

Mathematics and Nutritional Status: A Proposal for the Development of Research Skills

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Abstract. In the last two decades of the 20th century and the first of this, the academic community has been reflecting about girls and boys as scientists. Some authors propose thinking the activity scientific as an activity cognitive that looks like what the children and girls make in the world that surrounds them. Within this approach, the development of scientific skills can assimilate to certain specific thinking skills of research processes.

This work has as objective the development of a didactical proposal in the area of mathematics for the development of skills cognitive, starting from processes of research on the nutritional status of the girls and the boys, driving concepts as Index of Mass Body and Carving for the Age.

The work was carried out with sixth grade students of education basic of the educative institution Felix Henao Botero of the city of Medellín, in Colombia. The area of mathematics was the base for the development of this project that also sought that the student acquires the basic skills of the course in the mathematical thinkings required for the grade.

The paper presents the theoretical basic approaches in that it is supported the project, the structure of the intervention made, as well as the results obtained in front of the skills that they can develop.

Introduction

This work shows the process of planning and implementation of a didactic unit in the area of mathematics that has as objective, in addition to the development of the mathematical thinking, begin to explore the possibilities that offer the development of the research skills in students of grade sixth (11 to 15 years) of an educative institution of the city of Medellín. For the realization of this unit it has been used as a research problem the nutritional status of the students of sixth grade of the institution, taking as indicators for this the Index of Mass Body (IMC) and Carving for the Age (T/E).

The paper presents the objectives that were at the level of skills, achievements and in the development of mathematical thinking and an analysis of the research competencies that are used for the achievement of these objectives. In addition, a basic theoretical framework surrounding the foundation of the didactic unit is displayed.

Theoretical Framework

Problem-Based Learning

Problem-Based Learning is a didactical proposal based on the idea of making the students, to learn, to confront problems; it gives priority to operational skills as learning content. Within this proposal the major concern is that the student learns to work in contexts with proper sense, in the case of the course in the context of the documentary research and solving problems [1].

The role of the teacher is tutor, concentrating on the task of designing and consulting of the task of the students. It has the responsibility to accompany the selection of the problem taking into

account the significant that is, determine the stages and goals of the experience and advise the group in the design of the solution of the problem.

The student chooses the role of investigator within a work team, consults sources of information and is involved in the activities of selection and structuring of the problem to work, proposes alternative solutions to the problem and supports his choice. The student is autonomous but cooperative protagonist of the learning process, his task is to design solutions to a problem starting from sources of information.

Research Skills

Defined as "the degree of capacity of a particular subject against a particular target; in the moment in which it has reached the objective proposed in the skill, it is considered that this has been attained while this objective has got of a form little refined and economic. You want to also make explicit the meaning that guides the development of these skills, as it is the capture the act of rediscovery that child performs on what science or scientific thinking have been discovered and previously established, and rescue research activity as a recognized strategy to achieve it, with the possibility to promote it and facilitate it, from the first years of life ", both in the context family as in the school" [2]. According to Garcia and Ladino [3], these skills are:

- Observe, collect and organize information
- Learn to use methods of information analysis
- Evaluate research methods according to requirements of the object of study
- Share results
- Learn to use measurement method
- Learn to classify
- Learn to address problems from different approaches
- Learn to manipulate objects and record
- Learn various ways of examining objects according to their characteristics and states
- Develop activities and procedures to obtain new data analysis
- Learn to use the inference (interpret, explain)
- Learn to establish the difference between predicting and guess inside the research processes
- Learn to interpret charts, statistical data, journalistic data
- Learn to experiment using different states of the object of study as of environments of experimentation
- Employ the use of relations of time and space

The Nutritional Status of Students (IMC, T/E)

For the theoretical approach of the nutritional status, it will take as a base the document of the Ministerio de Protección Social [4], in which it adopts the patterns of growth published by the Organization World of the Health–WHO–in the 2006 and 2007 for the boys, girls and adolescents of 0 to 18 years of age. Taking into account this, the following definitions are taken:

- Nutritional Status: It is the result of the relationship between the intake of energy and nutrients and spending given by the nutritional requirements for age, sex, physiological status and physical activity.
- Indicator anthropometric: It is the combination of two variables or parameters, examples: weight/size, size/age, among others.
- BMI (BMD): It is a number that describes the weight of a person in relation to its length/size, calculated as kg/m^2 .
- BMI-for-age: It is an indicator of growth that relates the BMI with age.
- Length/height-for-age: An indicator of growth that relates the length or size of a child to the age.

Mathematical Thinking

The definition of mathematical thinking has had an interesting development historical, in this case we focus in the definitions raised in the Conference International of Psychology of the Mathematical Education, in where [5] has described in a synthetic way the mathematical thinking as the type of thinking that put in game to the do math. Since the Greeks this thought has been divided for analysis, distinguishing between how to do math on the number: arithmetic, and how to make them with regard to space: geometry [6].

In the case of Colombia have been distinguished five thoughts:

1. Numerical thinking and numerical systems.
2. Spatial thinking and geometric systems.
3. Metric thinking and the metric system or of measures.
4. Random thinking and data systems.
5. Variational thinking and the algebraic and analytical systems.

Population and Sample

The work is performed in the educative institution Félix Henao Botero, in the sixth grade, with a number of 153 students divided in 5 courses. In all of them the area of mathematics is studied 5 hours a week and the work was carried out for 6 weeks. The students live in the Caicedo neighborhood, marginal area of the city, with population mostly in stratum 1 and 2, where they live different situations of violence, with dysfunctional families and with a low level of motivation by the learning of the mathematics.

Development of the Didactic Unit

The activities is developed in a continuous way during all the period academic according to the order that is presented below and relating it with the research skills of the following way:

- Declarative activity for the definition of the concepts of mass and weight. Conversion of measures of mass from everyday problems. It is developed a series of everyday problems that allow an approach to the application of the mathematics to real cases, to the development of competencies and to the improvement of arithmetic procedures, concepts as percentages and simple rule of three.

- Research skills: With this activity aims, in addition to clear the preconceptions, learn to approach problems from different perspectives.

- Presentation of the proposal of research called Measurement of the Index of Mass Body (IMC) in the sixth grade. Design of work plan to carry out the research process. Introduction to the Index of Mass Body starting from review of videos. Design of collection of information instrument.

The presentation of the project as a research allows to the student to contextualize the activities that will be complete, taking a role in the process and to verify the fulfillment of assumed liabilities.

To the make a plan jointly, the development of competencies for the life is achieved, because the students have to think the full process full and not only the day to day. Besides it can be verified if each one of the activities is made and which ones make lack.

The understanding of the concept to work or what you want to get, also approach to the learning object to the student. In addition to do so from images or videos closer to understanding since it is a means that allows to view and reflection after the presentation generalizes and resolves questions.

When designing the instrument of collection of information is accomplished advance in the development of research skills, since the design of these instruments is an essential step in any process of research.

- Measurement of the mass with digital scale. The data collection of the measurement with the designed instrument for this purpose. The process of measurement of the mass of the students is performed, initially, by the teacher to explain in what way they must do and then, in teams of two people, so one measures the mass to the another, leading with this to ensure that each one learns to use the instrument of measure.

Information is organized in the designed instrument for this purpose determining, by this way, the importance that information is obtained correctly and orderly also.

The debate about the accuracy of the instruments and the mistakes that can lead, since they are man-made devices, could be realized.

- Measurement of the size with a tape measure. Calculation of BMI. Analysis of BMI tables. Assessment of the BMI of the students from the analyzed tables. It is realized the process of measuring of the size of students, this is being discussed in class the best ways to do so, the type of instrument to be used, how use the instrument, the possible errors in measurement. It is used the scale of centimeters and it of meters for determine the differences and see the handling of the decimal numbers.

It is realized the calculation of BMI manually, teaching students the steps to achieve this.

It is performed again the calculation of the BMI, this time using calculators that are found in the web. By this, advance is made in the process of approximation of data since these software require only a decimal.

From this calculation, it is realized the valuation of each one of the students from the table of BMI, which makes a difference by age and sex.

- Measurement of the Height/Age indicator from the tables presented by the Ministerio de Salud. Relationship between consumption of drugs and nutritional status. Analysis of the relationship Height/Age with data that already had about mass, height and age. It analyzes the result of each one. The work is collaborative with the Ministerio tables and data collected during the investigation.

Articulating tasks of the project of sexuality and drug abuse, it is realized a job where was that students would bring themselves to the consequences of drug abuse in the nutritional status of people.

Results and Impact

The work is managed to perform with all the students and data found were analyzed. Different percentages of obesity, normality and malnutrition were found, by which project managed the reporting of cases of severe malnutrition to those responsible for that purpose and that measures be taken to counter this situation. For this reason the project had an socially significant impact. To educational level, the students understood the concepts and advanced in the understanding of his body and the correct way as it should take care. Furthermore, the project will be presented in local science fairs so it will have one greater audience to show how statistics is important for the recognition of social and personal variables.

Conclusions

Although some difficulties were presented in the development of the work, what it can see is that the implementation of the proposal allows the articulation of different mathematical thinkings in a single project, without having to separate each of them explicitly. This allows a wider vision of students about the ways in which mathematics are part of everyday life.

Research skills are the basis for the development of the work, which will acquire is both an objective and a need to be able to follow. If they don't get the ability, it cannot move forward on some of the activities raised.

A proposal developed on this occasion allows students address problems from different points of view, which can also see mathematical relationships with other aspects of life, such as drug abuse and nutritional problems.

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