

LEARNING STYLES, ACADEMIC PERFORMANCE AND TEACHING EVALUATION

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ABSTRACT

Understanding learning styles becomes necessary to identify how learners concentrate, absorb, and transform information they receive into knowledge. This study aims to analyze the relationship between learning styles and academic performance in students of Accounting Sciences with the evaluation of teachers. The material to perform the descriptive and relational study with a quantitative approach was obtained with self-completion questionnaires with 257 Accounting Sciences students from all periods at a Community University of Southern Brazil. The statistical methods used were Student's t test, analysis of variance and correlation analysis. The results showed the predominance of the Auditory style (37.4%), followed by Kinesthetic (23.7%) in the Vark model and the Convergent (43.6%) followed by the Assimilative (40.1%) in the Kolb model (1984). The least represented were respectively the Visual (5.1%) and the Divergent (2.7%) style for these two models. The lowest performance styles were the Divergent, which had an average student grade of 7.28 and the Accommodative, with 7.47. Students' evaluation of teachers who teach the subjects in which these students are enrolled indicates that the years with lower performances evaluate teachers better and vice versa. Finally, the self-

Article presented at the XI Congress of Administration, Society and Innovation, in December 2018, from 06 to 07, Rio de Janeiro.

Submission on 02/21/2019. Review on 04/02/2019. Accepted on 05/05/2019. Published on 06/03/2019.

assessment that teachers made is statistically greater than the one made by the students about the teaching practices, however, the differences decrease as last year data are analyzed.

Keywords: Accounting Science course. Kolb. Vark's inventory .

1 INTRODUCTION

These days, given the changes brought about by the constant advancement in technology and trade blocs development, accountants find themselves in a new environment in which their opportunities and liabilities have increased. In this sense, in order to meet these new professional and social requirements, accounting training constantly seeks to improve itself. According to Vogt, Degenhart and Biavatti (2016: 64), "Accounting professionals must synthesize, analyze and evaluate information awareness in an economic and social environment."

It is the aim of a higher education to build up professionals' skills in order to make them critical, articulate, reflective and able to contextualize and apply their attainments. The criticism about the educational processes point out to the fact that these are based on a reductionist view in disagreement with the pace of the current changes (Bertero, 2006).

Converging to this, evaluation of teaching and learning processes is important, because according to Dias Sobrinho (2010) it is the main tool to implement educational improvements, and is related to the desired transformation in the present and future.

It can be said that today people live in an information society and, according to Lima (2003), it is necessary to instill in future management professionals the capacity to invigorate managerial processes through constructivist methodologies by relating action, reflection and students' collaboration in the learning context. In this sense, Andere and Araújo (2008, p. 92) argue that "studying the education and the quality of teaching contributes to the promotion of change and to the progress of society." In this way, understanding learning styles becomes necessary to identify how students concentrate, absorb and transform information received into knowledge (Almeida, 2010).

A learning style, according to Miranda, Miranda and Mariano (2007), is a method that an individual uses to acquire knowledge. It is not what a person learns but how they behave during learning. Santos, Colauto, Gassner, Antonovz and Correa (2014: 38) support that "the style of learning combined with methodologies and appropriate teaching techniques for each case can facilitate both the student's learning and his / her relationship with the teacher and with the course itself".

Several authors investigated learning styles in accounting students and findings report that it is possible to adapt the teaching-learning process to make it more effective, to have a better use and a higher quality level (Silva, 2006; Oliveira, 2008; Oliveira Neto, Oliveira & Miranda, 2009, Santos *et al.*, 2014).

Based on the context described, this study sought to answer the following question: What is the relation between the students' learning style in Accounting Science and the academic performance and teachers' evaluation? In order to answer this question, it was defined as a general objective to analyze the relationship between learning styles and academic performance in students of Accounting Science with teachers' evaluation.

In this paper, we sought to obtain new empirical evidence of the analyzed theme. Based on the identification of learning styles, it is possible to combine efforts between teachers and the institution in order to seek mechanisms that facilitate teaching and learning process, thus contributing to improve connectivity and adaptability between teachers and students, minding the fact that intellectual development is one of the main objectives of education. Moreover, according to Cristofaro (2016), cognitive styles are modified according to biological factors, cultural influences and educational practices. In this way, it is believed that by changing

educational methodologies it is possible to instill some changes in students' cognitive styles, thus offering them better opportunities for insertion on labor market.

This study is structured in five other sections, besides the introduction. The theoretical framework is presented in the second section and the methodological approach in the following section. In the sequence, data are analyzed, and in the fifth section final considerations are presented. Finally, the references.

2 THEORETICAL REFERENCE

In this section we present the theoretical framework defined as necessary to understand the adopted approach. For this purpose, concepts and models of learning styles were discussed, concluding with studies related to the theme.

2.1 Learning Styles

Teaching-learning studies are ever-constant not only in didactic-pedagogical field, but also in all other areas of teaching, reinforcing the need to investigate how this process occurs in accounting training (Mendes, 2000, Morozini, Cambrizzi & Longo, 2007).

Learning styles are of great importance for a good relationship between teachers and students, especially for the first ones, since they can plan their didactics in accordance with best methods of learning. The teacher, regardless of his / her area of knowledge, needs to keep in mind the teaching planning practice and the learning objective to choose the best strategy within the educational environment (Masetto, 1994, Marion & Marion, 2006). In this sense, McCarthy (2016) points out that learning styles have been the focus of many studies over the past 30 years in an effort to improve institutional courses designing and understand how students learn.

According to Cerqueira (2000), the importance of learning styles emerged in the 1970s directly from studies of cognitive styles, and their creators were more action-oriented than practical applications in education and training. According to Price (2004), they are usually used as a metaphor for a number of differences used by individuals in the learning process.

For Gallert (2005), learning styles theories are considered as resulting from heredity (genetic code), education, personality and the individual's adaptation to environment demands. Yet, for the author, they are related to the particular way of acquiring knowledge, skills or attitudes through experience or years of study and would be as a subset of cognitive styles. In this sense, Silva, Lima, Sonaglio and Godoi (2012) argue that as the individual matures, learning styles tend to change over time. It's all about how intensely different is the learning of each person. "They are particular modes of adaptation, reinforced by the permanent choice of situations where a style is successful" (Butzke & Alberton, 2017, p. 73).

The creation of tools to hold up the different individual styles also tends to favor the efficiency of teaching-learning. From the moment the teacher is aware of the students' individual differences, he / she can identify groups with similar characteristics and similar channels of perception (Marion & Marion, 2006). Thus, it will be possible to determine appropriate teaching strategies to the existing classes profiles so these strategies can be more efficient in their professional environment (Beck & Rausch, 2015).

Tools to identify learning styles are usually based on representing dimensions of different ways of perceiving and processing information and how to make decisions and organize one's own life, providing good structures for teaching planning. In this sense, Sonaglio, Lazzaretti and Pereira (2013) argue that knowing and identifying different students' learning styles can contribute to teachers' better choice of methodological practices.

In 2011, Valaski, Malucelli and Reinehr published a bibliometric survey (2005 to 2011) on several international empirical studies, with the objective of identifying learning styles in active methodologies usage. In this survey, the model of Felder and Silverman (1988) was the

most commonly used, followed by Kolb's (1984) and Vark's models of experiential learning cycle, developed by Fleming and Mills (1992). Therefore, in this paper, the identification of the learning style will be done by the models proposed by Kolb - LSI (1984) and Fleming and Mills' (1992) Vark inventory (*Visual, Auditory, Read-Write and Kinesthetic*).

2.2 Kolb Learning Style Inventory

In Experiential Learning Theory (ELT), human learning and its development play a central role (Santos, Cirne & Albuquerque, 2017). This theory explains the importance of the students' previous experiences in the learning process, clarifying that the student must experience situations, take risks and master problems experienced (Santos, Cirne & Albuquerque, 2017).

Kolb (1984) points out the need to identify the student's profile in relation to particular aspects of learning styles. It is necessary to think over each learner profile to better explore pedagogical practices, as well as a way of evaluating them. It is possible to perceive by the descriptions of the characteristics of each learning style that the students can differentiate themselves by their behavior, their reality approach and by the ways they prefer to attain knowledge.

Based on ELT, Kolb (1984) presented the following learning styles:

a) Divergent: it has the opposite force of convergence learning. This approach emphasizes concrete experience and reflexive observation. The strong point of this orientation lies in the individual's imaginative capacity and his set of values. An individual classified in this learning style performs better in situations that require the shaping of alternative ideas, for example, through brainstorming.

b) Assimilative: The predominant learning capacities are reflexive observation and abstract conceptualization. The strong point of this orientation is the inductive reasoning and the capacity to build up theoretical models, as well as to assimilate discrepant observations in an integrated explanation. This style is less focused on people and more concerned with abstract ideas and concepts.

c) Convergent: it is based on dominant skills learning, abstract conceptualization and active experimentation. The greatest advantage of this style lies in problem solving, decision making, and practical application of ideas. In this learning style, knowledge is organized in such way that it can be focused on specific problems by hypothetical-deductive means.

d) Accommodative: This one is contrary to Assimilative, emphasizes concrete experience and active experimentation. The purpose of this orientation is to get things done and engage in new experiences through defined plans and tasks. The adaptive emphasis of this approach lies in the pursuit of risk, opportunity and action. This style is called weaver because it is the appropriate style for adaptation in certain circumstances immediately. People with Accommodative learning style are seen at ease with people, but sometimes they are also seen as impatient and aggressive.

2.3 Vark Learning Style Inventory

Vark's model of learning styles proposed by Fleming and Mills (1992) focuses on the sensory (sight, hearing and kinesthetic) channels preferred by people when they learn. In this mode four learning styles are identified:

a) Visual (V): learns best through schematics, figures, graphs, and other visual aids. Visual resources are common in management field, by presenting figures about organizational environments, schematics such as process flowcharts or organizational charts, or even sales, growth, financial, market research charts and other information (Fleming & Mills, 1992).

b) Auditory (A): They prefer to learn in the presence of the teacher, listens to the information and explanations transmitted through speech. With this style, the student learns best

by sounds, can easily become distracted and diverts attention by other sounds surrounding the classroom environment. Lectures may be preferred by this type of student (Fleming & Mills, 1992).

c) Read / Write (R): Students who have this profile have a writing natural ability. They develop better jobs that require the search for books, do better with theoretical concepts and prefer to leave their knowledge formalized on paper. Another feature is that they tend to be more theoretical (Fleming & Mills, 1992).

d) Kinesthetic (K): They prefer group work. This student has as main characteristic learning through experiences. The student with this profile has preference for experiences about the object of study. Moreover, unlike the Read / Write style, they have a pre-disposition for collaboration among the agents involved in the learning process. Practical classes are preferred by learners with this style (Fleming & Mills, 1992).

e) Multimodal (M): This one is considered hybrid and on the same level has two or more Vark Model styles. This style is better suited to different situations, since its adaptability to teaching methods is fluid. (Fleming & Mills, 1992).

About Vark model, it is interesting to note that there is no clear definition if the proposed style model was designed for school-age students or adults. The Vark model deals with learning styles independent of the student's age group.

2.4 Related studies

A lot of studies have used learning styles models to identify specific academic characteristics. Cerqueira (2000) applied the Kolb inventory in Brazil (1984), identifying the relationship of students from several undergraduate courses with the most common learning styles. The study evidenced that the Assimilative style, predominant in the focused university students, remains stable in all semesters and areas. It also suggests that a study with private institutions in the south of Brazil should be carried out, since only public institutions participated in its sample.

Kolb and Kolb study (2010) describes the importance of experiential learning, but does not stereotype students that participated in the study with their respective learning styles. The study is a way of demonstrating the importance of experiential learning, and that the game provides greater responsibility for the students in managing their self-learning. Another benefit is the fact that the student don't focus only on the scoreboard, since this only makes sense when considering their experience in playing.

As the study by Cerqueira (2000) identified a specific relation between the learning style and the training area, Cordeiro and Silva (2012) corroborate that point, identifying that most of the students surveyed in Business courses also have an Assimilative learning style. By correlating learning styles with academic performance in finances in Business courses, they did not find a significant relation, but they identified a relation between professional experience and learning style, convergent with the assumptions of Kolb (1984), whose focus is Experiential Learning.

Miranda, Miranda and Mariano (2007) only applied the Vark Model of Fleming and Mills (1992) in Accounting Sciences courses. The authors point out a great concentration of kinesthetic students and teachers, and traditional techniques of expository classes, exercises resolution and seminars are still prevailing in classes, even though some of them are not seen by the students as the best pedagogical practice.

In studies conducted by Madkur, Mrtvi and Lopes (2008) learning styles were analyzed to determine team formation in learning process with company games. The results showed that the behavior of the teams in the process of analysis and decision-making did not present significant differences between styles. Reis and Paton (2009), in turn, studied the differences in

Accounting Science students styles in public and private institutions. Results showed prevalence of Convergent style, regardless of the nature of the institution.

Research of Sonaglio, Lazzaretti and Pereira (2013) compared Business Management and Technology students learning styles. The results showed styles in both courses are similar, with predominance of the Assimilative style. Bacinello and Domingues (2016) investigated the learning styles of Business and Accounting students in order to verify the influence of the academic profile in these styles. They concluded that in both courses the preponderant style was the Assimilative, followed by the Convergent in Accounting and the Accommodative in Business.

Lima Filho, Bezerra e Silva (2016) sought to identify the predominant learning style of undergraduate students in Accounting in presential and e-learning modalities both public and private institutions in Bahia. The results showed Assimilative style as preponderant. The studies of Santos, Cirne and Albuquerque (2017) also evidenced the predominance of the Assimilative style in Business, Accounting and Social Work students in high education institutions in the Alto Sertão of Paraíba. Butzke and Alberton (2017) investigated the relationship between the learning styles of Management students with company games. The research findings showed that the learning styles presented significant difference in the teaching strategy in the dimensions of processing and entry. Simões, Melo and Batista (2018) investigated the relationship between students' learning styles and teaching methods used in Accounting Science course at Federal University of Campina Grande. The results showed the Assimilative style as predominant among students and, or and, the Convergent style, among teachers. Based on these studies, it is observed that cognitive styles have been investigated in different areas of knowledge and the Accounting field has also been object of study.

3 MATERIAL AND RESEARCH METHOD

Considering its objective, this research can be considered as a descriptive one. For Vergara (1998), objectives of descriptive research refer to obtaining information about a phenomenon or about a certain population and the description of its characteristics. From the point of view of the problem approaching, it is classified as a quantitative research. Quantitative evaluation comprises organizing, summarizing, characterizing and interpreting numerical data (Martins & Theóphilo, 2007). Regarding technical procedures, this research was a survey, which aims to contribute to the knowledge of a particular area of interest through data collection about individuals or their environment (Trez & Matos, 2006).

The research was carried out in a Community University of Southern Brazil with Accounting Sciences students. The total number of respondent students was 257, representing more than 50% of the enrolled who at the time of data collection were 462, being 55 of the first year, 24 of the second, 47 of the third, 17 of the fourth, 39 of the fifth, 18 of the sixth, 33 of the seventh and 24 of the eighth year. Data were collected in classroom and at meetings previously scheduled with the teacher responsible for the discipline. During the research, one of the researchers remained in the classroom to clear up any question. The learning style for each student was recorded in accordance with the two models used and student's average grade were also recorded.

The data on the evaluation of Accounting Science teachers were obtained from the Permanent Evaluation Committee of the University. In each academic semester this institutional evaluation is carried out and the performance bulletins are generated punctuating 10 items, from which the average grade is generated. The evaluation is done both by the enrolled student and by the teacher who teaches him, and there are two values to be considered.

To achieve that, two research tools derived from the model of Fleming and Mills (1992), known as the Vark inventory, and that derived from Kolb's (1984) model of experiential learning, were made available to students of all years. Both questionnaires have already been

validated in Brazil, Vark, by Miranda, Miranda and Mariano (2011) and Kolb, by Cerqueira (2000). The Portuguese version of both questionnaires is available in Dalfovo's thesis (2013).

In order to identify the student's learning style with the Vark (2012) model, an instrument composed of 16 questions was used. Each question has four possible answers in which the student needs to score himself on how he learns best. At the end of this questionnaire, there is a template in which the styles are identified, being: visual (V), auditory (A), read / write (R) and kinesthetic (K). The sum of these will represent the predominant profile on how the student prefers to learn, but when there is a tie between the scores of two or more styles, a fifth style called multimodal (M).

The inventory referred to Kolb model, in its turn, has 12 questions and also four categories, and the respondent should order from the way he learns less (1) to the way he learns more (4). The register of one of the four styles, Accommodative (Ac), Assimilative (As), Convergent (Cv) or Divergent (Dv), is made out of the punctuation of each dimension of the Experiential Learning. That is, the dimensions of concrete experience, reflexive observation, abstract conceptualization and active experimentation. Based on this, a radar graph is generated and, according to the largest surface triangle, the style is marked (Cerqueira, 2000). In this paper, when the triangles had very similar surfaces, a fifth style called multimodal (Mu) was adapted.

This study was not submitted to the Research Ethics Committee (CEP), as it implies a minimal risk for the participants. According to Shaughnessy, Zechmeister and Zechmeister (2007: 66), "... a minimal risk means that the harm or nonconformity that participants may experience in an investigation is not greater than what they may experience in their lives daily or during routine physical or psychological tests." Still, for the authors, only in situations where the possibility of physical or psychological harm is significantly greater than what occurs routinely in daily life, it is necessary to submit the research to CEP.

All the data collected were organized in an Excel spreadsheet, where the necessary pre-processing was done before the statistical analysis (Hair Jr., Black, Anderson & Tatham, 2009). Next, the databases by period were imported into the Statistica software with which the means comparisons were made using the T test and the analysis of variance (Anova). The categorical predictors used in Anovas were the course years and styles. Finally, the relation between the average grades by years and the students' evaluation of teachers was measured by the correlation coefficient and that evaluation was compared with the teachers' self-evaluation by the Student's t test.

4 RESULTS

When processing the data of the first year with the styles according to the Vark model, it was verified that there were two outliers, one for the Multimodal style (9,34) and one for the Visual (8,62), which were excluded before developing the Anova. Simultaneous comparison was not significant ($p = 0.1617$); however, students with read / write style had the highest mean score (8,13) and those with Visual style had the lowest (7.35). If we consider Fisher's least significant difference as a posteriori comparison test, students with read / write style have a higher mean than the Visual and Auditory ones (7,53).

When considering the styles according to the Kolb model (1984), we also found the presence of two outliers, one for the Accommodatives (6.63) and another for the Convergent (9,34). On the other hand, there was only one student with a Divergent learning style, whose average was 6.91. Simultaneous comparison of the four styles did not show significant differences, but when comparing them with the single value of the Divergent student, it was verified that all means were statistically larger, as shown in Table 1.

Table 1
Test of means against constant reference value

Styles	Mean	SD	N	SE	Divergent	t-value	g.1	p
Accommodative	7,818	0,7226	5	0,3232	6,91	2,8097	4	0,048
Assimilative	7,668	0,6801	26	0,1334	6,91	5,6809	25	0,000
Convergent	7,720	0,6394	16	0,1598	6,91	5,0667	15	0,000
Multimodal	7,838	0,6704	7	0,2534	6,91	3,6613	6	0,011

The descriptive analysis of second year data, according to the Vark inventory, showed that there were no students with the Visual style, and also the existence of an outlier among the Multimodal ones (8,84). After its withdrawal, and using the four styles as predictors in the Anova, it was verified that there are no differences in the simultaneous comparison ($p = 0.2126$). However, the highest average has returned to those with Read / Write style (7,74).

According to Kolb model (1984), the styles are distributed as follows: One Accommodative, 10 Assimilatives, 12 Convergentes and one Multimodal. There was no record of any Divergent style student. After the analysis of outliers, the value 8.84 appeared among the Convergent ones. Initially, means were compared between the Convergentes and the Assimilatives, which resulted in equality, and then the means were compared again with the Multimodal means (7.43) and with the Accommodatives (7.00). In the first case, there were no differences, but in the second the Assimilatives had a statistically higher mean, with 5% of significance, and the Convergent ones, with 10%, as shown in Table 2.

Table 2
Test of means against constant reference value

Styles	Mean	SD	N	SE	Accommodative	t-value	g.1	p
Assimilative	7,63	0,5563	10	0,1759	7,00	3,5838	9	0,006
Convergent	7,35	0,5710	12	0,1648	7,00	2,1247	11	0,057

The outliers evaluation of the third year period allowed to identify four students with Read / Write style and, in turn, it was verified that only two students with the Visual style. In the Anova test performed with the Auditory, Kinesthetic, Read / Write and Multimodal styles, the simultaneous comparison did not show significant differences. However, when comparing those four styles with the mean value of the two Visual students, it is verified that the Auditory and Multimodal students have significantly lower mean than the Visual ones, with a 10% significance, and this also occurs with the Kinesthetic ones, as table 3 shows.

When were considered styles in accordance with Kolb model (1984), there was only one outlier among the Assimilatives (9,44), just as there are only two students among the Divergentes and there are no representatives of Multimodals. In the simultaneous comparison, differences were not confirmed as when compared to Accommodatives, Assimilatives and Convergentes with the two Divergentes mean single value.

Table 3
Test of means against constant reference value

Styles	Mean	SD	N	SE	Visual	t-value	g.1	p
Auditory	7,73	0,6347	17	0,1539	8,13	-2,5951	16	0,020
Kinesthetic	7,55	0,7194	8	0,2543	8,13	-2,2656	7	0,058
Read/Write	7,99	0,1794	5	0,0802	8,13	-1,6952	4	0,165
Multimodal	7,50	0,5353	11	0,1614	8,13	-3,9035	10	0,003

The fourth year was the one in which fewer students answered the questionnaires, but all styles of the Vark inventory were represented, although only one was classified with the Read / Write style and one as Visual. No outliers were registered, and in the Anova test performed, the

other three styles means were the same. In the comparisons of Auditory, Kinesthetic and Multimodal fixed values means of the student with Read / Write style (7.42), and of the Visual one (7.75) it was found that the Auditory ones (8, 18) have a statistically higher mean than those Values.

Through Kolb Experiential Learning Styles (1984), fourth-year students were classified into 2 Accommodatives, 9 nine Assimilatives and 6 Convergents. That is, there was no representative of Divergents or Multimodals. Comparing the means between the Assimilatives and Convergents no differences were found, and when these means are compared with the fixed value 7.21, which corresponds to the means of the two Accommodatives, both styles have larger means, as shown in Table 4.

Table 4

Test of means against constant reference value

Styles	Mean	SD	N	SE	Accommodative	t-value	g.1	p
Assimilative	8,03	0,5632	9	0,1877	7,21	4,3977	8	0,002
Convergent	7,81	0,2848	6	0,1163	7,21	5,2170	5	0,003

The analysis of the data collected in the fifth period by Vark inventory allowed to identify two outliers among students with Multimodal style. And there were no Read / Write representatives and only one Visual student. The simultaneous comparison of means with Anova confirms their equality and when they were compared with the Visual student value it was verified that they were statistically smaller, as can be seen in Table 5.

Table 5

Test of means against constant reference value

Styles	Mean	SD	N	SE	Visual	t-value	g.1	p
Auditory	7,50	0,6770	22	0,1443	8,30	-5,510	21	0,000
Kinesthetic	7,34	0,5663	9	0,1888	8,30	-5,0604	8	0,001
Multimodal	7,73	0,2135	5	0,0955	8,30	-6,0203	4	0,004

In accordance with Kolb model (1984), the analysis of styles collected data, showed the presence of only one outlier among the Assimilatives and, in turn, there was only one Multimodal student. The Anova performed resulted in the four styles mean equality including in the simultaneous comparison, and when those means were compared to the fixed value of the Multimodal style (7,18), it was verified that only the Convergent ones (7.77) had a statistically higher mean ($p = 0.002$).

In the sixth year there were also few students who answered the survey, but all Vark styles were represented. There was only one student with Multimodal style, two with Visual and two with Read / Write style. With Auditory style were found seven students and six Kinesthetic, completing the 18 respondents of that year. There were no outliers, and the comparison of means showed no significant differences. When comparing the means of the different styles with the fixed value of the Multimodal student, it can be observed that only the Auditory mean (7.51) is significantly lower ($p = 0.016$) than the Multimodal grade (8,16). With Kolb's (1984) model data, most students (10) classify themselves as Convergents, followed by Assimilatives (4) and Accommodatives (3). The number of respondents were completed with one Multimodal student. No student was recorded as Divergent. Simultaneous comparisons revealed the equality of means, which was also verified when comparing the means with the grade (8,16), the fixed value of the multimodal student.

In the seventh year the Vark inventory descriptive analysis allowed to detect an outlier in the Read / Write style and, although all styles were represented, only one student was Visual style. In the simultaneous comparisons, as well as in the comparison of means with the grade (7.70) of the Visual style student, no significant differences were observed between the values.

According to the experiential learning of Kolb (1984), there were no Accommodatives or Divergent students. The descriptive analysis confirmed the presence of four outliers, two Assimilatives and two Convergents. The Anova carried out with the three styles confirmed the mean equality.

With data collected for the eighth and last year, according to the Vark model, it was verified that all styles were represented, however, only one student had the Visual style. After the data pre-treatment, no outliers were detected and the simultaneous comparison of the other four styles means confirmed its equality. The same result was obtained with a 5% significance when comparing those means with the student's grade with Visual style (7.53), but with 10% the students with Read / Write style means (7.35) shows up statistically smaller.

Finally, the data collected with the Kolb model (1984), when assessed for the presence of outliers, showed that there was one among the Assimilatives. There was no representative of Divergents, and as for the Accommodatives, only one student was found, whose average grade in the course was 7.71. After the application of the Anova among the Assimilatives, Convergents and Multimodals significant differences were verified [$F(2, 19)=7,283$; $p=0,005$], with the Multimodals students mean (8.45) greater than Assimilatives (7.51) and Convergents (7.48). When comparing the means of these three styles with the grade of the Visual student it is confirmed that with 5% of significance that there is equality, but with 10% it is equal only to Multimodals and greater than the other two styles.

After analyzing the data of each year, considering the two models of learning styles, an Anova was carried out to compare the means of the eight periods taken together and in each of the styles of both models (Table 6).

Table 6

Simultaneous comparison of the means of all years together

Style	T	A	K	R/W	V	M	Ac	As	Cv	Dv	Mu
T	(7,65)	equal	minor	equal							
A	0,679	(7,60)	equal								
K	0,625	0,940	(7,59)	equal							
R/W	0,248	0,122	0,106	(7,82)	equal	equal	minor	equal	equal	minor	equal
V	0,336	0,175	0,154	0,849	(7,76)	equal	minor	equal	equal	minor	equal
M	0,426	0,228	0,201	0,697	0,847	(7,79)	minor	equal	equal	minor	equal
Ac	0,179	0,343	0,381	0,017	0,028	0,037	(7,47)	equal	equal	equal	major
As	0,814	0,517	0,470	0,352	0,462	0,574	0,118	(7,69)	equal	minor	equal
Cv	0,958	0,718	0,663	0,228	0,312	0,396	0,196	0,773	(7,65)	minor	equal
Dv	0,046	0,089	0,099	0,005	0,008	0,011	0,331	0,031	0,050	(7,28)	major
Mu	0,388	0,214	0,190	0,811	0,955	0,899	0,039	0,518	0,362	0,011	(7,78)

Note. Main diagonal values (in parentheses) correspond to the means.

T (Total); A (Auditory); K (Kinesthetic); R/W (Read/Write); V (Visual); M (Multimodal); Ac (Accommodative); As (Assimilative); Cv (Convergent); Dv (Divergent); Mu (Multimodal).

As can be seen in Table 6, the mean calculated for Divergent students (Dv), according to Kolb's (1984) model, was statistically smaller, with 5% significance, than the mean of all styles taken together (T) and the means of Read / Write (R/W), Visual (V) and Multimodal (M). Still, with 10% of significance, it was also lower than Auditory (A) and Kinesthetic (K). That is, practically all the styles of the Vark model.

When considering the other styles of Kolb's model (1984), the divergences have a lower mean comparing to Multimodal (Mu), Assimilative (As) and Convergent (Cv). There is only one value equal to the mean of the Accommodative (Ac). These Accommodatives students had the second lowest mean, which was statistically lower than the Multimodal (Mu) of the Experiential Learning and also lower than the means of Read / Write (R/W), Visual (V) and Multimodal (M) of the Vark model.

Due to the number of female respondents (171), which was almost double the male respondents (86), differences between proportions were tested. In the case of styles in the Vark model, no difference was found, but in the Kolb model only the Assimilatives proportion was statistically higher, with a significance of 10%, than the proportion of male students ($p = 0.068$). On the other hand, considering Kolb's model, the Assimilative female students summed up (63) to Convergentes (74) constitute a proportion of 0.80117, while for Assimilative male (40) summed up to Convergentes (38) reach a proportion of 0.906977, showing a significant difference ($p = 0.0157$). This means that male students with these styles, proportionally, are majority and, taken together, it should be considered that more than 83% of students possess these styles.

Considering the Vark model, the predominance is reversed in relation to that reported in the study by Miranda et al. (2007), because in the sample they studied, Kinesthetics students were 49% and the Auditory ones, 24%. However, the least represented were the Visual students. Regarding the Kolb model (1984), in the sample analyzed by Paton, Oliveira and Azevedo (2004), the Accommodative is indicated as the most present, which did not occur in the data collected for this research. However, coinciding with those authors, it was confirmed that students of Divergent style were also the least represented.

When analyzing the relation between students' average grades and their assessments of the subjects in which they are enrolled, we find that they have a negative correlation coefficient and a 10% significance level ($r = -0.6455$, $p = 0.084$). As shown in Figure 1, the students who had together smaller averages grades evaluated with higher grades their teachers and vice-versa.

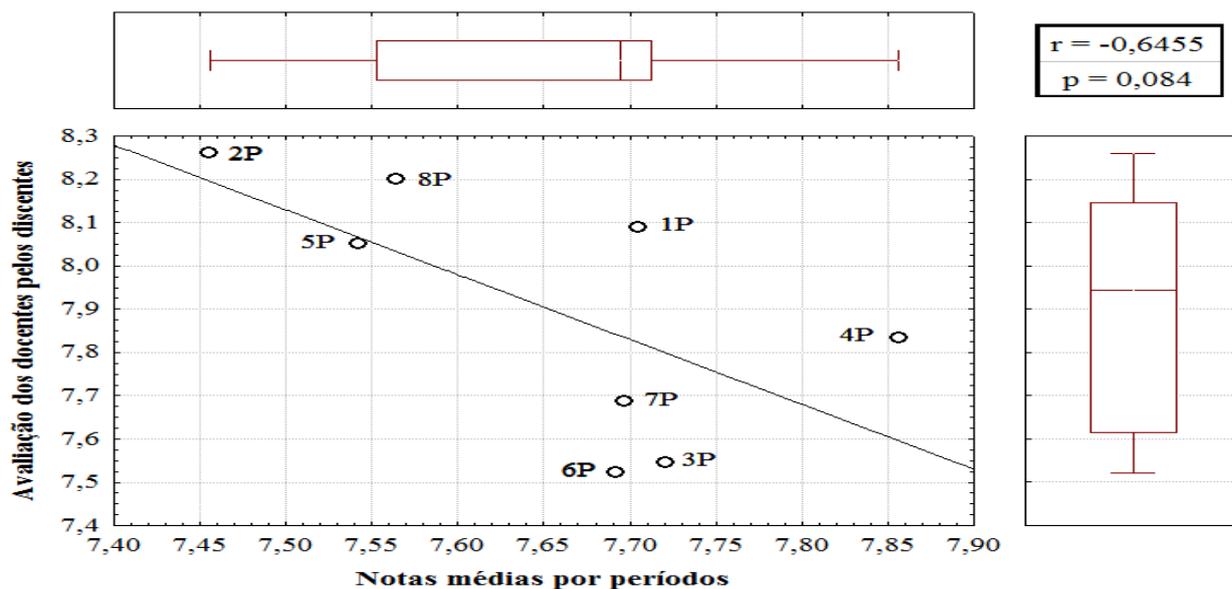


Figure 1. Relationship between students' average grades and the evaluation they make of their teachers

Finally, we compared the means of the grades that students gave to their teachers with the grades of the teacher's self-assessment. For this, the t-test was used for independent distributions. Results shows that teachers score higher, with a mean of 9.05, statistically higher ($p = 0.000$) than that from the students' scores (7.90). This difference may be associated to students' satisfaction with their learning. In first year, considering two semesters, it is 2.3 points; in second year this difference rises to 3.9; in third it falls to 1.9; and for the last year it only reaches 1.1. This indicates that students, as they progress and increase their knowledge, they better evaluate teaching, approaching their score with the self-assessment that teachers do.

The course where data were collected has particular characteristics that manifested through teacher evaluation by the student. As pointed out in Kraemer, Lizote and Verdinelli (2015), teachers with lower work hours were the best evaluated, and this can be related to the fact that they practice the accounting profession in offices and bring the current thematic to the

classroom with a professional view. In this way, the learning difficulty pointed out by Morozini et al. (2007), that the majority of the students have a preference for subjects that they find relevant, is reduced in the case of these teachers.

5 FINAL CONSIDERATIONS

This study aimed to analyze the relationship between learning styles and academic performance in Accounting Science students and with teachers evaluation. The results showed that all learning styles of both models considered in this research, the Fleming and Mills (1992) and the Kolb (1984), come about among the Accounting Science students considered. However, considering the Vark model, prevailed the Auditory (37.4%), followed by the Kinesthetic (23.7%) and considering the Kolb model, prevailed the Convergent (43.6%) followed by Assimilative (40.1%). The less represented styles were, respectively for these models, the Visual (5.1%) and Divergent (2,7%).

As all styles could be observed among the students considered, and taking into account the remark of Oliveira et al. (2011) and Miranda et al. (2007), it stands out that teaching techniques are not always the most appropriate to students' learning styles, and it is important that teachers become aware of the diversity of learning styles present in the classroom as well as the need to adapt their teaching work to contribute to the students' grasping of knowledge. However, it should be taken into account that in the sample considered, 83.7% of the students have Convergent and Assimilative learning styles, according to Kolb model, with a higher incidence among male students.

Considering the results, the use of the Fleming and Mills (1992) and Kolb (1984) models made it possible to identify the learning styles of all the 257 students who participated in the sample, including all course periods. The use of the average grade of each student made it possible to evaluate the similarities and differences between these students, considering their learning styles as predictors and the overall analysis of all school periods, it was verified that students with Divergent learning style were those who had the worst performance, followed by Accommodatives stendts.

As for the evaluation of the teaching performance done by the students, it was observed that groups that had lower average grades evaluated the teacher with higher scores, and vice versa. This allows us to conclude that this negative relation endorses the results of the teacher evaluation system by the student. On the other hand, differences between the scores given by the students and the self-assessment are diminished when seniors students are considered, being the last year of the course where this feature prevails.

We recommend that future researches seek to identify students' learning style from other management field courses. With such an effort, it is believed that it is possible for teachers to get to know their students better and, thus, to offer educational services with quality that meet students' expectations, also contributing to the teaching-learning process efficiency.

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