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Learning Styles in the Teaching of Mathematics

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Abstract---*The purpose of the research was to determine the scientific arguments that are developed with the way students learn and how teachers teach in the area of mathematics. In this sense, the objective was to identify the learning styles in the teaching of mathematics in the Cinco de Mayo Educational Unit of the Chone Canton in the year 2023. The problem of the study arises from the need that teachers do not plan accordingly. according to the styles that students have to learn and that are often not considered when the Teacher plans his classes. The methodology was based on the quantitative approach because it allowed the recovery, analysis, and assessment of information; A type of bibliographic-documentary and field research was applied, the methods used are inductive-deductive, analytical-synthetic, and statistical. The techniques we used in the research were the checklist to analyze the micro-curricular planning designs of the teachers, the interview to identify the methodologies for student learning, and the observation guide to evaluate the professional knowledge of the teachers. At the level of results, it was possible to show that good teaching depends on whether the teacher in his planning does so taking into account the learning styles of the students and the mathematics performance of the students; It is not due so much to the abstract nature of mathematics, but to the teaching practices that have been used in classes, it is evident that academic performance is related to learning processes. Furthermore, the panorama of work on academic performance and learning styles is very broad. For this, constant practice of problem-solving, and demonstration is important, so that in the teaching-learning process, students learn more effectively when they are taught with their predominant learning styles.*

Keywords---*learning styles, mathematics, teaching.*

Introduction

The purpose of the research was to determine the scientific arguments that are developed with the way students learn and how teachers teach in the area of mathematics. In this sense, the objective was to identify the learning styles in the teaching of mathematics in the Cinco de Mayo Educational Unit of the Chone Canton in the year 2023. The problem of the study arises from the need that teachers do not plan accordingly. to the styles that students have to learn and that are often not considered when the Teacher plans his classes. Nowadays, advances in teaching address problems that may arise in the classroom, where different situations are established that are generated in the educational process, due to the way students learn, whether inside or outside the educational center. , specifically with the individual differences of each student in the acquisition of new knowledge.

Learning styles have served to make significant changes in the educational process, [Estrada-Rodriguez \(2018\)](#). This has helped both students and teachers understand that each human being learns differently and that there is no right or wrong way of learning; On the other hand, academic performance is a fundamental part of the teaching and learning process, because it allows us to identify whether the student meets the learning standards set out in the education curriculum to be promoted to a higher level.

It is important to know the importance of planning with the four learning styles (theoretical, pragmatic, reflective, and active), a situation that is not common to see in Teachers' planning, even more so in the execution of the

curriculum in the mathematics classroom, with strategies for each of these, seeking to demonstrate the effectiveness when executing planning with teachers in the areas of mathematics, which is exacerbated by teachers who do not have different ways of teaching and do not reach all students, in which it is evident the inadequate design of micro-curricular planning because teachers are based on traditional education by conducting generalized classes with heterogeneous students in the learning process, so it is important to associate the class plan with learning styles (Pragmatic, Active, Reflective and Theoretical) (Pantoja Ospina et al., 2013).

The investigation develops a quantitative approach with the methods: inductive, deductive, analytical, synthetic, and statistical; The information collection techniques are based on the comparison sheet to analyze the micro-curricular planning designs of the teachers; In addition, the interview to identify the methodologies for student learning and the observation guide to evaluate the professional knowledge of teachers.

It is important to mention that learning styles show that they have different ways students can learn Clavero (2011), so when planning is designed taking into account the educational needs of the students, the result is greater, which leads us to investigate This topic in an education in which a methodology that does not promote the integrality of the areas prevails. Being relevant to enhance the ability to solve problems that require mathematical knowledge and skills, teachers must know how their students learn (their learning styles and strategies) to design activities and teaching resources that favor their preferred style and improve the learning of the contents of the subject, in such a way that it is focused on demonstrating that adequate knowledge of learning styles can contribute significantly to academic performance.

Learning styles are defined as the different ways in which an individual can learn (Jiménez Galán & Aragón García, 2009). For (Alonso et al., 1994), they are the cognitive, affective, and physiological traits that serve as relatively stable indicators of how students perceive interactions and respond to their learning environments. It is believed that all people use a particular method of interacting, accepting, and processing stimuli and information.

The learning process is made up of four different stages. It has been discovered that people concentrate more on a certain stage of the cycle so that clear preferences appear for one stage or another. Depending on the dominant stage, we can talk about four learning styles. The authors mention that each classroom is a universe by noting that each student is characterized by their particularities and preferences when it comes to learning and it is possible to understand this situation when it is understood that, although everyone must share the same space and teacher, each one He has his own particular style of learning and this most likely affects the degree of affinity he feels towards certain pedagogical strategies (Garibotto Trujillo et al., 2019).

Learning Styles offers concrete proposals and suggestions to overcome discrimination, promote inclusion, and adapt teaching to the characteristics of the student. People, both children and adults, learn differently. We only have to analyze how each of us prefers an environment, a space, a situation, a type of exercise, some tools, some strategies, some methods, a degree of structure, some technologies, a form of socialization, a way of collaborating and sharing that shows that we have a “Preferred Learning Style” or a way of learning (Gallego et al., 2022). To this end, competencies in the area of mathematics are related to communication, modeling, reasoning, and problem-solving. The activity of solving problems has been considered an important element in the development of the subject and the study of knowledge.

Competency-based learning is a pedagogical approach that combines different types of knowledge and skills (Beleño, 2022). However, the development of mathematical competencies represents a continuous challenge, due to the imperative that students use tools to appropriate the use of logic and discernment. The influence and importance of mathematics in society have been constantly growing, largely due to the spectacular increase in its applications (Cardoso & Cerecedo, 2008). It can be said that everything is mathematized.

Materials and Methods

The methodology was based on the quantitative approach because it allowed the recovery, analysis, and assessment of information, a type of bibliographic-documentary and field research was applied, the methods used are inductive-deductive, analytical-synthetic, and statistical. The techniques we used in the research were the checklist to analyze the micro-curricular planning designs of the teachers, the interview to identify the methodologies for student learning, and the observation guide to evaluate the professional knowledge of the teachers. The population under study is 831 people distributed among 790 students, 3 managers, 34 teachers, and 4 administrators of the Cinco de Mayo Educational Unit in the city of Chone. For López et al. (2004), the sample “is a subset or part of the universe or population in which the research will be carried out.” By random agreement, 238 high school students were selected, as 2 directors and 3 mathematics teachers from the Cinco de Mayo Educational Unit in the city of Chone

Analysis and Discussion of Results

It is important to recognize that the motivation and expectations we have of students influence their learning. The "decision" to learn, and the "need" to learn to achieve a goal, are elements that can favor the construction of knowledge, as long as they do not carry a level of tension that can block students (Espinoza, 2013), for Mora (2003), most of the works written on mathematics education refer to teaching, leaving little room for reflection on learning. It is also true that many of the didactic ideas developed and validated in recent years have barely been put into practice. years. The theoretical foundations of each of these conceptions of teaching and, obviously, of learning are very broad, and are substantially nourished by different disciplines related to pedagogy, didactics, and areas related to mathematics itself. In the interviews with the Teachers to identify the methodologies for student learning, 3 significant responses were identified.

The first related to the knowledge of the way their students learn, the students responded that in general, they do have the idea of how they learn, but specifically no, because there are individual differences and some are more intelligent than others, to have The idea is clear, the abilities and difficulties of each student must be evaluated, diagnosed and analyzed. It is important to highlight that there is no type of educational methodology that is more effective than another, the important thing is that you have experience in the area and that students are attended to in their learning needs (Maher et al., 2018; Dinçol et al., 2011; Suweken et al., 2017; Mahendra, 2016).

They were consulted about the styles that their students have to learn, they responded that they know the styles of the students, what one does as a teacher, one plans according to the topic, incorporates previously established content, and programs how to work, which, in reality with the years of work in the subject, one does is resort to their notes and draw on years of experience in mathematics. Was asked about the strategy or strategies that are applied in the development of a class, The interviewees mentioned that they try to apply integration, cooperation, and inclusion strategies; in addition to problem-solving, they work with cooperative learning, also in tasks that require the development of practical exercises, both in the classroom and in homework.

When asking teachers in the area of mathematics if they apply different ways for students to learn the topic presented, they responded that, yes, they do, but not according to the students' styles, but rather based on their achievements. we want to achieve these, but in reality, they are the same ones that are developed in each class (Friso-Van den Bos et al., 2013; Tambychik & Meerah, 2010; Ginsburg & Amit, 2008).

With the results it can be understood that the Teachers are unaware of the learning styles of their students, they do not define the strategies that they must use for correct teaching that meet the needs of their students, and their methodology is based on the years they have as a Teacher in the area, and it is not understood that Mathematics and Physics are subjects that in most teaching processes students have difficulties in facing the contents and ensuring that they understand and learn the knowledge in a logical way and it was not taken into account in planning learning styles in the teaching of mathematics, so essential to achieve satisfactory results in learning achievements, various authors mostly agree that it is about how the mind processes information or how it is influenced by the perceptions of each individual. (Gallego Gil & Nevot Luna, 2008). Learning styles are defined as the different ways in which an individual can learn (Jiménez Galán & Aragón García, 2009). For (Alonso et al., 1994), they are the cognitive, affective, and physiological traits that serve as relatively stable indicators of how students perceive interactions and respond to their learning environments. It is believed that all people use a particular method of interacting, accepting, and processing stimuli and information. The learning process is made up of four different stages. It has been discovered that people concentrate more on a certain stage of the cycle so that clear preferences appear for one stage or another. Depending on the dominant stage, we can talk about four learning styles, these are shown in Figure 1.

In the Cinco de Mayo Educational Unit, with the application of Honey Alonzo's questionnaire on teaching styles, it was evident that teachers have different styles with 60% being pragmatic-reflective, 30% belonging to the theoretical learning style, and 10% an active learning style.

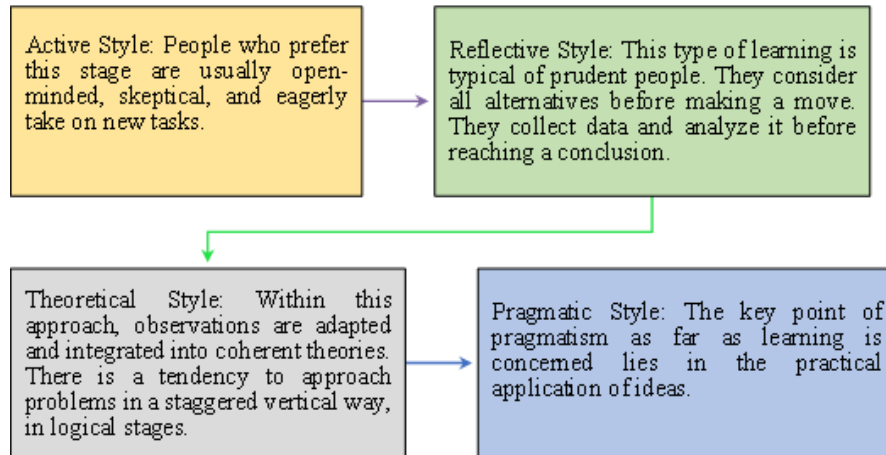


Figure 1. Stages of the learning process

The results shown are the data obtained from the interview with the purpose of identifying the methodologies in student learning, likewise, the observation guide allowed evaluation of the professional knowledge of the teachers. In this sense, it can be said that the methodology most used in the teacher's classrooms is problem-solving, which starts with observation, description, resolution, and verification. The interviewees mention that they try to apply integration, cooperation, and inclusion strategies; in addition to problem-solving, they work with cooperative learning, also in tasks that require the development of practical exercises, both in the classroom and in homework. It was evident regarding the application of the checklist that there are no strategies for groups of students, or strategies that respond to the different styles that students have for learning (Özgen et al., 2011; Okur & Bahar, 2010; Katranci & Bozkuş, 2014).

It is important to mention that having a single learning style is much more complicated than having a variability of styles according to the characteristics of each of the students; the student has various individualities, therefore, it is not possible to do, think or believe that 46 people in a classroom are going to think the same as the teacher, for them, it is important to have a situation of adaptability according to the individual differences of each one.

The predominant role of written materials: blackboard, notes, and textbooks, together with the teachers' masterful presentations, has ensured that students with a preference for Theoretical and Reflective Styles are those with the highest performance in mathematics. However, current ways of considering learning in mathematics advocate the use of teaching methods that favor and promote Active and Pragmatic Styles. When the students were observed in a mathematics class in the way they learn, it was evident that they do it routinely as presented in the class by the Teachers, and what was observed was developing exercises both on the blackboard and on the notebooks, students feeling stressed and not interested or motivated to learn.

(Peña & Naranjo, 2015), indicate that current education needs to promote knowledge construction processes, so as to achieve critical, supportive, reflective, and autonomous beings, for this it is necessary to propose active methodologies based on contributions from constructivist pedagogies. It is mistakenly thought that building knowledge is just transmitting fractional ideas, and dismantling important pedagogical processes. For this, another important task of the teacher is to listen to the reasoning of his students through a special class dynamic in which he interacts with them. This communication also requires that the teacher use this specialized knowledge to respond effectively to his or her students and thus improve the teaching process in mathematics.

With the results it can be understood that the Teachers are unaware of the learning styles of their students, they do not define the strategies that they must use for correct teaching that meet the needs of their students, and their methodology is based on the years they have as a Teacher in the area, and they do not understand that Mathematics and Physics are subjects that in most teaching processes students have difficulties in dealing with the contents and ensuring that they understand and learn the knowledge in a logical and reasoned way (Arteaga, 2020; Cajal, 2018; Espinosa, 2013; Sirmaci, 2010; Buentello-Montoya et al., 2021).

Teachers must carry out diagnoses of the student's learning styles to adapt the teaching-learning strategies to the different groups of students in a classroom, for this it is important to mention that learning styles are cognitive, affective, and physiological traits, which serve as relatively stable indicators of how students perceive interactions and respond to their learning environments.

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