

STYLES OF LEARNING AND  
ACADEMIC PERFORMANCE OF  
UNIVERSITY STUDENTS.  
THE CASE OF STUDENTS  
CHEMISTRY OF THE UNACH

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— *Abstract*—

This ongoing investigation intends to explore the different learning styles of first to fourth semester students from the Autonomous University of Chiapas and the possible connection with their performance. The learning styles were constituted in an extensive field of study of psychology applied to education which has allowed to have a variety of material to support the different learning styles (attitude, motivation, cognitive, among others). That we find during the learning process and are related to the students final results, their classroom performance and their disposition towards learning. The Honey questionnaire CHAEA was administered to 126 students finding a high level of preference for the, theoretical and pragmatic style, and low preference for the reflexive and active style. The analysis between the academic performance and age and gender of the students it was not statistically significant, but it was significant with respect to the semester studied, it was observed statistical difference between this two variables. A positive significant correlation was found between the academic performance and gender in subjects of third and fourth semester.

**Keywords**

*Styles of Learning, Performance, CHAEA.*

The belief that the basic purpose of the educational process is to teach students through active and participatory teaching models, has been extended, in the educational field, since the last quarter of the twentieth century, focused on teaching-learning processes and in the individual differences. In reality, learning would become, from this paradigm, a process of processes (Secadas, 1995), whose identification and diagnosis will allow implementing educational intervention programs aimed at increasing the quality of learning from a global perspective. (Adam, M. I., 2004).

In this interest in how students learn, by their individual characteristics, in order to favor and improve their learning processes, there is concern about the way in which subjects process information through the different perceptual channels, where they face, solve problems or act. This is called "Styles", which is our own cognitive, affective and behavioral identity, fruit of the socio-cognitive interaction that makes each person unique and unrepeatably over the "aptitudes" common to the human race and that are one of the pillars of the individualized attention of the students that fill our classrooms. (Adam, M. I., 2004).

The theory of learning styles must be incorporated into the daily work of all teachers, so the pretensions of education and educational models are going to be achieved effectively. (García and Galán, 2009).

The general notion of Style appears for the first time in psychology in Lewin's 1935 work (cited by Ferrari and Stemberg, 1998 in Hederich, C., 2004), who related this concept to the personality and defined it as a disposition to use of certain cognitive abilities. Later Allport (1937), cited in Hederich, C. 2004, links elements of personality with intellectual styles, referring to lifestyles, which identify some distinctive types of behavior. According to the same author, the general notion of style implies some general characteristics: it is essentially different, insofar as it establishes distinctive characteristics among people, it is relatively stable in each individual; it is integrative in that it relates different dimensions of the subject and neutral in relation to what cannot be assessed in absolute terms or superimposed, one style over another.

The analysis of learning styles offers indicators that help to interpret the person's interactions with reality. The concept that different authors have about learning styles is not common to all and is defined in various ways.

In this same sense, the concept of learning styles (or cognitive styles for many authors) has its etymological background, also, in the field of

psychology. As a concept, it began to be used in the 1950s by cognitive psychologists as an expression of the particular forms of individuals to perceive and process information.

Several authors define learning styles: (Claxton, CS, and Ralston Y. 1978; Riechmann, SW 1979; Schmeck, R. 1982; Butler, A. 1982; Kolb, D. 1984; Guild and Garger 1985; Smith, RM 1988, Keefe 1988, Dunn, R., Dunn, K. and Price, G. 1990), but Honey, P. and Mumford, A. (1992) define that a learning style is a description of attitudes and behaviors that determine the preferred way the individual learns. Sternberg, R. (1997) states that styles deal with the way in which people prefer to focus on tasks. We can see that there are different ways of understanding the learning style concept. Therefore, one option is to approach the problem from the different typologies that have been proposed, the sum of which is a conglomerate of prisms from which to address the issue (Cited by Albert and León, 2005).

On the other hand, at the University of Camagüey, Cuba, it is considered that learning styles are the set of psychological characteristics, cognitive, affective and physiological features that are usually expressed together when a person must face a learning situation. Cognitive features have to do with how students structure content, form and use concepts, interpret information, solve problems, select means of representation (visual, auditory, kinesthetic), etc. Affective traits are linked to motivations and expectations that influence learning, while physiological traits are related to the student's biotype and biorhythm (El diagnóstico y de, n.d.).

Just like learning styles, academic performance has been defined by several authors such as Chadwick (1979), who defines academic performance as the student's expression of abilities and psychological characteristics developed and updated through the teaching-learning process that makes it possible to obtain a level of performance and academic achievements over a period or semester, which is synthesized in a final qualifier (quantitative in most cases) evaluator of the level reached. Tonconi (2010), who defines the academic performance as the level of knowledge showed in an area or subject, evidenced through quantitative indicators, usually expressed by means of a weighted qualification in the vigesimal system and, under the assumption that is a qualified social group that sets the approval ranges, for certain areas of knowledge, for specific contents or for subjects. And Retana (2011) defines that Academic Performance is the level of knowledge expressed in a numerical grade obtained by a student as a result of an evaluation that measures the product of the teaching-learning process in which it participates.

A significant number of the studies cited, and many others, used the CHAEA as an instrument to identify and describe the predominant learning styles in the population study. The CHAEA questionnaire is based on D. Kolb (1984), P. Honey, and A. Mumford's (1986) models, who conceive the learning process from experience, Kolb's taxonomy proposes four dimensions of the learning process: 1. Concrete Experience. 2. Reflective Observation. 3. Abstract Conceptualization and 4. Active Experimentation.

Mumford, on the other hand, points out four stages of the process: 1. Having an Experience. 2. Review the Experience. 3. Draw Conclusions from the Experience and 4. Plan the next steps.

In response to the above approaches, Alonso, C, Gallego, D. and Honey, P (1999) affirm that people tend to concentrate more in some stages than in others, generating preferences called Learning Styles, as follows:

1. Live from experience: Active Style
2. Reflection: Reflective Style
3. Generalization, elaboration of hypothesis: Theoretical Style
4. Application: Pragmatic Style

According to Alonso C, Domingo J, Honey P (1994) the Learning Styles can be described as follows:

Active Learning Styles.- The active learning style is the diligent or agile style, where the dynamism and the full participation of students who are group and open-minded people reign. This learning style stands out for being: animator, improviser, discoverer, risk-taker and spontaneous. It is characterized by the pleasure of being locked into an experience, of prolonging the activity and the preference for the invention of ideas.

Reflective Learning Styles.- Reasoning style where predominates the observation and analysis of the experiences' results. It stands out for being: weighted, conscientious, receptive, analytical and exhaustive; it is characterized by the desire to make decisions without contradictions of time. Because of setback and distance importance movement they take into consideration people and things. It is marked by prudence and in-depth reflection before making a decision to act, listen to the exhaustive accumulation of data before giving an opinion.

Theoretical Learning Styles.- It is the style of speculation, where the observation in the field of theory predominates and little in the field of practice. This is

typical of people who integrate the perceptions of reality into logical and complex theories, focusing on problems with logical structures. They tend to be perfectionist and flee from the subjective and the ambiguous. The Theoretical Style stands out for being: methodical, logical, objective, critical and structured. It is characterized by the investigation of logic and coherence in the organization of accumulated information, for the preference of analysis and synthesis, an interest for basic predictions and the underlying principles, an appreciation of the rational and of objectivity.

Pragmatic Learning Styles.- It is the style of order, where practice, application of judgments or intuition and little theory reign the most. This style stands out for being experimenter, practical, direct, effective and realistic. It is characterized by an interest for the implementation of ideas, theories, and techniques for the purpose of validating the operation. Stands out also for the preference of solving problems to find concrete and practical benefits. Also, a marked preference for realistic and practical solutions is observed.

In this field of learning styles and academic performance, studies have been conducted that have served as a reference in the importance of distinguishing these variables and their relationship between them. In a study titled Student Learning Styles of the University of Sonora, Mexico case study, they conclude that:

*The different Learning Styles are a tool that can be used to generate methodologies that achieve significant learning, being also of the teacher's interest, since it allows planning and applying teaching strategies focused on the student obtaining better results, which is fundamental in all disciplines. Miranda and Beltrones (2010)*

In addition, learning styles turn out to be rich in explanations to support teachers' classes because they can better adapt their teaching style to the learning style of their students.

In a study on learning styles and academic average in students of Bacteriology and Clinical Laboratory (Molinares, 2014), the author concludes that academic performance is one of the most important components in the teaching and learning process and is closely related to the evaluation and it is in it and in the institutional university policies where there is a failure to interpret and assess the real development of a student's competences.

The author of this work considers that the student requires scenarios, teaching strategies that allow him to potentiate his different learning styles, which

would guarantee learning how to learn and to perform properly in the face of any problematic situation and learning environments. In reviewing studies of Piaget, other cognitive theorists and the theory of information development, it is inferred that learning is not only about acquiring new knowledge, it can also consist in consolidating, restructuring, eliminating knowledge that already exists; it always involves a change in the brain's physical structure and with it its functional organization, a modification of the students' knowledge and/or cognitive structures, and is achieved from access to certain information, interpersonal communication (with parents, teachers, peers, among others) and the performance of certain cognitive operations.

In a study on academic performance and learning styles in Psychology students conducted at the Autonomous University of the State of Mexico (Saúl, Guadalupe, *et al*, 2011), they conclude that learning styles influence the average of students (numerical representation of the quantitative and qualitative accreditation criteria), but above all in the quality of the learning that is achieved throughout the professional training resulting from an educational process in which three actors are involved: the student, the curricular content and the teacher.

Finally, in a study published in a scientific journal on the factors associated with academic performance in university students (Vargas, 2007), it is concluded that knowing the possible factors that mainly affect academic performance in university students would allow at least, between others, predict possible academic results and be able to analyze their impact on the quality of education expected and be a tool for decision making in this area. You cannot talk about the quality of higher education without knowing in depth indicators associated with the academic performance of university students, because this analysis represents a strategic monitoring in terms of academic performance and therefore the use of resources that the state invests.

Although it is well known that the predictive power of the CHAEA is criticized, as well as its psychometric rigor, its multiple uses and its demonstrated utility in countless works, I allow its consideration as a support instrument for the present investigation.

This work was proposed as a strategy to enrich the teaching work, because it provides us with the indispensable information for the planning of the learning experiences in the classroom and outside of it, of information for the understanding of the student with their individual differences (motivations, styles, processes, practices and interests) or for the understanding of the dynamics of their learning process, will also facilitate the functional mobility

between the different learning styles and thus contribute to the adjustment of the student to the demanding university context, the teacher becomes involved as a participant in the training process. It should be noted that the research aims to be outlined as a strategy of feedback and operationalization of the institutional pedagogical model and as a beginning for the consolidation of work teams in this important area in the context of university education.

## METHOD

### *Participants*

In the present study we worked with the total population; because according to (Núñez Flores, 2014), it is "the set of all the elements that are part of the territorial space to which the research problem belongs", in this case, to all the students enrolled from first to fourth semester of the Bachelor's degree in Chemo-pharmacobiology from the Autonomous University of Chiapas' Faculty of Chemical Sciences in Ocozocoautla de Espinosa.

## INSTRUMENTS

The Honey-Alonso Learning Styles Questionnaire (CHAEA) is a dichotomous response questionnaire, individual or group application, consisting of 80 items, 20 for each learning style (active, reflective, pragmatic and theoretical) distributed randomly. The absolute score that each subject obtains in each group of 20 items indicates the level reached in each of the four styles, allowing assessing the preferences of students in each of the styles and obtaining, ultimately, their learning profile.

## PROCESS

Once the sampling was done, a schedule for the application of the instrument was organized. The application was made, once given the instructions of the questionnaire, to those who voluntarily wanted to participate in the project. The data was processed in the latest version of the SPSS software.

## RESULTS

### *General Average and Learning Styles*

With regard to the correlation between the general average registered by the students and the learning styles, it was observed that there is no statistically significant difference ( $p= 0.7748$ ) between these two variables,

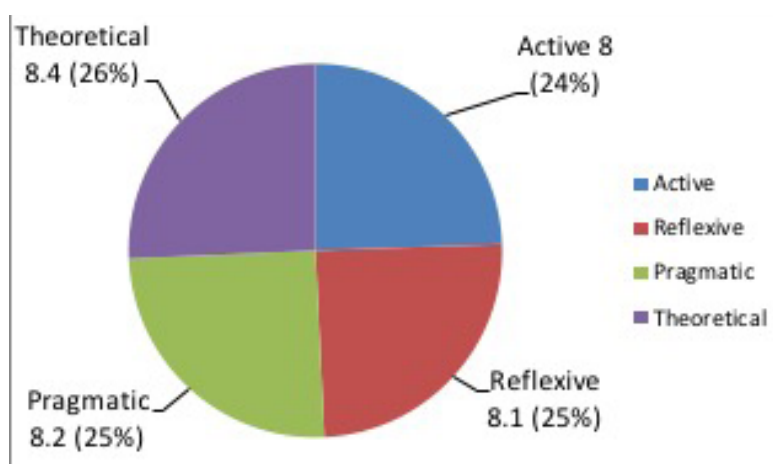


that is, they have a very similar academic performance with respect to the general average and the learning styles identified, however, it was observed that the best general average was presented by the theoretical learning style with 8.4. See chart No. 1, image No. 1 and table No. 1.

**Chart 1.** General Average Ratio and Learning Styles

Learning styles	General average
Active	8.0
Reflexive	8.1
Pragmatic	8.2
Theoretical	8.4

**Image 1.** General Average and Learning Styles



**Chart 1.** General Average and Learning Styles

Analysis of Variance for PRO\_GEN by E. A.

Source	Sum of Squares	Df	Mean Square	F-Ratio	P-Value
Between groups	0.988564	4	0.247141	0.45	0.7748
Within groups		68.0896	123	0.553574	
Total (Corr.)			69.0782	127	

Multiple Range Tests for PRO\_GEN by E. A.

E. A.	Method: 95.0 percent LSD			Homogeneous Groups
	Count	Mean		
Pragmatico	8	8.02625		X
Activo	16	8.05938		X
Reflexivo	73	8.19507		X
Pragmático	19	8.20421		X
Teorico	12	8.39333		X

The analysis between academic performance and learning styles reveals that the predominant styles were the theoretical and the pragmatic style. This implies that the theoretical style is characterized by the investigation of logic and coherence in the accumulated information, for the sake of analysis and synthesis, an interest for the basic predictions and the underlying principles, a valorization of the rational and objectivity. The pragmatic style is characterized by an interest for the implementation of ideas, theories, and techniques for the purpose of validating the operation; for the preference of solving problems to find concrete and practical benefits. It is also characterized by a marked preference for realistic and practical solutions (Rodríguez Conde *et al.*, 2010).

Cisneros and Robles (2004) (from Adscripción, Bustamante, and Talamante, 2011), say that identifying the preferred learning style of students facilitates the development of techniques and teaching strategies much more effective, favors the creation of a more welcoming climate and promotes a much more active student participation.

In addition, Alonso and Gallego, (n.d), say: it seems sufficiently proven that students learn more effectively when they are taught with their predominant learning styles.

## DISCUSSION AND CONCLUSIONS

The data presented allow us to make a very specific analysis for the population evaluated, about the relationships found between the learning styles and the academic performance of the students that made up the sample.

The predominant learning styles were: Active, Theoretical, Pragmatic and Reflective in that order.

This allows students to be characterized as active, open-minded, enthusiastic, easily integrated into groups, spontaneous, but of fragile motivation because they are moved by novelty and immediacy. Likewise, they are shown as practical, direct, effective and realistic people; its strength is the experimentation and application of ideas. On the other hand, they show strengths for the analysis, synthesis and establishment of principles, theories and models. They usually seek rationality and objectivity, discarding the subjective and ambiguous.

The preference for these styles suggests to the teacher to provide 3 groups of conditions, which, according to Alonso, C, Gallego, D. and Honey, P (1999), allow the student to interact in a variety of situations in which he will feel

comfortable and in readiness to learn: on the one hand it is recommended to provide experiences of cooperative work, problem solving, discussion and debate, as well as the representation of social roles, innovative and ingenious activities, among others, will be motivational conditions for students with greater preferences for the active style, mainly.

Secondly, it requires spaces that allow the student to question, participate actively, perform structured tasks and with a clear purpose, have the possibility of analyzing a situation and have time to explore methodically the relationships between ideas and situations. Students with greater preferences for the theoretical style, will feel motivated in situations of intellectual demand, and while interacting with people of the same level.

In the third instance, as conditions that facilitate student learning, it is suggested to provide knowledge and techniques that may be applicable in a specific context and, in fact, facilitate the immediate implementation of what has been learned.

In view of the above, the preferences of students are suggesting that the teacher is increasingly structured when planning learning experiences, ensuring the articulation between theory and practice and incorporating innovative and challenging methodologies that stimulate the development of thinking skills. From this perspective, it is very important for the student to know WHAT and WHY he is going to learn something, rather than how.

On the other hand, the lowest preference learning style observed in the individual analysis was Reflective, which shows that students prefer action rather than reflection; they can be impulsive, unwise, with limitations to consider different points of view. It is possible that students who are not very reflective to have difficulties to review and return to what they have learned, to self-manage their own process and rhythm of learning, to listen to the point of view of others, to pay attention and observe what others do, for task planning and research.

Since much of the literature suggests the existence of a functional mobility between the different learning styles, it is necessary to provide spaces for the development of metacognitive skills that bring the student closer to reflective styles, to strategic learning, and to the self-management of their own learning process.

According to the literature, the great diversity of concepts, instruments and ways of researching learning styles have limited their ability to predict

and their reliability, however, we cannot deny the valuable contribution that these studies make, because they allow us to know the student even more in terms of their preferences, needs and limitations; it allows us to re-conceptualize its role in this new model of teaching and learning, while it points out guidelines to design learning experiences that mobilize the development of its potentialities.

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