el teorema de Pitágoras?

a. b. c. d.

7. ¿Cuál de las siguientes operaciones utiliza correctamente el Teorema de Pitágoras para encontrar el lado faltante, X?

8 10 X

a. $8^2 + 10^2 = X^2$
b. $X + 8 = 10$
c. $X^2 + 8^2 = 10^2$
d. $X^2 + 10^2 = 8^2$

8. Cuál es la medida de la longitud (en metros) de la escalera?

7 m ? 8 m

a. 11,5 m
b. 10,6 m
c. 9,5 m
d. 10,5 m

9. ¿ Cual es la medida de la longitud (en metros) de la escalera del carro de bomberos?

8 m 6 m

a. 12 m
b. 9 m
c. 10 m
d. 14 m

Figure 1. Pre-test Pythagorean theorems

1. What is the name of the triangle with which the Pythagorean theorem is used?

In this question it was obtained that 51 students of the 120 to whom the pre-test was applied answered correctly and these are equivalent to 42.5%, which identify the name of the triangle with which the Pythagorean theorem works.

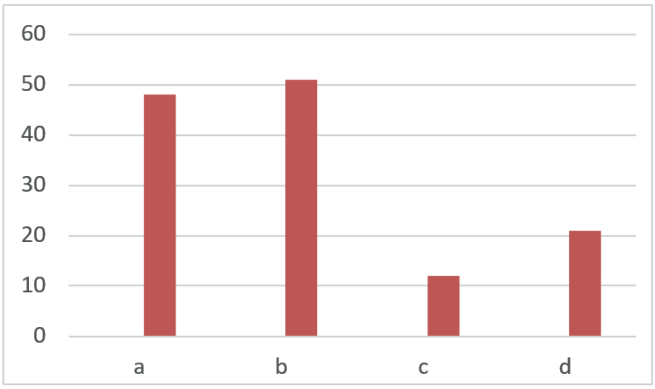


Figure 2. Name of the triangle with which the Pythagorean theorem is worked

2. What is the longest side of the triangle in the Pythagorean theorem?

In this question, it was obtained that 46 students of the 120 to whom the pre-test was applied answered correctly and these are equivalent to 38.3%, which identify which is the longest side of the triangle with which the theorem of Pythagoras.

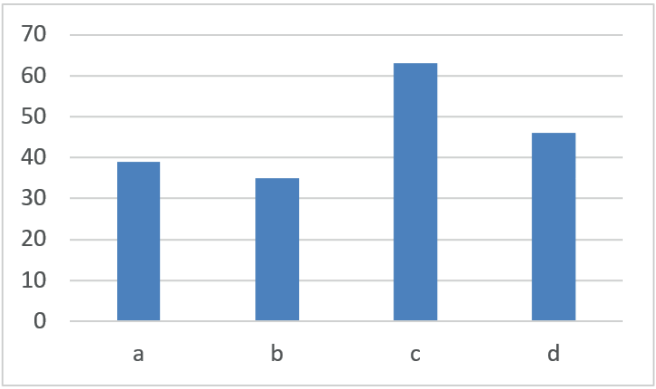


Figure 3. Longest side of the Pythagorean theorem triangle

3. What is the Pythagorean theorem for?

In this question it was obtained that 57 students of the 120 to whom the pre-test was applied answered correctly and these are equivalent to 47.5%, which are clear about what the Pythagorean theorem is for.

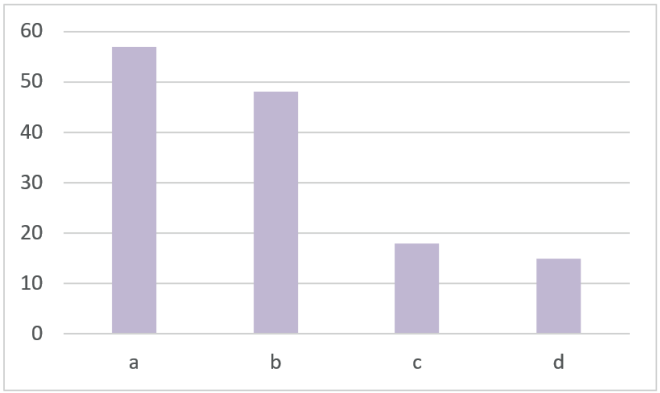


Figure 4. What is the Pythagorean theorem for?

4. In a right triangle the sides adjacent to the angle are:

In this question it was obtained that 60 students of the 120 to whom the pre-test was applied answered correctly and these are equivalent to 50%, which identify the adjacent sides of the right triangle applied in the Pythagorean theorem.

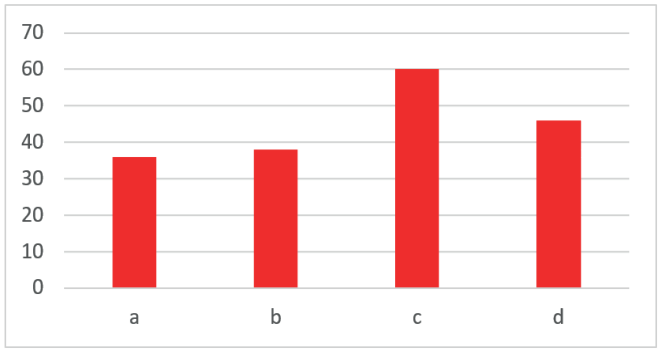


Figure 5. In a right triangle the sides adjacent to the angle

5. What is the formula used in the Pythagorean theorem?

In this question, it was obtained that 59 students of the 120 to whom the pre-test was applied answered

correctly and these are equivalent to 49.1%, which recognize the formula of the Pythagorean theorem.

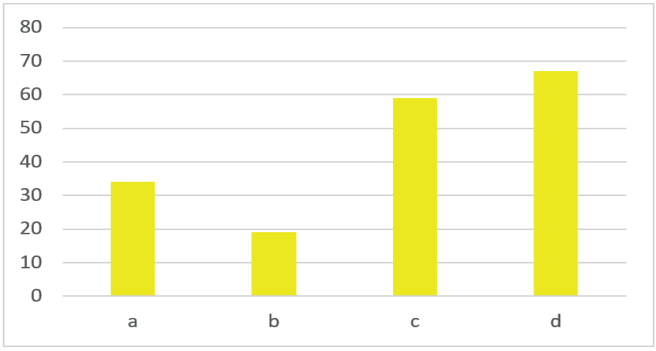


Figure 6. Formula used in the Pythagorean theorem

6. Which of the following triangles works the Pythagorean theorem?

In this question it was obtained that 71 students of the 120 to whom the pre-test was applied answered correctly and these are equivalent to 59.1%, which recognize the triangle of the Pythagorean theorem.

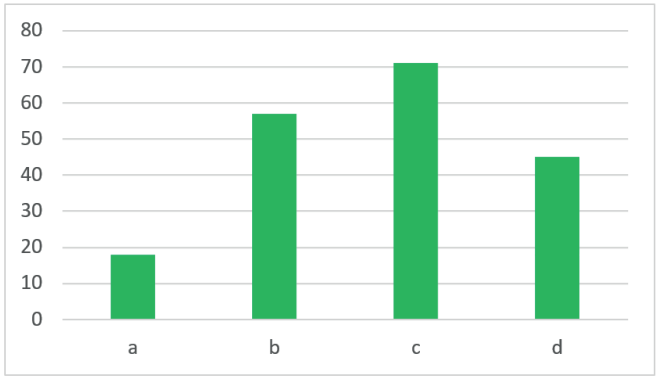


Figure 7. Which of the following triangles works the Pythagorean theorem

7. Which of the following operations correctly uses the Pythagorean theorem to find the missing side x?

In this question, it was obtained that 24 students of the 120 to whom the pre-test was applied answered correctly and these are equivalent to 20%, which apply the Pythagorean theorem.

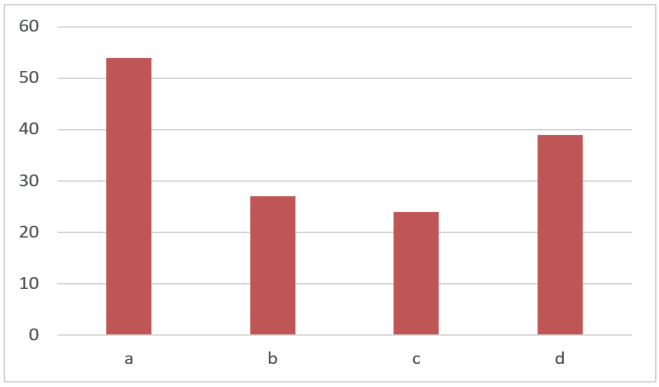


Figure 8. From the following operations correctly use the Pythagorean theorem to find the missing side x

8. What is the measurement of the length (in meters) of the ladder?

In this question, it was obtained that 56 students of the 120 to whom the pre-test was applied answered correctly and these are equivalent to 46.6%, which contextualize the Pythagorean theorem.

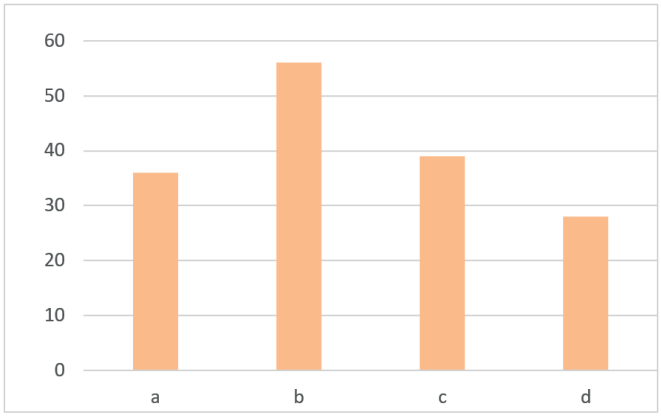


Figure 9. The length measurement (in meters) of the ladder

9. What is the length measurement (in meters) of the fire engine ladder?

In this question, it was obtained that 28 students of the 120 to whom the pre-test was applied answered correctly and these are equivalent to 23.3%, which contextualize the Pythagorean theorem.

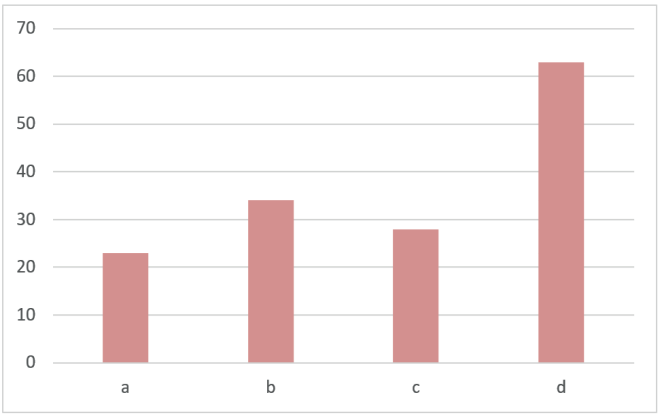


Figure 10. The length measurement (in meters) of the fire truck ladder

Taking into account each of the results of the questions in the application of the pre-test, it was possible to show that most of the students have preconceptions about the Pythagorean theorem, but for the most part they need to contextualize and put it into practice of their realities. or daily life, for this reason it was necessary to identify what factors were influencing the lack of understanding and appropriation of the subject, also included the development of methodological strategies to improve the teaching of the Pythagorean theorem.

Identify factors that influence the attitudes of eighth grade students in learning the topic of the Pythagorean Theorem

To achieve this objective, each of the classes and activities were observed where the attitudes of the students towards the subject and its applicability were analyzed, some of the attitudes that the students presented in each of the meetings were lack of interest, laziness, demotivation and lack of understanding of the subject, for this reason we began to work from motivation and recreational activities outside the classroom. After these applications, a great change could be observed in the students because their attitudes were improving by 50% since these were given by the monotony of the classes and the decontextualization of them,

Evaluate the impact of the methodological strategy on the learning and attitudes of the eighth grade students of the Institution Monsignor Jaime Prieto Amaya

To achieve this objective, assertiveness of the students was taken into account since by changing the teaching methodology and creating playful strategies, they helped those bad attitudes towards the subject and the classes to change; in this way the learning was much more meaningful and thus they felt motivated and liked the classes.

General objective

Create strategies for teaching the Pythagorean theorem in the eighth grade of the Institution Monsignor Jaime Prieto Amaya.

To achieve this objective, every detail was taken into account, starting with the attitudes of the students towards the classes, needs and factors that influence the lack of understanding of the subject, from there the work began, it was sought to generate strategies that would allow awakening the Interest in the student and in this way their learning was significant, it was raised from the area of physical and artistic education because these areas attract their attention and that is how these strategies began to be created, in the implementation of the activities based on physical education, they were given from exits to the patio where they mediate the field, they looked for spaces where they found the right triangle and thus related it to the Pythagorean theorem, after that they began with the games Like soccer and basketball, the Pythagorean theorem was applied to them, finding distances and measurements that would allow the applicability of the theme as such.

From the artistic area, they worked in the classroom with origami, the students created figures from the right triangles and applied the Pythagorean theorem when they found some side of the triangle that did not know its measure.

In this way, it was possible to obtain a significant learning with each of the students since these methodologies allowed to carry out a different and much more appropriate work for their learning rhythm, since it is much more practical and to experience the learning, of this form they find meaning in what they do and find it of great use and application to their daily life.

Conclusions

The motivation in terms of student learning is found in conducting fun classes in which they see the usefulness of what they are taught for the future and that can be useful at any time or to solve a problem, in addition that can be immersed in different areas and activities of daily life.

It can be said that these methodological strategies mark a great importance in interdisciplinarity since it is possible to work or relate to any area, because the student develops capacities and skills by relating different abstract topics with simple activities in their environment such as practicing some sport or knowing how far away some people or objects are.

In conclusion, the research in all its moments was interesting, the students' partition, the interest and the motivation to carry out a mathematics class outside the classroom was innovative and curious for them, likewise it was important to achieve evidence of learning in a meaningful way from daily experiences, achieving with the students to show and recognize that everything they learn has a utility for their daily life.

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