

Latin American undergraduates and learning patterns in the transition to higher education: an exploratory study in Colombia

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Abstract

Introduction. The aim of this study was to analyse the relationship between learning patterns, associated factors, and academic performance in 115 Colombian first-year university students. We posed the need to discuss the Vermunt model in other contexts, with an aim to supply evidence toward a more robust, inclusive model in analyzing learning processes.

Method. Data were collected using a Spanish version of the Inventory of Learning Style (Martínez-Fernández et al., 2009; Vermunt, 1998). Additionally, we collected data about the students' age, gender, dedication to study, perception of teaching, effort, and academic performance. The data were processed by means of descriptive analysis, correlation, MANOVA, and path analysis.

Results. The results show a structure of four learning patterns consisting of different factor combinations according to Vermunt: 1) Meaning-directed with external regulation (MD/er); 2) Passive-Idealistic (PI); 3) Passive-Motivated (PM); and 4) Reproduction-directed with lack of regulation (RD/lr). The relationship between learning patterns and the different factors was not sustained. However, we found an interesting explanation of academic performance from the perspective of self- and external regulation.

Discussion and Conclusion. Based on these results, we defend the need to make the cultural dimension of learning patterns a key topic in the research agenda on learning processes.

Keywords: Learning patterns; Higher Education; Latin-American students; Cultural dimension; Transition processes.

Resumen

Introducción. El objetivo de este estudio fue analizar la relación entre los patrones de aprendizaje, ciertos factores asociados y el rendimiento académico en una muestra de 115 estudiantes universitarios colombianos de 1er año de carrera. La necesidad de discutir el modelo de Vermunt en otros contextos se plantea como un reto en esta área de estudio con la finalidad de aportar evidencias para un modelo más robusto e inclusivo en el análisis de los procesos de aprendizaje.

Método. Los datos fueron recolectados empleando la versión española del Inventario de Estilos de Aprendizaje (Martínez-Fernández et al., 2009; Vermunt, 1998). Adicionalmente, se obtuvo información acerca de la edad, el género, la dedicación al estudio, percepción de la docencia, esfuerzo y rendimiento académico de cada uno de los participantes. Los datos fueron procesados a partir de medias, análisis descriptivos, correlaciones, MANOVA, y análisis de ruta.

Resultados. Los resultados muestran una estructura de cuatro patrones de aprendizaje combinados de diferentes maneras con relación a la propuesta de Vermunt: 1) Dirigido a los significados con regulación externa (MD/er); 2) Pasivo-idealista (PI); 3) Pasivo-motivacional (PM); 4) y Dirigido a la reproducción con ausencia de regulación (RD/lr). No se identifica ninguna relación entre los diferentes patrones y los factores analizados. Sin embargo, se halla una interesante explicación del rendimiento académico desde la perspectiva de la autorregulación y de la regulación externa.

Discusión y Conclusión. Para concluir, y con base en los resultados obtenidos, se apoya la necesidad de poner la dimensión cultural de los patrones de aprendizaje como un punto clave en la agenda de la investigación acerca de los procesos de aprendizaje.

Palabras clave: Patrones de aprendizaje; Educación Superior; estudiantes latinoamericanos, Dimensión cultural; Procesos de transición.

Introduction

Learning processes seem to be rooted in culture, and this culture is constantly changing. Therefore, we can assume that learning processes must be redefined and changed according to certain contextual demands as well as certain personal factors. However, these changes may often cause students uncertainty and confusion, especially when they have to activate their learning processes in a new context. This change clearly requires teaching strategies that guide and foster learning based on deep processing, with personal interest and high levels of self-regulation. Such strategies are more effective in promoting lifelong learning, but they may clash with previous academic experience. For these reasons, the aim of this study was to discuss the relationship between learning patterns according to the Vermunt model (1998) and certain associated factors in a sample of Latin American students who are entering university. In general, this is an exploratory look at the Vermunt model, as it applies to a sample of first-year university students in Colombia.

In this respect, since the late 1990s, Vermunt has proposed a more integrated understanding of learning processes taken as a whole, based on the analysis of conceptions of learning, learning orientations and processing and regulation strategies. He uses these components to define the learning patterns model (Vermunt, 1998). Additionally, he went a step further in understanding these learning patterns and proposed investigating how they relate to certain personal and contextual factors (Vermunt, 2005). There has been thorough reporting and analysis of this model in the context of Europe and Asia. It has also been used to analyse Latin-American samples, where relevant data has supported the existence of similarities across several cultural contexts, as well some differences in the learning patterns identified and their relationship to academic performance (García-Ravidá, 2017; Martínez-Fernández & Vermunt, 2015; Vermunt, Bronkhorst, & Martínez-Fernández, 2014). Such differences are commonly attributed to contextual factors rooted in the culture. Consequently, in the case of Latin-American university students, high levels of external regulation have been identified. These seem to be a determining factor in activating deep processing. There is also a positive impact on effort and academic performance (The Spanish and Latin-American Paradox; Martínez-Fernández & Vermunt, 2015, p.283). Therefore, external support seems to be necessary in the early stages of university study. Students may experience these early stages as the loss of a sense of belonging upon their arrival at university, learning to fit in by the end of the first

year, followed by change in their approach to learning and sense of belonging in later years of study, and changing selves in the years following graduation (Tett, Cree, & Christie, 2017).

Learning patterns

In the last four decades, several educational researchers have focused on the way students learn, taking into account cognition, metacognition, motivation, different approaches to learning, regulation strategies, etc. (Flavell, 1979; Marton & Säljö, 1976; Pintrich et al., 1988; Zimmerman, 1998). They were searching for significant interrelations between different aspects of learning so as to design integrative models of learning (Vanthournout, Donche, Gijbels, & Van Petegem, 2014).

Vermunt (1998) defined a model based on four main components from an integrated point of view on learning processes. The components are, namely: 1) *Conceptions of learning*, related to beliefs that students have about acquisition of knowledge and the meaning of learning; 2) *Learning orientations*, referring to the domain of goals, motivations, expectations and attitudes towards learning; 3) *Regulation strategies*, which considers oversight of students' learning activities by evaluating, regulating and adjusting – externally or internally; 4) *Processing strategies*, referring to how students process learning content, how they select the information related to new and old concepts, use practical examples, etc. Thus, Vermunt's (1998, 2005) research has identified different combinations of the components mentioned above to describe students' learning patterns. A *meaning-directed* (MD) pattern looks at learning in a constructive way, takes the perspective of personal interest and makes use of self-regulation strategies. In addition, deep processing strategies and critical thinking are observed. A *reproduction-directed* (RD) pattern describes students who view their learning as the intake of knowledge. They look upon their learning from an external viewpoint and are oriented towards certificates and self-testing. Additionally, these students memorise and rehearse with a certain level of analysis. *Application-directed* (AD) refers to students who base their learning on the practical use of the content. They are vocationally oriented and can make use of both external regulation and self-regulation. In addition, they learn through concrete processing. Finally, *Undirected* (UD) students need support and their learning is prompted by others. They have an ambivalent orientation, can be recognised by their lack of self-regulation in learning, and lastly, they show a lack of processing. The specific, consistent combination of certain beliefs and actions identified with the Inventory of Learning Style (ILS) gives rise to the specific learning patterns (see Table 1).

Table 1. *Patterns of learning and the ILS sub-scales*

<i>Reproduction directed</i> <i>RD</i>	<i>Application directed</i> <i>AD</i>
Memorising and rehearsing, analysing, external regulation of learning processes, external regulation learning outcomes, intake of knowledge, certificate and self-test directed learning orientations.	Concrete processing strategies, use of knowledge as conceptions of learning, vocational and certificate-oriented learning orientation, self-regulation and external regulation
<i>Undirected</i> <i>UD</i>	<i>Meaning directed</i> <i>MD</i>
Lack of regulation, an ambivalent learning orientation, co-operation, and stimulating education as conceptions of learning.	Relating and structuring, critical processing strategies, self-regulation of learning processes, self-regulation and learning contents, construction of knowledge, and personal interest as learning orientation.

More recently, Vermunt, Bronkhorst and Martínez-Fernández (2014) summarized studies from different countries where certain universal patterns (MD, RD and AD) have been reported. Additionally, two new patterns were included. The first one, PI (passive-idealistic), refers to a combination of all the learning conceptions without a particular connection to learning strategies. In other words, this is a passive pattern where subjects identify with a broad framework of beliefs about learning, such as a constructivist view along with reproduction of chunks of knowledge and the practical use of information; but without any clear connection to the actions they use for learning (strategies). The second one, PM (passive-motivated), refers to a combination of several learning orientations. In this case there are many and varied motives for learning (for personal interest, for grades, for future vocation, etc.) without any clear correspondence to certain learning strategies. Students with these patterns were characterised by an epistemic way of learning with no specific relation to their learning strategies (processing and regulation). Consequently, learning patterns do not always reflect complete consistency between activities and beliefs about learning. These findings require new hypotheses that allow us to design and discuss learning processes that reflect more and less consistency and diversity. In this respect, we need to add certain considerations

to the learning patterns model that are more rooted in certain personal or cultural factors. Vermunt (2005) himself has claimed that personal and contextual factors influence the complex manner in which students learn.

Further research is still needed, with samples from different countries, in order to discover how this relationship is established, and to discuss different results from different countries. In the words of Vermunt and Donche (2017): “in order to examine the cross-cultural nature of learning patterns, more research in international contexts is needed (p. 292)”.

Learning patterns, associated factors and academic performance

Learning at university should be conceived not only as professional training, but also as a place where epistemological and professional experiences are shared, experiences that provide students with training in various aspects of life. Accordingly, some personal and contextual factors, as well as their perception of the teaching, determine these different ways to achieve learning (Baeten, et al., 2010; Evens, Verburgh, & Elen, 2013).

With regard to *age*, some authors consider this an influential variable in the learning pattern configuration. In this sense, younger students tend more toward reproduction, while older ones tend to be more constructive (Beccaria, et al., 2014, Martínez-Fernández, 2004; Severiens & Dam, 1997). Older students with enriching educational experiences favour the MD pattern (Richardson, 1995; Vermunt, 2005), albeit with some nuances of the *Reproduction-directed* (RD), *Undirected* (UD) and *Application-directed* (AD) learning patterns (Martínez-Fernández & García Ravidá, 2012). In this respect, it is unclear how and when the learning pattern changes. Vermunt (1998) mentions a 'period of time'. We believe that longitudinal studies are needed for a deeper discussion of the role of age in configuring learning patterns.

Regarding *gender*, Vermunt (2005) found that women were more cooperative, more oriented towards external regulation, and less oriented towards obtaining certificates. Likewise, de la Fuente, Sander and Putwain (2013) found that female students showed less surface approach to learning, and the males most frequently employed critical processing and concrete strategies. Severiens and Dam (1998) pointed out that women tended to expect more external stimulation and use the reproductive learning pattern more often, as opposed to males, who used the undirected pattern. In contrast to previous studies, Phan (2009) found that gender did not seem to be decisive in goal orientations in academic tasks and learning, in

the use of deep processing strategies and reflective thinking practices, or in the amount of effort.

With regard to these factors, authors like Sadler-Smith and Tsang (1998) found that older male students scored higher on the deep approach than did younger males, in contrast to other authors who did not report gender-related differences (Phan, 2008; Rocha & Ventura, 2011).

As for the *level of study*, Rocha and Ventura (2011) found that first-year university students tended to show an AD pattern while final-year students were more MD-oriented. Marton and Säljö (1997) defended the hypothesis that experience explains the decline of reproductive patterns more than age. Accordingly, first-year students learn in a more undirected way than final-year students, who show more characteristics of an MD pattern (Busato, et al., 1998; Catrysse et al., 2015; Cela-Ranilla & Gisbert, 2013; Donche, Coertjens, & Van Peetegem, 2010; Severiens, Dam, & Van Hout Wolters, 2001). Likewise, Donche and Van Peetegem (2009) argued that students seem to progressively adopt an MD pattern as they pass university courses. However, the increase of this pattern is not necessarily related to a decrease of reproductive learning patterns. On the contrary, it may be explained by the use of increasingly flexible learning strategies triggered by the demands of the context and their cumulative experience in strategy use. Leese (2010) claimed that most first-year students perceived the need to be independent learners; paradoxically, they also felt the need for more structured activities and more support from the academic staff.

Regarding the *specific domain*, studies show that students with greater MD orientation were enrolled in Humanities (Andreou, Vlachos, & Andreou, 2006; Rocha & Ventura, 2011), Art, Psychology (Vermunt, 2005), and final-year Pharmacy (Smith, et al., 2010). However, Biotechnology students (Rocha & Ventura, 2011), Economics and Law students (Vermunt, 2005), Business Science students (Prosser & Trigwell, 1999; Slaats, Lodewijks, & van der Sander, 1999), and Economics and Management students (Andreou, Vlachos, & Andreou, 2006) were more oriented towards a RD pattern. Lastly, students of Healthcare sciences (Rocha & Ventura, 2011) and technical students (Prosser & Trigwell, 1999; Slaats, Lodewijks, & van der Sander, 1999) were more oriented towards AD.

As regards *country of origin*, culture can be conceptualised as shared motives, values, beliefs, identities and interpretations or meanings of significant events stemming from common experiences among the members of collectives that are transmitted across generations (Marambe, Vermunt, & Boshuizen, 2012; Martínez-Fernández & Vermunt, 2015). In this sense, successful Western European students are characterised by a higher prevalence of a meaning-directed approach (Vermunt, 2005). Meanwhile, the Asian students, who perform better at school, show high levels of memorisation to support the development of meaning, as well as high levels of deep processing and self-regulation, as opposed to mechanical memorisation (Marton, Wen, & Wong, 2005; Sachs & Chan, 2003; Sakurai, et al., 2014). This suggests that memorization might be occurring in conjunction with attempts to reach understanding; this is known as the *Chinese paradox*.

Accordingly, recent studies indicate that Latin-American and Spanish students base their successful learning processes on an Application-directed pattern (Alves De Lima et al., 2006; de la Barrera, et al., 2006). However, other studies associate Latin-American and Spanish successful students with a Meaning-directed pattern, similarly to successful students from Western Europe. However, first-year Latin-American and Spanish undergraduates require higher use of self- and external regulation in order to achieve the MD pattern (Martínez-Fernández & García-Ravidá, 2012; Vermunt, Bronkhorst, & Martínez-Fernández, 2014). These results provide a different way of understanding constructive learning mediated by external regulation: *the Latin-American paradox* (Martínez-Fernández & Vermunt, 2015; p. 283).

To sum up, certain factors seem to play a determining role in some contexts and situations, but not in others. Consequently, the analysis of learning processes still requires more complex models from the theoretical perspective, and more robust from the empirical perspective. These models will bring us closer to understanding the best learning and development methods in different territories. Most probably, transition stages require support, help and explicit understanding (Teet, Cree & Christies, 2018), not only in cognitive processes, but also in emotional processes, with differences based on certain personal traits: a true challenge for the designers of teaching processes.

Students make an interpretation of their own effort, the teaching strategies, workload, etc., such that academic results are affected by the learning environment differentially (Beat-

en, et al., 2010). A two-fold interpretation takes place (of one's own effort and of the learning environment), regulated by the perception of each student.

Likewise, with regard to *effort* and *dedication to study*, findings have been inconclusive concerning the relationship between amount of effort applied during academic tasks, and learning strategies and academic performance. Phan (2009) claims there is no relationship between deep processing of learning and effort applied. Elsewhere, effort – in consonance with a strategic approach to academic tasks – has been found to enhance academic achievement (Diseth, et al., 2010; Loyens, Rikers, & Schmidt, 2008; Martínez-Fernández & Vermunt, 2015; Phan, 2008).

Ultimately, regarding *perception of teaching*, several authors argue that when students have active engagement, a positive perception of teaching and, in addition, teachers provide tools to achieve long-term quality learning, the results are better than with passive teaching strategies (Beyaztaş & Senemoglu, 2015; Diseth et al., 2010; Donche, et al., 2013; Jepsen, Varhegyi, & Teo, 2015; Urionabarrenetxea & García Merino, 2013). Likewise, some of these authors (Diseth, et al., 2010; Urionabarrenetxea & García Merino, 2013) have added that students who are dissatisfied with the quality of education show greater intention to leave school as well as a surface approach. In the case of Chinese undergraduates, good teaching was related to a surface approach (Yin, Wang, & Han, 2016). Finally, authors like Martínez-Fernández and García-Ravidá (2012), and Vermetten, Vermunt and Lodewijks (2002) did not find significant differences between learning patterns and perception of teaching.

These arguments show further advances towards understanding how students learn; but there are inconsistent results from different samples, specific domains, level of study, gender, age, etc. In the case of Latin-American students, further research is needed on learning patterns and the way that certain factors influence it.

Learning patterns and academic performance

Several authors point out that a higher grade point average (GPA), deep processing and regulation strategies are related to dedication to study (Diseth et al., 2010; Martínez-Fernández & Vermunt, 2015). Also, other authors (Ruffing, et al., 2015) have reported that learning strategies, effort, attention and the learning environment were related to the GPA. By contrast, Vázquez (2009) found no relationship between learning patterns and GPA in engi-

neering students. In general, students characterised by a Meaning-directed learning pattern put more effort into their studies and get a better GPA (García-Ravidá, 2017; Loyens, Rikers, & Schmidt, 2008; Phan, 2008). Likewise, Phan (2009) found indirect effects of effort on GPA.

However, there has been little exploration into the specific relationships between the different ILS sub-scales and GPA as a global measure of achievement. Along these lines, Vanthournout et al. (2012) found the *relating and structuring* scale to be the best predictor of academic success. They also noted a contribution from *external regulation* and *lack of regulation* subscales as sources of prediction, the latter in a negative direction. In summary, the prediction model explained nearly 10% of the variance. Results from Vanthournout et al. (2012) were similar to those of Martínez-Fernández and Vermunt (2015), finding a 10% explanation of academic performance based on the *deep processing* subscales, which in turn were explained by self-regulation. Thus, it seems that a Vermunt-type strategies component has greater explanatory force for learning outcomes, although one must consider that this strategies component is predetermined by beliefs about learning and by motives for learning. This model therefore allows us to identify specific types of (processing and regulation) strategies with differential impact on academic achievement. Finally, although the effect of these measures is small, we agree that the data are highly valuable for designing formative actions for optimizing academic achievement and the pursuit of university studies.

Based on all of the above, this study puts forth the research questions below.

Research questions

1. What kind of learning patterns can be identified among a sample of first-year university students from Colombia?
2. How do learning patterns and associated factors relate to academic performance?

Method

Participants

The participants were 115 first-year Teacher Education students in a Colombian higher education institution (City of Medellín). The participants were 89 females (77.4%) and 26 males (22.6%) with a mean age of 23.7 years ($SD = 4.77$, range = 17 to 42). For most of the

undergraduates, studying was their main occupation ($N = 57$; 49.6%). However, others shared this occupation with other activities ($N = 49$; 42.6%); while a small group of students did not consider studying as their main occupation ($N = 9$; 7.8%).

Instruments

ILS (Inventory of Learning Styles):

To identify learning patterns, a Spanish version of the ILS was administered (Martínez-Fernández et al., 2009). This ILS version was developed, reviewed and validated by an international research team from different Latin-American countries (Argentina, Colombia, Mexico and Venezuela) and from Spain. Considering the large expanse of territories addressed, the instrument was adapted by making several electronic substitutions for proper item comprehension across the different countries, and interjudge agreement was used to ensure content validity. The ILS consists of 120 statements covering the four domains. Part A, ‘Study activities’, contains 27 items on processing activities and 28 on regulation activities. This part was answered on a Likert scale ranging from (1) “I rarely or never do it” to (5) “I always do it”. Part B, ‘Study motives and views on studying’, comprised 25 items on learning orientation and 40 on mental models of learning. These items were answered on another Likert scale going from (1) “I completely disagree” to (5) “I completely agree”. From these 120 items, and based on Cronbach’s alpha index, as a reliability indicator, 20 sub-scales were calculated. Cronbach’s alpha index showed that 15 out of 20 sub-scales yielded good and excellent indexes (α between .89 and .70); whereas the other 3 yielded lower indexes ($\alpha > .70$), of which *personal interest* showed the lowest reliability index ($\alpha = .33$) (Hair, et al., 1998). Accordingly, we excluded that sub-scale from the analysis.

Finally, based on those 19 sub-scales, and in terms of construct validity, a four-factor empirical structure was reported ($KMO = .79$) (χ^2 Bartlett = 1073.10; $p < .01$); a good index was obtained according to Izquierdo, Olea and Abad (2014) (see Table 2).

Table 2. *Alpha de Cronbach, means, standard deviation, and Factor loadings of the ILS scales in a 4-factor Oblimin solution (N = 115) (Principal component analysis; loadings > .30 and < .30 omitted).*

Inventory Scale	α scales	M (SD)	Factor 1	Factor 2	Factor 3	Factor 4
<i>Processing strategies</i>						
Deep processing						
Relating and structuring	.79	3.60 (.64)	.90			
Critical processing	.69	3.50 (.73)	.78			
Stepwise processing						
Memorising and rehearsing	.79	2.68 (.84)				.81
Analysing	.74	3.40 (.66)	.77			
Concrete processing	.75	4.14 (.57)	.69			
<i>Regulation strategies</i>						
Self-regulation						
Learning process and re- sults	.75	3.54 (.63)	.87			
Learning content	.73	3.36 (.77)	.75			
External regulation						
Learning process	.51	3.21 (.54)	.34			.66
Learning results	.64	3.57 (.66)	.33			.61
Lack of regulation	.77	2.90 (.80)				.83
<i>Conceptions of learning</i>						
Construction of knowledge	.79	4.38 (.46)		.72		
Intake of knowledge	.84	3.55 (.80)		.74		
Use of knowledge	.71	4.37 (.54)		.75		
Stimulating education	.93	3.49 (1.09)		.73		
Cooperative learning	.86	3.50 (.88)		.74		
<i>Learning orientations</i>						
Personally interested	.33					
Certificate-oriented	.74	2.96 (.86)			.79	
Self-test-oriented	.85	3.69 (1.16)			.85	
Vocation-oriented	.69	4.20 (.70)			.73	
Ambivalent	.71	2.07 (.92)			.61	
Eigen values			4.98	3.34	2.18	1.64
% explained variance			26.20	17.59	11.45	8.63
Cumulative %			26.20	43.78	55.23	63.87

Data on the associated factors

A sociodemographic questionnaire designed by the PAFIU research group was administered to gather data related to associated factors. This was a kind of sociodemographic form where subjects reported their age, gender, effort, and other variables; and signed their consent to participate in the research. In a global assessment of their experience during their first year at university, students informed about their context, based on their university experience and how they perceived it. They rated their effort, their dedication to study and their perception of teaching on a scale of 0-10, where 10 was the highest score. They were also asked to report their grade point average (GPA) for their first year in higher education.

Procedure

The ILS and a set of personal and contextual questions were administered to the students in the classroom for approximately 45 minutes of their lesson time. The researchers had been granted permission by the administration in order to collect the data. Students were informed about the study and were asked to participate voluntarily.

Data Analysis

The data were analysed using SPSS 20.0 and AMOS 19.0. Several analyses were conducted in order to obtain descriptive data and mean comparisons by means of ANOVA. Likewise, we applied factor analysis, alpha reliability, a multivariate analysis (MANOVA), Pearson's correlation and a path analysis. This series of measurements allowed us to report scale reliability, differences in patterns according to the different associated factors, the relationship between the variables, and take a first step toward predicting academic performance as a function of the different ILS subscales.

Results

Learning patterns

In order to answer the first question, about learning patterns identified in these students, an exploratory factor analysis was taken from the empirical study by Martínez-Fernández and Vermunt (2015; p. 289).

The first factor ($\alpha = .89$) was composed of deep processing strategies, stepwise processing (analysing), concrete processing and self-regulation strategies, as well as external

regulation strategies. Thus, in this main factor we observed a predominant MD pattern with analysing strategies and a lower saturation of external regulation; therefore, the pattern can be defined as *Meaning-directed with external regulation* (MD/er). The second factor ($\alpha = .80$) includes all the conceptions of learning with no clear correspondence to defined learning strategies (regulation and processing). Therefore, it has been called the *Passive-Idealistic* pattern (PI). Regarding the third factor ($\alpha = .73$), all subscales corresponding to learning orientations saturate there. Accordingly, it has been named the *Passive-Motivated* pattern (PM): as described in the introduction, it represents a broad-ranging combination of motives and reasons for learning, without any clear correspondence to regulation or processing strategies. Finally, the fourth factor ($\alpha = .78$) saturates in the subscales of stepwise processing, external regulation and lack of regulation strategies. Therefore, it seems to refer to a *Reproduction Directed* pattern with a *lack of regulation* (RD/lr).

Learning patterns and associated factors

Regarding the second question, about the relationship between the learning patterns identified (MD/er, PI, PM, and RD/lr) and certain personal, contextual and perceived contextual factors, a MANOVA analysis was performed following a factorial design with 2 (gender) x 3 (dedication to study) as independent variables and each of the learning patterns as dependent variables (see Tables 3 and 4).

Table 3. Means and standard deviations of learning patterns by personal and contextual factors.

Variables	(MD/er)	(PI)	(PM)	(RD/lr)
	<i>M SD</i>	<i>M SD</i>	<i>M SD</i>	<i>M SD</i>
<i>Gender</i>				
Male	3.56 (.50)	3.85 (.55)	3.39 (.55)	3.13 (.55)
Female	3.42 (.52)	3.80 (.51)	3.45 (.62)	3.10 (.56)
<i>Is study your principal occupation?</i>				
Yes	3.46 (.48)	3.77 (.55)	3.52 (.63)	3.06 (.62)
Yes, but	3.39 (.55)	3.87 (.50)	3.37 (.53)	3.11 (.51)
No	3.75 (.48)	3.74 (.50)	3.28 (.77)	3.14 (.42)

Table 4. Mean differences of learning patterns in relation to personal and contextual factors (MANOVA).

Variables	Learning Patterns	MS	F	<i>p</i>	η^2
<i>Dedication to study</i> (<i>df</i> = 2)	MD/er	.46	1.80	.17	.03
	PI	.34	1.24	.29	.02
	PM	.47	1.28	.28	.02
	RD/lr	.06	.19	.83	.00
<i>Gender</i> (<i>df</i> = 1)	MD/er	.64	2.49	.12	.02
	PI	.49	1.81	.18	.02
	PM	.16	.43	.51	.00
	RD/lr	.11	.35	.56	.00
<i>Dedication*Gender</i> (<i>df</i> = 2)	MD/er	.50	1.96	.15	.04
	PI	.62	2.31	.11	.04
	PM	.66	1.82	.17	.03
	RD/lr	.06	.19	.82	.00

Note: *MD/er*: meaning directed/external regulation; *PI*: passive-idealistic; *PM*: passive-motivated; *RD/lr*, reproduction directed/lack of regulation.

The MANOVA results indicated no statistically significant differences in relation to gender ($F= 1.00$; $p= .41$; $\eta^2= .04$) or dedication to study ($F= 1.42$; $p= .19$; $\eta^2= .51$). Regarding analysis of the interaction between the two variables, no statistically significant differences were found ($F= 1.40$; $p= .20$; $\eta^2= .50$) in any of the learning patterns identified.

Secondly, Pearson's correlation coefficients were calculated (see Table 5). No significant relationship was found between learning patterns and personal, contextual or perceived factors. However, the analysis yielded a significant positive relationship between perception of teaching and effort ($r= .57$; $p= .01$), as well as between age and effort ($r= .21$; $p< .05$). It is essential to emphasise the strong relationship between the MD/er and RD/lr patterns.

Table 5. *Pearson's correlation between learning patterns, associated factors and GPA.*

Variables	1	2	3	4	5	6	7
1. MD/er	-						
2. PI	.14	-					
3. PM	.14	.16	-				
4. RD/lr	.60**	.06	.16	-			
5. Perception of teaching	.01	.16	.02	-.02	-		
6. Age	.06	.02	-.13	-.02	.15	-	
7. Effort	-.07	.07	-.02	-.01	.57**	.21*	-
8. GPA	.07	-.06	-.15	-.05	-.08	.12	.10

Note: *** $p < .01$

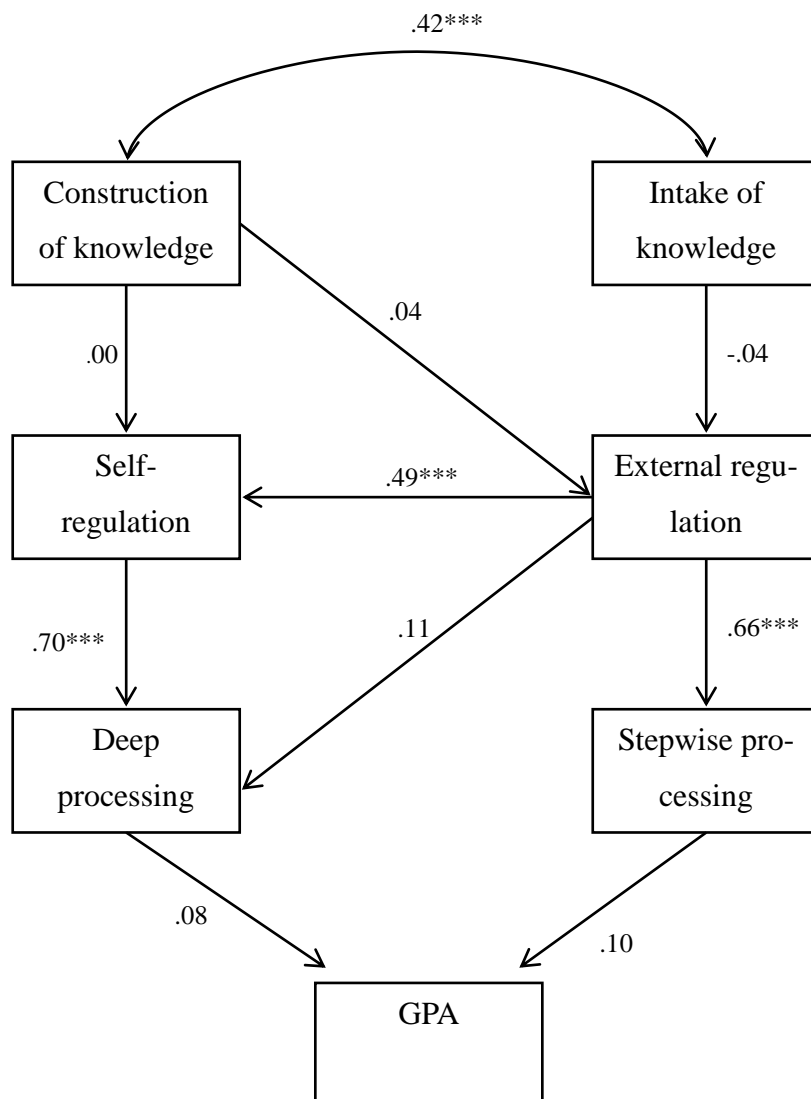
ILS and academic performance: path analysis

Results of the correlations analysis indicated no relationship between measurements of the different patterns and GPA. However, considering the results from Vanthournout et al. (2012) and Martínez-Fernández and Vermunt (2015), we decided to look further into the relationship with each one of the 16 subscales. Taking into account the extreme patterns of MD and RD, an exploration using path analysis was used for better comprehension of GPA. Accordingly, among the components that define the MD and RD patterns, we chose two conceptions of learning (construction of knowledge and intake of knowledge), two regulation strategies (self- and external regulation) and two processing strategies (deep and stepwise processing).

Consequently, maximum likelihood was used as an estimation method to carry out the path analysis (Pampel, 2000). Additionally, to evaluate model fit, several indexes were used to ensure more reliable and accurate decisions (Hu & Bentler, 1995). The following indexes were employed: the χ^2 test of significance, the χ^2 /degrees of freedom ratio (χ^2/df), the comparative fit index (CFI), the goodness-of-fit index (GFI), the root mean square residual (RMR), and the root-mean-square error of approximation (RMSEA). CFI greater than .90, GFI greater than .95, and RMSEA values between .05 and .08 indicate good model fit (Hu & Bentler, 1995). Accordingly, all indexes revealed good model adjustment ($\chi^2 = 22.58$, $CMIN/DF =$

2.51, CFI= .95, GFI= .95, RMR= .03, and RMSEA= .09, $p= .01$) (see Figure 1). Therefore, model fit appears to be strong enough to allow us to report and interpret the standardised path estimation (Browne, et al., 2002; Lévy Mangin & Oubiña Barbolla, 2006). After several analyses, one could observe that the selected conceptions of learning (construction and intake) were influencing each other (.42). Nevertheless, they do not seem to explain the activation of regulation strategies. However, self-regulation significantly explained deep processing (.70). In turn, these processing strategies account for GPA (.08). On the other hand, external regulation strategies influence stepwise processing (.66), while the latter significantly influences GPA (.10). Moreover, we found that external regulation also significantly influences self-regulation (.49) and deep processing (.11).

Figure 1. Standardized path coefficients from some conceptions of learning, regulation strategies, processing strategies, and GPA.



Note: *** $p < .01$

Discussion and conclusion

This study aimed to provide exploratory information about the learning patterns of a sample of Latin-American students (in this case, from Colombia), during their transition into higher education.

Thus, regarding the first research question, four patterns were found, in agreement with Vermunt (1998; 2005). A first pattern was characterised by *meaning-directed* learning with the use of *external regulation* (MD/er), similar to the factor reported by Martínez-Fernández and Vermunt (2015) for a whole sample of Latin-American and Spanish students; and in line with the findings of Martínez-Fernández and García-Ravidá (2012) who support the aforementioned theory about the Latin-American paradox. A second pattern comprised all the conceptions of learning. This pattern characterised students who approached academic content in an epistemic way, which may determine the strategies they use, but without a specific dominant strategy. This '*passive-idealistic*' (PI) pattern is similar to the one defined by Ajisuksmo and Vermunt (1999) and Marambe, Vermunt and Boshuizen (2012) in a sample of Japanese and Sri Lankan students, respectively. In the same line, a third pattern encompassed students who addressed and assessed their learning by the motivations that drive their learning process: *passive-motivated* (PM) (Vermunt, Bronkhorst, & Martínez-Fernández, 2014). Lastly, a fourth pattern, the *reproduction-directed with lack of regulation* (RD/lr) typified students who tended to approach their learning processes in a reproductive way, with a lack of regulation and without any specific motivation.

In general, we observed Vermunt's factors for identifying learning patterns, but combined differently. The RD/lr pattern is a clear mixture of the worst learning methods, as Vanthournout et al. (2014) said: 'the negative sides' of the learning processes (pp. 17-18). Likewise, two patterns based on beliefs were identified --PI and PM-- whereas only one MD-based pattern was identified but with a significant connection to external regulation. In this respect, these students were in their first year of tertiary education and this is probably the main reason for these findings. A transition stage into university and professional training reflects a variety of reasons for learning and of conceptions about learning; but without clarity or correspondence to the learning strategies (processing and regulation) that support these

strategies. According to Leese (2010), they are *in the middle of a big need to develop self-regulation* and autonomous learning but, at the same time, they need external support, guidelines, and orientation to respond adequately in this new Higher Education context. In sum, such students most probably need a great deal of help to guide their learning processes in order to shape their own processing and regulation strategies. Consequently, external regulation or “depending on another” might not necessarily be an explanation of poor learning, but the consequence of being in a transition process. In the Latin-American context, moreover, higher education involves a strong commitment with the family, the society and a significant personal challenge. In this situation, students link their learning components to external regulation or lack thereof. These results indicate that the four-pattern model of learning is insufficient to address the different configurations of beliefs, motives and actions used for learning around the world. The Vermunt model (1998; 2005), therefore, should be expanded with the possible different combinations of the ILS subscales, and especially, a much more inclusive, comprehensive interpretive framework of the educational implications in different contexts is required. A broad, universal scientific model must incorporate the broadest variety of differentiated avenues for explaining learning outcomes. In this line we find the exploratory contribution from Martínez-Fernández and Vermunt (2015), who identify three different avenues for activation of deep processing, and their impact on learning outcomes.

Regarding the second research question – about the relationship between learning patterns, associated and perceived contextual factors, and academic performance – we found no relationship between these factors (Phan, 2008; Rocha & Ventura, 2011). It seems rather curious that we found no differences with regard to age, gender, dedication to study or effort. However, these students were in their first year of tertiary education with numerous challenges, in the midst of different changes, adaptation, educational transition, etc. All of this may well account for the patterns found, and for low levels of significance in relationships between some personal and contextual factors. Friction might be the overriding characteristic of the first year of university, at least, in this sample of Colombian students. In this context, starting tertiary education is a significant personal and family challenge. Additionally, an unexpected relationship between two theoretically opposite learning patterns, MD/er and RD/lr, must be noted. This may perhaps be explained by the effects of the transition from secondary education to higher education, when there is still a strong prevalence of external regulation.

Finally, in the search for more accurate results and considering the path analysis performed, regulation strategies show some interesting results. Not only does external regulation relate to stepwise processing, but it also interacts with self-regulation, in line with findings by Martínez-Fernández and Vermunt (2015) and Vanthournout et al. (2012). These students were in their first year of tertiary education, and for that reason they probably retain characteristics of high school students. Furthermore, considering the fact that they are within a time of adaptation to the university educational system, they need to strengthen the interaction between their experiences and the new educational context (Catrysse, et al., 2015; Donche & Van Petegem, 2009; Evens, Verburgh, & Elen, 2013; Marambe, Vermunt, & Boshuizen, 2012). It is also relevant to note that the direct relationship between self-regulation and deep processing, mediated by the influence of external regulation, supports the results defined in the MD/er pattern (Vermunt, Bronkhorst, & Martínez-Fernández, 2014), thus contributing to reinforce the *Latin-American and Spanish Paradox* (Martínez-Fernández & Vermunt, 2015).

To sum up, the results presented previously stress the need for further study of the associated factors that students bring with them, and how these relate to learning patterns. In fact, the lack of research about learning patterns that characterise students from Latin America and Spain can be seen as a limitation. To date, differences have been reported according to combinations of patterns found in Latin-American (Martínez-Fernández & Vermunt, 2015), Western European (Vermunt, 2005) and Asian students (Ajisuksmo & Vermunt, 1999; Marambe et al., 2012), but research remains scarce with regard to cross-cultural studies. We know of different authors that address this model in Latin American samples, but with less-than-robust analyses; their work therefore appears in journals with little or no impact according to current standards of science. On the other hand, it seems clear that the instrument used for identifying patterns (the ILS) needs cross-cultural adaptation that would allow for contextualized measurement, but at the same time would not limit comparative, international studies. For that reason, we agree with Vermunt and Donche (2017) in supporting the need to make the *cultural dimension* of learning patterns a key subject in the research agenda regarding learning processes.

Finally, we point out our sample size and its origin as a limitation to the representativity of this study. Nonetheless, we consider that this exploratory study contributes data of interest in this area, paving the way for continued inquiry into learning processes in Latin American students, and that its findings represent quality evidence for more global theoretical mod-

els and approaches to understanding learning at university --in this case, for the phase of transition and initial university studies. In this way, Higher Education institutions should reflect deeply on the design of teaching actions that would encourage self-regulated learning across very different starting points in terms of beliefs about learning, motives for learning, and relationship of all the above to certain associated factors. In an early stage, institutions should focus on understanding the emotional, cognitive and socio-cultural processes that characterize a specific group of students transitioning into Higher Education.

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Received: 23-04-2019

Accepted: 01-06-2019