

A learning styles comparative study from high level students of face-to-face and distance education

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Abstract

This paper compares the dominant learning styles in the high level students from face-to-face and distance education modalities. It understands the learning style as something proper to the individual, because it defines how the students elaborate the construction of knowledge in their cognitive structure. The students learning styles identification is relevant to the teachers because, as mediators, they can direct the strategies that best contribute to the process of teaching and learning. Considering the distance education expansion it is necessary to evaluate which learning styles are prevalent among students of this modality, by this reason the central issue of this investigation is in the scope of comparative education, seeking to observe the particular learning styles from students of these two modalities. This is a quantitative approach research that uses as a data source a field research, conducted in an intentional and non-probability sampling, composed of post graduating students from face-to-face and distance education and using the questionnaire developed by Felder and Silverman as a data instrument collection. The study concludes that in both groups of students there is a predominance of the active, sensitive, visual and sequential learning style, revealing the urgency of changes in the strategies of teaching and learning towards a meaningful learning.

KEY WORDS: Learning styles; High level; Face-to-face education; Distance education

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Resumen

Estudio comparativo de estilos de aprendizaje de estudiantes de enseñanza superior de educación presencial y a distancia. El presente artículo compara los estilos dominantes de aprendizaje de estudiantes de enseñanza superior en las modalidades presencial y a distancia. Comprende el estilo de aprendizaje como algo propio del individuo, porque define cómo los estudiantes desarrollan la construcción del conocimiento en su estructura cognitiva. La identificación de los estilos de aprendizaje es relevante para los profesores porque, como mediadores, pueden orientar las estrategias que contribuyen mejor al proceso de enseñanza y aprendizaje. Considerando la expansión de la educación a distancia es necesario evaluar qué estilos de aprendizaje son prevalentes entre los estudiantes de ambas modalidades, por este motivo el punto central de esta investigación busca observar los estilos de aprendizaje particulares de estudiantes de estas dos modalidades. Este es un enfoque de abordaje cuantitativo, que utiliza como fuente de datos una investigación de campo, conducida por medio de muestreo intencional y no probabilístico, realizado por estudiantes de post-graduación de enseñanza presencial y a distancia, utilizando el cuestionario desarrollado por Felder y Silverman como instrumento de recolección de datos. El estudio concluye que en ambos grupos de estudiantes existe un predominio del estilo de aprendizaje activo, sensitivo, visual y secuencial, revelando la urgencia por cambios en las estrategias de enseñanza y aprendizaje hacia un aprendizaje significativo.

PALABRAS CLAVE: Estilos de aprendizaje; Enseñanza superior; Educación presencial; Educación a distancia

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Introduction

One of the ultimate purposes of the teaching institutions is to develop in the students the necessary academic competences for such area of education, stimulating the acquisition of knowledge, development of abilities and attitudes preconized by teaching plans, either in early childhood, primary, secondary and higher education. In effect, national and international performance exams of students attempt to evaluate the competence attained by the students graduating from educational systems and, consequently, also evaluate the success of the institutions and of the entire educational system.

In view of the above, it is fundamental that the teaching and learning process occurred in the classroom environment and in the whole process of mediation by the teacher be effective, because to the contrary a successful outcome in attaining the required competences will be difficult. In this perspective, it is of utmost importance that the teachers understand the learning styles of their students and implement pleasurable and instigating teaching techniques which make the whole knowledge construction process of the students easier.

With the growing expansion of higher education, in the face-to-face and distance education modalities, the higher education institutions do not measure efforts to assure the Development of the competences preconized in their study plans. Nevertheless, frequently the teachers use teaching plans that perpetuate through the years, not considering the specificities of the Learning styles of the students or groups of students, either in the face-to-face or distance modalities.

In this manner and considering the continuing expansion of distance education the present article has the purpose of evaluating the prevailing learning styles in this modality of education

and compare them to the styles of students in face-to-face modality, with the aim of identifying similarities and differences in order to subsidize the teaching practice in the pedagogical mediation process.

From a methodological point of view, this is an investigation with a qualitative approach, operationalized by means of an exploratory and descriptive research, and the collection of information contemplated both a literature review as well as a field investigation, in the scope of the compared education. The field research was performed with a non-probabilistic sample of 221 students, of which 104 post-graduate *lato sensu* students in a face-to-face course and 117 post-graduate students in a distance course, all of which proceeding from the same private Brazilian higher education institution. The Felder-Silverman model ILS – Index of Learning Styles was used as a data collection instrument for researching and mapping the predominant Learning styles.

This investigation is justified by the necessity of understanding the predominant styles of learning in the case of post-graduate students in face-to-face and distance modalities, with the aim of finding alternative teaching methodologies contemplating the specificities, transforming the teaching and learning process into a pleasurable and significant process both for students as well as for teachers.

Theoretical Framework

The learning styles have been defined as a manner in which the students, or group of students, prefer to conduct their process for knowledge construction. Montgomery & Groat (1998) comment that the understanding of these learning styles has been fundamental for an individualized approach of teaching in its pedagogical practice.

De Bello (1990) comments that there are many theories and definitions for learning styles, with similar terms and distinct methods, nevertheless, after a historical retrospect of various theoretical contributions the author proposes a comprehensive definition, being, “learning style is the way people absorb, process, and retain information” (DeBello, 1990, p. 1).

In relation to the understanding of the learning styles as a possibility of feedback for the teaching practice, Kuri (2004, p. 7) clarifies that:

[...] in the measure in which the teacher becomes aware of the fact that each student has his/her own manner of learning and of relating, the teacher begins to promote a manner of teaching guided by these parameters, using strategies to promote a more efficient and long-lasting learning experience.

Important contributions are also supplied by Felder and Silverman (1998) when they state that the benefits to the students is a direct result both of the ability of correlating their prior knowledge, as well as the compatibility of their learning styles with the teaching styles of their teachers. The authors point out that when there are incompatibilities among the learning and teaching styles the students tend to become unmotivated and disgruntled in relation to the curriculum and the course and, also, the teachers may become over critical in relation to their students.

According to Almeida (2010) the concepts of the learning styles and its models are based on one or more theories of the learning psychology. For example, Carl Jung’s theory of psychological types is used as a model for the Myers-Briggs model of learning styles; on the other hand, Jean Piaget and Lev Vygotsky’s cognitive theories for processing information were the basis for the Kolk, Felder-Silverman models and Godon Allports’ theory of personalities is supported by the models proposed by Gregorc and Ford. Despite the specificity of its theoretical genesis, all the concepts on learning styles converge to the central idea of creating a “set of conditions by means of which the individuals concentrate, absorb, process and transfer an information into knowledge, namely, there are certain

preferences in the form of absorbing, organizing and transforming the information making it easier to be understood" (Almeida, 2010, p. 40).

In this manner, although literature points out to the existence of over fifty (50) different models describing learning styles, all supplying subsidies for understanding how the learning process occurs, in other words, the preferential form in which people perceive and process information, transforming it into knowledge. The learning styles that the mentioned models present should not be approached as bad or good, but as the preference of the educator to organize and control the process of construction of knowledge (Pereira, 2005).

Despite the elevated quantitative of existing models, it can be observed in literature the ample use of some of the models frequently used in the research of learning styles in the educational area, for example, Kolb (1984), Myers and Briggs and the Felder & Silverman (1988) model.

In the process proposed by Kolb (1984) learning occurs as of the perception and processing of information. The individual realizes the information by means of concrete experiences (listening, speaking, reading etc.) or abstract (preparation of mental concepts) once the processing requires an active experience, namely, reflect or do something with the information obtained. From these two dimensions the proposal of learning styles of the author are originated, these being, type I – divergent (concrete and reflective); type II – assimilating (abstract and reflective); type III – convergent (abstract and active) and type IV – accommodating (concrete and active). In order to map the learning styles preferences the Kolb method uses the LSI – Learning Style Inventory questionnaire composed of 48 questions subdivided into 12 items that remit to one of the learning styles proposed by the model (Almeida, 2010).

Lopes (2002) investigated the results obtained using the Kolb model with the application of the LSI instrument and concluded that in different situations fragile correlations were observed in relation to the cognitive performance measures and the significance of learning, evidencing, therefore, limitations that the LSI presents in the explanation of the variation of learning styles, despite its significant contribution in relation to the reflection of the learning process.

The model preconized by Myers and Briggs sustains that the learning styles of people are a reflection of the psychological types delineated by Carl Jung, resulting in four dimensions, these being, referral to life (extroverts versus introverts), perception (sensing versus intuitive), judgment of ideas (objective versus subjective), referral to the external world (judging versus perceptive). The authors developed the MBTI- Myers-Briggs Type Indicator, a questionnaire that determines the learning style preferences, composed of 72 dichotomous and of easy on-line access (Almeida, 2010). Additionally, Lopes (2002) and Pereira (2005) indicate that the MBTI is widely used by educators to verify the psychological types, with the purpose of solving problems, construction of teams and academic counseling, etc.

The dimensions of the learning styles in the Felder and Silverman (1988) proposal are related to the form of absorbing, perceiving, organizing, processing and understanding the information by the individual. The Felder-Silverman model was originally prepared to be applied in students of engineering, nevertheless it is possible to be applied to other areas of knowledge, because it encompasses four dimensions common to the learning practices preconized by the authors: perception (sensing or intuitive), input (visual or verbal), processing (active or reflective) and understanding (sequential or global).

In the Felder-Silverman model the first dimension relates to the preference of perception of information, contemplating the sensing versus sensitive: the sensing perceive more easily the external signals, sounds, physical sensations and the intuitive are more attend to the insights from specific information and have the capacity of interpreting symbols ad texts more quickly than the sensing types (Felder & Silverman, 2008; Almeida, 2010).

The second dimension of the Felder-Silverman denominated visual versus verbal reminds us to the preference for capturing information, this being, visual people intake information in a better way in the form of diagrams, outlines, flowcharts, sketches, demonstrations while the verbal students prefer to capture the information by means of the listening channel, for example, the spoken word, sounds, etc. (Felder & Silverman, 2008; Almeida, 2010).

In its third dimension, the Felder-Silverman includes the preference in the processing the information, this being, in the active versus reflective manner, because while the active student process in a better manner the information through experimenting, executing some activities, they prefer to understand to experiment, they take a while to initiate activities and prefer individual work (Felder & Silverman, 2008; Almeida, 2010).

The Felder-Silverman model, in its fourth dimension, points out to the preference in the form of understanding, namely, global versus sequential, understanding that the global student needs the vision of the whole content to understand, while the sequential model learns better when the contents are presented in a linear manner (Felder & Silverman, 2008; Almeida, 2010).

Table 1: Cognitive Learning Styles of the Felder – Silverman model

Dimension	Learning Styles	Description and indication of teaching styles
Processing	Active	Learn through active experimenting, understand the information more efficiently through discussion and application of the concepts.
	Reflective	Need some time alone to think and reflect on the information obtained.
Perception	Sensing	Prefer to deal with concrete situations, information and experiments
	Intuitive	Intuitive are innovators, like to deal with concepts, theory and abstractions.
Intake or Fomenting (Input)	Visual	Learn more easily through figures, diagrams, flowcharts, films and demonstrations.
	Verbal	Understand better the information transmitted by means of words.
Understanding	Sequential	Learn better when the concept is expressed in a continuous manner of difficulty and complexity.
	Global	Multidisciplinary, learn in great leaps, dealing randomly with the contents.

Source: Adapted from Felder & Silverman (1988); Dias, Gasparini & Kemczinski (2009)

Table 1 summarizes the dimensions of the learning styles proposed by the authors Felder & Silverman (1988) correlating them to possible teaching styles. With the purpose of mapping the learning styles the Felder-Silverman model uses the ILS – Index of Learning Styles questionnaire, easily accessed on-line. The questionnaire deals with the four dimensions of learning styles and totals forty-four (44) questions, of which eleven (11) for each one of the dimensions.

According to Felder & Silverman (1988) the styles are not convergent, and must first be considered as poles that complement each other to originate a dimension of information. In this manner, the individuals have all the styles with different intensities, and as abilities to be developed, being the educator's responsibility to prepare teaching plans that explore the preferred learning styles of the students as well as permitting the development of the non-preferred styles. According to Almeida (2010, p. 47), this "vision of the styles admits that all the individuals have the same capacities and, therefore, does not place the individual into rigid and pre-established categories".

Despite the ample use of the approaches of the learning styles in the educational area it is necessary to recognize that its application is not universally accepted in literature, once some psychologists

and educators argue that these models do not have any theoretical bases and its instruments lack the appropriate validation. Nevertheless, refuting such arguments we have the studies of Zywno (2003) with the validation of the Felder-Silverman model, as well as the investigation of Felder & Spurlin (2005) demonstrating the convergences and validations of the MBTI, Kolb and Felder-Silverman models. It can be observed in these validation studies, that the authors state with unanimity that such models present an alternative for the teacher to adapt the classes to the students' different forms of learning (Rosario, 2006).

Method

In order to perform a comparative study of the learning styles among post graduate students of the face-to-face and distance modalities, we carried out a research with a sample of students enrolled in both these modalities in a private higher education institution.

Having as a basis the analysis of the principles of compared education, we corroborated the ideas of Ferreira (2008, p. 136) by proposing that the comparative studies should be open methodologically and "strongly concerned in contributing towards the best knowledge in education through the comparison of its manifestations". For the author, compared education should not be only the bearer of denunciation or assessment, it needs first to be proactive, producer of knowledge and capable of "contributing towards a more conscious knowledge and for more conscientious policies and practices in the domain of education" (Ferreira, 2008, p. 137). It is in this perspective of analysis that this study is based on the environment of compared education.

Participants

This investigation was performed with post-graduate students enrolled in a private higher-education institution, both in the face-to-face and distance modalities. The locus of the researched institution is duly recognized by the Brazilian Ministry of Education and its post-graduate courses comply with the prevailing regulatory framework.

An intentional and non-probabilistic sample of 104 post-graduate student in the face-to-face modality and 117 in the distance modality were selected, totaling 221 students whose information was collected between the months of February and March, 2013.

In the face-to-face post-graduate modality, 89 students were of the female gender and 15 males, with ages between 21 and 56 years. In the distance post-graduate modality the sample contemplated 80 female students and 37 male students, with ages between 23 and 69 years.

The criteria for inclusion of the students of the research were: to be enrolled and attending a face-to-face or distance post-graduate course in the institution; agree to participate in the research and answer correctly the questions of the research instrument.

Materials and Procedures

For the collection of information, we used the technique of survey, with the aim of identifying the dominant learning styles of the post-graduate students in face-to-face and distance education in the analyzed sample. The research instrument used was the ILS - Index of Learning Styles questionnaire, prepared by Felder & Silverman (1998) and basis for mapping of the model.

We opted for the Felder-Silverman model due to the fact that it is an instrument directed towards the identification of learning styles in adults and it is of easy understanding. Almeida (2010) suggests that the Felder-Silverman was prepared based on observations in a school environment, being

the most adequate for education institutions. Further, the ILS questionnaire, as an instrument for collecting information, has free access for compilation of the information, using the website of the University of North Carolina – USA, being widely used in educational researches related to mapping students preferred learning styles.

Results

The information collected from the ILS questionnaire resulted in a mapping of the preferences of learning styles of the students in accordance with the four (4) styles of the Felder-Silvermann model, these being, a) preference in the manner of processing the information: active versus reflective; b) preference in the manner of perception of the information: sensing versus intuitive; c) preference in the form of capturing the information: visual versus verbal e d) preference in relation to the mode of comprehension: sequential versus global. Table 2 summarizes the general information of the researched sample.

In a global manner, as expressed in Table 2, the investigation demonstrated that students of the sample presented the following dominant learning styles:

- a) 82.7% of the face-to-face post-graduate students and 57.3 % of the distance modality presented an active style of processing the information;
- b) 95.2 % of the face-to-face post-graduate students and 81.2% of the distance modality preferred to perceive the information in a sensorial manner;
- c) the verbal style of capturing information is preferred by 53.8% of the students of both groups;
- d) 76.9% of the face-to-face students and 76.1% of the distance modality preferred the sequential style for the understanding of the information.

Table 2: Learning Styles in the dimensions of the Felder-Silverman model

Learning styles	Total n = 221	Total %	Post-graduate face-to-face n = 104	Post-graduate face-to-face %	Post-graduate distance n = 117	Post-graduate distance %
Active	153	69.2%	86	82.7%	67	57.3%
Reflective	68	30.8%	18	17.3%	50	42.7%
Sensing	194	87.8%	99	95.2%	95	81.2%
Intuitive	27	12.2%	5	4.8%	22	18.8%
Visual	119	53.8%	56	53.8%	63	53.8%
Verbal	102	46.2%	48	46.2%	54	46.2%
Sequential	169	76.5%	80	76.9%	89	76.1%
Global	52	23.5%	24	23.1%	28	23.9%

Source: own authorship

When comparing the information obtained from other similar researches, one can verify that these corroborate with the investigations performed by Rosario (2006), with face-to-face higher education students, where the dominant styles were revealed as active (63.5%), sensing (82.7%), visual (71.0%) and sequential (52.4%). Further, the results of the researches of Belhot, Freitas

& Dornelas (2005) are opportune with the results collected in a sample with 123 face-to-face students, in which the students presented as dominant the dimensions: active (60%), sensing (72%), visual (78%) and sequential (45%).

Franzoni & Assar (2009) in a sample with 26 students of the Instituto Tecnológico Autónomo de México (ITAM) verified the predominance of the active (62%); sensing (62%); visual (85%) and sequential (62%) styles. Also, as obtained by Dias, Gasparini & Kemczinski (2009), in an investigation addressing the interaction of 25 students with a distance education platform using only the dimension of understanding of the Felder-Silverman model, articulating it with the Ford-Chen model for the purpose of the objectives of the investigation. The results pointed out that in the dimension related to the preference for understanding the information 17 (68%) investigated students presented the sequential style, denoting preference for acquiring knowledge through a direction guided by prerequisites established by the teacher. The authors recognize the limitations of their study and recommended new applications of the ILS with the purpose of supplying subsidies for improvement of the teaching and learning process in the distance modality, which was also highlighted by Cristea & Stach (2006) when they commented that there are few researches of learning styles regarding students of distance education.

Discussions

Regarding the dimension of processing the information the researched sample revealed a preference for the active style of learning in both the compared groups of students, with 82.7% in face-to-face post-graduate students and 57.3% in distance post-graduate students, despite the latter having presented a high quantity of students with reflective styles (42.7%), revealing the necessity for distance education projects to contemplate this specificity close to the equilibrium of these styles.

Felder & Silvermann (1988) point out that the active versus reflective style refers to the strategy of the individual in relation to the process of obtaining the information, namely, those with an active propensity frequently prefer the engagement, discussing or applying the information and don't usually obtain good results in situations leading to a passive behavior, as occurs in an expository classes. On the other hand, those with a reflective propensity tend to privilege introspection; namely, they prefer to reflect calmly on the information and do not usually obtain successful outcome in learning situations that do not offer opportunities for thinking about the information presented.

Predominance in this dimension of the style of active learning reveals, in both compared groups of this investigation, the necessity for the teaching and learning process to be based on a dialogic relationship between the student and the teacher and contemplate methodological teaching techniques that induce the students to action making them protagonists in the construction of knowledge, because the passive, repetitive and monotonous teaching does little to contribute for the active learning of students. In this manner, the interposition of the teacher is essential to instigate the student in the engagement of the discussed information, consolidating the construction of knowledge.

In distance education it is necessary for the pedagogical project, especially the platform adopted for the Virtual Learning Environment (VLE), to be attentive to this learning style specificity. Indeed, Hutchins (2003) encourages the distance education institutions to instigate active learning once the students are required to apply their learning in an oral or written manner as presented in Table 3, in accordance with the proposals of Franzoni & Assar (2009).

In relation to the preference of the perception of information, it is observed in Table 2 that both of the groups of the compared students point out to a predominance of the sensing style (95.2%

in post-graduate students of face-to-face courses and 81.25 for distance education) in detriment to the intuitive style. According to Felder & Silverman (1988), the students with preference to the perception of information is characterized as sensing is distinguished by the wish for learning facts, solve problems with well-established and standardized methods, without complications or surprises. Also, the students with sensing learning styles tend to be concrete and methodical and have a greater perception for information related to the data and experiments, “because they feel more comfortable learning and following pre-established rules and procedures” (Kuri, 2004, p. 88).

In this perspective, table 3 points out to some pedagogical mediation strategies to deal with learners presenting the sensing style in the dimension of the perception of information. In this case, the appropriate teaching methodology should observe clear and detailed procedures, considering that the content approached should frequently be correlated with the contemporary world and, when appropriate, using laboratories for practical application. The teaching techniques should contemplate the presentation of questions and answers and, whenever possible, the use of a learning methodology based on the solution of problems.

The comparison of the dimension related to the capture or feeding of information of information revealed that the two groups of students presented an equilibrium between the verbal and visual styles, with only 7.6 percentage points of difference between them; further, we can observe identical percentages in post-graduate face-to-face and distance students, with 53.8% for the visual style and 46.2% for the verbal style.

Table 3: Adaptive taxonomy for the Learning Styles Dimensions I

Dimension	Processing		Perception	
	Active	Reflexive	Sensitive	Intuitive
Style				
Specifications				
Description	Applicable and group work	Write short summaries	Practical. Don't like courses without an immediate link to the real world	Conceptual, innovative, oriented to theory and meaning, enjoy working with abstract problems and mathematic formulations.
Appropriate pedagogical method	Tend to comprehend and assimilate new information when they practice using it (discussion, implementation, group presentations) and rather learn working with others	Think about quietly before go ahead. Stop periodically to review what have been learning. Stop periodically to think possible questions Stop periodically to think possible applications	Specific, facts and procedure oriented, enjoy problem solving by following well established procedures, patient when dealing with details, enjoy practical work, lab class and can memorize things easily	Are innovative and hate repetitive work, rather discover possibilities and relationships, assimilate new concepts easily, don't like courses that require much memory and tedious calculation.
Characteristics of the media to be used	Group work and cooperation	Watching Listening	Practical, problem solving, laboratory and experiments	Theoretical, abstraction and math related
Associated Teaching Strategies	Games and simulations. Learning based on problem solving. Role playing. Discussion panel. Brainstorming. Project design method	Presentation Case study Question and answer method	Presentation Question and answer method Learning based on problem solving	Discussion panel Games and simulations Role playing Case study. Project design method
Electronic Media	Collaboration Communication Search	Digital magazines, newspapers, e-books and Internet research	Collaboration Diagrams	Search Tutoring

Source: Adapted from Felder & Silverman (1988); Franzoni & Assar (2009)

In view of the equilibrium between the visual and verbal styles observed in the dimension related to the manner of capturing the information, it can be observed that the didactic strategies that best adapt to such students are those that mix audio-visual resources to verbal explanations. In this manner, for such students the information best perceived and remembered are those that stimulate both the visual and verbal channels, such as figures, diagrams, flowcharts, demonstrations, films, among others, conciliating these with the written or spoken explanations; extracted from discussions or verbal explanations, as proposed by Felder & Silverman (1988) and demonstrated in Table 4. Additionally, the Johnson (2007) investigation also demonstrates that students with a visual style also prefer to answer questionnaires over the web than to work in groups in digital platforms, corroborating with the notes of Franzoni & Assar (2009).

Table 4: Adaptive taxonomy for the Learning Styles Dimensions II

Dimension	Input		Understanding	
	Visual	Verbal	Sequential	Global
Style				
Specifications				
Description	Highly visual elements	Oral and text elements	Orderly, step by step and sequential	See everything as a whole
Appropriate pedagogical method	Rather work with visual representations when receiving information and remember what they see	Rather receive information spoken or verbally and remember what they read or hear	Learn through small orderly steps when these are logically associated and follow small orderly steps logically associated when solving problems	Learn through big leaps, suddenly and almost randomly, can solve complex problems quickly and put things together in an innovative way may have difficulties to explain how they did it
Characteristics of the media to be used	Visual representations and diagrams	Text and sounds	That allows content to be shown in steps (chapters)	That allow to see everything as a whole
Associated Teaching Strategies	Games and Simulations Presentation	Discussion panel Brainstorming Question and answer method	Presentation Question and answer method	Role playing Brainstorming Case study Project design method
Electronic Media	Collaboration Diagrams Read and Video	Audio Video	Audio Read	Collaborations Communication Search

Source: Adapted from Felder & Silverman (1988); Franzoni & Assar (2009)

In the comparative sample, the dimension related to the understanding of the information revealed that both groups demonstrated predominance for the sequential style (76.9% face-to-face and 76.1 distance education) in as opposed to the global style. In the Felder-Silverman model the students with a predominantly sequential style progress towards an understanding in continuous steps, with linear processes for solving problems, learning in an easier manner the matters exposed in a continuous form of complexity and difficulty (Felder & Silverman, 1988; Kuri, 2004).

Table 4 demonstrates that when dealing with students with predominantly sequential styles the teacher needs to organize in logically understandable steps, associating these to actual issues with the purpose of solving the problems. In this manner, the teaching strategies that best adapt are those related to the presentation of the content, case studies, questions and answers, etc.

When evaluating all the dimensions and their respective styles we perceive that the comparative study did not reveal significant differences between the students in the samples of students researched in face-to-face and distance post-graduate students. It is observed that only in the dimension related to the manner in which the information is processed where there different results, although both point out to a dominance of the active style, with 82.7% of face-to-face post-graduate students and 57.3% for distance education.

It is our understanding that the learning styles should not be considered as labels or tags, because they only present the preference of the students in the studied dimensions and, above all, they are opportunities for developing in these students the abilities for the non-preferred styles.

Furthermore, conciliate the predominant learning styles of the students with the styles and strategies for didactic mediation could result in the improvement of the academic performance of the students, as concluded by Johnson (2007).

Concluding Discussions

The urgent necessity to search for means of improving the effectiveness of the teaching and learning process is considered a consensus in all levels of education, in order for the proposed competencies in the teaching plans may be effectively reached. The expansion of the higher education and, above all, the growing massification of distance education are a challenge for teaching education institutions and their students, because they need to look for pedagogical mediation strategies that conciliate the teaching styles with the learning styles of the students with the aim of significant learning.

The comparative information of the field research collected based on the Felder-Silverman model revealed that, in the investigated sample, both the post-graduate face-to-face students as well as the distance education students present similar learning styles in the four (4) dimensions preconized by the model. In the two researched groups, the results obtained were similar in the dimensions related to the perception of the information (sensing versus intuitive), form of capturing the information (visual versus verbal) and means of understanding (sequential versus global). Nevertheless, the dimension related to the form of processing the information (active versus reflective) demonstrate that the students from the face-to-face course have a higher preference for the active style (82.7%), while an equilibrium was observed between these two styles in distance post-graduate students (57.3 active and 42.7% reflective).

With reference to the teaching methodology regarding the mapped styles, the information of the research reveal the possibility of conciliating the teaching techniques and the respective audio-visual resources to the predominant styles presented by the researched students, considering that the students with a predominance for the active style process more efficiently the information through experimenting, execution of activities and prefer to understand to experiment. On the other hand, sensing students prefer to perceive the information by means of external signals, sounds, physical sensations, etc. The students with preference for capturing the information in the visual manner need diagrams, outlines, flowcharts, sketches, demonstrations, while the sequential manner understand better when the content is presented in a linear fashion, step-by-step.

It is important to observe that these styles are not rigid categories, nor should then be labeled as good or bad aspects of the students, because literature recognizes that the individuals have all of the styles in different intensities, and as abilities to be developed, being the responsibility of the educators to prepare teaching plans to explore the preferred learning styles of the students as well as to permit the development of the non-preferred styles.

We understand that the present comparative investigation requires further applications of the Felder-Silverman model, especially with regards to distance education students. This was an attempt to compare the information obtained with the learning styles of the post-graduate students in the face-to-face and distance education modalities, once it is our belief that the awareness of the style of each student, or group of students, provides both the institution and the teacher the appropriate adaption of the methodologies and teaching techniques which leverage the teaching and learning process.

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