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Editorial EOS

Regulatory Teaching and Self-Regulated Learning in College Students: Confirmatory Validation Study of the IATLP Scales

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Abstract

Introduction. The purpose of this study was to empirically confirm two conceptual interactions proposed by the IATLP Scales: (1) the combination of the teacher's regulatory teaching and the student's self-regulated learning, in order to produce satisfaction with learning; (2) the relationship of this interaction with students' prior self-regulation.

Method. The sample included 2,429 undergraduate students enrolled in education or psychology programs at three universities. Two measures were used: (1) perception of the teaching-learning process, through four subscales from the *Interactive Assessment of the Teaching-Learning Process* (IATLP), and (2) personal self-regulation, through the *Self-Regulation Questionnaire* (SRQ). Using a structural equation and correlational design, the study examined the relations between teaching variables, learning variables and students' outcomes following the presage-process-product paradigm.

Results. The results offer evidence for a consistent, first- and second-order empirical model (with thirteen and four factors, respectively); and significantly confirm the proposed conceptual theoretical model, suggesting that regulatory teaching was strongly linked to self-regulated learning and to students' successful outcomes. The correlations between personal self-regulation and the proposed model were statistically significant.

Discussion. The principles of regulatory teaching are also addressed, being derived from instructional strategies and principles of self-regulated learning.

Keywords: IATLP Scales, Teaching and Learning Process, Regulatory teaching, Self-Regulated learning, Higher Education.

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Enseñanza reguladora, y aprendizaje autorregulado en universitarios: estudio de validez confirmatorio de las escalas EIPEA

Resumen

Introducción. El propósito de este estudio fue confirmar empíricamente dos interacciones conceptuales propuestos por las Escalas EIPEA: (1) la combinación de la enseñanza reguladora del profesor y el aprendizaje autorregulado del alumno produce satisfacción con el aprendizaje, (2) la relación de esta interacción con la autorregulación personal previa de los estudiantes.

Método. La muestra incluyó a 2.429 estudiantes de Grado matriculados en programas de educación o la psicología de tres universidades. Se utilizaron: (1) la percepción del proceso de enseñanza-aprendizaje, a través de cuatro subescalas de la Evaluación Interactiva del Proceso de Enseñanza-Aprendizaje (EIPEA), y (2) Autorregulación personal, a través del Cuestionario de Auto-Regulación (SRQ). Utilizando un diseño correlacional y estructural, el estudio examinó las relaciones entre las variables de enseñanza, variables de aprendizaje y los resultados de los alumnos siguiendo el paradigma presagio-proceso-producto.

Resultados. Los resultados ofrecen evidencia de un modelo empírico, consistente y significativo, de primer y segundo orden (con trece y cuatro factores, respectivamente), que confirmar la propuesta del teórico conceptual de las Escalas EIPEA, lo que sugiere que la enseñanza reguladora estaba estrechamente relacionada con el aprendizaje autorregulado y los resultados exitosos. Las correlaciones entre personal de la autorregulación y el modelo propuesto fueron moderadas pero estadísticamente significativas.

Discusión. Los principios de la enseñanza reguladora también se abordan, que se deriva de las estrategias de enseñanza y los principios del aprendizaje autorregulado.

***Palabras clave**:* Escalas EIPEA, Enseñanza-Aprendizaje, Enseñanza reguladora, Aprendizaje autorregulado, Educación superior.

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Introduction

Teaching students to optimize self-regulation skills becomes a lifelong educational goal in response to exciting challenges brought on by societal changes that affect teaching and learning (Jones, 2010; Meeus, Petegem & Nadine, 2009; Österlind, 2010; Van de Watering, 2006). First, we live in an information age where students are exposed to many sources of information in many different forms. Teacher effectiveness is not ensured by merely covering content, in alignment with local curriculum and policies, but also requires fostering students' commitment to active learning through self-inquiry and developing self-regulated learners who take responsibility for managing their own learning activities (Azevedo & Cromley, 2004; Bach, Haynes & Lewis, 2006; Boekaerts, De Koning & Vedder, 2006; Cardelle-Elawar & Sanz de Acedo, 2010; De Grez, Valcke & Roozen, 2009).

Second, higher education is experiencing a trend toward increasing diversity in the classroom, which means increasing demands on teacher proficiency. The situation presents a special challenge to teachers' commitment to equity within the classroom, where instruction should be tailored to meet individual differences. Often, teachers' concerns reveal their struggle for ways to adapt their teaching as they promote students' self-regulated learning and their use of higher-order thinking skills. As a result, teachers consistently seek ways to manipulate instruction to actively engage all students in meaningful knowledge construction (Bartels, Magun-Jackson & Kemp, 2009). This instructional inquiry becomes a critical focus for the improvement of teaching quality in 21st century educators (Biggs & Tang, 2007; Eriksson, 2009; Glasgow & Hicks, 2009; Kramarski & Michalsky, 2010; Zimmerman, 2008).

Interactive Models of the Teaching-Learning Process

A review of the literature offers a variety of interactive models of the teaching and learning process. Central to the vision of these models is examining teacher quality variables that predict improvement in student achievement. What emerges in these models is that teaching is a complex intellectual and emotional task. Moreover, learning to teach well is a developmental process that unfolds over time (Booker, 2009; Borko, Liston & Whitcomb, 2007; Darling-Hammond, 2009; Gage & Berliner, 1998).

Self-regulated learning in this study includes the three components recognized in the literature as especially essential for academic performance, namely, the student's metacogni-

tive strategies for *planning*, *monitoring*, and *modifying* their cognition (Pintrich & De Groot, 1990). These processes were embedded within the classical presage-process-product teaching models which categorize both student attributes and teaching variables that influence the quality of student learning (Biggs & Tang, 2007). Huitt (2003, 2007), in his interactive teaching-learning model, describes four major categories: (1) *context*, referring to factors outside the classroom that affect the processes of teaching and learning, such as state educational policies and families; (2) *input*, referring to characteristics of teachers and students that they bring with them, (3) *classroom processes*, teacher and student behaviours in the classroom, as well as some other variables such as classroom climate, and (4) *output*, referring to measured student achievement. Biggs (2001) proposed the 3P Model, focused on the *presage-process-product* factors of teaching and learning processes, by employing the Revised Two-Factor Study Process Questionnaire (Biggs, Kember & Leung, 2001). This measure contains four subscales related to essential aspects that indicate a greater or lesser presence of self-regulated learning: deep motive; deep strategy; surface motive, and surface strategy. In Spain, the theoretical model called *Modelo de Calidad de Situación Educativa* [Quality of Educational Situations Model], designed by Doménech (2006, 2011a, 2011b), has established important relationships in this direction.

Entwistle and McCune (2004) proposed a model of teaching for understanding at the university level, suggesting that effective teaching takes place when the teacher creates a classroom environment where students are deeply engaged in processing the content and become responsible for their learning. Consistent with this focus on students, Bach, Hynes, and Smith (2006) suggested that the current focus on learning outcomes should be used to encourage research that explores learning from the students' point of view. Recently, Hattie's (2009) model urged educators to examine learning through the eyes of their students, so that students see themselves as their own teachers. Such an approach draws students away from their comfort zone, the textbook. As a result, at the same time students are developing higher-order thinking skills, they are gaining ownership of their own learning (Wu, 2009). The role of the educator would be to assist students to become self-regulated learners by stimulating their thinking processes and providing clarity about the learning task. Additionally, a series of studies (De la Fuente, 2011; De la Fuente & Justicia, 2007; De la Fuente & Martínez-Vicente, 2007) developed the theoretical, interactive *DEDEPRO model* – DEsign, DEvelopment, PROduct – to assess potential relations among presage-process-product variables recommended by research findings from previous research models.

The question of how learning environments influence students' self-regulation is still under investigation (Nicol, 2009). To understand how teachers' regulatory behaviors in the classroom promote students' self-regulated learning continues to be a central in formal instructional situations in higher education (Entwistle & Peterson, 2004; Schunk, 2005).

The present study

The present investigation builds on previous research findings and suggestions from the literature by developing an interactive teaching learning model that follows the *presage process product* paradigm. In other words, personal self-regulation may be considered a presage variable, regulatory teaching and self-regulated learning may be considered two process variables in interaction, and achievement and satisfaction with the process are product variables. As such, the concepts used in this research were derived from the Biggs 3P model (Biggs, 2001) and were cross-culturally validated in a series of pilot studies that conceptualized the theoretical interactive DEDEPRO model (De la Fuente & Justicia, 2007).

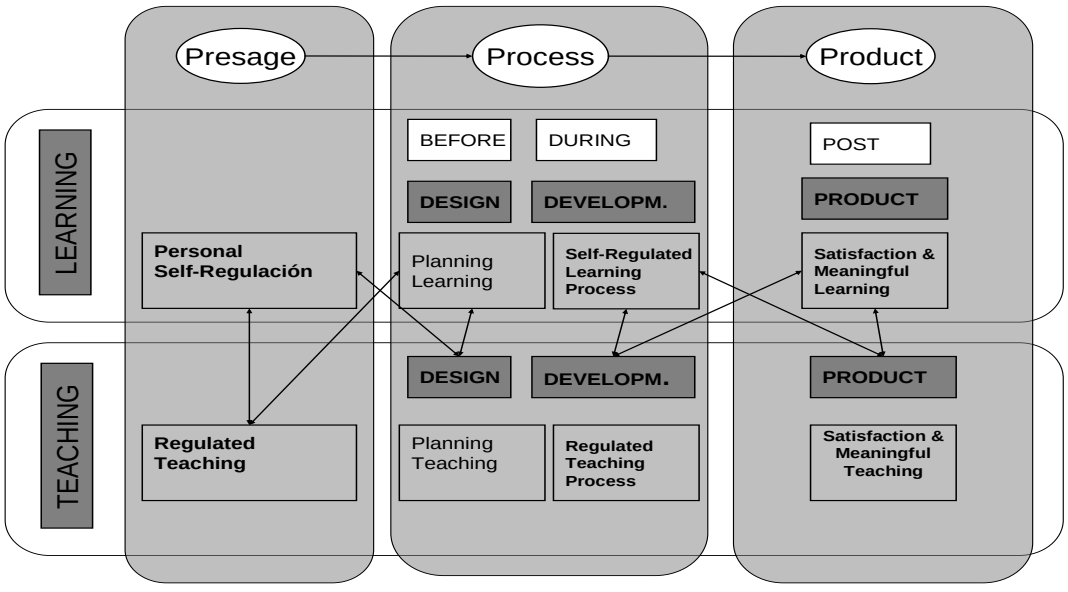

Figure 1. **The DEDEPRO Model, inserted in Biggs' 3P Model. Bold text indicates variables being studied in the present investigation (De la Fuente, 2011)**

The variable of *personal self-regulation* may be considered a presage variable of the student, according to Biggs' Model (2001), since it may determine his or her behaviour during the teaching learning process. It refers to the subject's characteristic behaviours of planning,

control and assessment in daily situations; specifically, to the behaviours of goal setting, perseverance, decision making and learning from mistakes (Pichardo et al, in review). There is prior evidence for the importance of personal regulation in addictive behaviours (Brown & Newby-Clark, 2005; Ernst, Hogan, Vallas, Cook & Fuller, 2009; Neal & Carey, 2005; Rodríguez, Gutiérrez & Pozo, 2010), in social adaptation (De la Fuente, Peralta & Sánchez, 2009) and in grade point average (Okun, Levy, Karoly & Ruehlman, 2009).

Regulatory teaching is a process variable in Biggs' Model (2001) and in the DEDEPRO Model (De la Fuente, 2011; De la Fuente, & Justicia, 2007). It refers to teaching efficacy, involving adequately structured teaching and assistance in order to facilitate and induce self-regulated learning (Kramarski & Michalsky, 2009). In complementary fashion, *self-regulated learning* or autonomous learning is a process variable of the student, referring to the type of learning that involves adequate planning with goals, and self-monitored learning behaviours, through self-control and self-evaluation (Pintrich, 2004; Zimmerman & Shunck, 2001). Self-regulated learning has been related to achievement (Bembenutty & Zimmerman, 2003; Neuville, Frenay & Bourgeois, 2007; Valle, et al., 2008; Vermunt, 2005). The product variable, called *achievement and satisfaction with teaching and learning*, refers to both objective performance and the subjective perception of satisfaction, and has been documented in the Biggs model (2001) and the DEDEPRO model (De la Fuente & Justicia, 2007).

In this interactive model, it was assumed that all the above variables are found on a low-to-high continuum, with different types of probabilistic relations (see Table 1). Following are the four logical hypotheses that can be derived from the DEDEPRO model (a) When the learner possesses high personal self-regulation (*presage*) and is exposed to highly regulatory teaching, he or she will carry out highly self-regulated learning (*process)*, ultimately producing a high level of satisfaction and performance (*product).* (b) When the learner possesses high personal self-regulation *(presage)* and is exposed to a low level of regulatory teaching, he or she will demonstrate moderately self-regulated learning (*process)*, ultimately producing a moderate level of satisfaction and performance (*product).* (c) When the student possesses low personal self-regulation *(presage)* and is exposed to highly regulatory teaching, he or she will carry out a moderately self-regulated learning (*process)*, ultimately producing a moderate level of satisfaction and performance (*product)*. (d) When the learner possesses low personal self-regulation and is exposed to a low level of regulatory teaching *(presage)*, he or she will

carry out a low level of self-regulated learning (*process)*, ultimately producing low levels of satisfaction and performance (*product).*

***Table 1*. Types of relations between levels of variables in the DEDEPRO model, in the context of the 3P model, with the IATLP Scales.**

Type	Presage	Process (Design and Regulatory Implementation)		Product	
	Personal Self-Regulation	Regulatory Teaching	Self-Regulated Learning	Satisfaction	Significant Learning
1.	High	**High**	**High**	**High**	**High**
2.	High	Low	Moderate/High	Moderate/high	Moderate/high
3.	Low	**High**	**Moderate/Low**	**Moderate/Low**	**Moderate/low**
4.	Low	Low	Low	Low	Low

Objectives and hypothesis

The present investigation had two complementary objectives with their corresponding hypotheses:

(1) To explore which variables from the *process* dimension (regulatory teaching and self-regulated learning) have an association relationship with the *product* dimension (satisfaction with teaching and learning, and academic achievement). It was expected that these analyses should provide empirical evidence to support or reject the regulatory model. Specific hypotheses derived from the first objective are the following: There will be a positive association relationship between a *process* of perceived regulatory teaching and self-regulated learning, and the *product* of perceived satisfaction and high performance (this is called the *Type 1* relationship). However, regulatory teaching will be perceived negatively by students who are low in self-regulated learning (*process),* and therefore will be associated with lower satisfaction and achievement (*product*) (This case is called the *Type 3* relationship). This investigation did not incorporate all the variables of the model, for example, Design variables. Nor did we attempt to study all the possible interaction relationships (Types 2 and 4). Therefore, the study aims for only a partial validation of the model.

(2) The second objective was to determine the association relations between the *presage* variable (personal self-regulation), the *process* variables (regulatory teaching and self-regulated learning), and the product variables (satisfaction with teaching and learning, and academic achievement), in order to expand the relationships postulated in the Biggs and the DEDEPRO models. The hypothesis poses that the subject's level of personal self-regulation *(presage)* will have a positive correlation with the variables from the empirical model, that is,

with perception of regulatory teaching and with self-regulated learning *(processes)*, with satisfaction and achievement *(product)*. Hypotheses derived from the second objective are the following: It is expected that personal self-regulation (presage) should be related to self-regulation in learning (process). Moreover, a positive relationship can be expected, though to a lesser degree, with *regulatory teaching*, since this construct is distant from the personal self-regulation construct. There is prior evidence that, with higher levels of personal self-regulation, there is more self-regulated learning and more perception of regulatory teaching, and vice versa (De la Fuente et al., 2010). However, this evidence was obtained with other instruments.

Method

Participants

Stratified sampling was used, including students from different class subjects who agreed to participate in the assessment of their teaching-learning process. Students from three universities participated; two universities were in southern Spain (Universities of Almeria and Granada), and one in the United Kingdom (Cardiff Metropolitan University). The 2,429 student participants were enrolled in undergraduate degrees in psychology (1031), school psychology (369), or education (931). The sample included 1,760 females and 452 males, with a mean age of 21.95 years (SD = 5.2). A total of 1355 students were enrolled in pro-regulation teaching-learning experiments (the teacher provides information and an exhaustive work plan to aid their learning), and 952 students were enrolled in the usual university classroom subjects.

Measurement Instruments and Procedure

The instruments administered to participants for data collection come from two sources. The first four scales were from the *Interactive Assessment of the Teaching and Learning Process, IATLP* (De la Fuente & Martínez-Vicente, 2004, 2007), evaluating the teaching-learning process from the students' perspective and possible causal relations among the presage-process-product variables. Overall reliability for this scale was alpha =.75, which we considered acceptable. Reliability of the four scales used is as follows: 0.75 for IATLP Scale 2; 0.97 for IATLP Scale 4; 0.93 for IATLP Scale 6 and 0.92 for IATLP Scale 8 (see Table 2 for examples of items). The IATLP is a self-report instrument to be completed by the teacher and the students, available in Spanish and English versions. Responses are on a Likert-type scale,

with scores ranging from 1 (totally disagree) to 5 (totally agree). As for the instrument's external validity, results are also consistent, since there are different interdependent relationships among the perception of variables that exist in an academic environment. Variations in scores for the learning process have shown that the Scale is sensitive to the latter's influence on the teaching-learning process. These results provide empirical evidence of the scale's external validity. This validity can be considered adequate, the scale having been shown to be powerful enough to define relations with other variables—learning approach, or teaching and learning experiences—in a sample using Spanish and UK versions of the instruments (Sander et al 2011).

The second source was the *Personal Self-Regulation Questionnaire, SRQ* (Brown, Miller & Lawendowski, 1999), in its Spanish version. The SRQ had high internal consistency (*alpha* =.91) and a 2-day stability over time, r (83) =.94. Two later studies (Carey, Neal & Collins, 2004; Neal & Carey, 2005) offered a psychometric analysis of the SRQ. In the first study, Carey, Neal & Collins, 2004) obtained only one factor, in contrast to the seven factors determined by Brown, Miller & Lawendowski,1999); they conclude their paper with a proposed reduced version of the SRQ. The second study (Neal & Carey, 2005), however, obtains a two-factor structure (*Impulse Control* and *Goal Setting*), concurring with reliability values and the factor structure obtained in other recent studies in Spain (De la Fuente, Peralta & Sánchez, 2009; Pichardo et al, in review). The measures were completed during normal classtime. A set of instructions at the beginning of each assessment instrument included an example, and explained that there were no right or wrong answers. It was made clear that participation was voluntary and that students could withdraw at any point. Examples of *Goal Setting* items are*:* "I usually keep track of my progress toward my goals" or "I set goals for myself and keep track of my progress"; and *Impulse Control* items*:* "I am able to resist temptation" or "Little problems or distractions throw me off course".

Design -Data Analysis

A causal ex post-facto structural and correlational type cross-sectional design was used. We conducted two types of analyses to test the hypotheses that would validate the interactive model: (1) a structural equation model with AMOS (Byrne, 2010), to test and confirm relationships among the variables under study, and (2) Pearson bivariate correlation analyses between personal self-regulation and perception of the teaching learning process. Analyses were carried out using SPSS v. 18 (Arbuckle, 2008).

Results

The first objective was to explore which variables from the *process* dimension (regulatory teaching and self-regulated learning) have an association relationship with the *product* dimension (satisfaction with teaching and learning, and academic achievement). This objective was examined conducting Structural Equation Modeling procedures (SEM).

The structure of the teaching-learning model

First level model

The variables included in the structural equation analysis (based on the DEDEPRO model) were the process variables – Design (IATLP 2: conceptions of teaching), Teaching (IATLP4: perception of the teaching process) and Learning (IATLP6: perception of the learning process) – and the product variable of Satisfaction (IATLP8: satisfaction with the two processes). See Figure 1, Table 2 and Figure 2 for more comprehensive relationships. Relationships between the initial variables were not organized around the presage-process-product heuristic, because we were seeking to validate only the relationships implicit in the IATLP Scales, based on the DEDEPRO model, which only evaluates process (design and development) and product variables.

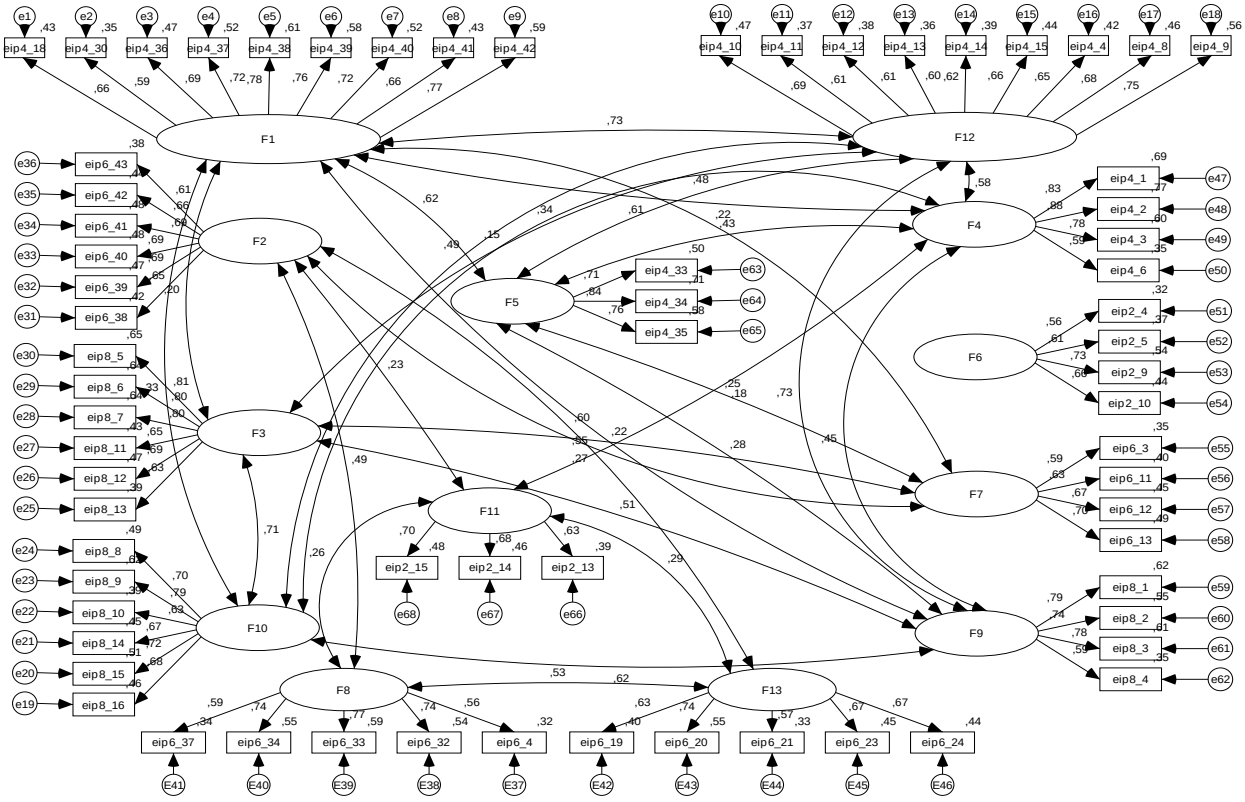

***Figure 2*. First-order Model with thirteen factors of IATLP Scales**

The first level of the analysis, using the above scale items, served as the basis for the empirical model showing 13 primary factors and their relationships. Probability levels of the χ^2 statistic were less than 0.01, indicating inadequate fit. However, this value should be considered cautiously, because the χ^2 goodness-of-fit statistic depends excessively on sample size. In order to consider other goodness-of-fit indicators, the NFI, NNFI, TLI and CFI indices were calculated. Values equal to or greater than 0.90 are interpreted as good model fit. Results were satisfactory with indices approaching 0.90 and errors around 0.05, reasonably consistent values considering the complexity: Chi Square = 6565.876, *df* = 2181, *p* <.000, RMR=.06 RMSEA=.029, CFI=.84, TLI=.83, NFI=.82 and NNFI=.81. All 13 factors, the items they comprise and their factor saturations are presented in Table 2.

***Table 2*. Items in the 13 factors that constitute the first-order empirical model of IATLP Scales**

Factor	Scale	It.	Saturation	Meaning
	Alpha:			
1.	**.897**			**Specific regulatory teaching**
1	IATLP4	38	.760	While we are learning, the teacher helps us to make clear, realistic learning goals
1	IATLP4	39	.752	While we are learning, the teacher works with us on skills for reviewing and modifying our learning objectives
1	IATLP4	40	.658	While we are learning, the teacher makes us think about the way we are learning: at the beginning, during and after finishing the activities
1	IATLP4	37	.592	While we are learning, the teacher creates opportunities so we can think together about how we are learning
1	IATLP4	41	.583	While we are learning, the teacher asks us to reflect, instead of making us repeat all the information.
1	IATLP4	30	.451	The teacher does learning preparation activities with us.
1	IATLP4	18	.371	The teacher makes us reflect on our learning in order to improve it
1	IATLP4	36	.349	While we are learning, the teacher dialogues with the students about the objectives of the lesson or topic
	Alpha: .837			
2.				**Planned learning**
2	IATLP6	41	.805	Before beginning any learning activity or task, I usually look ahead, calculating the time I have available in order to realistically

				distribute my time
2	IATLP6	40	.698	Before beginning any learning activity or task, I organize what I have to do, telling myself: "first I have to do this, then I have to do that ..."
2	IATLP6	39	.628	Before beginning any learning activity or task, I usually divide it into parts, to make it easier
2	IATLP6	38	.603	Before beginning any learning activity or task, I usually take into account what I need to know, and how much time I must devote to it.
2	IATLP6	42	.509	Before beginning any learning activity or task, I usually take into account the different materials, books or documents I'm going to need.
2	IATLP6	43	.388	Before beginning any learning activity or task, I try to find the best conditions so I do not get distracted.
	Alpha: .878			
3.				**Satisfaction with learning**
3	IATLP8	11	-.399	I have learned "how to better learn" this subject matter.
3	IATLP8	13	-.645	My performance was adequate
3	IATLP8	12	-.647	I have planned my learning and carried it out well.
3	IATLP8	5	-.656	I am satisfied with the way I have learned
3	IATLP8	7	-.779	I have adequately learned the material.
3	IATLP8	6	-.816	I have met the learning objectives proposed.
	Alpha: .813			
4.				**Regulatory assessment**
4	IATLP4	34	.943	The teacher uses some activity to evaluate what we know while the lesson or topic is under way
4	IATLP4	35	.664	The teacher uses some activity to evaluate what we know when we have finished the lesson or topic.
4	IATLP4	33	.616	The teacher uses some activity to evaluate what we know when beginning a lesson or topic
	Alpha: .773			
5.				**Achievement conceived of as reproduction**
5	IATLP2	9	.669	Learning is knowing what I have to do in order to carry out class activities
5	IATLP2	5	.653	Learning is getting adequate results on exams
5	IATLP2	4	.629	Learning is knowing how to restate the subject matter that the teacher has explained

5	IATLP2	10	.626	Learning is knowing what I have to do when I am studying at home
	Alpha:			
6.	**.849**			**Preparation for learning**
6	IATLP4	6	-.347	The teacher shows relationships which exist between the material we are going to work on and other material we learned previously
6	IATLP4	3	-.733	The teacher explains the objectives of the activities we are going to carry out
6	IATLP4	1	-.820	At the beginning of each unit or lesson, the teacher explains why we are going to learn this material
6	IATLP4	2	-.894	At the beginning of each activity, the teacher explains why we are going to do it.
	Alpha:			
7.	**.809**			**Thoughtful learning**
7	IATLP6	4	-.472	At the beginning of each topic or lesson, I think about relationships that exist between material we are going to work on, and other material learned previously
7	IATLP6	37	-.501	When learning about something, I like to think about it and ask myself questions, using with my own reflections and considerations
7	IATLP6	32	-.690	When learning new material, I try to relate it to other knowledge I already have, looking for similarities and differences
7	IATLP6	34	-.704	When learning about something, I try to put it into practice or apply it to reality, whether present or future.
7	IATLP6	33	-.775	When learning, I like to relate it to my own experience and my life.
	Alpha:			
8.	**.883**			**Satisfaction with the teaching**
8	IATLP8	1	-.409	I am satisfied with the way my teacher has carried out the teaching
8	IATLP8	4	-.523	The teacher is interested in continuing to teach this way in upcoming instructional units
8	IATLP8	3	-.740	The teacher transmits enthusiasm for learning this subject
8	IATLP8	2	-.759	The teacher is motivated to teach this subject.
	Alpha:			
9.	**.784**			**Study techniques**
9	IATLP6	24	-.437	I usually ask myself and try to discover what the central idea of the topic or lesson is.

9	IATLP6	19	-.546	I usually underline ideas or words that I want to stand out in the text
9	IATLP6	23	-.592	I usually make notations when learning new material
9	IATLP6	21	-.598	I usually write in headings or subheadings for paragraphs or chunks of text that I am learning from.
9	IATLP6	20	-.767	I usually draw out the most important ideas from the topic I am learning about and write them down.
	Alpha:			
10.	**.851**			**Meaningful learning**
10	IATLP8	10	-.301	I have a good understanding of the learning material
10	IATLP8	15	-.308	I would like to keep learning the way we've been learning in this lesson or in the latest lessons or topics
10	IATLP8	16	-.451	I have acquired new learning that develops me as a person
10	IATLP8	14	-.603	What I have learned will be useful in life
10	IATLP8	8	-.742	I am interested in learning about this area of knowledge
10	IATLP8	9	-.810	I am motivated to learn this material
	Alpha:			
11.	**.703**			**Conception of regulatory teaching**
11	IATLP2	15	.703	Procedures should be taught that help students learn on their own
11	IATLP2	13	.648	Helping each student know how to learn on his own encourages students' learning
11	IATLP2	14	.643	Each student should form his own learning system, and the teacher's involvement can contribute to this greatly.
	Alpha:			
12.	**.883**			**General regulatory teaching**
12	IATLP4	4	-.381	The teacher tries to determine whether the students have understood the learning objectives well.
12	IATLP4	13	-.397	The teacher takes time to address our questions
12	IATLP4	12	-.434	The teacher allows us to speak in class about how we are learning.
12	IATLP4	11	-.434	The teacher frequently informs us as to our progress in the subject
12	IATLP4	10	-.436	The teacher is clear and orderly in his or her explanations.
12	IATLP4	8	-.467	The teacher makes the classes enjoyable
12	IATLP4	14	-.471	The teacher helps us with corrections
12	IATLP4	9	-.572	The teacher is concerned that students feel comfortable in class
12	IATLP4	15	-.587	The teacher realizes when students have trouble learning
	Alpha:			
13.	**.752**			**Self-assessed performance**

13	IATLP6	12	.648	I use some activity (oral questions, questionnaire, etc.) to evaluate what I already know when beginning an instructional unit
13	IATLP6	13	.603	I use some activity (test, questionnaire, oral questions, etc.) to evaluate what I have learned at the end of the topic or lesson.
13	IATLP6	3	.491	At the beginning of each topic or lesson, l map out the material we are going to work on using a conceptual map
13	IATLP6	11	.470	I make a work plan for each topic or lesson

Second Level Structure

To refine the model, a second order analysis was performed using the above factors. The second-order hypothesis was that the factors would group around the dimensions belonging to regulatory teaching (D1), self-regulated learning (D2) and the product of learning, or satisfaction with teaching and learning (D3). The results indicated empirical consistency across the four secondary factors and their relationships. Empirical consistency again showed reasonable values (n = 2429) for the level of complexity: Chi Square = 590.626, df = 48, p <.000, RMSEA=.068, CFI=.83, TLI=.83, NFI=.85 and NNFI= .86. See Figure 3. Therefore, in global terms, the model can be considered defensible and valid. Recently it has been demonstrated that the choice of cutoff values depends on model specifications, degrees of freedom, and sample size (Chen et. al, 2008).

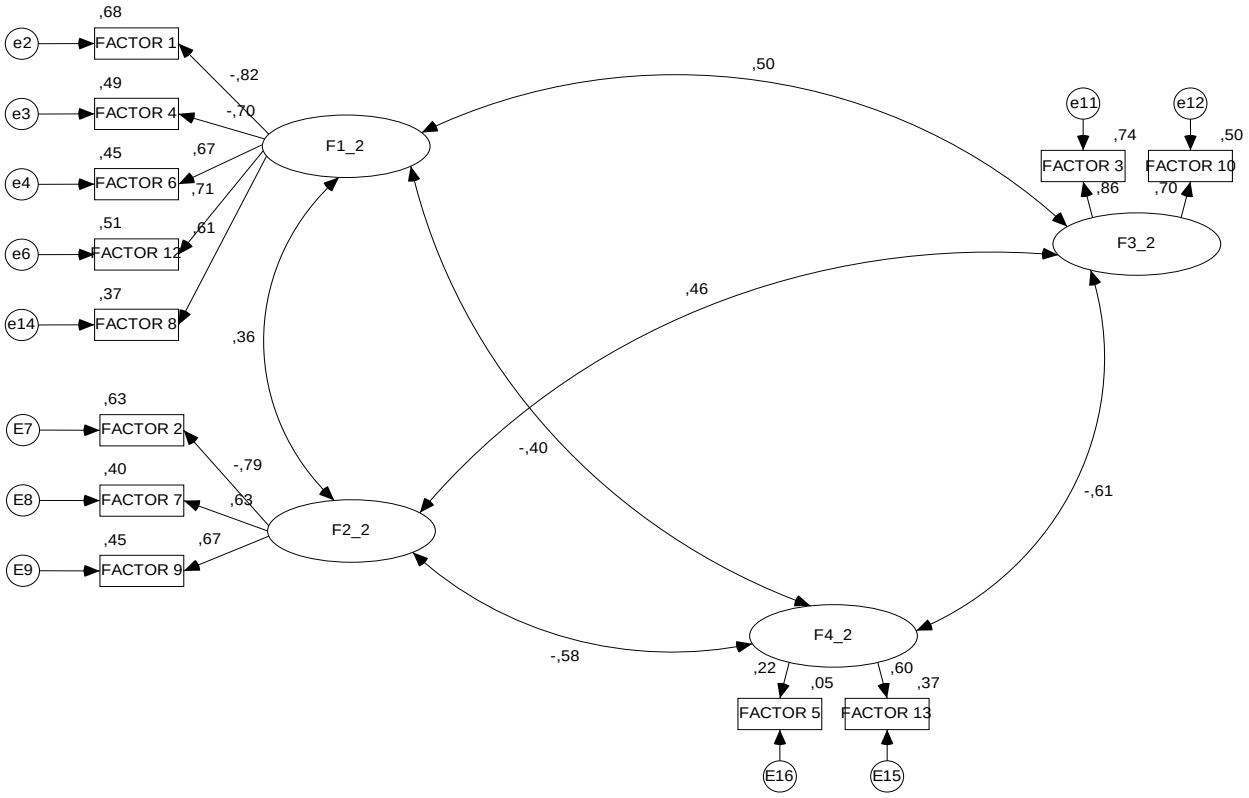

Figure 3. **Second-order Model, with four factors of IATLP Scales**

The resulting factors have their own identity and form part of different scales relating to the DEDEPRO Model (see Figure 1). The first factor, called *regulatory teaching*, groups together Factors 1, 4, 6, 12 and 8, described above. Notice that the weight of the factors and the order of the first four factors corresponds to factors referring to development of the teaching process: factor 1, specific regulatory teaching, with a negative value; factor 4, regulatory assessment, with a negative value; factor 6, preparation for learning, with a positive value; and factor 12, general regulatory teaching, with a positive value. Finally, factor 8 refers to the product of teaching, that is, satisfaction with the teaching, and has a positive value. The second factor is labeled *self-regulated learning*, included three factors (2, 7 and 9) pertaining to the development of the learning process. Similarly, the order and weight of the factors corresponds to *the design* of learning (factor 2, planning, with a negative weight) and to the development of the learning process (factor 7, thoughtful learning, and factor 9, study techniques, both with a positive value). The third factor is labeled *result*. It is made up of two factors, referring to the *product* of the learning process: factor 3, *satisfaction with learning*, and factor 10, meaningful learning, both with a positive weight. The fourth factor is called *performance- or reproduction-focused learning*, which acquires an identity of its own and is formed by two factors: one factor from *design* of the learning process (Factor 5, achievement conceived as reproduction, with a positive weight) and another from the *development of learning* (factor 13, self-assessed performance, with a positive weight). Recall that the regulatory teaching dimensión, self-regulated learning and reproductive learning belong to the Development phase of the DEDEPRO model, and the dimension of satisfaction with learning belongs to its Product phase.

There are positive relationships between factor 1 (regulatory teaching), factor 2 (self-regulated learning) and factor 3 (result), and a negative relationship between all the above and F4 (learning conceived as reproduction). Moreover, it must be noted that factor 11 (conception of regulatory teaching) disappears in this empirical structure.

Relationship between Student Personal Self-regulation (Presage) and Regulated teaching, Self-Regulated learning (Process) and Satisfaction (Product).

The second objective was to determine the association relations between the *presage* variable (personal self-regulation), the *process* variables (regulatory teaching and self-regulated learning), and the product variables (satisfaction with teaching and learning, and

academic achievement). This objective was examined conducting bivariate Paerson's correlations. The relationship between the presage variable *personal self-regulation* and the process variables indicated that personal self-regulation, as a *presage* variable, did not appear in any significant relationship with the *Regulatory Teaching* dimension. However, it did have a relationship with the *Self-regulated Learning* dimension (r =.115, p<.000), specifically with factor 2, planned learning (r =.175, p<.000), with factor 7 (thoughtful learning; r =.133, p<.001) and with factor 9, study techniques (r =.09, p <.02). In the *Product* Dimension it showed a significant correlation (r =.112, p <.004) with factor 3, satisfaction with learning (r =.112, p <.005). Finally, a significant correlation appeared with Dimension 4, *Performance-focused Learning* (r =115, p <.003), and with factor 5 (achievement conceived as reproduction, r =.135, p <.000).

In summary, bivariate correlation analyses between the personal self-regulation dimension (planning and control of action) showed statistically significant correlations of action control with regulatory teaching (r= .082; p <.03), with self-regulated learning (r= .318; p <.000), with performance-focused learning (r = -158; p <.000) and with product (r =.181; p <.000).

Discussion

Research objectives

With regard to the first objective and hypothesis, second-order confirmatory analysis has established a relatively consistent structure. The indices are acceptable since the choice of values for cutoff points depend on model specifications, degrees of freedom, and sample size (Chen, Curran, Bollen, Kirby & Paxton, 2008). The model of IATLS Scales reveals the characteristics of *regulatory teaching*, comprising four process factors (specific regulation, continuous assessment, preparation for learning and general regulation) and one product factor (satisfaction with the teaching). In addition, it establishes how, at university level, the first two process factors are seldom put into practice, and therefore appear with a negative weight. In complementary fashion, the model gives evidence for the constituent components of *self-regulated learning*, comprising three factors (planned learning, thoughtful learning and use of study techniques), and also shows that planning behaviours are seldom executed at higher levels. It also incorporates the *product*, configured by two factors (satisfaction with learning and meaningful learning, which includes perceived performance). Factor 11 (conception of

regulatory teaching) falls out of the second empirical model, probably because it does not match conceptually with the second order factor of regulatory teaching. This result would seem to be coherent, since it refers to a student belief more than a perception of the teaching-learning process and its outcomes.

However, the most important relationship established is the positive relationship that appears between regulatory teaching and self-regulated learning, and between these two and the product. These empirical relationships provide partial evidence to confirm the relationship postulated in the empirical model as Type 1 (see Table 1), in coherence with prior investigations that established this relationship (Cleary & Zimmerman, 2004; Labuhn, Bogeholz & Hasselhorn, 2008). Lee, Yin and Zhang (2009) also showed the influence of teaching, although among students in Hong Kong, teacher-focused instruction encouraged self-regulated learning. In contrast to these studies, Rotgans and Schmidt (2009) provide evidence for the contextual independence of self-regulated learning. This apparent contradiction should probably lead future studies to differentially define self-regulated learning (autonomous, but attentive to regulatory signals and contextual restrictions) and independent learning (autonomous, but indifferent to signals and imposed requirements).

The interactive model of regulatory teaching for promoting students' self-regulated learning has also established constituent elements of *performance-focused learning*, comprising two factors (achievement conceived as reproduction and self-assessed performance). But most important is the consistent, negative relation that this factor shows with regulatory teaching, self-regulated learning and product. This result sheds more light on the relationships hypothesized in *Type 3* interactions (see Table 1). Here, as in prior studies (Bartels, Magun-Jackson & Kemp, 2009; Pintrich, 2000), students who are focused on performance (product), and not on learning (process), do not want a regulatory teaching process nor do they have a self-regulated learning process; instead, they prefer a kind of independent learning.

As for the second objective and hypothesis, having to do with the relationship between the presage variable personal self-regulation, and the empirical variables of the regulatory model, there is evidence of positive, significant association relationships between this personal characteristic and regulatory assessment (teaching process), planned learning (learning process) and satisfaction with learning (TL product). This provides evidence for a relationship between the presage variable and the rest of the relationships postulated in Type 1 (see Table

1): high personal self-regulation, associated with a positive perception of regulatory teaching and with self-regulated learning, leading to an end product of high satisfaction and performance. However, the positive relationship that appears between personal self-regulation and achievement conceived as reproduction alerts one to the possibility that performance-oriented learning may also involve a certain level of self-regulation. This result may contradict the classic relationship between performance and learning, where self-regulation is concerned (Vermetten, Vermunt & Lodewijks, 2002; Vermunt, 1998). Moreover, achievement-focused students, who directs their self-regulation toward performance, exemplifies the relationships described above, with a negative relationship to regulatory teaching, self-regulated learning and satisfaction with the product. This type of student would prefer to learn with an exclusive focus on performance, not wanting to invest time in the learning process. Such students would not delve deeply into learning, since they are less involved with the demands of the contextual teaching-learning process, and more focused on the product (independent learning). In this phenomenon, the process-product metaphor applies: precisely the students who least need a regulatory teaching process (students with the most self-regulation) are the most participative and are most inclined to value regulatory teaching. They look for meaningful elements to self-regulate their learning process, and tend to be more process oriented. Paradoxically, the students who most needs it – those who lack self-regulated strategies and are more predisposed to follow procedural knowledge – do not appear to be in control of their own learning as decision makers (Minnaert & Vermunt, 2010). Those with the least self-regulation are the least participative in a regulatory teaching process, and do not seem to want it, pursuing a kind of independent learning (as compared to autonomous) that is more product focused.

Conclusions

For these reasons, we can conclude that: (1) Independence in learning (de-contextualized self-decision) should not be considered equivalent to autonomy. *Independent* learning is not self-regulated: it does not take into consideration the indications from other-regulation that are offered by regulatory teaching. *Autonomous learning*, however, is self-regulated by definition, since it involves the active search for informative indications that will aid in self-regulation, typically offered in regulatory teaching. (2) Encouraging autonomy in students (or self-regulation), should not involve less process regulation, but rather the opposite, greater external regulation. The "journey metaphor" (Pintrich, 2000) is applicable to this situation: in order for students to travel on their own during the learning process, staying on all its pathways, the latter should be well designed, well constructed and be well marked to

orient the traveler. Self-regulated, or autonomous, drivers take the journey by actively seeking out information, adjusting their course of travel according to the information acquired, while independent drivers will decide, *motu propio*, how to make the journey. Both types of drivers want to reach the goal in good shape, but they will travel and reach the goal differently. Thus, if the teaching process is not developed in regulatory fashion, it may be encouraging Type 2 and 4 relations postulated in the DEDEPRO Model, lack of external regulation based on a utopian, alleged autonomy of the university student. The present interactive, regulatory model for promoting students' self-regulated learning can be the implicit teaching model that guides educators of undergraduate students to develop a self-inquiry approach to their own promotion of self-regulated learners. The results establish a legitimate inquiry into relations between teacher behavior and student learning outcomes.

Implications

There are several implications from this study. First, regulatory teacher behaviours influence students in becoming better self-regulated learners. Second, educators at all levels, starting with pre-service teachers, should be aware that their teaching method will affect not only students' learning outcomes but also their perception of satisfaction in learning (Meeus, Petegem & Nadine, 2009; Minnaert & Vermunt, 2010; Van de Watering, 2006). These concerns are part of the self-inquiry process that educators should adopt during the three components of regulatory teaching: planning, instructing, and evaluating students' work. Teachers should create a classroom environment where errors can be sources of learning instead of occasions for punishment (Cardelle & San de Acedo, 2010; Kramarski & Michalsky; 2010).

One noteworthy result of our research was the lack of statistically significant association effects between self-regulatory personal strategies and types of instructional strategies. The lack of an apparent relationship between personal self-regulation (presage variable of the student) and instructional strategies (process variable of the teacher) is explained by the distance that separates these variables. In Biggs' model (2001), this is similar to comparing self-regulated learning (a student process variable) with regulatory teaching (a teacher process variable). Thus, personal self-regulation (presage) should be related to self-regulated learning (process), where the latter is the realization of the former in a teaching-learning situation. Keep in mind that *personal self-regulation* is a general personal construct, taking shape in

different behaviors in specific situations (health, social behaviour, learning, and so on); in the present case it is a prior personal correlate (presage) of self-regulated learning (process).

Future research

The results encourage further investigation of this issue, using larger populations that include students from more varied universities and student programs. This further research could use mixed methods, not only with quantitative data but also using qualitative methodology as suggested by Booker (2009), complementing results that only quantitative data cannot explain. Similiarly, it is also recommended that the model being tested undergo refinement. Such work could have a constructive impact on teacher education policy and practice, as recommended by Borko, Liston and Whitcomb (2009).

In conclusion, in terms of teacher effectiveness, this study suggests an examination of whether instruction, in the context where learning takes place, is promoting self-regulated learning (Martens et al., 2010; Rotgans & Schmidt, 2009; Whitcomb, Borko & Liston, 2009). Future conceptual reviews and empirical studies of variables that determine academic achievement at university should pay attention to regulatory teaching as an essential characteristic of effective teaching, in interaction with many individual characteristics, for which consistent empirical evidence already exists (Richardson, Abraham & Bond, 2012).

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