Motivational, Volitional and Metacognitive Aspects of Self Regulated Learning

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Abstract

Introduction. Today one of the main objectives of education is to help students to become autonomous and efficient learners. This is only possible to the extent that students self-regulate their own learning. Hence, the purpose of this study was to study some contextual and personal factors that facilitate this process.

Method. Participants were 604 high-school students from a northwestern city in Spain. Structural Equation Modeling (SEM) was utilized to determine how well the proposed theoretical model fit the research data.

Results. Analyses of the relationships between the model variables reveal the following results: students' perception of the classroom structure is an important condition for the development of his or her personal goal orientation. Goal orientation appears to lead students to take responsibility (or not) with the persistence and perseverance required to achieve the goals defined by their motivational orientation, by controlling motivation and emotion. This effort and persistence for goal achievement has in turn a positive effect on the use of strategies to control and direct his or her mental processes for the self-regulation of learning.

Discussion and conclusions. This study showed the importance of students' perception of the classroom goal structure to get involved in their own learning, and the possibility to increase the use of metacognitive strategies, for the self- regulation of learning, through the use of volitional strategies.

Key words: Motivation, volition, metacognition, self-regulated learning

Aspectos motivacionales, volitivos y metacognitivos del aprendizaje autorregulado

Resumen

Introducción. Hoy en día uno de los principales objetivos de la educación es ayudar a los estudiantes a ser autónomos y eficaces. Esto sólo es posible en la medida en que los alumnos autorregulen su propio aprendizaje. Por lo tanto, el objetivo de este estudio fue estudiar algunos de los factores contextuales y personales que facilitan este proceso.

Método. Los participantes fueron 604 estudiantes de Educación Secundaria en una ciudad al noroeste de España. Se utilizó el Modelado de Ecuaciones Estructurales (SEM) para determinar qué tan bien el modelo teórico propuesto se ajustaba a los datos de la investigación.

Resultados. El análisis de las relaciones entre las variables de modelo revelan los siguientes resultados: la percepción de los estudiantes de la estructura del aula es una condición importante para el desarrollo de su orientación personal a metas. La orientación a meta parece conducir a los alumnos a asumir la responsabilidad (o no) con la persistencia y perseverancia necesarias para lograr los objetivos definidos por su orientación motivacional, a través del control de la motivación y la emoción. Este esfuerzo y perseverancia para el logro de la meta a su vez tiene un efecto positivo sobre el uso de estrategias para controlar y dirigir sus procesos mentales para la autorregulación del aprendizaje.

Discusión y conclusiones. Este estudio mostró la importancia de la percepción que los estudiantes tienen de la estructura de metas de aula, a fin de involucrarse en su propio aprendizaje y la posibilidad de aumentar el uso de estrategias metacognitivas, para la regulación automática de aprendizaje, mediante el uso de estrategias volitivas.

Palabras clave: motivación, voluntad, metacognición, aprendizaje autorregulado

Introduction

The study of the factors that influence students' learning and achievement is one of the topics to which educational research has dedicated its attention during the last decades. The current emphasis is on the students' active participation in their own learning in order to become independent, autonomous and self-motivated. In this context, self-regulation of learning becomes of particular importance; it focuses on how students personally modify their thought, affect and behavior, by using specific mechanisms and support meta-abilities towards the achievement of their goals (Zimmerman, 1989).

In general, for significant learning to take place, students must be motivated to learn and possess and mobilize the necessary strategies to regulate their cognition (metacognitive strategies). They also need strategies that help them to persist and manage their effort to achieve goals that improve their learning (volitional strategies). Moreover, contextual factors have an important role in facilitating or constraining self-regulation.

In this context, *Goal Orientation Theory* is a current line of research in the study of students' learning motivation. Goal orientations refer to the purposes that guide individuals to initiate and develop actions in achievement situations (Pintrich and Schunk, 2006). Also, they reflect the criteria by which people judge their task execution and their success or failure in goal achievement (Urdan, 2004). Traditionally, in goal orientation research, there are two types of goals that students can adopt in the academic context, according to how they perceive their level of competence: learning goals and performance goals (Kaplan and Midgley, 1999).

Some researchers (Midgley et al., 2000) have considered both orientations as more complex, both from a theoretical perspective and from the empirical results. They propose that learning goal orientation contrast with performance goal orientation (both having positive approaches), and also include a new goal orientation, called performance-avoidance goal orientation, that includes the avoidance component. Performance-approach goal orientation focus is in trying to demonstrate ability. While performance-avoidance goal orientation focuses in trying to avoid looking incompetent.

Several studies have found from this perspective that self-regulated learning can be obtained through learning goals (Pintrich, 1999). However, there are different results regard-

ing the adoption of goals to demonstrate ability (Muis, Winne and Edwards, 2009) and negative results when adopting goals to avoid showing lack of ability (Urdan, 2004). So, depending on the goal the student adopts, he or she evaluates learning situations and tasks differently (Tapola and Niemivirta, 2008), engages in tasks with different expectations, and explains the obtained results in a different way (Alonso-Tapia, 1992).

According to Goal Orientation Theory, all the different mental representations students generate about the types of goals they aim to achieve within the educational context (personal goal orientation) do so under the influence of external factors such as teacher's planning, the level of demand, and the class organization (Pintrich and Schunk, 2006). Two general types of environments take place in the classroom: learning and performance. A learning structure has been defined as the educational environment that emphasizes mastery and effort. In a learning environment internalized performance standards are prevalent along with the idea that new skills and knowledge are acquired through involvement in situations where the student is challenged to learn. In contrast, in a performance structure there is a marked emphasis on external rewards; the ability of a student, as indicated by the student's performance relative to the performance of other students, is emphasized (Ames, 1992).

From this perspective, several studies have found that students' perceptions of their classroom goal structure are positively related to their personal achievement goals for those classes (Ames, 1992; Gaeta, 2006) and personal goal orientations in turn are significant predictors of their level of persistence and task involvement (Radosevich, Vaidyanathan, Yeo and Radosevich, 2004). Specifically, perceptions of a learning-oriented goal structure are positively related to more adaptive learning patterns such as the use of effective learning strategies, as well as to involvement in the class, motivation, effort, affective states and eventually academic achievement (Sideridis, 2005). In contrast, a performance goal structure has been associated with negative learning patterns (Ryan, Gheen and Midgley, 1998).

Depending on whether the aim pursued is to improve their competence (i.e., learning goals), to prove their competence (i.e., performance-approach goals) or to avoid looking incompetent (i.e., performance-avoidance goals), there are differences in the ways of thinking and acting in task performance (Midgley et al., 2000). Consequently there will be variations in their cognitive processing and regulation of the learning processes.

Self-regulation at the cognitive level involves, on the one hand, knowing and managing a number of cognitive and metacognitive strategies to carry out study tasks and, on the other hand, knowing oneself as information processor. Self-regulation also involves the awareness of the requirements of each task to be able to plan, set goals, organize, self-monitor and self-evaluate during learning (Roces and González, 1998).

Conceptually, according to contemporary psychological literature, metacognition consists of the knowledge and regulation of one's cognitive processes. Metacognitive knowledge refers mainly to the information a person has about his or her cognitive processes. In contrast, the regulation of one's cognition includes: processes of setting goals, planning activities, monitoring during learning, and reviewing and assessing results (Brown, 1987). It is part of what has been termed "metacognitive strategies" (Lompscher, 1994, in Efklides, 2006).

As we have seen, motivation is an essential factor for students' learning and achievement (Pintrich and Schunk, 2006). However, academic goals often require time to be achieved, and several situations that hinder the required action to achieve desired goals can be present, as well as motivation fluctuations due to attitudes and emotional states (Husman, McCann and Crowson, 2000). Therefore, in the face of motivation decreases, students' abilities to use strategies that help them to direct their motivation towards action, in the set goal direction, are a central aspect of self-regulated learning (Wolters and Rosenthal, 2000).

In order for students to keep their motivation and interest in learning, they need to be able to self-regulate their activity during the learning process (Corno and Rohrkemper, 1985, in Alonso-Tapia, 1992). In this sense, volition, intended to regulate effort, is essential for students' performances, especially when goal attainment demands concentration and effort for long periods of time (Heckhausen and Kuhl, 1985). This approach emphasizes will as the person's driving force that enables him or her to execute his or her decisions and protect his or her psychological states in the face of other alternatives, thoughts and unwanted emotions. Current self-regulated learning models propose that volitional strategies for maintaining motivation and effort towards goals, as well as for controlling negative emotions, are interrelated and jointly involved in the self-regulation of learning (Pintrich, 2000a).

This mediating variable (e.g., volition) has also been included in other cognitive-motivational models. In this context, several studies have found a relationship between learn-

ing goal orientation and the use of strategies to increase motivation and effort (Bartels, Magun-Jackson and Kemp, 2009; Radosevich *et al.*, 2004). Various studies have also shown a mediating role of volitional strategies in the learning process, finding that volition and the use of metacognitive strategies influence better academic performance (Wolters, 1998; 2000).

The present study

The unique characteristics of each academic environment, combined with those of the students themselves, make learning a real challenge. Specifically, in Secondary Education, students not only have to cope with their emotional and biological changes, they must also be able to manage different assignments from multiple teachers, in a broader study program, and are also expected to engage in more independent study time. To be able to meet these expectations, students need to have a repertoire of self-regulation strategies that they can access and use (Suárez and Fernández, 2011). Therefore, we emphasize on the need to train students towards an autonomous learning, through the use of different strategies that control many aspects of their cognition, motivation and affect in order to meet their academic goals.

In this study we start with the basic assumption that metacognition is a central construct in self-regulation of learning processes (Pintrich, Smith, García and McKeachie, 1991). Self-regulated learners use their metacognitive knowledge to regulate their learning effectively and, in turn, regulation of their own learning can lead them to acquire new knowledge related to the task, to the strategies to deal with, and to their own learning resources (Pozo *et al.,* 2006). In this context, metacognitive strategies, which include planning, monitoring and regulating strategies, assist students in the control and regulation of their cognition and therefore help them to foster independent learning (Pintrich *et al.*, 1991).

Moreover, developmental, individual and contextual differences may all interfere with or support efforts at self-regulation. Although students of different ages may have metacognitive experiences, which improve with age, is the capacity to take advantage of them which help students in the acquisition of knowledge and competences. Hence the critical importance for adolescents to be aware of and control cognitive processes to becoming cognitively engaged. Also, in school students pursue multiple goals, so learning goals are not always adopted by students and sometimes find it difficult to maintain their intentions to accomplish learning goals, even when they are adopted (Boekaerts and Corno, 2005). So, to be able to use strategies that help them maintain their motivation to learn and to control their affect under

conditions of difficulty or competing goals (volition control) is of great importance (McCann and Turner, 2004).

Objetives and hypothesis

Based on the above, in this study we hypothesize that metacognitive strategy use will be related to different motivational and volitional variables. Motivational variables include perceptions of the classroom structure and personal goal orientations, and volitional variables include motivation and affect control strategies. We propose a set of structural relationships among these constructs; students' perceptions of the classroom goal structure have a direct influence on their goal orientations, and volitional strategies -motivation and affect control- have a mediating role between students' goal orientations and the use of metacognitive strategies.

The basic assumptions of the model and the relationships between the corresponding variables are displayed in Fig. 1. From a general perspective, in the research model it is hypothesized that:

1. Classroom performance-approach goal structure and classroom performance-avoid goal structure would positively relate to performance goal orientation.
2. Performance goal orientation would be positively related to metacognitive strategies.
3. Classroom mastery goal structure would be positively associated to mastery goal orientation.
4. Mastery goal orientation would positively relate to metacognitive strategies.
5. Volitional strategies would mediate the relationship between mastery and performance goal orientations and metacognitive strategies.
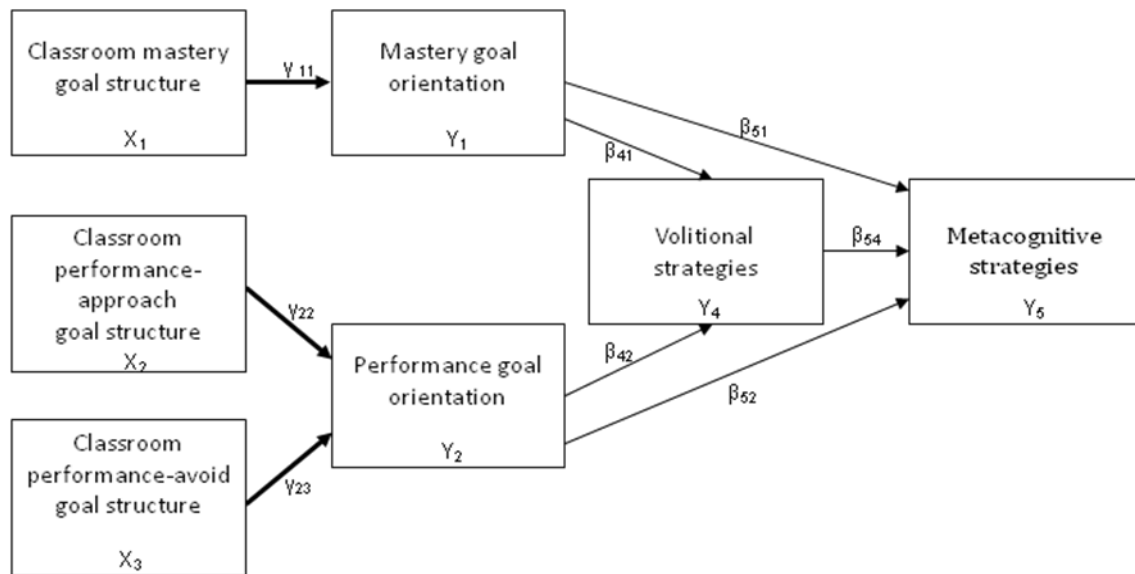
Note: Thick arrows indicate the effects (γ) of exogenous variables (X) on endogenous variables (Y). Thin arrows indicate principal effects (β) between Y variables.

Figura 1. *Graphic representation of the proposed model.*

Regarding volitional strategies, we used a single latent variable "volition", which integrated "stress reducing actions", "negative-based incentives" and "self-efficacy enhancement" strategies. In addition, two random halves were used as indicators for all the latent variables in the model in order to reduce the number of parameters (MacCallum and Austin, 2000). We used a total of 14 indicators and 7 latent variables in investigating the theoretical structural model.

Method

Participants

Participants in the study were 604 Secondary School students, sampled from the seventh (n=336) and tenth (n=268) grades, from three public and three private schools of a northwestern city in Spain. The sample consisted of 303 females and 301 males, ranging in age from 12 to 17 years. Stratified random sampling was used in the study (population importance of each zone in the city, and number and type of school: public and private).

Instruments

Students' perceptions of their classroom goal structure were measured using the corresponding questionnaire section from the *Patterns of Adaptive Learning Survey* (PALS;

Midgley *et al.*, 2000). It contains three subscales: The "classroom mastery goal structure" scale measures students' perceptions about goals of developing abilities and competence (e.g., "In our class, trying hard is very important"). The "classroom performance-approach goal structure" scale measures perceptions about goals of demonstrating abilities and competence (e.g., "In our class, getting good grades is the main goal"). The "classroom performance-avoid goal structure" scale measures perceptions about goals of avoiding demonstrating incompetence (e.g., "In our class, showing others that you are not bad at class work is really important"). Midgley *et al.* (2000) obtained the following reliability coefficients (Cronbach's α) for each of the subscales: classroom mastery goal structure (.76), classroom performance-approach goal structure (.70) and classroom performance-avoid goal structure (.83). In our sample, we obtained coefficients (Cronbach's α) for each scale of .75, .66 and .71, respectively, and the factor structure of the scale using our data coincides fully with that obtained in the original instrument.

Students' goal orientations were assessed by means of the corresponding questionnaire section from the Patterns of Adaptive Learning Survey (PALS; Midgley *et al.*, 2000). The questionnaire provides an evaluation of three general types of academic goals: The "mastery goal orientation" scale indicates students' task engagement to develop competence and mastery (e.g., "I do my schoolwork because I am interested in it"). The "performance-approach goal orientation" scale is indicative of a student that wants to demonstrate competence and ability (e.g., "I want to do better than other students in this class"). "The performance-avoidance goal orientation" scale indicates a students' purpose to avoid appearing incompetent (e.g., "The reason I do my work is so others won't think I'm dumb"). Midgley *et al.* (2000) obtained the following reliability coefficients (Cronbach's α) for each of the subscales: mastery goal orientation (.85), performance-approach goal orientation (.89) and performance-avoidance goal orientation (.74). In the present study, after the exploratory factor analysis, instead of the three expected factors, only two factors emerged: mastery goal orientation (Cronbach's α=.78) and performance approach-avoidance goal orientation (Cronbach's α=.83), which we designated with the term "performance goal orientation". The obtained reliability coefficients led us to consider the scale an instrument with fairly satisfactory indexes.

To evaluate the use of metacognitive strategies we have used the corresponding scale from the *Motivated Strategies for Learning Questionnaire* (MSLQ; Pintrich *et al.*, 1991). The metacognitive strategy use scale measures the strategies used by a student to control and regu-

late his or her own cognition (e.g., "When I'm reading for this class I stop once in a while and go over what I have read"). In the present study, the reliability of this scale was fairly high (Cronbach's α=.79) compared to the reliability coefficient obtained in the original scale (Cronbach's α=.78).

The use of volitional strategies was assessed utilizing the *Academic Volitional Strategy Inventory* (IEVA; McCann and Turner, 2004). This survey instrument measures the extent to which students engage in motivational regulation strategies for controlling their motivation and emotional states as they initiate and attempt to maintain action on academic requirements. The "self-efficacy enhancement" scale represents behavioral control in which students reassure themselves about their capacity to do expected tasks (e.g., "I tell myself, I can do this"). The "stress reducing actions" scale represents students' actions taking to reduce stress produced by attractive alternatives (e.g., "I usually use some form of relaxation techniques so I am better able to concentrate on my studies"). The "negative-based incentives" scale represents students' attempt to remind themselves of their goals and to increase motivation to fulfill academic commitments (e.g., "I do think about the kinds of job/career I may end up with if I flunk out of school). In our study, the reliability coefficients (Cronbach's α) for each of the scales are: self-efficacy enhancement (.75), stress reducing actions (.61) and negative-based incentives (.58). The reliability estimate for the full questionnaire is fairly strong (Cronbach's α=.81) compared to that of the original instrument (Cronbach's α=.87).

Procedures

All the instruments were translated and adapted to the Spanish context, with the revision by experts. The MSLQ had been translated and adapted for Spanish university students' samples (Roces, Tourón and González, 1995), so there was only a semantic revision for its application in secondary school samples. The adapted assessment instruments were administered to the students in their classroom, in one session during the normal academic schedule. Students were assured that their answers would be kept confidential and were encouraged to ask for clarification regarding unclear items.

Data Analyses

In order to validate the factor structure of the instruments for the present study, Confirmatory Factor Analysis (CFA) was conducted, using LISREL 8.8 (Jöreskog and Sörbom,

2006). For the estimation of the parameters we used the maximum likelihood method; all analyses were carried out with covariance matrices.

Results

Preliminary analyses

Confirmatory Factor Analysis (CFA) was used in order to replicate the factor structure of the instruments used in the study. The fit indices displayed in Table 1 indicate a good model fit for the factor structures; the RMSEA values are recommended to be below 0.10 for a moderate fit, below 0.05 for a good fit, and below 0.01 for an outstanding fit to the data (Hair, Anderson, Tatham and Black, 2000), values above 0.90 are recommended for a good fit for GFI, AGFI, NFI, TLI and CFI (Jaccard and Wan, 1996) and the x^2/d.f. ratio bellow 5 is considered acceptable and below 3 indicates a good fit of the data (Bollen, 1989).

Table 1. *Confirmatory Factor Analysis (CFA) of the instruments used in the study (n=604).*

Instrument	RMSEA	GFI	AGFI	NFI	TLI	CFI	x^2/d.f.
Perception of Classroom Goal Structures	.055	.967	.946	.923	.931	.949	2.83
Personal Achievement Goal Orientations	.075	.963	.935	.925	.918	.941	4.39
Motivated Strategies for Learning Questionnaire	.040	.979	.965	.937	.957	.968	1.98
Academic Volitional Strategy Inventory	.052	.952	.934	.876	.893	.912	2.61

In general, the fit indices, as well as the significances of the parameters and the average values of the standard errors, indicate that the proposed structure for all the instruments may not be rejected. Therefore, all the questionnaires have an adequate structure for further analyses.

An examination of zero-order correlations, shown in Table 2, provides validity evidence for our measures. In general, most variables were positively correlated with metacogni-

tive strategy use. The two exceptions to this pattern were classroom performance-approach goal structure and classroom performance-avoid goal structure. Also, the latter was the only variable not significantly correlated with mastery goal orientation and to the use of volitional strategies. Mastery goal orientation and volitional strategies had the strongest correlation with metacognitive strategy use.

Table 2. *Correlations among classroom goal structure perceptions, goal orientation, volitional and metacognitive strategy use variables (n=604).*

|	1	2	3	4	5	6	7
1. Mastery goal structure	-	-	-	-	-	-	-
2. Performance-approach goal structure	,15**	-	-	-	-	-	-
3. Performance-avoid goal structure	-,16**	,26**	-	-	-	-	-
4. Mastery goal orientation	,56**	,13**	-,04	-	-	-	-
5. Performance goal orientation	,02	,23**	,56**	,14**	-	-	-
9. Volitional strategies	,30**	,12**	,04	,47**	,26**	-	-
12. Metacognitive strategies	,30**	,06	-,04	,56**	,13**	,57**	-

*p<.05; **p<.01

Model Goodness of Fit

Based on the fit indices, the hypothesized model fit the data quite well. The RMSEA=.061$_{(.052\ .071)}$ shows an appropriate value, which is corroborated by its confidence interval. Data provided by other indices also offer support for the acceptance of the model proposed in our study (NNFI=.95; CFI=.97; GFI=.95; AGFI=.92; SRMR= .05; x^2/d.f.=3.27).

Despite the good fit of the tested model, the results suggested that there was room for improvement. A close examination of the estimated parameters' significances and the hypothetical relevance of those not estimated (observed through modifying indexes and standardized residuals) led us to modify the proposed model: the path showing the hypothetical asso-

ciation between the classroom performance-approach goal structure and the performance goal orientation was deleted (γ=.09; t=1.62), as well as the path showing the relationship between the performance goal orientation and volitional strategies (β=.07; t=1.58), since they were not significant. Also, a path showing the link between volitional strategies and the performance goal orientation was included for its estimation (β=.24; t=4.07). The new tested model was both conceptually meaningful and provided good results on the model fit (RMSEA=.059$_{(.050}$ $_{.068)}$, NNFI=.96; CFI=.97; GFI=.95; AGFI=.92; SRMR=.05; x^2/d.f.=3.10) and at the specific parameters' estimation level.

Evaluation of individual parameters

Fig. 2 shows the path coefficients of the proposed relationships among the variables in the model. Only significant relationships between variables are included, according to the corresponding "t" value ("t" is significant above 1.96, p=.05; Doménech, 1994). The obtained results confirm totally or partially the hypotheses used for the construction of the model. First, classroom performance-avoid goal structure significantly relates to performance goal orientation, however, this is not the case for the classroom performance-approach goal structure and performance goal orientation. Second, performance goal orientation is significantly associated to metacognitive strategies, but not to volitional strategies. Third, classroom mastery goal structure is strongly related to mastery goal orientation. Fourth, mastery goal orientation significantly relates to metacognitive strategies. Fifth, volitional strategies have a significant mediating effect between mastery goal orientation and metacognitive strategies. Additionally, volitional strategies influence performance goal orientation.
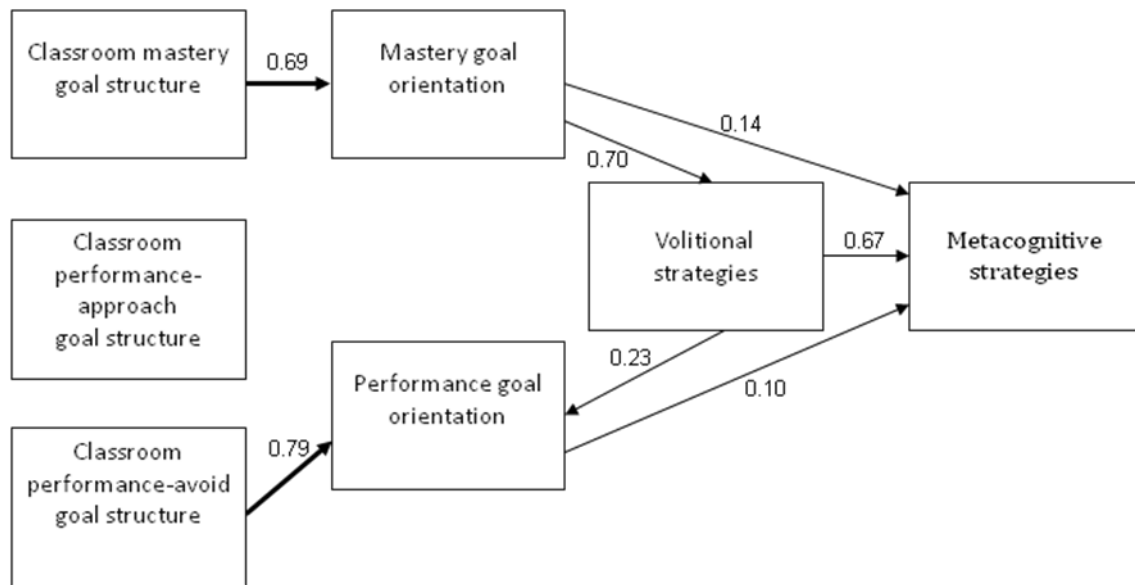
Note: All standardized coefficients are statistically significant.

Figura 2. Path coefficients of the proposed relationships in the model (standarized results).

Discussion and Conclusion

A contribution of the present study is the empirical test of the model shown in Fig. 1. According to the model fit evaluation criteria, the obtained results show a high degree of congruence between the theoretical model and the empirical data. Analyses of the relationships between the model variables reveal the following results: students' perception of the classroom structure is an important condition for the development of his or her personal goal orientation (Ames, 1992). Goal orientation appears to lead the student to take responsibility (or not) with the persistence and perseverance required to achieve the goals defined by his or her motivational orientation, by controlling motivation and emotion (Bartels *et al.*, 2009; Wolters and Rosenthal, 2000). This effort and persistence for goal achievement has in turn a positive effect on the use of strategies to control and direct his or her mental processes for the self-regulation of learning.

From the model of mediation it can be observed, in the first place, that the performance-avoid goal structure relates significantly to the performance goal orientation. However, contrary to our expectations, such personal goal orientation is not related to the performance-approach goal structure. This indicates that, in general, most of the students in this study per-

ceive that the goal of engaging in academic work is not to prove competence (for example, get good grades), but to avoid demonstrating lack of competence (for example, not to be the worst in class), which leads them to compare themselves to others and to avoid demonstrating any lack of ability (performance orientation).

Performance goal orientation, in turn, has a significant association to metacognitive strategies, but not to volitional strategies, indicating that seeking to be better than others or avoiding looking incompetent does not interfere with the use of metacognitive strategies, and could even promote their use. These results coincide with other studies in secondary education (Valle *et al.*, 2006). However, this goal orientation does not seem to promote devoting time and effort to using strategies to persevere in the task. This confirms other researchers opinion (Pintrich and Schunk, 2006), claiming that performance-oriented students tend to consider effort and skill as inversely related.

Another important finding in this regard is the influence of volitional strategies on performance goal orientation, indicating that using volitional strategies -to enhancing self-efficacy, reducing stress and setting consequences for not acting- promotes, indirectly, the students' strategic involvement, by looking for positive social evaluation. This result suggests that although, in general, the behavior of mastery oriented and performance oriented individuals may be very different from each other, in situations where they are highly confident about their abilities, there will be no significant differences between the two orientations (Millar, Behrens, Greene and Newman, 1993, in González, Valle, Nuñez and González-Pineda, 1996). These findings lead us to further research in this regard, to a better understanding of this relationship.

We also found that the classroom mastery goal structure strongly relates to the mastery goal orientation and the latter influences, in turn, the use of metacognitive strategies. These results coincide with research (Ames and Archer, 1988) indicating that students' perceptions of the classroom structure, as well as their personal goal orientations, are relevant to their cognitive involvement and performance in the classroom. In addition, our data contributes to numerous studies (Urdan, 2004), showing that mastery-oriented students make a greater use of metacognitive strategies -activities to plan their goals and to self-monitor their understanding of the material- and finding mastery orientation as more adaptive, associating it to a series of positive action mediators.

Similarly, according to our expectations, we found that volitional strategies have an important mediating role between mastery goal orientation and metacognitive strategies. This indicates that mastery-oriented students are more likely to find a strong link between their effort and their results, and work to reduce both internal and external distractions (Pintrich and Schunk, 2006) and showing higher levels of persistence, compared to performance-oriented students. These motivational and emotional control strategies will produce, as a result, a greater commitment to learning and to the use of cognitive control strategies. Our research also suggests that when learning tasks don't require much volitional strategies use, effort and persistence are supported by the mastery goal orientation.

Nevertheless, there are some limitations to the present work that should be noted. Although our data were shown to fit the predicted model reasonably well, this does not mean that the data would not fit other configuration of the variables. Second, further research is needed through longitudinal studies to understand issues of casualty. Also, we tested only a small number of theoretical self-regulation of learning predictors and these data may also support other sets of relationships, such as the influence of self-efficacy beliefs, previous knowledge, cognitive attributions (see Pintrich, 2000b) or expectations (Suárez and Fernández, 2011).

In summary, despite the limitations, this work contributes to a better understanding of the importance for and contribution to students' self-regulated learning, through learning academic environments, mastery goal orientation and the use of metacognitive and volitional strategies. The study also contributes to a better understanding of how the strategies that students use to keep their effort on the task, and to regulate their emotions, favors their academic involvement, by encouraging the use of metacognitive strategies.

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