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A study oriented to significant learning: Learning styles

Un estudio orientado al aprendizaje significativo: Estilos de aprendizaje

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Abstract

Education is a priority axis for the government of our country, Mexico. The teaching-learning process is a challenge in each classroom, its importance lies mainly in raising the productivity of society. In this context, the application of pedagogical approaches and environments that allow meaningful learning are sought. For its part, we identify learning styles as cognitive, physiological and affective traits, of how students perceive, interact and respond to different learning environments. The objective of this research is to analyze and evaluate learning styles as an indicator that serves as a starting point to distinguish the way in which students learn and guide the teaching act in the design of learning strategies according to a segmentation of students of according to their learning styles or their predominance to achieve meaningful learning. The study proposes a field investigation using the Honey Alonso Learning Styles Questionnaire (CHAEA) as a data collection instrument. The methodological process of the research was divided into two phases: the first covers the design and application of the CHAEA instrument. In the second, the results obtained by means of a frequency analysis are exhibited.

Learning style, Significant knowledge, CHAEA

Resumen

La educación constituye un eje prioritario para el gobierno de nuestro país, México. El proceso de enseñanza-aprendizaje es un reto en cada aula, su importancia radica principalmente en elevar la productividad de la sociedad. En este contexto, se persigue la aplicación de enfoques pedagógicos y entornos que permitan un aprendizaje significativo. Por su parte, los estilos de aprendizaje son rasgos cognitivos, fisiológicos y afectivos, de cómo los estudiantes perciben, interaccionan y responden a los diferentes ambientes de aprendizaje. La presente investigación tiene como objetivo principal analizar y evaluar los estilos de aprendizaje como un indicador que sirva de punto de partida para distinguir la forma en que aprenden los alumnos y guiar el actuar docente en el diseño de estrategias de aprendizaje conforme a una segmentación de estudiantes de acuerdo con ellos, a fin de alcanzar un aprendizaje significativo. El estudio plantea una investigación de campo utilizando el cuestionario Honey Alonso de Estilos de Aprendizaje (CHAEA) como instrumento de recogida de datos. El proceso metodológico de la investigación se dividió en dos fases: la primera abarca el diseño y aplicación del instrumento CHAEA. En la segunda, se exhiben los resultados obtenidos mediante un análisis de frecuencias.

Estilo de aprendizaje, Conocimiento significativo, CHAEA

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Introduction

The study presents the importance of learning styles within the meaningful learning system. A field research is conducted on university students in the area of computer science using the CHAEA questionnaire aligned to Honey and Mumford's model as a data collection instrument.

The main objective of this research is to analyze and evaluate learning styles as an indicator that serves as a starting point to distinguish the way in which students learn and to guide teachers in the design of learning strategies according to a segmentation of students according to them, in order to achieve meaningful learning.

The central hypothesis of the study establishes that the way in which students learn allows for a segmentation with its own characteristics that leads to meaningful learning. The sections of the article involve:

a) The state of the art: it includes the priority foundations of meaningful learning, learning styles and the CHAEA questionnaire.

b) The methodology: defines the description of the methodological design carried out in the field research conducted. And finally

c) Presentation of the results: shows the frequency analysis of the findings derived from the field research data collection.

State of the art

Significant learning

Learning is a process of individual and social construction that the learner must regulate. Biggs argues that four conditions are necessary for learning (Biggs & Burville Biggs, 2006):

– Well-structured knowledge base
– Appropriate motivational context
– Student activity
– Interaction with others

Significant learning is characterized by:

– Development of autonomy: learning is centered on the student who is primarily responsible for it.

– Creation of critical sense: through permanent processes of reflection.

– To be dynamic: due to its cyclical nature and where the significant learning obtained at a given moment subsequently becomes prior learning.

– Personal: because the new knowledge is significantly related to the student's interests, allowing him/her to be interested in retaining the new knowledge.

– Development of creativity: if the new information does not easily adapt to the student's cognitive structure and the student is interested in acquiring the new information, associations will be made that allow him/her to acquire significant knowledge.

– Being a metacognitive process: the learner makes conscious, learning to learn.

As a theoretical reference associated with meaningful learning, Piaget and García (2008) state, in relation to the construction of the different forms of knowledge, that these are sequential, i.e., that knowledge is the consequence of the results of previous knowledge, and this in turn will be the necessary condition for the construction of a new one. Figure 1 shows the meaningful learning system.

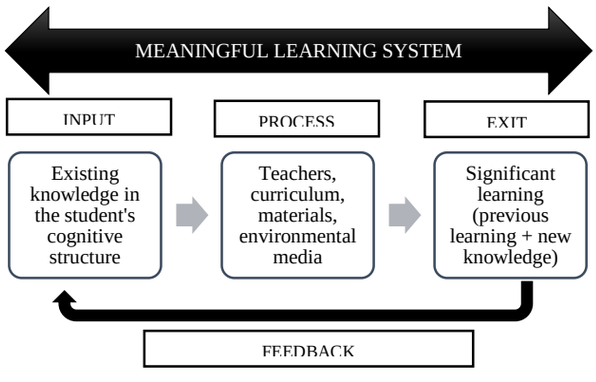

Figure 1 Meaningful Learning System
Source: (Ahumada Méndez & et. al., 2019)

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Based on the learning system

The present study addresses two critical points: student-centered learning and the importance of environments in the learning process. Furthermore, valuing that, the significant knowledge acquired, in turn, will become an input to the system, that is, prior learning.

In the teaching-learning process, the product resulting from the task performed by the student is as important as the process followed to perform it. If the teacher wants to have complete information on the learning process of his students, he cannot forget either of these two aspects. However, currently there are educational currents that give priority to the importance of "how" over "what". That is to say, they focus on the processes used, the strategies chosen, the mistakes and successes made, etc. Each student faces a task according to his or her own cognitive, affective and behavioral variables. Hence the differences that exist between different people when performing the same task.

In the educational field, the learning style is defined as the way of perceiving a task, of facing it and performing it, and will depend on personal cognitive, affective and physiological traits. Learning styles must be considered as individualized profiles that will be determined by different aspects such as the learning processes that each student sets in motion, the physical conditions required in the task (Design of Teaching-Learning Environments: Considerations based on NLP and Learning Styles, 2017).

The challenge circulates around the idea of the value of teaching styles and learning styles as a contribution to a comprehensive education and the articulation of teaching processes according to the interests, needs and motivations of social actors. Likewise, it seeks to glimpse alternatives to understand the performance of the teacher and the student in the relationship established in teaching and learning, highlighting the leading role of each person in the construction of knowledge. (Ruiz Ospino & Sánchez Fontalvo, 2019).

Learning styles

One classification of learning styles is that proposed by Honey and Mumford (1986), who suggest that students should be able to adopt each of the four learning styles they propose in their model in order to successfully solve diverse learning tasks. The four learning styles proposed in the Honey-Mumford model are: active, reflective, theoretical, and pragmatic.

Students with an active style show ease in learning, but just as easily forget what they learn. They tend to be improvisational learners.

Students with a reflective style think about the why of things. They think exhaustively about why things happen.

On the other hand, students with a theoretical style find it difficult to abandon their previous theory, their way of doing things. They tend to be critical of the versions that appear.

And finally, the pragmatic style experiments with the new. It is usually a realistic profile.

The research

The research proposes a field study in the Faculty of Engineering of the Autonomous University of Campeche. The purpose is to be able to segment or group students with the same ways of learning. From this, the need arises to apply a specific instrument to assess or weigh the four different learning styles of Honey-Mumford (active, reflective, theoretical and pragmatic) and thus affirm the hypothesis proposed.

In this sense, the Honey-Alonso Questionnaire of Learning Styles (CHAEA) is an instrument to diagnose learning styles. Inscribed within the cognitive approaches to learning, it is based on the vision of learning in line with Kolb, Juch, Honey and Mumford. These authors propose a scheme of the experiential learning process divided into four stages:

- Living the experience: Active Style.
- Reflection: Reflective Style.
- Generalization, Hypothesis development: Theoretical Style.
- Application: Pragmatic Style.

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The reliability and validity of CHAEA has been demonstrated based on the relevant statistical tests by analyzing the Learning Styles in a sample of 1371 students from 25 faculties of the Complutense and Polytechnic Universities of Madrid. (Navarro Cadavid, Fernández Martínez, & Morales Vélez, 2013).

The CHAEA Questionnaire consists of eighty questions (twenty items referring to each of the four learning styles) to which one must respond with agreement or disagreement. In addition, a series of socio-academic questions have been added, which provide a total of eighteen variables to analyze the relationships between these variables and the responses to the items. (Alonso & Honey, 1994).

Like Honey and Mumford, CHAEA posits the existence of four learning styles (Sáez López, 2018):

– Active: People with predominance in the Active Style are fully involved and without prejudice in new experiences. They are open-minded, not at all skeptical and undertake new tasks with enthusiasm. They are very group-oriented people who get involved in the affairs of others and center all activities around them.

– Reflective: Reflective people like to consider experiences and look at them from different perspectives. They collect data, analyzing it carefully before reaching a conclusion. They are people who like to consider all possible alternatives before making a move. They enjoy observing the actions of others, listen to others and do not intervene until they have taken ownership of the situation.

– Theorist: Theorists adapt and integrate observations into logical and complex theories. They tend to be perfectionists. They integrate facts into coherent theories. They like to analyze and synthesize. They are deep in their system of thought, when it comes to establishing principles, theories and models.

– Pragmatic: The strength of people with a predominantly Pragmatic Style is the practical application of ideas. They discover the positive aspect of new ideas and seize the first opportunity to experiment with them. They like to act quickly and confidently on ideas and projects that appeal to them. (Cañas, 2000).

Methodology

The methodological process of the research was carried out as described below:

The design of the CHAEA questionnaire was implemented with the Google Forms Tool to easily, quickly and consistently submit, collect, consolidate and analyze the results. Figure 2 shows the CHAEA questionnaire (digital) divided into 4 categories, where the specific questions for each of the learning styles are combined in each block.

The evaluation of the sample was performed using the CHAEA test score scales of learning styles shown in Table 1.

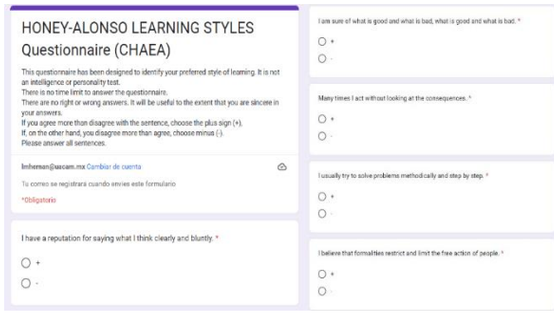

Figure 2 The CHAEA questionnaire in Google Forms
Source: Own

Style	Preferences				
	Very low	Low	Moderate	High	Very High
Active	0-6	7-8	9-12	13-14	15-20
Reflective	0-10	11-13	14-17	18-19	20
Theoretical	0-6	7-9	10-13	14-15	16-20
Pragmatic	0-8	9-10	11-13	14-14	16-20

Table 1 Scoring scales for the questionnaire CHAEA
Source: (Buzón García, Romero García, & Verdú Vázquez, 2021)

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The population of the field research covers two groups of the last active semester of the Computer Systems Engineering Educational Program in the 2022-2023 Phase 1 school year with a maximum total of 100 students of the Faculty of Engineering of the Autonomous University of Campeche. The sample size was defined using the Normal Distribution formula:

$$n = k^2 qpN/(e^2(N-1) + k^2 pq) \qquad (1)$$

The minimum required sample size is 67 subjects, Table 2 shows the values and the calculation performed.

Parameter	Description	Value
N	The total number of people who could be surveyed.	80
k	Probability that the answers are true. A confidence level of 95% was proposed here,	1.96*
p	Proportion of individuals in the population that possess a specific characteristic.	50%**
q	Proportion of individuals who do not possess a specific characteristic, q=1-p.	50%
e	Difference between the responses of the sample and the total population.	5%
n	**Sample size**	**66.35**
* Confidence level of 95% ** The same probability of success or failure is taken.		

Table 2 Calculation of the sample size with normal distribution
Source: Own

The questionnaire was sent to 100% of the population. However, only the following responded 70 students, which is sufficient for an accepted sample. The Questionnaire can be accessed from the following link:

https://forms.gle/bXY5QzcLX1DuQ4Rq5

Results

Next, after collecting the data through the CHAEA Questionnaire (using institutional e-mail as a channel), the results obtained for each of the four learning styles previously described are presented. Figure 3 shows the concentrate of the data obtained through Google Forms and exported for analysis to Microsoft Excel 2019. The data collected are downloaded into an Excel spreadsheet, consolidating the results obtained according to the score scales of the CHAEA questionnaire specific to each learning style.

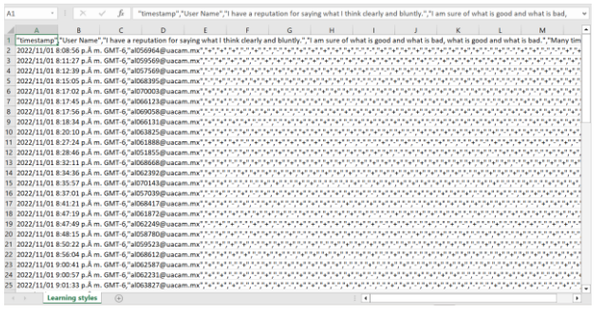


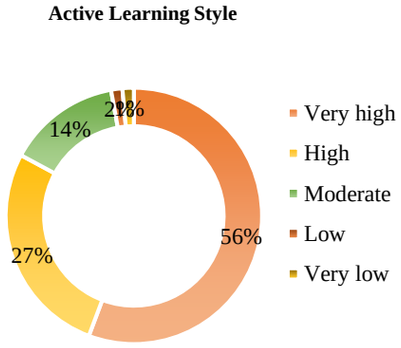
Figure 3 Database collected through the CHAEA Questionnaire in the field study
Source: Own

After consolidating the results by each category, i.e., by learning style, Table 3 reveals the ratings obtained from the field study.

Learning style *	MA	A	M	B	MB
Active	39	19	10	1	1
Reflective	3	4	35	21	7
Theoretical	25	17	22	6	0
Pragmatic	13	13	27	9	8
* MA=Very high, A=High, M=Moderate, B=Low and MB=Very low					

Table 3 Consolidated results of the data collected in the field study
Source: Own

Analyzing the consolidated results of the field study, out of 70 students who answered the CHAEA Questionnaire, for the Active learning style dimension, the majority, 39 out of 70 students obtained a preponderance for the Very high scale, corresponding to 56%, and an additional 27% for the High scale. Graph 1 shows the result obtained for the "Active" learning style.



Graph 1 Results for the Active Learning Style
Source: Own

The results of the field study for the Reflective learning style dimension obtained a preponderance for the Moderate scale corresponding to 50%, and an additional 30% for the Low scale. Graph 2 shows the results obtained for the "Reflective" learning style.

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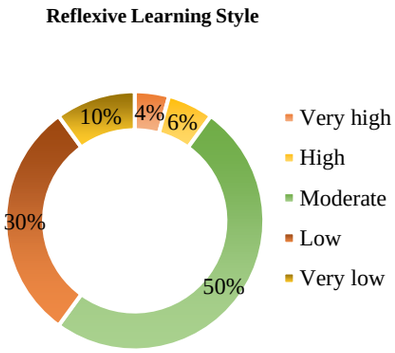
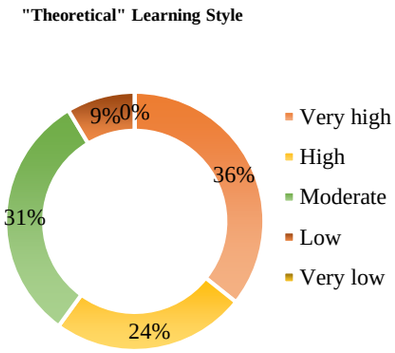


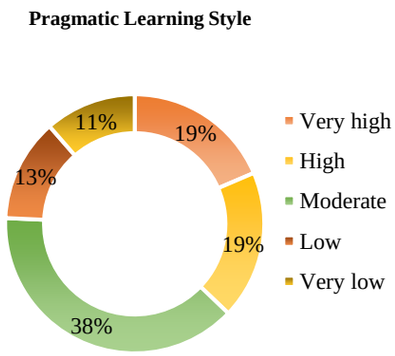
Graph 2 Results for the Reflective Learning Style
Source: Own

The Theoretical learning style dimension, on the other hand, obtained a preponderance for the Very high scale corresponding to 36%, and an additional 31% for the Moderate scale. Graph 3 shows the result obtained for the "Theoretical" learning style.



Graph 3 Results for Theoretical Learning Style
Source: Own

The results of the field study for the Pragmatic learning style dimension, for the most part, obtained a preponderance for the Moderate scale corresponding to 38%, and an additional 19% for the Very high and High scale. Graph 4 shows the result obtained for the "Pragmatic" learning style.



Graph 4 Results for the Pragmatic Learning Style
Source: Own

Conclusions

The quality of education is a continuous challenge in the development of our country, Mexico. However, educational models must be focused mainly on student learning. From this, the diversity of teaching-learning strategies becomes valuable when they are in accordance with the learning styles of specific groups of students.

Aligning methodological and didactic activities to the predominant learning style(s) will have a positive impact on the significant knowledge achieved by students.

Evaluating, distinguishing and considering learning styles in the educational task is undoubtedly a strategy that allows segmenting groups of students to specifically determine, accordingly, how and what tools will be used to carry out learning.

Finally, it should be emphasized that learning styles are only one aspect of the perspective of the way or manner to reach meaningful knowledge, but it is not the instrument or the tool.

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