

Learning Styles in High School Mathematics

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Abstract

In this research, our purpose is to show that when considering the different styles of learning of each student, it is possible to improve the teaching-learning process of High School Mathematics. This research was originated because most of the students in natural way do not have interest in the learning of the Mathematics of High School. In the first place, the exercises were applied to two groups A and B, of 20 students each, considering only their learning styles in the first group. Then the results of their expressed traits of the students of each group are compared, when solving the same exercises of the course of Mathematics II. Finally, it is concluded that when considering the learning styles of the students, positive results are obtained in the teaching-learning process, such as: getting the student to motivate himself in the learning of High School Mathematics and how their evaluation will be better.

Keywords: Learning styles in math; High School learning styles.

1. Introduction

Nowadays the clear majority of students are apathetic in learning Mathematics, they are always using their cell phones to copy what is seen in class. On the other hand, in other subjects they use their notebooks to record what they have seen in class and the means available to delve deeper into the subjects discussed, they feel that there are no boundaries or limits in the communication between them and the knowledge of some of their subjects, when they are interested in something they are willing to know the content, without considering what bores them from the blackboard of the subjects seen in class.

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What could make the student have more interest in the learning of High School Mathematics?

According to our experience as teachers, we consider that one of the measures, so that the student manifests his interest in the learning of Mathematics, could be to consider their styles of learning, to be able to orient the teaching of Mathematics according to their characteristics of learning of their group and so it is interesting to realize the learning activities of the Mathematics, so that they obtain a significant knowledge that leads them to obtain a successful evaluation, with the minimum effort.

Although this problem and the importance of learning styles have been identified by several authors [1,2] some features that students have shown to improve their disposition in learning Mathematics have not been considered.

The role of teachers in the teaching of High School Mathematics is to be active companions during the process of teaching and learning of students, to raise and manage the contents, instilling values, giving them all the attention, inducing them to think, reason and create, without losing sight of the different styles of learning that each of them have, applying the evaluation instruments that evidence the skills and mastery of the mathematical concepts acquired by them.

On the other hand, the learning styles of each student have led us to consider some of the challenges faced by high school teachers, as they are part of the formation of human beings in the stage of adolescence in the knowledge society, and in a changing world, these challenges are:

- Ensure that the knowledge of the subject of Mathematics of High School is integrated to those that the student possesses previously.
- Establish structures of actions or methods to achieve the objectives of the Mathematics subject.
- To enable the student to acquire the skills of thinking, to acquire the knowledge of the subject, such as: comparison, classification, induction, deduction, error analysis, support, abstraction, value analysis and synthesis development.
- To achieve that the student acquires significant knowledge from the activities established in the course.
- To achieve that the student acquires productive mental habits that are consequence of activities such as: planning, critical thinking and creative thinking.

Learning, in the current context in which students are immersed, must be in accordance with the changes and needs of our time, so that the students can develop with a critical-reflective vision and behavior in accordance with the current society.

We are living an era of modernity that has surpassed us by the large number of students who are users of information on the INTERNET. In the field of education in the teaching of Mathematics in the world. The teaching-learning process allows one to go further in instruction, by making use of the information tools and their learning styles, as well, this allows the teacher to train the students so that they can adapt to the transition processes that undertakes the teaching of Mathematics of High School in the classroom.

Students learn in a different way, so considering their different learning styles is extremely important to establish a suitable learning environment in the classroom, which allows them to build their learning.

To do this research we consider three learning styles:

- Kinesthetic

- Visual

- Auditory

According to the model of Bandler and Grinder, and was also considered by quoted by Dunn, R., & Dunn, K. [3,4,5], which unlike other models considers the neurolinguistics criterion, which considers the ways of entering information and the system in the preferences of who is learning or teaching. On the other hand, the research in [6], allowed us to establish the differences between the different learning styles. Which helped us to decide to use the model of Bandler and Grinder.

In carrying out this research, some important aspects were registered for the learning and evaluation of the students when considering their learning styles and when not considering them. The results obtained show us that when considering the different learning styles of students when applying Mathematics II exercises, students show greater interest in learning mathematics.

This shows the importance of considering the different learning styles of the students to achieve the learning of the concepts and consequently obtain a better evaluation of the students of High School Mathematics.

2. Materials and methods

The research was done in the classroom, considering the Bandler and Grinder model of three learning styles (Kinesthetic, Visual and Auditory). Also, considered in [7]. In this research, we identified only 6 aspects of the student's attitudes to establish their advantages using their learning styles in Mathematics. In the reference [8], concluded that students learn best when the teaching strategies used by teachers pick up their prevailing learning styles, we decided to do this research in such a way that students use their learning styles to solve math exercises. Since [9], it is argued that learning styles are of interest for educators because they predict academic achievement in ways that go beyond the self-rated skills of the participants. We detected 6 traits in the form that the students solve the exercises who used the three different learning styles. Considering two groups of the subject of High School Mathematics to solve two exercises we proceeded to conduct the research in a qualitative way primarily, although some percentages were taken it is not considered quantitative.

2.1 Application in the classroom

Two groups A and B of 20 students each were given Mathematics II exercises, of the same subject, to be solved. In Group A their learning styles were considered, while in group B their learning styles were not considered.

During the resolution of the exercises were noted some behavioral traits presented by each student. After reviewing their exercises, they were evaluated by detecting their conceptual bases to solve them for both groups. Two tables were constructed one for group A and one for group B. This served to make comparisons and analyze the results.

3. Results

In solving the exercises the students of group A during the activity could detect the following traits in their behavior: interested in content, computerized, communicative, creative, not willing to study and without conceptual bases. With the traits and different learning styles of this group, Table 1 was constructed.

Table 1: Shows the number and percentage of students who present the different learning styles, with the respective characteristics when solving the exercises.

Learning Styles	Features	Number of Students	% Students of group A
Kinesthetic	Interested in Content	1	5
	Computerized	2	10
	Communicative	2	10
	Creative	1	5
	Not Willing to Study	0	0
	Without Conceptual Bases	1	5
Visual	Interested in Content	3	15
	Computerized	4	20
	Communicative	1	5
	Creative	1	5
	Not Willing to Study	1	5
	Without Conceptual Bases	0	0
Auditory	Interested in Content	1	5
	Computerized	1	5
	Communicative	0	0
	Creative	1	5
	Not Willing to Study	0	0
	Without Conceptual Bases	0	0

Time used in the resolution of the exercises 18 minutes.

Table 2: Shows the traits of the students of group B who were not considered some style of learning when solving the exercises of Mathematics II.

Features	Number of Students of Group B	% Students of Group B
Interested in Content	2	10
Computerized	7	35
Communicative	5	25
Creative	1	5
Not Willing to Study	3	15
Without Conceptual Bases	2	10

Time used in the resolution of the exercises 20 minutes.

4. Discussion

One difference between this research and others of the same subject, is that we use the learning styles to obtain benefits in the learning of Mathematics. For example, regarding the work of the reference [4], they perform an 18-question questionnaire to establish the learning styles of the students and in this research, we only consider 6 aspects to distinguish from the 3 different learning styles, to establish what benefits in the learning of each student is obtained when performing the math exercises. Other works on the same subject have been reported in the reference [10], which makes the study with undergraduate students of Medicine, in the subject of Genetics, considering other aspects in learning styles. And other research [11], they do an investigation through INTERNET, like the research of the reference [12], these studies do not consider the same aspects as in our research.

From the results obtained in this research it can be established that:

According to the results detected in the two groups it can be said that:

- The solutions of exercises obtained by group A were found in less time and with better precision than those of group B.
- There were more students interested in content in group A than in group B.
- The number of computerized students in group A was the same as in group B.
- Group B has more communicative students than group A.
- The number of creative students in group A is greater than in group B.
- There are more students not willing to study in group B than in group A.
- The number of students with no conceptual bases in group B was higher than in group B

The above observations lead us to establish that by letting students use their learning styles to solve the exercises, they get faster solutions and are more interested in learning math.

5. Conclusion

With this research, it was possible: to use the learning styles (Kinesthetic, Visual and Auditory). to obtain benefits in the learning of Mathematics and to detect that the Mathematics teacher has the need to consider the learning styles of the students that study the subject of Mathematics of High School, to achieve positive results in the teaching-learning process. In addition, this also allowed to observe some features that manifested when solving the exercises, which allowed to value the importance of the learning styles of the students so that they acquire the necessary interest for the learning of Mathematics.

On the other hand, it can be said that learning the subject of High School Mathematics, students find it too difficult, due to the abstraction of their concepts, which means that the teacher needs to apply strategies where the student could be involved in a natural way and without pressure to understand the concepts, one of these strategies is to let the student perform the class activities considering their learning styles, so that they can express their interest in learning this subject.

Therefore, it is essential for the teacher to consider the learning styles his / her students possess, so that they are motivated to carry out the activities with better disposition and consequently acquire the significant knowledge of the subject of Mathematics with ease and consequently obtain better results in the evaluation of this course.

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