

The importance of the knowledges from different kind of learnings of computer engineering students and strategies applied by professors from TecNM Tizimín Campus

Importancia del conocimiento de los estilos de aprendizaje de los estudiantes de ingeniería informática y las estrategias empleadas por los profesores, del TecNM Campus Tizimín

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Abstract

The objective of this research project is to know and describe the different learning styles of the students from computer engineering educational offer at National Technological Institute of Mexico Campus Tizimín, using the model proposed by Honey Alonso; this with the importance of identifying if there is a relationship between the career and the strategies used by the teachers in the classroom. The data collection technique was through two questionnaires; one of them directed to students and the other directed to professors. Was considered a sample of 114 students from all semesters from computer engineering and other considered a sample 10 professors belonging to the computer engineering academy. The results obtained have important implications for educational practice and the design of educational policies that promote personalized and student-centered learning.

Learning styles, Honey Alonso, strategies, Academy

Resumen

El presente trabajo de investigación tiene como objetivo conocer y describir los diferentes estilos de aprendizaje de los estudiantes de la oferta educativa de ingeniería informática del Tecnológico Nacional de México Campus Tizimín, utilizando el modelo propuesto por Honey-Alonso; esto con la importancia de identificar si existe relación entre la enseñanza que proporcionan los docentes del Tecnológico con el estilo de aprendizaje de los estudiantes. La técnica de recolección de datos fue a través de un cuestionario dirigido al alumnado y entrevistas realizadas a los profesores de la academia de ingeniería informática. Se consideró una muestra de 114 estudiantes de todos los semestres de ingeniería informática y otra muestra de 10 profesores pertenecientes a la academia de la misma carrera. Este proyecto de investigación tiene un enfoque Mixto porque se recolectan, vinculan y analizan datos cuantitativos y cualitativos. Los resultados obtenidos tienen implicaciones importantes para la práctica y el diseño de estrategias educativas que promuevan el aprendizaje personalizado y centrado en el estudiante.

Estilos de aprendizaje, Honey-Alonso, estrategias, academia

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Introduction

In the classroom, where the teaching-learning process takes place, there may be students with different characteristics, abilities and skills, so each student has a different way of learning. Unfortunately, teachers ignore not only the students' abilities, but also how they learn, and all this ignorance implies that the way in which teachers teach in the classroom is not adequate for the students. From this follows the importance of exploring and knowing the relationship between the learning styles of students and the ideal way in which teachers should teach their classes; undoubtedly a topic of great relevance in education.

Learning styles have become an extremely important element of study as it favors quality teaching, and provides valuable information for the adaptation of teaching strategies in the classroom in order to achieve efficient learning in students and thus contribute to raising the academic level of both students and the educational institution (Gutiérrez, 2018).

At the Instituto Tecnológico de Tizimín, difficulties have been observed in some students, which causes them to fail subjects and find themselves at a disadvantage with respect to their classmates, so that sometimes they are forced to drop out. Although failure and dropout can be due to multiple internal or external factors, it is necessary to know how students learn and how teachers teach in order to improve educational practice and contribute to the eradication of failure and dropout.

This research seeks to explore the relationship between students' learning styles and the teaching given by Tecnológico teachers. For this purpose, data were collected on students' learning styles, according to an instrument (CHAEA), a questionnaire of the Honey-Alonso model and an interview designed to know the teaching preferences of teachers in the classroom (Pérez, Méndez, Pérez and Yris, 2019).

Honey-Alonso Model

The Honey- Alonso model is a model that consists of and divides learning styles into active, reflective, theoretical and pragmatic.

Each with specific characteristics as described below:

Active: Those who possess this learning style regularly are open-minded, enthusiastic and not at all skeptical; they thrive on challenges, are group people and always with constant activities to perform. They are animators, improvisers, discoverers, risk-takers and spontaneous.

Reflective: This learning style is characterized by the fact that students are usually prudent people. They gather data and analyze it in a detailed and systemic way with the objective of reaching a conclusion. They observe and listen to others, they are also thoughtful, conscientious, receptive, analytical and exhaustive.

Theoretical: They learn by analyzing problems in a vertical and staggered way, taking into account logical stages, they are perfectionists, they consider a depth in the system of thought, they like to analyze and synthesize. They are methodical, logical, critical and structured.

Pragmatic: They apply the learned contents, discover the positive aspects of the ideas and as soon as they can they experience them; they act quickly in front of projects that call their attention. They are impatient with people who theorize. They are experimenters, practical, direct, effective, realistic (Castro and Guzmán, 2015).

Once knowing what the Honey - Alonso model is based on, the data will be analyzed using statistical techniques to identify which are the learning styles of computer engineering students. Analyzing the relationship between the learning styles of students and the teaching strategies used by teachers in the classroom will be a study and discovery that will be used to improve the academic level of the institution.

It is important to explore this relationship in the particular context of the students and teachers involved in this study, since it is expected that the results obtained will provide valuable information to improve educational practice.

It is expected that the results obtained will provide valuable information to improve educational practice and will be a support in decision making to establish new strategies to guide the achievement of educational objectives, such as strengthening the quality of the educational offer of the TecNM Campus Tizimín (Instituto Tecnológico de Tizimín, Institutional Development Program, 2023).

Materials and methods

The research was mixed in order to combine quantitative and qualitative methodology. Mixed methods represent a set of systematic, empirical and critical research processes and involve the collection and analysis of quantitative and qualitative data, as well as their integration and joint discussion, in order to draw inferences from all the information collected and achieve a better understanding of the phenomenon studied. The chosen design is sequential explanatory, which is characterized by a first stage in which quantitative data are collected and analyzed, followed by the collection and evaluation of qualitative data. In this way the findings of both stages are integrated to perform an analysis and interpret both results (Hernández-Sampieri and Mendoza, 2018).

The research is divided into two phases: in the first phase we used the instrument called questionnaire that will help us to identify the learning styles of the students of the computer engineering career (Casas, Repullo and Donado, 2003) In the second phase a brief semi-structured interview was designed to know what are the learning styles implemented by the teachers of the computer academy when developing teaching strategies (Fernández, 2001).

The implementation of the project was carried out in the facilities of the Instituto Tecnológico de Tizimín, specifically in the classrooms of building D of the academic area, classrooms designated for the students of the computer engineering career, where the same professors in charge of this research informed the students of the questionnaire to be answered.

Results

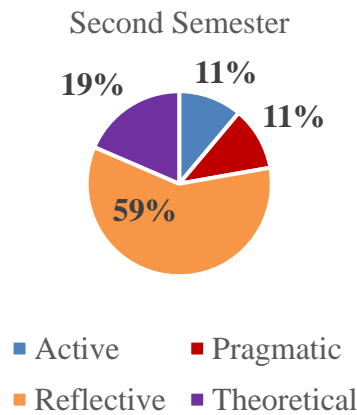
The surveys were applied to all the students of the computer engineering educational offer of all semesters. These were carried out digitally, sending the link by virtual means such as institutional email and WhatsApp application. The Honey-Alonso questionnaire to be answered was carried out with the Google tool called "Google Forms", so that students could answer from the comfort and privacy of the place of their choice through an Internet connection.

This tool was also used to develop brief questions, which served as a guide to conduct the interviews with the professors of the Computer Engineering academy and thus discover the teaching strategies they use in class.

This Google tool collects and organizes all kinds of information, including surveys. Survey responses are collected automatically and sorted into forms, with graphs and real-time data (Google, 2023).

Students

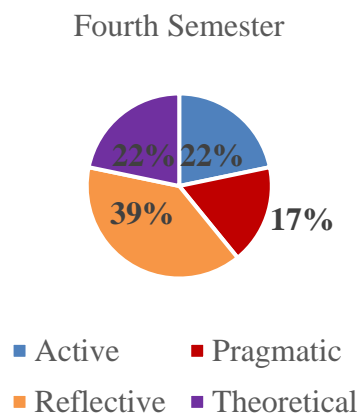
The students surveyed were those who entered in August 2021 and this educational research was carried out during the January-June 2022 semester; semester in which they returned to the classroom after two years of confinement, finding the following results:



Graphic 1 Results of the Honey-Alonso survey of second semester computer engineering students

As can be seen in the results of Graph 1, the learning style that predominates most in second semester students is reflective, with theoretical, pragmatic and active being below. Reflective learners are those who review, meditate and observe experiences. They prefer to be cautious people, not to be in the front ranks and keep a low profile. This type of students enjoy observing the performance of others (Araiza, Pérez, Jardines, Dörfer, Catilla, & Vazquez, 2013).

For the case of fourth semester students the result obtained was the following:

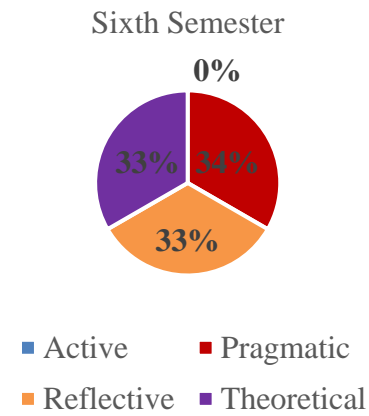


Graphic 2 Results of the Honey-Alonso survey of fourth semester computer engineering students.

The results of graph 2 indicate once again that, like the second semester students, fourth semester computer science students learn in a reflective manner, with the pragmatic being far behind, and the theoretical and active learning style obtaining the same figure of 22%.

It is important to mention that reflective students enjoy being observers, who know how to listen and follow the course of the discussion without intervening, until the person takes control of the situation.

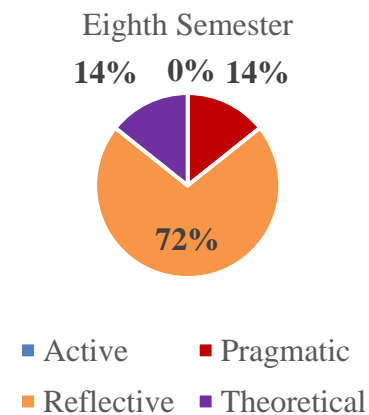
The sixth semester students obtained the following result:



Graphic 3 Results of the Honey-Alonso survey of sixth semester computer engineering students.

In these results we can determine that the highest percentage is obtained by the pragmatic learning style with 34%. Pragmatic learners are experts at testing ideas, theories and techniques to see if they work. Their philosophy is: "If it works it is good", they are not interested in analyzing and synthesizing like reflective students (Araiza, Pérez, Jardines, Dörfer, Catilla, & Vazquez, 2013).

The surveys applied to eighth semester computer engineers, obtained the following result:



Graphic 4 Results of the Honey-Alonso survey of eighth semester computer engineering students

Graph 4 shows the highest percentage of 72% for the reflective learning style, with the theoretical and pragmatic styles being below. There are no eighth semester students with an active learning style. An important fact about eighth semester students is that they are generally taking specialty subjects. According to the Guidelines for the integration of specialties, found in Chapter 19 of the TecNM Academic-Administrative Guidelines Manual, the specialty subjects are structured by contents that address aspects of their work and professional training. It is important to know this, since, if we relate it to the reflective learning of eighth semester students, it will contribute to a better grasp of the knowledge of these subjects by the students. (Tecnológico Nacional de México, Manual de Lineamiento Académico-Administrativos del Tecnológico Nacional de México, 2023).

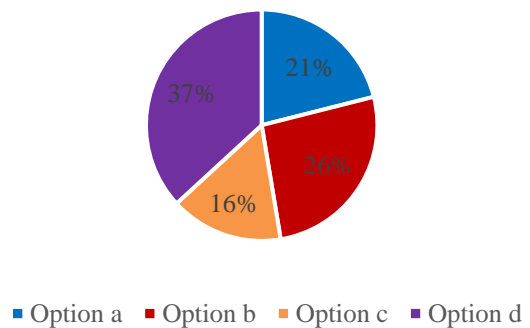
Teachers

The interview conducted with the teachers of the computer engineering academy was based on a brief questionnaire in order to obtain and determine whether the teaching strategies used by the teachers are in accordance with the learning style of the computer science students. The following are the questions and the results of the interview:

In the question: among the teaching strategies you employ in the classroom, do you include activities such as:

- a) Debates, deductions, planning dramas, planning experiments, problem solving, application of lessons to daily life, personal inventories, round tables, review.
- b) Dramas, case studies, program presentations.
- c) Small groups, mime, skits, creative writing (poetry, songs, stories, parables), posters, collages, sculptures, drawings, newsletters, decorations, art projects, narratives, etc.
- d) Topic presentation, seminar, lectures, organized reading, demonstrations, research, questions, quizzes, crossword puzzles, etc.

Results of Question 1

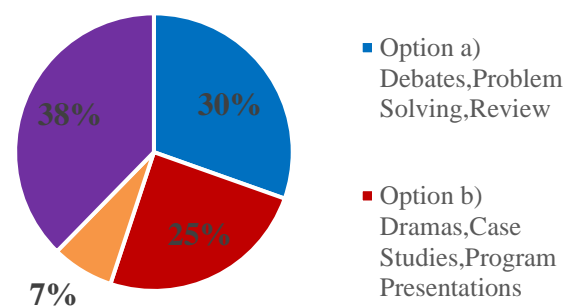


Graphic 5 Teaching strategies used by computer science teachers in the classroom.

As we can see in Graph 1, with a result of 37%, we determine that the teaching strategies most used by teachers in the area of computer science are: exposition of the subject, seminar, master classes, organized reading, demonstrations, research, questions, questionnaires and crossword puzzles; strategies that are used for the theoretical learning style (Jiménez, Vega, Capa, Fierro, & Quichimbo, 2019). It can also be seen that the strategies that teachers use the least are mimicry, staging, creative writing (poetry, songs, stories, parables), posters, collages, sculptures, drawings, newsletters, decoration, art projects and narratives (Jiménez, Vega, Capa, Fierro and Quichimbo, 2019).

Similarly, teachers were asked the following questions: Regarding the answer to the previous question, please describe the sequence of numbers that best represents your preference for activities when designing your class. The first three you mention will be represented as priority.

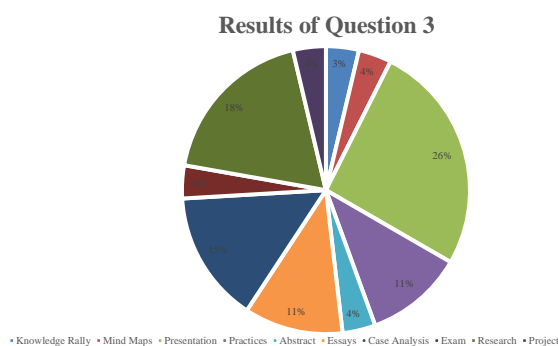
Results of Question 2



Graphic 6 Teaching strategies frequently used by computer science teachers in the design of their classes

The results are of interest since 38% of the teachers mentioned in the interview that among the activities they prefer to include as a priority in their didactic instrumentation are three. In first place is the exposition of the topics, in second place, investigations, and in third and last place, questionnaires. Activities such as mimicry, drawings and narrative are low in their consideration.

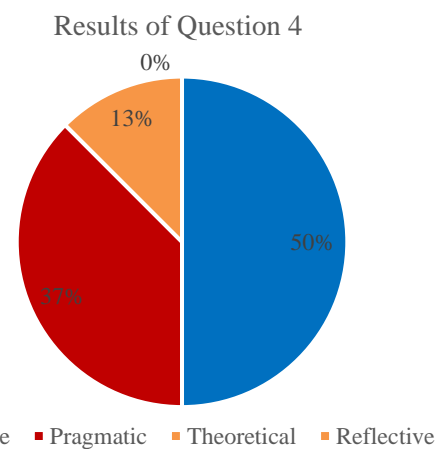
In the question: Describe the main teaching activities that you use most frequently with your students, the result was as follows:



Graphic 7 Main teaching activities used by computer science teachers

Twenty-six percent of computer science teachers mentioned that among the teaching activities they use the most with their students are presentations, with research in second place with 18% of preference and case analysis in third place with 15%. This last teaching activity is given so that students can exercise skills and explore the knowledge proposed as objectives in a class. It is a collaborative dynamic, in which the teacher previously prepares the case, taking into account not only that it is representative of a situation that students could face in the real world as professionals, but also that it can promote the achievement of the learning objective (De la Fe, Vidaurreta, Gómez and Corrales, 2015).

The next question asked in the interview was: Which learning style do you think predominates among your students? The results were as follows:



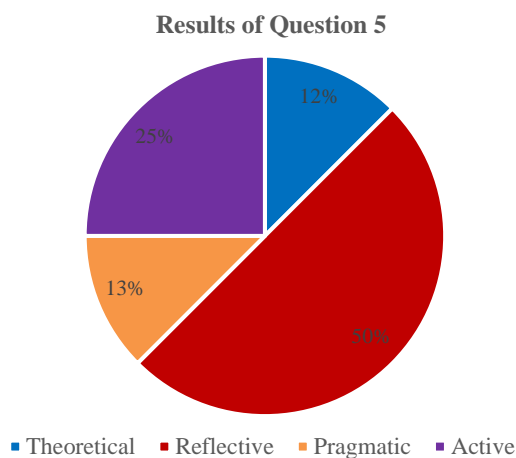
Graphic 8 Learning style of computer engineering students, according to the teachers of the computer science academy

Teachers affirm that computer engineering students are active learners. It is important to remember that active students are those who have an open mind, are enthusiastic and always with constant activities to perform (Araiza, Pérez, Jardines, Dörfer, Catilla & Vazquez, 2013). The teachers of the area do not consider that the students have a reflective learning style, hence no teacher mentions this type of learning.

And the final question of the interview was Of the following 4 options of learning styles that I will mention below, which one do you identify with the most?

- PRAGMATIC:** They like to look for and test new ideas, theories and techniques and see if they work in practice. They are immediately bored and impatient with long discussions, endlessly discussing the same idea.
- REFLEXIVE:** They tend to consider their experiences and opportunities from different perspectives, gather data, analyze them meticulously to arrive at solid conclusions. These people consider all possible alternatives before undertaking a task.
- ACTIVE:** Innovative, participative, active, protagonist, conversationalist, fun, leader, innovator, creative, novel, inventor, eager to learn, problem solver, experiential, vital, generator of ideas, competitive, willful, shocking, adventurous, renewer.

- d) **THEORETICAL:** They proceed by logical steps, so they adjust their observations and experiences to logical and complex theories. They tend to analyze, synthesize, seek rationality and objectivity in everything. For them, learning is finding the answer to the question: what?



Graphic 9 Which learning style do you identify with?

The graph shows, with a percentage of 50%, that the learning style with which the teachers of the computer engineering educational program identify themselves the most is the reflective one. Many of the teachers argued in the interview that they are people who enjoy collecting data, determining results and analyzing them in order to reach a conclusion.

Thanks

Thanks to the support of the teachers that make up the computer science academy of the TecNM Campus Tizimín for obtaining valuable information through the interviews, as well as the support of the students of the computer engineering educational program, for taking the time to answer each of the questions of the Honey-Alonso questionnaire.

Conclusions

Through this research it was interesting to discover that the learning style with the lowest percentage in the second, fourth and eighth semesters was the pragmatic one, the opposite of the sixth semester.

During the January-June 2022 school year, there was only one group per semester, but if in subsequent school years there were two groups per semester, it is important to consider obtaining results from both groups, even if it is the same semester. It is important to consider knowing not only by semester but also by group the learning style of each group.

From the results of the student surveys we can conclude that not all groups are the same. While it is true that we found three groups of computer science students with the same learning style, we also found a group different from the others. Obtaining the following results not only made us understand in a general way the importance of knowing the learning style that predominates in the computer engineering career, but also to discover in a more specific way the learning style that the students have by semester or groups.

The teachers were surprised to learn the results, because they never imagined that their students had a learning style in which they enjoy being observers and that, when interacting, they prefer to listen and let the other person talk. They are analytical students who first prefer to observe, review and meditate on their experiences.

Quite the opposite of what they thought, since students with an active learning style are usually the ones who take the initiative, the first to speak and act, considering the consequences afterwards.

It is important to remember that active learners are also those who have an open mind, are enthusiastic and always with constant activities to perform (Araiza, Pérez, Jardines, Dörfer, Catilla, & Vazquez, 2013). The teachers of the area did not consider that the students have a reflective learning style, hence no teacher mentioned this type of learning at the time of the interview.

It was also interesting to know that the students who are studying the specialty subjects are reflective learners, which means that they are students who think before acting, are receptive, analytical, observers and enjoy being taught through problem-based learning (Jiménez, Vega, Capa, Fierro and Quichimbo, 2019).

Problem-based learning is a very good teaching-learning method, centered on the student where the student acquires knowledge, skills and attitudes through situations or problems that could arise in real life or in their professional context in order to obtain the best solution (Luy, 2019).

Unfortunately, the teachers of the computer science academy do not consider this teaching strategy, which they can include very well with students with a reflective learning style and who at the same time are taking specialty subjects with topics and subtopics that address aspects of their professional work, as was the case of the eighth semester computer science group.

An attractive fact of this research was to discover that the teachers of the computer engineering academy identify themselves with the reflective learning style, which is very interesting to know, since computer science students have the same learning style as their teachers. However, teachers prefer to use different teaching strategies such as topic exposition, research and case studies, strategies that are commonly used for the theoretical learning style (Gutiérrez, 2018).

Undoubtedly, this research not only left an extremely important knowledge about how important it is to know the learning styles of our students in order for them to obtain an effective learning, but also how fundamental it is to know previously how they learn and once this is known, determine the teaching strategies to be used and translate it into the didactic instrumentation.

Many times we worry about carrying out the didactic instrumentation according to the times established by the quality management system, without considering the effectiveness that this will have, since unfortunately the instrumentation is done without previously knowing what the learning style of the group is, resulting in a strategy that in the long run will not contribute much in the classroom. Therefore, this research work undoubtedly provided knowledge that can later be used to improve the academic and administrative strategic processes of the Tecnológico Nacional de México Campus Tizimín.

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