

## **Personalisation Of The Learning Of The Administrative Process Through The Use Of Digital Resources Adapted To The Learning Styles Proposed By David Kolb**

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### **Abstract**

This study focused on exploring the learning styles of students enrolled in the National Learning Service (SENA) in Duitama, Boyacá, Colombia, in order to select digital educational resources that contribute to strengthen the learning of the administrative process. David Kolb's model and the CHAEA test were used to identify active, theoretical, reflective or pragmatic learning styles. Appropriate digital resources were categorized for each learning style. The methodology was mixed, including qualitative measures of participants' subjectivity. The results highlight the importance of adapting digital strategies and resources to improve educational quality in a personalized way, considering cultural, emotional, cognitive and personality factors. It is concluded that educators must adjust their pedagogical strategies and digital tools to address the diversity of learning styles, recognizing the inherent complexity of the educational process and the influence of multiple variables in the formation of students.

**Keywords:** Learning, Learning Styles, Kolb, Digital Resources

### **Introduction**

Learning about the administrative process, addressing aspects such as planning, Organisation, coordination and control in business areas, represents a challenge for many students. Despite its relevance in the academic and work environment, the teaching of this subject faces significant obstacles, especially when the didactic resources used by educators are not adapted to the individual needs of learners.

According to (Aguilera and Ortiza, 2010; García et al., 2012; Cipagauta, 2017) learning styles play a fundamental role in the educational process by allowing both teachers and students to structure teaching and learning activities more effectively. However, it is common for educators, faced with educational policies and time constraints, to neglect individual student learning differences. Hung et al. (2016) and Ullauri (2017) point out that this neglect is reflected in general assessments that do not take into account the particular learning styles of each student, nor the selection of didactic materials that allow understanding of the topics in the classroom.

In this sense, there is a need to reflect on how students learn and how educators can adapt their pedagogical practices to meet these individual needs. Rojas (2018) and Martínez et al., (2019) argue that it is important for teachers to ask fundamental questions about their students' performance and learning before starting the teaching-learning process. Questions such as "How do my students learn?", "Why do they learn and at what times?", "Why do some fail to learn at the desired level?", among others, are intrinsically linked to learning styles. These questions summarize the variability in the learning processes of each student and underline the need to consider learning styles as a key element in educational planning.

SENA students, like many others, face these difficulties when learning the administrative process. Although theoretically teachers rely on David Kolb's model in their educational approach when teaching, in practice, this model is rarely implemented during educational activities. This discrepancy between theory and practice provides a clear justification for the development of this research, which seeks to make educators aware of the importance of adapting their pedagogical methods to facilitate students' learning, taking into account their individual learning styles. It is essential to personalize teaching resources, especially digital resources, so that each student can make the most of those that best suit his or her learning process and integral development.

## Literature Review

The exploration of the literature in this study focuses on discerning learning styles within the educational environment and their impact on the holistic development of students.

### Conceptualisation of Learning Styles

According to research by Santrock (2006) and Zorrilla (2017), learning styles encompass the methods through which students develop their cognitive competences for the acquisition of knowledge and their response to the challenges present in educational environments. These styles can manifest themselves in different ways depending on the context, curriculum design, subject matter, level of interest and motivation of the learner in different areas of knowledge.

When exploring learning styles, we enter a terrain where the singularities that make up the personality of each individual are manifested. According to Salas (2004 cited in Lizcano, 2017), the learning process is presented as a phenomenon in constant evolution and change, where elements such as the ability to adapt to the environment and the notable intervention of neurobiology play an essential role in the acquisition of knowledge. This last argument is based on the role played by the brain in the handling of information through visual, auditory, kinaesthetic and tactile channels.

A comparative analysis of the relationship between personality types and learning styles by Given et al. (as cited in Salas, 2008) identified a strong correspondence between learning methods and academic performance. As a result, it was concluded that "the similarity between learning style and personality is clear, as both play an essential role as predictors of academic success in the educational context". It was therefore established that a number of personal factors can influence school performance.

In the same line of research, Curry (as mentioned in the work of Salas, 2008) underlines the significant relevance of positive student motivation, as it has an impact on successful academic performance and task engagement, aligning with mental processes, while taking into account the influence of environmental and social circumstances. From this perspective, it is evident that the particularities of each individual, as well as the environment in which learners develop, give rise to divergent thinking, varied ways of learning and disparate strategies in the process of acquiring knowledge. These processes generate patterns, models and ways of thinking and acting that shape their own style (Chen and Macredie, 2002; Salas, 2008).

According to Dunn et al. (1979), "learning styles correspond to a set of personal, biological or developmental characteristics that make a teaching method or strategy effective for some students and ineffective for others" (p. 5).

Based on the definition provided by Keefe (1988), learning styles are understood to be characterized by cognitive, emotional and physiological attributes that function as relatively stable indicators of how learners interact with, respond to and perceive learning environments. The cognitive component seeks to establish differences in the way people process and understand information, while aspects such as emotions, need to learn, motivation and expectations play an elementary role in acquiring knowledge. Meanwhile, physiological traits are linked to individual biological characteristics.

From the ideas presented by these authors, it is possible to conclude that the whole learning process is based on communication, an important aspect in this context. People not only have different perceptions, but also interact and respond in different ways in learning environments. Learning styles can therefore be seen as approaches to knowledge acquisition.

Within the framework of this research, the relevance of defining learning style is emphasized, given its ability to delineate the unique way in which individuals approach challenges and perform in emotional, cognitive and physical domains. This dimension is seen as a constant factor that illustrates how learners interpret, interact and respond in the educational environment. Consequently, based on these foundations, this study proposes a strategy aimed at the effective incorporation of Information and Communication Technologies, taking as a guide the taxonomy of learning styles proposed by David Kolb.

### Importance of Considering Learning Styles in Teaching Practice

Today, it is clear that there are different forms of learning that manifest themselves in different ways in individuals of different ages, as well as in individuals from different geographic and cultural backgrounds. These individuals tend to show preferences towards certain educational environments, pedagogical approaches and levels of structuring, aspects that correlate with their respective learning styles (Gallego and Alonso, 2012) and Diago (2018). Based on the authors' reflections, it is understood that each human being has an intrinsic uniqueness that is manifested in his or her process of acquiring knowledge. These distinctive characteristics are what shape and highlight their personalized learning style.

In education, it is crucial to highlight the importance that education reforms attach to the recognition of students' Learning Styles, as pointed out by Gallego and Alonso in their 2012 study. They persistently underline the need for educators to appropriately address the different learning styles that characterize students, as well as their preferences in terms of how they perceive, process and retain new information or acquire skills.

From a pedagogical perspective, as Gutiérrez (2018) and Fong et al., (2021) point out, it is common to find professionals who follow a fundamental premise, based on the idea of "teaching the way they would like to be taught". This pedagogical approach proves effective when applied to students who share a similar learning style to that of the teacher, but is insufficient to meet the needs of those whose learning styles differ significantly. In the field of higher education, from the researchers' point of view, an analysis of evaluations conducted by university students for the purpose of assessing their academic performance provided evidence to support the idea that when the student's learning style is aligned with that of the teacher, this often results in a more positive evaluation for the students themselves.

According to the explanations of Escurra (2011), Gallego and Alonso (2012) and this discovery makes it possible to establish two fundamental aspects related to the challenge of the learning process:

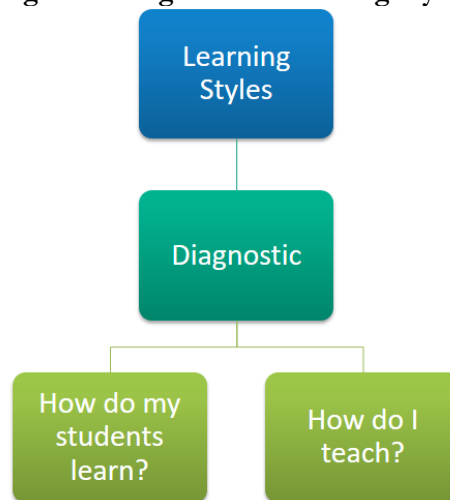
- Firstly, it can be seen that a teacher's pedagogical approach is strongly influenced by his or her personal learning style.

- Secondly, it is found that when students are exposed to teaching adapted to their own learning style, they experience greater receptivity and, as a result, an increase in their academic performance is observed.

Learning Styles represent a valuable tool for teachers, as they allow them to conduct a more technical and objective analysis of their students, thus going beyond simple observation and attention. In this context, these styles provide information about students' learning preferences, their level of need for direction and structure, as well as a deeper understanding of how they would prefer to be taught. Teachers can base their decisions on data regarding the selection of materials, the way information is presented, the individualization of learning, the creation of groups and subgroups, as well as the methods of work and assessment (Gallego and Alonso, 2012).

Given that each learner has his or her own uniqueness and each group of learners in a class shows a specific configuration, the analysis of Learning Styles emerges as an essential tool to define more precisely the objectives and approaches to be applied to these particular learners. Consequently, teachers should actively incorporate learning styles into their pedagogical approach, as they provide a detailed diagnosis of various aspects related to the learning process of learners, giving them a more complete picture of their identity in terms of their learning preferences.

**Figure 1. Diagnosis of Learning Styles**



Adaptation based on Gallego and Alonso (2012).

In analyzing the study by Camacho et al. (2012) and Gallego and Alonso (2012), the various ways in which the theory of learning styles can be applied by teachers in their pedagogical practice are demonstrated. It is clearly evident that the lack of alignment between the students' learning styles and the didactic resources employed can play a crucial role in the educational failure of learners. It is therefore necessary that the pedagogical design is enriched through a thorough analysis of the learning needs, which implies a thorough understanding of the predominant learning styles of the learners, as this variable has a significant influence on the shaping of the pedagogical design. This approach encompasses the selection of the content to be taught, the choice of the methodology to be applied and the regulation of the pace of teaching, all of which are harmonized with the learning styles identified.

In the same way, learning styles acquire a role of inescapable relevance for the teacher, as they provide guidance in the selection of the most appropriate didactic resources and technological tools according to the learning preferences of their students. The choice between the use of printed materials or technological and audiovisual resources in the educational process is subject to the inclinations derived from the students' unique ways of appropriating knowledge. Therefore, it is up to the teacher to discern which Learning Styles match each type of resource in each specific situation, in order to ensure an appropriate and efficient choice.

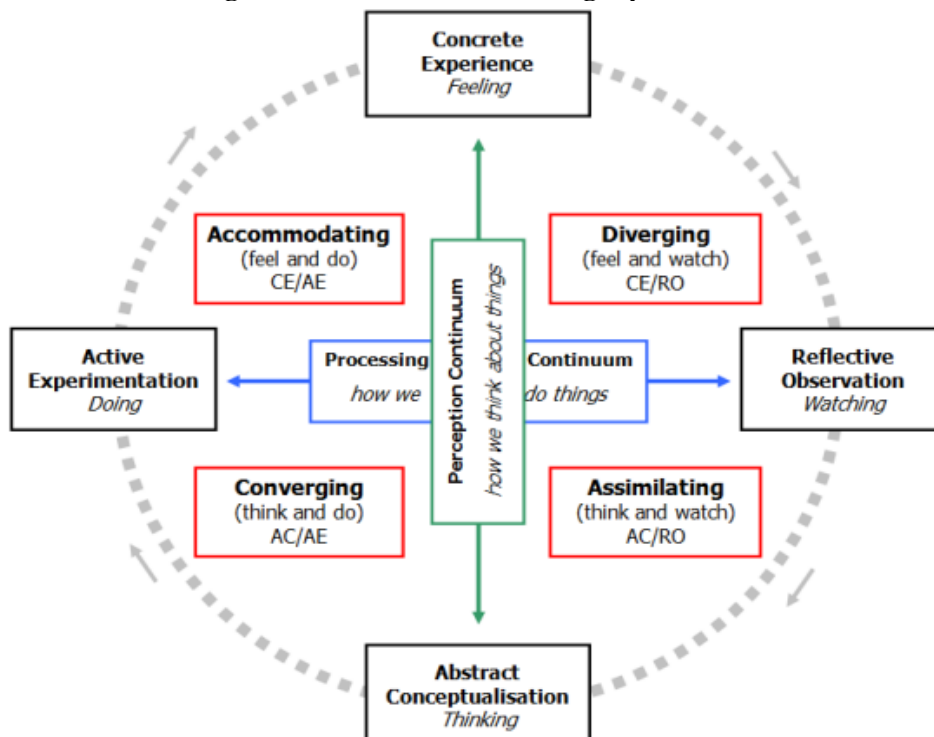
From the perspective of Alonso and Gallego (1994) and Altun and Serin (2019), in general terms, learning styles are characterized by being relatively constant in each individual. This implies that each person has his or her own preferences and learning styles, but these preferences can evolve throughout his or her educational and life trajectory. According to this view, it is a fundamental responsibility of the teacher to guide and enrich the learning style preferences of his or her students. To achieve this, one must begin by helping students to recognize their own learning styles and then provide them with the necessary tools to develop and master them. The ultimate goal is for students to acquire the ability to select and apply the most appropriate learning style according to the specific demands of each learning situation.

### Exploring the Learning Styles of David Kolb's Model

Different learning styles researchers recognise the significance of Kolb's theory, as they consider that this theory has served as a basis for a wide range of research, projects, theories and educational tools. According to Kolb's model, the learning process starts with a concrete and tangible experience, which is the starting point for observation and reflection (Kolb, 1976). These reflections are incorporated into a theoretical structure, giving rise to abstract concepts that can be applied in a general way, after confirmation of their implications in novel situations. These implications and assumptions lay the foundation for the creation of new experiences (Cipagauta, 2017).

Simultaneously, the model proposed by Kolb argues that the learning process starts from experience towards the construction of concepts, which in turn guide the experience of new situations (Undurraga, 2007) and Duque et al., (2018). Under this approach, four categories of students are identified according to their way of assimilating information and knowledge: active, reflective, theoretical and pragmatic, each with their distinctive features. From these categories, four interconnected phases are derived: action (active learner), reflection (reflective learner), theorization (theoretical learner) and experimentation (pragmatic learner), as illustrated in Figure 1. From these phases and categories, four learning styles are deduced: divergent (oriented towards imagination), accommodating (interested in new experiences), convergent (oriented towards the practical application of ideas) and assimilating (focused on theoretical and investigative aspects) (Aguilera and Ortiz, 2010) and Klačnja et al, (2011).

Figure 2: David Kolb's Learning Styles Model



Source: Kolb (2015)

From Kolb's (1976) perspective, the learning process begins with a tangible and specific experience, which serves as a starting point for observation and reflection. From these observations, a "theory" is constructed which gives rise to abstract concepts, enabling their implementation in new contexts. These consequent implications or hypotheses play the role of foundations for the creation of new experiences.

As a result, four different capacities are activated in the learning process:

1. The Faculty of Concrete Experience (CE), which involves immersing oneself fully in new experiences without prejudices or reservations.
2. The Aptitude for Observational Reflection (OR), which entails reflecting on these experiences and analyzing them from multiple perspectives.
3. Abstract Conceptualization Competence (AC), which encompasses the creation of novel concepts and the integration of observations into sound logical theories.
4. Competence in Active Experimentation Practice (AEP), which involves the use of these theories for decision making and practical problem solving.

Kolb (as cited in Cipagauta, 2017) posits that these four abilities are completely opposed to each other, and in learning, one must choose between them. These abilities constitute a two-dimensional model of learning that is composed of two fundamental aspects:

- Perception, which addresses how a person prefers to perceive and understand their environment, either through concrete or abstract thinking.
- Processing, which refers to how one chooses to process or transform the information one receives, choosing an active or reflective approach.

Kolb (1984) postulates that experiential learning progresses by transforming experience through a repetitive cycle consisting of four phases: concrete experience, observational reflection, abstract conceptualization and active experimentation. Because each person tends to prefer one of these phases, four specific learning styles are derived and described below:

**Divergent or pragmatic style:** According to the description provided by González et al. (2017), this style is characterized by the way in which the person perceives information through concrete experiences and processes it through reflective observation. This approach to learning is distinguished by imaginative agility, the ability to consider situations from multiple perspectives, the generation of ideas, an interest in human interactions and an active emotional response on the part of the learner.

In the divergent learning style, the learner demonstrates traits such as experimentation, practicality, efficiency, realism, technical orientation, usefulness, speed in decision-making, planning, a positive attitude, concreteness, objectivity, clarity, self-confidence, organization, keeping up to date, problem-solving skills, application of what has been learned, and action planning (Ullauri, 2017).

**Assimilationist or theoretical style:** This approach is characterized by its capacity for abstract conceptualization and its orientation towards reflective observation. Students who adopt this style are noted for their skills in theoretical modelling and inductive reasoning. They show a greater interest in abstract concepts compared to personal interactions (González et al., 2017).

In this type of learning approach, students excel in logical thinking, the ability to integrate observations into logically sound theories, and their pursuit of rationality, objectivity, precision and accuracy. Their thinking process is characterized by being sequential and step-by-step, coherently connecting scattered facts into theories. They have an affinity for analysis and synthesis of information, and their value system favours logic and rationality. They experience discomfort with subjective judgements, lateral thinking approaches and activities that lack clear logic. The central question they seek to answer through learning is "What is it" (Ullauri, 2017).

**Convergent or reflective style:** characterized by a capacity for abstraction and a focus on practical action. Individuals who adopt this style tend to seek concrete application of ideas, validate answers, solve problems and engage in logical reasoning, whether hypothetical or deductive. They often show a more objective approach, focusing on objects rather than people (González et al., 2017).

For the convergent or reflective learning style, learners exhibit traits such as detailed observation, data collection, patience, argument construction, anticipation of alternatives, behavioral study, research and the ability to write reports or statements. This style is characterized by slower processing, a detached and cautious attitude, and a preference for reflection before action. These individuals carefully analyze data before reaching conclusions and carefully consider all alternatives before making decisions. They tend to enjoy observing the performance of others,

listen carefully and prefer not to intervene until they fully understand the situation. This contributes to an environment in which they may appear aloof or condescending (Ullauri, 2017).

**Accommodating or active style:** As described by González et al. (2017), this learning approach is characterized by the perception of information through concrete experiences and its processing through practical action. Individuals who adopt this style are noted for their willingness to carry out plans, engage in new experiences, take risks and find solutions intuitively. They tend to rely on interaction with others and are comfortable in social settings.

In the context of accommodative or active learning, learners are characterized by their creativity, their inclination towards innovation, their adventurous spirit, their proactivity, their ability to generate ideas, their leadership, their active participation, their competitive spirit and their desire for constant learning. These individuals fully engage in new experiences without prejudice, maintaining an open mind and an enthusiastic approach to novel tasks (Ullauri, 2017). In addition, they value group interaction, are involved in the affairs of others and often take leadership roles in joint activities (Honey and Mumford, 1992).

Key learner characteristics in this learning style include meticulousness, logical thinking, objectivity, critical ability, structuring, discipline, planning, systematization, order, synthesis, reasoning, thinking, relating, striving for perfection, generalization, exploration of hypotheses, theories, models, questions, underlying assumptions, concepts, clear goals, rationality, motivations, value systems or criteria, inventiveness in creating procedures, and willingness to explore (Ullauri, 2017).

Undoubtedly, the analysis of Learning Styles presented in David Kolb's model offers a rich and versatile view of how individuals approach the act of learning. Divergent, assimilative, convergent and accommodative learning styles, each with their own distinctive characteristics, reflect the diversity and richness of approaches that people use to understand and apply knowledge. This provides a sound basis for educators to adjust pedagogical strategies and foster an educational environment that is enriching and effective.

## Materials and Methods

Johnson et al., (2007) propose a nested research approach, which integrates both qualitative and quantitative elements in data collection and analysis. In contrast, Creswell (1994) describes the mixed method as a paradigm that influences the philosophical assumptions and methods employed in research, merging qualitative and quantitative approaches at various stages of the research process.

Under this vision, the present study employed a qualitative approach to investigate the learning styles of the students of the SENA regional Boyacá - Centro de formación Duitama, capturing their perceptions, opinions and reflections. At the same time, a quantitative approach was used to assess students' learning styles using the CHAEA questionnaire, which is based on David Kolb's model.

In terms of the study design, a descriptive scope was followed, in accordance with Danhke's (1989) guidelines. This type of scope seeks to describe phenomena, situations or events in detail, highlighting their characteristics and manifestations. Within this context, the descriptive study focused on analyzing and exposing the different situations linked to the learning styles of the students of the SENA regional Boyacá - Centro de formación Duitama. Throughout the research, description was the main tool used to discern the particularities and learning choices of the participants.

## Unit of Study

The study was developed with students from the SENA regional Boyacá - Centro de formación Duitama, who formed the unit of analysis as they belonged to the programme Technology in Coordination of Logistic Processes. They were administered the CHAEA questionnaire created by Honey and Mumford to determine their learning style, with the purpose of developing a proposal aimed at the integration and use of digital resources adapted to the different learning styles identified, in order to improve the learning process in administration.

The criteria for the selection of the study unit are due to the fact that the study can also be classified as a field study, according to Hernández et al, (2014) for this type of study, the type of sample is non-probabilistic or directed, the choice of the participating subjects (teachers and students) does not depend on probability, but on causes related to the characteristics of the research or of the person making the sample, the procedure is not mechanical, nor based on probability formulas, but depends on the decision-making process of a person or a group of people, and of course, the samples selected obey other research criteria.

During this research, a field study was carried out without using statistical formulas to determine the sample. A census was carried out in which all sample subjects were included, including a teacher or tutor in charge of the selected group of students, as well as eighty students enrolled in the Logistics Process Coordination Technology programme.

The analysis focused on inquiring into the learning methods employed by the students participating in the study, in order to discern the prevailing approach based on David Kolb's theories. Likewise, the pedagogical and didactic strategies implemented by the tutors to meet the educational needs of the students were examined, adapting them to each learning style delineated by Kolb. The variable "learning styles" was used in order to delve deeper into the individual characteristics of the students during the process of knowledge acquisition.

### Study variables

In this study, the dependent variable "Learning Styles" was analyzed with the aim of characterizing the learning style of the students of the Logistics Process Coordination Technology programme. The aim was to establish whether students present active, reflective, theoretical or pragmatic learning styles in order to better understand their preferences and approaches to the learning process.

On the other hand, the independent variable "Classification and Integration of Digital Resources" was examined in order to determine which digital resources are best suited to each learning style identified. This analysis sought to identify effective strategies for integrating digital resources into the educational process, thus maximizing students' learning potential. The detailed operationalization of these variables is presented in table 1.

**Table 1. Operationalisation Study variables**

SCOPE	VARIABLES	INDICATORS	QUESTIONS	INSTRUMENT
Conceptual	DEPENDENT Learning styles	Characteristics of learning styles according to David Kolb	What is the learning style of the students of the Logistics Processes Coordination Technology programme offered by the SENA Duitama training center?	CHAEA test
		Activities that favour each learning style		
Investigative	INDEPENDENT Classification and integration of digital resources	Relationships of teaching resources and students' learning styles	How do students perceive the use of ICT to strengthen their learning style?	Student survey
		Using ICTs as a resource for mediating learners' learning styles		

### Stages of the research

The study was divided into three phases in order to fulfil the objectives set and address the reality of the study environment.

During the first phase, an evaluation of the learning styles of the students enrolled in the programme of Technology in Logistics Processes Coordination of the SENA regional Boyacá - Centro de formación Duitama was carried out. For this purpose, the CHAEA questionnaire was used, based on David Kolb's theory, which was administered online to eighty students through a digital platform. This procedure made it possible to identify the different learning styles present among the participants.

In the second phase, digital resources were categorized according to the learning styles previously identified. A collaborative learning wiki site was designed and put into operation, where both students and tutors had the opportunity to delve deeper into the learning styles and access activities and technological resources adapted to each style. This space provided relevant information, explanatory videos and recommendations for ICT resources to enhance the learning process for students, taking into account their individual characteristics.

The third phase adopted a qualitative approach to examine the relevance of learning styles and the use of ICT as educational tools. Surveys were conducted with tutors and students in order to explore their experiences and perceptions of learning styles and the integration of ICT in the educational process. In addition, observation records were kept in the form of a field diary to complement the reflections and opinions gathered. This qualitative analysis allowed for a deeper understanding of the impact of learning styles on teaching and the role of ICT in this context.

## Results

The results presented derive from the estimation of the learning styles variable, which was measured through the application of the CHAEA test, as well as the application of a survey of SENA students, which was applied to investigate aspects of the pedagogical process related to learning styles.

### Results phase one - diagnosis

For the data collection a session was coordinated during the first semester of 2023. The instrument used was the CHAEA questionnaire, consisting of 80 dichotomous response items which are equally distributed into: Active style, reflective style, theoretical style and pragmatic style, in relation to the validation of the questionnaire in 2007 the authors themselves Honey and Alonso, cited in Jara (2010) with the use of Cronbach's alpha found the reliability of the questionnaire, the indices were active style 0.74578, reflective style 0.78633, theoretical style 0.8267 and pragmatic style 0.74578. The items are randomly distributed to form a single set. The score obtained by the subject with respect to the learning styles indicates their degree of preference according to the scale proposed by Alonso (Table 2). It is worth mentioning that the data collection was carried out during class hours and in the physical spaces of the SENA regional training center.

**Table 2. Preference measurement scale according to Alonso et al. (1995)**

	Preference				
	<u>Very Low</u>	<u>Low</u>	<u>Moderate</u>	<u>High</u>	<u>Very High</u>
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 - 15	16 - 20

Source: (Own elaboration, based on Alonso et al. (1995).

The CHAEA questionnaire consists of 20 items for each learning style, with dichotomous yes/no questions. Students select their responses according to their preferences, and items marked "yes" are identified to determine the predominant learning style. The assignment of the preference rank is based on these affirmative items, which allows the most appropriate learning style to be determined. Table 3 presents the questions assigned to each learning style.

**Table 3. Questions by learning style according to Alonso et al. (1995)**

Learning Style	Questionnaire Questions
<b>Active</b>	3, 5, 7, 9, 13, 20, 26, 27, 35, 37, 41, 43, 46, 48, 51, 61, 67, 74, 75, 77
<b>Reflective</b>	10, 16, 18, 19, 28, 31, 32, 34, 36, 39, 42, 44, 49, 55, 58, 63, 65, 69, 70, 79
<b>Theoretical</b>	2, 4, 6, 11, 15, 17, 21, 23, 25, 29, 33, 45, 50, 54, 60, 64, 66, 71, 78, 80
<b>Pragmatic</b>	1, 8, 12, 14, 22, 24, 30, 38, 40, 47, 52, 53, 56, 57, 59, 62, 68, 72, 73, 76

Source: (Own elaboration, based on Alonso et al. (1995).

The Shapiro-Wilks test was used to assess the normality of the data. The results indicated that the active, reflective and pragmatic learning styles show an asymmetric distribution, while the theoretical style shows a normal distribution. Details are presented in Table 4.

**Tabla 4: Pruebas de normalidad (Shapiro-Wilk) de los puntajes obtenidos en los estilos aprendizaje**

Learning styles	Significance
Active	0.01878
Theoretical	0.2379
Reflective	0.01344
Pragmatic	0.0303

Source: (Own elaboration) \*Significance value  $p < 0.05$

On evaluating the averages of the learning styles among the students included in the research (see Table 5) and analyzed according to the established scale (see Table 2), a marked inclination towards the reflective style is evident, with a preference classified as "high". On the other hand, the theoretical, active and pragmatic styles have a degree of preference considered as "moderate" (see Table 6).



**Tabla 5. Medidas de tendencia central estilos de aprendizaje**

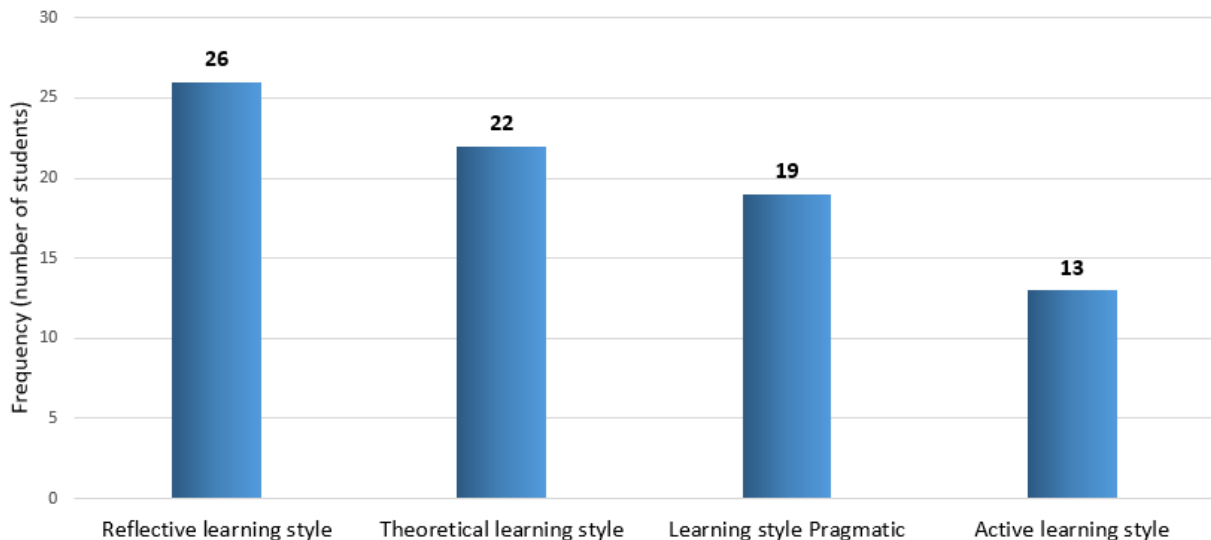
Type of Apprenticeship	Media	Moda	Mediana	Standard deviation	Range	Minimum value	Maximum value
Active	11.82	10 11	11	2.804	12	6	18
Reflective	18.79	12	14	4.013	14	5	19
Theoretical	13.19	15	13	2.851	13	6	19
Pragmatic	13.18	16	13	2.666	15	5	20

Source :(own elaboration R software)

**Table 6. Learning styles diagnosed in students**

Learning style	Mean / Standard deviation	Degree of preference
Active	11.82 / 2.804	Moderado
Theoretical	13.19 / 2.851	Moderado
Reflective	18.79 / 4.013	Alto
Pragmatic	13.18 / 2.666	Moderado

Source :(own elaboration R software)

**Figure 3. Diagnosed learning styles Preference Learning styles**

Source: (Own elaboration)

According to the analysis carried out, 32.5 % of the individuals participating in the research (n=26) exhibit a reflective learning style, while 27.5 % (n=22) show a theoretical approach in their way of learning. On the other hand, 23.75% (n=19) present a pragmatic style, and 16.25% (n=13) evidence an active learning style. Each of these styles has its own characteristics, which are detailed in Table 7.

**Table 7. Characteristics of each learning style.**

Active	Reflective	Theoretical	Pragmatic
Animator	Weighted	Methodical	Experimenter
Improviser	Conscientious	Logical	Practical
Discoverer	Receptive	Objective	Direct
Risk-taker	Analytical	Critical	Effective
Spontaneous	Thorough	Structured	Realistic

Source: (own elaboration)

### Results phase two - categorization of digital resources

During the second stage of the research, digital resources were categorized according to the learning styles identified in the diagnostic phase. To facilitate this process, a collaborative learning wiki site was designed and implemented,

where both students and tutors had the opportunity to delve deeper into the learning styles and access activities and technological resources adapted to each style.

Based on the results of the first stage, it was observed that participants exhibited different learning style preferences. Each of these styles has particular characteristics that influence the way students assimilate and process information.

- **Active learning style:** Students with this learning style are spontaneous, lively, improvisational, and enjoy direct experimentation. They prefer to learn through action and active participation.

To meet the learning needs of active learners, digital resources that encourage interactivity and direct participation were selected. An online collaborative learning platform was chosen, which allows students to engage in real-time discussions, collaborate on group projects and share ideas interactively. In addition, interactive simulations were included to provide virtual environments where students can experience practical situations and make decisions in real time. These digital resources were selected with the aim of providing dynamic and stimulating learning experiences that align with the learning preferences of active learners.

- **Reflective learning style:** Learners with this style are thoughtful, conscientious, receptive and analytical. They prefer to take time to reflect and analyze before acting.

Based on these characteristics, for students with a reflective learning style, digital resources that encourage self-reflection and critical analysis were selected. These included online discussion forums, which provide a space for students to reflect on specific topics and share ideas and perspectives. The use of digital learning journals, which allow students to record their reflections and learning experiences privately, was also suggested. These digital resources were selected in order to provide opportunities for reflection and self-assessment, thus promoting deeper and more meaningful learning.

- **Theoretical learning style:** Students with a theoretical learning style are methodical, logical, objective and critical. They prefer to explore theories and abstract concepts in a structured and systematic way.

Therefore, digital resources that facilitate the exploration and understanding of abstract concepts were selected for this group of students. These included digital libraries and academic databases, which offer access to a wide range of academic resources, including books and research articles. The use of concept maps and interactive graphic organizers, which help students visualize and organize complex information, was also suggested. These digital resources were selected to provide opportunities for exploration and critical analysis, thus promoting deep and reflective learning.

- **Pragmatic learning style:** Learners with this style are experimental, practical, direct and realistic. They prefer to learn through practical application and concrete problem solving.

For students with a pragmatic style, digital resources were selected that encourage the practical application of the concepts learned. These included case studies and practical exercises, which provide real-world situations that students can analyze and solve. The use of business simulation tools, which allow students to simulate business management and make strategic decisions in a virtual environment, was also suggested. These digital resources were selected with the aim of providing opportunities for the practical application of knowledge, thus promoting meaningful learning.

Overall, the selection of digital resources was based on the characteristics and preferences of each learning style, in order to provide effective and meaningful learning experiences that align with the needs of students, as it is essential that educators recognize the diversity of learning styles present in the classroom and provide didactic alternatives adapted to each of them. This can enable students to appropriate knowledge more effectively and develop skills relevant to their academic and professional training.

### **Results Phase three - relevance of learning styles and ICT use**

In the final phase of the study, a qualitative approach was used to explore the relevance of learning styles and the use of ICT as an educational tool. Surveys were conducted with students to investigate their perceptions and experiences in relation to learning styles and the integration of educational technology in the educational process. Specifically, an opinion survey was applied to the students involved in the study. This survey made it possible to determine the students' perception of the use of ICT as a mediation tool in their learning process. Subsequently, an open, axial and selective coding of the data collected was carried out using AtlasTi software, which led to the identification of emerging categories and subcategories.

The emerging categories obtained from the axial coding process were as follows:

- **Category - More interactive and active classrooms for learning**

The students clearly expressed their longing for a change in the dynamics of the classroom. They want to be more than mere recipients of information; they want to be active participants in the construction of their own knowledge. The implementation of ICT is seen as an opportunity to achieve this transformation. Some students mentioned that traditional classes, where the teacher transmits knowledge in a unidirectional way, can be monotonous and unmotivating. However, the use of ICTs opens up the possibility of more dynamic and participatory learning. For

example, the possibility of interacting with multimedia content or participating in online discussions allows them not only to receive information, but also to actively question and explore it.

In addition, the importance of fostering a collaborative environment where students work together in the construction of knowledge was highlighted. ICT offers tools to facilitate this collaboration, such as online learning platforms or collaborative work applications. Students value the opportunity to share ideas, discuss concepts and collaborate on group projects, which allows them not only to learn from their peers, but also to develop teamwork and communication skills.

#### - **Category - Peer support**

Students highlighted the importance of mutual support among peers and with teachers in their learning process. The integration of ICT is seen as an opportunity to strengthen these relationships and generate a more collaborative and supportive working environment. For example, online communication tools allow them to be in constant contact with their peers and teachers, facilitating collaboration and the exchange of ideas.

In addition, it was mentioned that ICT can contribute to improving the relationship between students and teachers by providing more accessible and efficient communication channels. Students value the possibility of receiving feedback and guidance from teachers in a more personalized and timely manner, which allows them to feel more supported and motivated in their learning process.

#### - **Category - Knowledge Construction**

Students expressed their desire to be the protagonists of their own learning and to have the opportunity to explore and construct knowledge in an active and autonomous way. They consider that ICT offers tools and resources that enable them to do this construction in a more effective and meaningful way. For example, online learning platforms provide them with access to a wide variety of educational resources, such as videos, articles and simulations, which allow them to explore different topics and approaches in a more in-depth and personalized way.

In addition, the importance of developing cognitive skills such as creativity, critical and reflective thinking through interactive and participatory activities was highlighted. ICT offers opportunities to develop these skills by allowing students to explore and experiment with different ideas and perspectives, and by providing them with immediate feedback on their learning process.

#### - **Category - Interactive Learning**

Students recognized the transformative potential of ICT in the educational process. They valued the diversity of digital resources available that allow them to learn in a more active and personalized way. For example, they mentioned that simulations and educational games allow them to experience practical situations and make decisions in a controlled environment, which helps them to understand abstract concepts and apply them in real situations.

In addition, they stressed the importance of diversifying the digital resources available to suit their different learning styles and preferences. For example, some students prefer to learn through videos or animations, while others prefer to read texts or participate in hands-on activities. ICT offers a wide variety of resources and tools that allow students to choose the learning method that best suits their needs and preferences.

The results of this stage show the importance of integrating ICT effectively into the educational process to promote more active, collaborative and meaningful learning. The students expressed their interest in using ICTs as mediation tools to improve their learning process and develop relevant skills for their academic and professional training. However, the importance of ensuring a responsible and ethical use of ICT, as well as providing adequate support and guidance to students to maximize the benefits of these tools in their learning process was also highlighted.

### **Discussion**

The research focused on the personalization of learning in the administrative process through the adaptation of digital resources to the learning styles proposed by David Kolb, aimed at students enrolled in the National Learning Service (SENA) in Duitama, Boyacá, Colombia, in the Logistics Process Coordination Technology programme.

The results of the characterisation stage reveal that a significant percentage of participants exhibit varied learning styles: 32.5% have a reflective style, 27.5% a theoretical approach, 23.75% a pragmatic style and 16.25% an active style.

Based on these results, digital resources adapted to the identified learning styles were selected. For example, for students with an active style, an online collaborative learning platform and interactive simulations were chosen. For those with a reflective style, online discussion forums and digital learning journals were suggested. For students with a theoretical style, digital libraries and interactive concept maps were proposed, while for pragmatists, case studies and business simulation tools were recommended.

It is essential to highlight the relationship between learning styles and learning resources, especially in the context of Information and Communication Technologies, as the latter offer a wide range of resources that can be adapted

to different learning styles, allowing for greater personalization of the educational process (Hwang et al., 2013). Educators play a key role in the selection of these resources, as they must take into account the individual needs of each student and offer a variety of options that integrate different learning styles.

Educators must attend to students based on their needs and, particularly, on their learning style Gallego (2013). This involves recognizing the diversity present in the classroom and adapting teaching strategies and educational resources to meet the individual needs of each student. It is important that educators do not limit themselves to offering resources tailored to a single learning style, but provide a variety of options that integrate the full range of learning styles: active, reflective, pragmatic and theoretical.

In this line, different researchers support the importance of adapting educational resources to students' learning styles. For example, Bromley (2013) highlights the role of ICT in personalizing learning, while Acosta (2016) highlights the need for educators to adapt to students' preferences and technological skills in order to improve the educational process.

In the specialized literature, the importance of adapting educational resources to students' learning styles has been highlighted. According to Zapalska (2002), students have different cognitive abilities and information processing styles, suggesting that a uniform approach to teaching may leave certain students behind. Therefore, careful selection of educational resources that align with diverse learning styles becomes a pedagogical imperative. Furthermore, authors such as Avendaño et al., (2021) have emphasized the need to integrate learning experiences that address both the cognitive and experiential dimensions of the learning process, which reinforces the idea that a variety of educational resources is essential to cater for the different ways in which students construct their knowledge.

In line with these theoretical approaches, educators play a key role in identifying and implementing educational resources that match the learning styles present in the classroom. As Navarro (2008) points out, teachers act as mediators between knowledge and students, and therefore have a responsibility to provide a learning environment that is sensitive to the individual needs of each learner. This involves not only recognizing the diversity of learning styles, but also designing teaching strategies that promote active participation and personal reflection. Ultimately, by offering a range of learning options and opportunities, educators can foster an inclusive and nurturing environment that enables each student to reach his or her full academic and professional potential.

Ultimately, the selection of educational resources adapted to students' learning styles is fundamental to ensuring effective and meaningful learning. Educators must play an active role in this process, recognizing the diversity of learning styles present in the classroom and offering a variety of options that integrate the different styles. This is the only way to ensure that each student receives the attention and support they need to reach their full academic and professional potential.

## Conclusions

After a detailed analysis of the learning styles of the sample students and the selection of digital resources adapted to these styles, the conclusions drawn from this study provide insight into the importance of adapting educational resources to students' learning styles. The emerging results support the premise that the diversity of learning styles in the classroom requires differentiated attention to ensure effective and meaningful learning for all learners.

First, it has been confirmed that students possess a variety of learning styles, reflecting Kolb's theory. This diversity of learning styles highlights the need for educators to recognize and respond to the individual learning preferences of their students.

The study has also shown that the careful selection of educational resources adapted to learning styles can significantly improve the teaching and learning process. By offering a variety of options that integrate different learning modalities, educators can encourage students' active participation and engagement, which in turn contributes to better academic performance and personal development.

Similarly, the crucial role of educators as mediators of learning, as proposed by Kolb's theory, has been highlighted. Teachers must not only recognize the diversity of learning styles, but also design teaching strategies that promote the active construction of knowledge and personal reflection.

Ultimately, these findings underline the importance of adopting an inclusive and differentiated pedagogical approach that takes into account the individual needs of each student. Doing so not only ensures that each student receives the attention and support needed to reach their full academic and professional potential, but also promotes a culture of respect, diversity and equity in the educational environment.

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