

Motivational profiles, volitional strategies and academic performance in exact and experimental sciences in high school

**María del Socorro Rodríguez Guardado¹,
Martha Leticia Gaeta González¹,**

¹ School of Education, Universidad Popular Autónoma
del Estado de Puebla, México

Mexico

*Correspondence: María del Socorro Rodríguez Guardado. 21 Sur 1103, Col. Santiago, Puebla, Pue.México.
E-mail: mariadelsocorro.rodriguez@upaep.edu.mx*

© Universidad de Almería and Ilustre Colegio Oficial de la Psicología de Andalucía Oriental (Spain)

Abstract

Introduction. In high school, the subjects of exact and experimental science demand the development of scientific competence, which in turn requires mastery of theoretical and practical knowledge, but also motivation and sustained effort for greater academic involvement and performance. Hence, it is necessary to know the motivational diversity that guides students to get involved (or not) in the learning of science, as well as the necessary strategies to persevere in achieving their goals based on their interests. The objective of this research was to analyze the motivational profiles of the students and assess the possible relationships with volitional strategies and academic performance in the subjects of exact and experimental sciences in high school.

Method. This study was carried out through a cross-sectional non-experimental quantitative design. Participants were 204 students, age 16 to 18, from four high schools, who answered the Volitional Strategies Inventory (AVSI) and the Academic Goals Questionnaire (CMA), previously validated.

Results. Results showed that the differentiated use of volitional strategies is related to the motivational profile of the students. Volitional self-efficacy control strategies are significantly related to academic performance.

Discussion and Conclusions. This work demonstrates the need to promote motivational and emotional strategies, in addition to cognitive ones, for better learning at high school. It is also important to consider including in the curriculum the strengthening of volitional strategies so that students persist in the face of difficulties and remain motivated to achieve their academic goals.

Keywords: Self-regulated learning, motivation, volition, academic performance.

Resumen

Introducción. En el Bachillerato, las asignaturas de ciencias exactas y experimentales demandan el desarrollo de competencia científica, que a su vez requiere el dominio del conocimiento teórico y del conocimiento práctico, pero también de la motivación y el esfuerzo sostenido para un mayor involucramiento y desempeño académico. De ahí la relevancia de conocer la diversidad motivacional que orienta al alumnado a involucrarse (o no) en el aprendizaje de las ciencias, así como las estrategias necesarias para que perseveren en el logro de sus metas, a partir de sus propios intereses. El objetivo de esta investigación fue analizar los perfiles motivacionales de los estudiantes y valorar las posibles relaciones con las estrategias volitivas y el rendimiento académico en las asignaturas de ciencias experimentales y exactas en el Nivel Medio Superior.

Método. El presente estudio se llevó a cabo mediante un diseño cuantitativo no experimental transversal. Participaron 204 estudiantes de cuatro bachilleratos, con edades comprendidas entre los 16 y 18 años, quienes respondieron el Inventario de Estrategias Volitivas (AVSI) y el Cuestionario de Metas Académicas (CMA), previamente validados.

Resultados. Los resultados mostraron que el uso diferenciado de estrategias volitivas está relacionado con el perfil motivacional de los estudiantes. Las estrategias volitivas de control de la autoeficacia se relacionan significativamente con el rendimiento académico.

Discusión y conclusiones. Este trabajo evidencia la necesidad de promover estrategias motivacionales y emocionales, además de las cognitivas, para un mejor aprendizaje en el Nivel Medio Superior. Asimismo, es importante considerar incluir en el curriculum el fortalecimiento de las estrategias volitivas para que los estudiantes persistan ante las dificultades y se mantengan motivados para lograr sus metas académicas.

Palabras Clave: Aprendizaje autorregulado, motivación, voluntad, bachillerato, rendimiento académico.

Introduction

Knowing how to observe, experience and communicate what has been learned and researched are activities that should be carried out by those who study exact and experimental sciences. However, teaching science is no easy task, and promoting interest in young people for the activities and work learning science requires has been a challenge for educators. The problem may be attributed to low motivation, as well as little effort on the students' behalf.

For many years, the greater part of studies on learning science has had to do with the students' conceptual or procedural difficulties (Campanario & Otero, 2000), with very little research on their motivation and the strategies used for greater involvement and academic performance. Hence, knowing what motivates and guides the students to get involved (or not) in learning science is relevant, as well as responding to the motivational diversity so they reach their academic goals and success based on their personal interests.

In this regard, the theory of achievement goals constitutes one of the lines of research that is important for explaining academic motivation (Gaeta, 2009). The recent advances and contributions of different research regarding academic goals have mainly been focused on the distinction between different goal orientations (Alemán, Trías & Curione, 2011; De la Fuente, Pichardo, Justicia & Berbén, 2008; Martín, Bueno & Ramírez, 2010; Navas, Soriano, Holgado & Jover, 2016); few works have tackled its study from different combinations of goals, the students' motivational profiles (Valle et al., 2006; Valle et al., 2015) or those that have considered the use of the strategies that allow them to maintain attention and effort on those processes – volitional strategies (Bartels, Magun-Jackson and Kemp, 2009; Broc, 2015; Gaeta, Teruel & Orejudo, 2012; McCann & Turner, 2006; Valle, Cabanach, Rodríguez, Núñez & González-Pienda, 2006).

Taking into account that these and other research efforts carried out to present have not analyzed these aspects together, in this study we aimed to analyze the motivational profiles, the use of volitional strategies and academic performance of the high school students. We consider its study to be relevant in the subjects of exact and experimental sciences, whose content demands the development of scientific competence, which in turn requires mastery of theoretical knowledge, practical knowledge and motivational guidance. The OECD (2006) states that this mastery should include the identification of problems, the acquisition of new

knowledge, the explanation of the scientific phenomena and the extraction of conclusions, as well as the use of text analysis to make substantiated judgments. To this regard, Franco (2015) groups the scientific competences into seven dimensions, which are planning and design, data collection and processing, analysis, conclusions, critical reflection and communication of the results obtained and the attitude of teamwork. This all makes the strengthening of students' motivational and volitional aspects necessary.

Motivation and volition

Motivation has been considered a hypothetical construct that explains the start and guidance of a behavior toward a goal (De la Fuente, 2004). Therefore, motivation answers the question –Toward where or toward what is energy or movement directed? (Pintrich, 2003). Hence, motivation is responsible to a great extent for us continuing to carry out an activity; it is an internal state that drives us to act, it directs us in certain directions and it keeps us doing certain activities (Ormrod, 2005).

In this regard, traditionally the majority of the studies have been focused on two goal orientations: learning and performance. However, in more recent years, the study of goal diversity has had greater importance in such a way that the normative models have established academic goals divided into learning or mastery goals, execution or performance goals, avoidance goals, ego- centered goals and social goals (Midgley et al., 2001; Wentzel, 2001).

Pintrich's (2000) work shows the possibility of multiple goals, that is, the students may adopt different complementary goals, presenting an interaction between learning and performance goals for different cognitive motivations or results. Regarding the combination of goals, Pintrich (2000) adds the social factor, assuming that situations of social competence and comparison present themselves in a classroom and the student may adopt different combinations of goals, applying multiple patterns of goals that may follow different regulation strategies.

Goal management in young people to achieve their objectives leads to different motivational profiles. Therefore, studying the different orientations to academic goals from this perspective is one of the objectives we have established in this study, taking into account the fact that each profile represents a certain combination of motives in the students, but also gives a different way of being motivated at an academic level.

Motivational profiles consider different goal orientations within the subject since he or she may be motivated for different reasons. Therefore, the students may show interest and satisfaction in their studies, in which case they will have orientation toward learning goals. Students who adopt a comparative view, meaning they do not want to seem incompetent and are constantly measuring themselves up to other classmates, most probably present achievement or avoidance goals. On the other hand, the need for recognition by teachers, classmates and relatives are characteristics that define social reinforcement goals, which may also be present together with the learning or comparison goal (Pintrich, 1999; Pintrich, 2000).

Furthermore, in the school environment, the will to maintain motivation plays an important role (Gaeta, Cavazos, Sánchez, Rosário & Högemann, 2015), above all when homework and projects require greater time and effort to complete. In this regard, the self-regulated learning models consider self-regulatory or *volitional* control, which implies maintaining the intention and the effort to get involved or complete the activities. Volitional control involves the use of strategies aimed at the regulation of emotions, motivation and cognition in the process of goal oriented effort (Corno, 1993; Corno & Kanfer, 1993; Kuhl, 1987). It is a construct which has a direct impact on achievement behavior since it mediates between the intention to learn and the effort to reach the established goal.

Volition is, therefore, an important support in the aspects of cognition as the insight into the process which, in turn, reflects self-motivation and control strategies in which the inappropriate emotions are associated to inefficiency and impotence (Corno, 1993). Even the most committed students may get distracted from the proposed goals, which is why the volitional strategies gain importance by protecting the students' intentions to learn from internal and external distractions, and by maintaining concentration and effort. The volitional strategies control and guide the processing of information, feelings and behaviors that lead to the realization of the academic objectives. Thus, the volitional processes encourage the actions and strengthen the motivation aspects (Corno, 1993; McCann & García, 1999; McCann & Turner, 2004).

Volitional strategies may be defined as thinking and/or behavior focused on maintaining the intention and reaching a proposed goal despite different types of distractions and obstacles that may arise. They play an important role in the intention for learning and maintain-

ing motivation. This intention to learn may be seen in good grades earned on tests and homework, which in turn is seen as satisfactory academic performance.

As stated, motivation and volition are different concepts; however, they cannot be separated since they are implicit in students' self-regulation to achieve goals and reach satisfactory academic performance. Teachers need to know how to accomplish this merger since upon being motivated to establish their goals, they should consider work habits and, of course, the management of the volitional strategies that will allow them to persevere until completion.

Objectives and hypothesis

Based on what has been previously presented, the main objective proposed is to analyze the students' motivational profiles and assess the possible relations with volitional strategies and academic performance in the exact and experimental sciences at a high school level.

From the proposed objective, the following hypothesis is formed- the use of volitional strategies and academic performance varies according to the motivational profile of the students in exact and experimental sciences in high school.

With this study we hope to be able to contribute evidence on the variety of goals the students establish (motivational profiles) and that allow them (or not) to make use of the different volitional strategies to persevere in their studies and achieve satisfactory academic performance.

Method

Participants

The students subject of the study are enrolled in four educational institutions located in the city of Puebla, Mexico, and were selected due to accessibility. The total sample is made up of 204 students enrolled in fourth semester of high school, 130 women (63.7%) and 74 men (36.3%), age between 16 and 18 years ($M = 16.55$; $DT = .95$). The number of students from public schools was 134 (65.7%) and from private schools was 70 (34.3%).

Instruments

To identify the use of volitional strategies by the students, the *Academic Volitional Strategies Inventory (AVSI)* proposed by McCann and García (1999) and translated to Spanish, *Inventario de Estrategias Volitivas Académicas* by Gaeta (2009) was used. It is a self-reporting instrument that measures the teachers' tendencies toward volitional control in academic contexts. This survey takes into account three factors, which are *self-efficacy* (e.g. "I tell myself, 'you can do it'"), *stress reduction* (e.g. "I often look for a relaxation method to concentrate better on my studies") and *negative-based incentives* (e.g. "I think about how disappointed my family and friends will be if I fail").

The original instrument contains 20 items measured with a five-point Likert scale ranging from "Strongly disagree" (1) to "Strongly agree" (5). Internal consistence (Cronbach alpha) was .82 for self-efficacy, .69 for stress reduction and .87 for negative-based incentives, with a total alpha value for the scale of .87 (McCann & García, 1999; McCann & Turner, 2004).

El Achievement Goals Tendencies Questionnaire, proposed by Hayamizu and Weiner (1991) identifies the tendency of the individual to try to overcome obstacles and advance to achieve what he or she desires. The version adapted to Spanish, *Cuestionario de Metas Académicas (CMA)* by Núñez, González-Pienda, González-Pumariega, García and Rocés (1997), distinguishes four types of goals: *learning orientation* (e.g. "I like to learn new things"), *ego orientation* (e.g. "I want people to see how intelligent I am"), *social value orientation* (e.g. "I don't want my classmates to make fun of me") and *achievement orientation* (e.g. "I want to be valued by my friends"). The original instrument, with 20 items, obtained a total internal consistency of .88 and uses the Likert response scale. The psychometric properties of the CMA were examined by Gaeta et al. (2015) with Mexican university students, obtaining an internal consistency ranging between .78 and .89. In this study, the CMA showed an alpha value of .814.

Academic performance was taken as the average of the grades reported by the math, physics and chemistry teachers as of fourth semester of high school. Likewise, the subjects failed at the time the instrument was applied were taken into account.

Procedure

Fourth semester of high school was chosen since it is thought that students have already gone through the adaptation process high school demands. Also, according to Sanz de Acedo, Ugarte and Lumbreras (2003) in the study they conducted on the importance adolescents between the ages of 15-19 placed on their goals, they showed that in this stage, students reaffirm the need to show their image and worth to their peers and consequently, to get a good reputation, and good academic results support their social image, so a variety of goals may be present in this stage.

The permission necessary to apply the instrument (from directors, classroom teachers and parents) was requested before its application since the participants are minors. The application in each of the institutions was carried out collectively during the school day. The average response time was 20 minutes. Students' participation was voluntary and their personal information and of the responses to the instrument was kept confidential.

Data analysis

After determining the psychometric properties of the instruments, a cluster analysis was carried out to delve deeper in the knowledge of the students' motivational profiles; the viability of the groups was determined through hierarchical clusters and then a K-medias cluster analysis was carried out. Once the motivational profiles of the students were identified, a Kruskal-Wallis test was performed. Then, the Mann-Whitney-Wilcoxon test was performed to analyze the heterogeneity of the motivational profiles regarding the use of volitional strategies. Finally, a regression was carried out to analyze the incidence of the volitional strategies in academic performance. For the statistical analysis, the SPSS program, version 22.0, was used.

Results

Of the four motivational profiles of the participating students, the first, made up of 58 students, corresponded to achievement goal orientation; the second, with 81 participants, to multiple goal orientation; in the third, 17 students with no orientation were placed and in the fourth group, 48 students with performance and learning orientation were placed. Figure 1 shows the motivational profiles found in the students, as well as the goal orientations shown.

Regarding the volitional strategies used by the students, in first place are those of self-efficacy control ($M = 35.09$; $SD = 5.36$), followed by the negative-based incentives ($M = 18.01$; $SD = 3.78$), with those of stress reduction being the least used ($M = 16.31$; $SD = 4.26$).

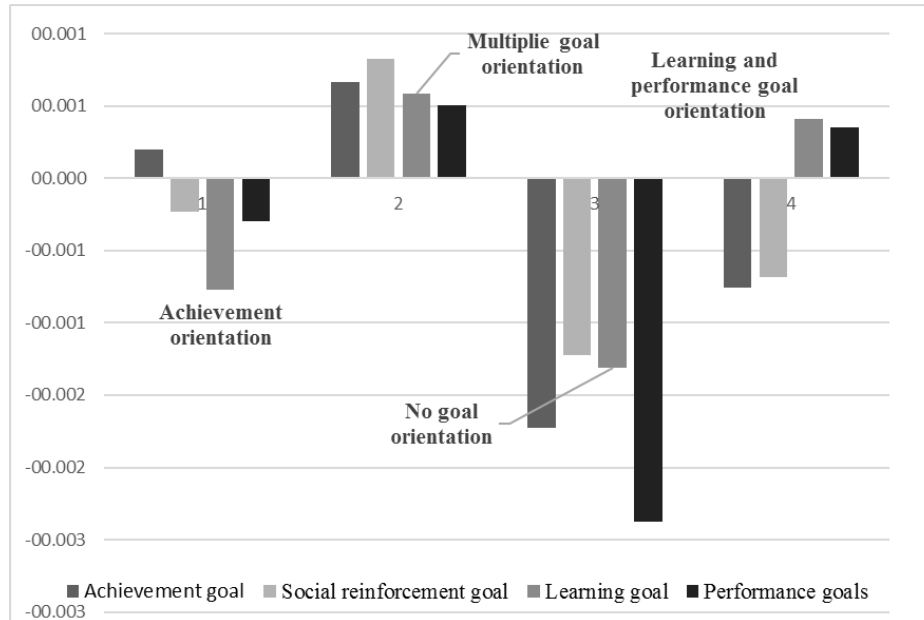


Figure 1. *Students' motivational profiles.*

From the Kruskal-Wallis test, regarding the use of self-efficacy control strategies, it was seen that the students with multiple goal oriented profile had the higher average (average range = 123.20), followed by the students with learning and performance goals (average range = 93.95) and achievement goals (average range = 90.51) and those with a profile with no goal orientation showed the lowest value (average range = 68.94).

Regarding the negative-based incentives, the students with the performance and learning oriented profile (average range = 79.18) and those who have no goal orientation (average range = 79.53) reported close values. The students with achievement goal oriented profiles got an average (average range = 98.88) lower than the students with multiple goal oriented profiles (average range = 123.73).

Regarding stress reduction, the students with achievement oriented profiles and those with performance and learning goal orientation had a similar average (93.47 and 93.21 respectively), while those who have no goal orientation profile have an average range of 75.44 and those who have multiple goal oriented profile have a value of 120.15.

The Mann-Whitney-Wilcoxon test was conducted to analyze the heterogeneity in the students' motivational profiles regarding the use of volitional strategies. Upon comparing the students with achievement goal oriented profile with those with multiple goal orientation, a significant difference was seen in the use of volitional strategies in the self-efficacy control ($z = 3.21$; $p = .00$), in negative-based incentives ($z = 2.66$; $p = .01$) and in stress reduction ($z = 2.63$; $p = .01$).

The comparison in the multiple goal orientation motivational profile and the profile with no goal orientation had a significant difference in self-efficacy ($z = 3.08$; $p = .00$), in negative-based incentive ($z = 2.68$; $p = .01$) and in stress reduction ($z = 2.63$; $p = .01$).

Upon comparing multiple goal orientation profiles with learning and performance orientation profiles, it was seen that there are significant differences in self-efficacy control ($z = 2.93$; $p = .00$), negative-based incentives ($z = 3.97$; $p = .00$) and stress reduction ($z = 2.63$; $p = .01$).

From the hierarchical-type multiple linear regression analysis (taking the volitional strategies as the predictive variable and academic performance as the criterion variable) it was seen that the total volitional strategies do not significantly influence academic performance ($F = 1.62$; $p = .19$), but a more detailed analysis showed that the self-efficacy control strategies do, although the effect is small ($\beta = .21$; $p = .03$, $R^2 = .024$). Table 1 shows these results.

Table 1. *Results of the regression analysis.*

Model	Non-standardized coefficients		Standardized coefficients		
	<i>B</i>	Standard error	<i>Beta</i>	<i>t</i>	<i>p</i>
(Constant)	7.927	.477		16.633	.000
SELFEFFICACY	.039	.018	.212	2.170	.031
INBANEG	-.007	.019	-.032	-.391	.696
REDESTRES	-.032	.025	-.118	-1.281	.202

a. Dependent variable: Academic performance

Note. INBANEG = Negative-based incentives. REDESTRES = Stress reduction.

Discussion and conclusions

The main objective of this study was to analyze students' motivational profiles and assess the possible relations with volitional strategies and academic performance in the subjects of exact and experimental sciences in high school.

The results showed the existence of four motivational profiles in the students-achievement goal oriented profile, multiple goal orientation profile (learning, performance, achievement and social reinforcement), profile with no goal orientation and motivational profile integrated by learning and performance goals.

From these findings, the possibility that various types of goals co-exist in the students is corroborated; thus, a student may seek to orient themselves both in achieving good academic performance while at the same time seek to improve his or her learning, make friends or seek recognition (social goals) or he or she may propose an achievement goal to get other rewards or awards. In this way, students orient themselves to several goals to approach the task, which agrees with previous research (Pintrich, 2000; Navas & Sampascual, 2008; González, Valle, Suárez & Fernández, 1999).

Specifically, the larger part of the students ($n = 81$) showed to have a multiple goal orientation profile, in which social reinforcement goals are mainly used. Just as Juvonen, Wentzel and Gutiérrez (2001) report that the search for social goals is positively related to academic and performance motivation, and in this case it may be an incentive for students to get involved in the study.

On the other hand, regarding the use of volitional strategies, the results showed the students make greater use of motivational type volitional strategies, such as self-efficacy control. Evidence showed that the use of volitional strategies related to emotion, such as stress reduction and negative-based incentive were used less frequently by the students.

These results guide us to delve deeper into the reasons that cause students to prefer motivational type strategies over affective strategies. We think the emotional processes constitute a relevant factor to explain student learning. Sometimes the achievement the students

reach has taken time and effort, which make it possible for them to fall into emotional attitudes and conditions that make reaching their objectives difficult (Pintrich & Schunk, cited in Estévez, Rodríguez, Valle, Regueiro & Piñeiro 2016). Gaeta et al. (2012) show that besides the establishment of goals so the student gets involved in his or her learning, the use of volitional strategies, both motivational and affective, is necessary to maintain his or her intention and effort.

The results also show a differential tendency to use and create volitional strategies according to their motivational profile. As established by García and Pintrich (1993), volitional control is an individual difference variable that contributes to maintaining motivation and effort in a determined context. Thus, upon identifying the volitional strategies in regards to the motivational profiles, it was seen that the profiles of self-efficacy control were the most used by the students with multiple goal motivational profile, with achievement oriented profile and with learning and performance oriented profile, but not so with a profile with no goal orientation. Regarding the negative-based incentives the students with multiple goal motivational profile use these strategies to a greater degree; however, in strategies comprised in stress reduction, lesser use was reported, which guides us to delve deeper into these aspects in future research.

Upon analyzing the incidence of the use of total volitional strategies in academic performance, it was seen that it is not significant. However, a more detailed analysis showed that the volitional strategies related to self-efficacy control positively and significantly influence academic performance, although the effect is small. The results coincide in general with Broc's (2015) findings, who found that the volitional strategies may be latent variables with indirect influence on academic performance, but may be direct with learning strategies, concluding that the students need volitional strategies that help them hold the decision to continue focused on the task. The need to promote the use of volitional strategies in the classroom was seen, considering not only those of motivation control, but also strategies that imply the control of emotions (negative-based incentives and stress reduction).

To that effect, González et al. (1999) conclude that significant learning and academic performance are directly influenced by motivational variables, one of which is self-efficacy. Therefore, self-efficacy is identified by the judgments a person makes on his or her own capacities to accomplish activities to get to the results, which enhances the commitment to

achievement (Schunk & Zimmerman, 2008). Thus, motivated individuals report greater self-efficacy and tendency to act (Bartels et al., 2009) and a strong belief self-efficacy predicts high academic aspirations (Kimm & Benneckib, 2013). Herein one finds the relevance of using strategies that allow one to maintain the sense of self-efficacy in students to carry out homework or academic activity. This study also corroborates the proposal of Mega, Ranconi and De Beni (2014) who note that academic achievement is attributed to the emotional factors of regulation and motivation.

As has been stated, there has been much research on teaching of sciences and over time different educational paradigms have arisen with which methodologies, strategies and different resources to promote better performance in the exact and experimental sciences and decrease the high failure rate have been implemented. One may draw from the results obtained in this study that the knowledge on volitional and motivational aspects may guide educational practice toward the strengthening of the aforementioned aspects, faced with the self-regulation of learning, which may at the same time be seen as satisfactory academic performance. This study highlighted the importance of considering other aspects besides only cognitive ones for improved student academic performance.

Dynamization in the teaching-learning process of sciences should be seen as an integral approach with components that enhance autonomous and self-regulated learning in different contexts (Asencio, 2012). Accentuating strategies in the educational practice as to strengthen and maintain the students' motivation is of utmost importance. As shown by González-Torres (2012), beyond the establishment of goals, it is fundamental to strengthen in the students the use of volitional strategies that help them maintain the effort and concentration in their studies.

Research on the motivational and affective aspects is a field in which we must advance further in order to contribute to the knowledge of these processes and provide the teachers with tools that contribute to strengthening self-regulation in learning in young people for improved academic performance in any subject, not only exact and experimental sciences.

In future research, control of motivation, volition and cognition together may be addressed and a broader sample may be used through probabilistic type sampling, and other subjects besides the exact and experimental sciences may be researched. These aspects that have

been mentioned are the limitations considered in this study. Likewise, it is necessary to inquire into the motivational profiles and the use of volitional strategies in other educational levels, such as elementary education.

Our findings stress the importance that teachers promote volitional strategies in the classroom in the curricular content to help students obtain satisfactory academic results in which the affective, motivational and cognitive aspects that contribute to their personal and academic growth are met, from the identification of their different motivational profiles.

References

- Alemán, M. J., Trías, D., & Curione, K. (2011). Orientaciones motivacionales, rendimiento académico y género en estudiantes de bachillerato. *Ciencias Psicológicas*, 5(2), 159-166.
- Asencio, E. (2012). Una alternativa didáctica para el perfeccionamiento del proceso de enseñanza aprendizaje de las ciencias. *Revista Iberoamericana de Educación*, 58, 81-97.
- Bartels, J. M., Magun-Jackson, S., & Kemp, D. A. (2009). Volitional regulation and self-regulated learning: an examination of individual differences in approach-avoidance achievement motivation. *Electronic Journal of Research in Educational Psychology*, 7(2), 605-626.
- Broc, M. A. (2015). Voluntad para estudiar, regulación del esfuerzo. *Revista de Investigación Educativa*, 29(1), 171-185.
- Campanario, J. M., & Otero, J. C. (2000). Más allá de las ideas previas como dificultades de aprendizaje: las pautas de pensamiento, las concepciones epistemológicas y las estrategias metacognitivas de los alumnos en ciencias. *Revista Electrónica Enseñanza de las Ciencias*, 18, 155-169.
- Corno, L. (1993). The Best Laid Plans: Modern Conceptions of Volition and Educational. *Educational Research Associations*, 22(2), 14-22.
- Corno, L., & Kanfer, R. (1993). The role of volition in learning and performance. *Review of Research in Education*, 19, 301-341.
- De la Fuente, A. J. (2004). Perspectivas recientes en el estudio de la motivación: la teoría de la orientación a meta. *Electronic Journal of Research in Educational Psychology*, 2(1) 35-62. doi:10.25115/ejrep.3.121.

- De la Fuente, A. J., Pichardo, M. C., Justicia, F., & Berbén, A. (2008). Enfoques de aprendizaje, autorregulación y rendimiento en tres universidades europeas. *Psicothema*, 20(4), 705-511.
- Estévez, I., Rodríguez, S., Valle, A., Regueiro, B., & Piñeiro, I. (2016). Incidencia de las metas académicas del alumnado de secundaria en su gestión motivacional. *Aula Abierta*, 44(2), 83-90. doi.org/10.1016/j.aula.2016.03.001.
- Franco, M. A. (2015). Competencias científicas en la enseñanza y el aprendizaje por investigación. Un estudio de caso sobre corrosión de metales en secundaria. *Enseñanza de las Ciencias*, 33(2), 231-252. doi:http://dx.doi.org/10-5565/revensciencias1645.
- Gaeta, M. L. (2009). La autorregulación del aprendizaje: la estructura del aula, la orientación a metas y las estrategias volitivas y metacognitivas en escolares adolescentes. *Revista Electrónica Interuniversitaria de Formación del Profesorado*, 12(2), 157.
- Gaeta, M. L., Teruel, M. P., & Orejudo, S. (2012). Aspectos motivacionales, volitivos y metacognitivos del aprendizaje autorregulado. *Electronic Journal of Research in Educational Psychology*, 10(1), 073-094.
- Gaeta, M. L., Cavazos, J., Sánchez, A. P., Rosário, P., & Högemann, J. (2015). Propiedades psicométricas de la versión mexicana del Cuestionario para la Evaluación de Metas Académicas (CEMA). *Revista Latinoamericana de Psicología*, 47(1), 16-24.
- García, T., & Pintrich, P. (1993). Intraindividual differences in students' motivation and self-regulated learning. *German Journal of Educational Psychology*, 7(3), 99-107.
- González-Torres, M. C. (2012). Más allá de la motivación: cultivar la voluntad de aprender para hacer frente a las demandas escolares, favorecer el éxito escolar y el desarrollo positivo de los estudiantes. *IDEA*, 39, 31-94.
- González, R., Valle, A., Suárez, J., & Fernández, A. (1999). Un modelo integrador explicativo de la relación entre metas académicas, estrategias de aprendizaje y rendimiento académico. *Revista de Investigación Educativa*, 17(1), 47-70.
- Hayamizu, T., & Weiner, B. (1991). A test of Dweck's model of achievement goals as related to perceptions of ability. *The Journal of Experimental Education*, 59(3), 226-234.
- Juvonen, J., Wentzel, K. R., & Gutiérrez, S. N. (2001). *Motivación y adaptación escolar: Factores sociales que intervienen en el éxito escolar*. Mexico: Oxford University Press.
- Kim, C., & Bennekibn, K. N. (2013). Design and implementation of volitional control support in mathematics courses. *Education Teach Research Development*, 61, 793-817.

- Kuhl, J. (1987). Action control: The maintenance of motivational states. In *Motivation, intention, and volition* (pp. 279-291). Berlin: Springer.
- Martín, P. M., Bueno, A. J., & Ramírez, D. M. C. (2010). Evaluación del aprendizaje autorregulado en estudiantes de bachillerato mexicanos. *Aula Abierta*, 38(1), 59-70.
- McCann, C., & García, T. (1999). Maintaining Motivation and Regulating emotion: measuring individual differences in academic volitional strategies. *American Educational Research Association*, 11(3), 259-279.
- McCann, E. J., & Turner, J. E. (2004). Increasing student learning through volitional control. *Teachers College Record*, 106(9), 1695-1714.
- Mega, C., Ronconi, L., & De Beni, R. (2014). Whats makes a good student? How emotions, self-regulated learning, and motivation contribute to academic achievement. *Journal of Educational Psychology*, 106(1), 121-131.
- Midgley, C., Kaplan, A., & Middleton, M. (2001). Performance-Approach Goals: Good for what, for whom, under what circumstances, and at what cost? *Journal of Educational Psychology*, 93 (1), 77 – 85.
- Navas, L., & Sampascual, M. G. (2008). Un análisis exploratorio y predictivo sobre las orientaciones de meta y sobre el contenido de las metas de los estudiantes. *Horizontes Educativas* 13(1), 23-34.
- Navas, L., Soriano, L. J., Holgado, F. P., & Jover, I. (2016). Las metas múltiples: Análisis predictivo del rendimiento académico en estudiantes chilenos. *Educación XXI*, 19(1), 267-285. doi:10.5944/educXX1.14225
- Núñez, J. C., González-Pienda, J. A., González-Pumariega, S., García, M., & Roces, C. (1997). Cuestionario para la evaluación de metas académicas en Secundaria (CEMA-II). *Departamento de Psicología, Universidad de Oviedo*.
- OECD (2006). Marco de la evaluación. Conocimientos y habilidades en Ciencia, Matemáticas y Lectura. *Programa para la Evaluación Internacional de Alumnos*. Santillana Educación para la edición española. www.marco-teoricos-pisa2006.pdf.
- Ormrod, E. J. (2005). *Aprendizaje Humano*. Madrid: Pearson-Prentice Hall.
- Pintrich, P. R. (1999). The role of motivation in promoting and sustaining self-regulated learning. *International Journal of Educational Research*, 31(6), 459-470.
- Pintrich, P. R. (2003). A motivational science perspective on the role of student motivation in learning and teaching context. *Journal of Educational Psychology*, 95(4), 667-686.
- Pintrich, P. R. (2000). Multiple Goals, Multiple Pathways: The role of Goal Orientation Learning and Achievement. *Journal of Educational Psychology*, 92(3), 544-555.

- Sanz de Acedo, L., Ugarte, M. D., & Lumbreras, B. M. (2003). Desarrollo y validación de un cuestionario de Metas para Adolescentes. *Psicothema*, *15*(3), 493-499.
- Schunk, H. D., & Zimmerman, B. J. (2008). *Motivation and Self-Regulated Learning. Theory, Research and Applications*. New York: Lawrence Erlbaum Associates.
- Valle, A., Cabanach, R., Rodríguez, S., Núñez, J. C., & Gozález-Pienda, J. A. (2006). Metas académicas, estrategias cognitivas y estrategias de autorregulación del estudio. *Psicothema*, *18*(2), 165-170.
- Valle, A., Cabanach, R., Rodríguez, S., Núñez, J. C., Gozález-Pienda, J. A., & Rosario, P. (2006). Perfiles motivacionales en estudiantes de secundaria: análisis diferencial en estrategias cognitivas, estrategias de autorregulación y rendimiento académico, *Revista Mexicana de Psicología*, *26*(1), 113-124.
- Valle, A., Regueiro, B., Rodríguez, S., Piñeiro, I., Freire, M., & Suárez, N. (2015). Perfiles motivacionales como combinación de expectativas de autoeficacia y metas académicas en estudiantes universitarios. *European Journal of Education and Psychology*, *8*(1), 1-8.
- Wentzel, R. K. (2000). What is that I'm trying to achieve? Classroom goals from a content perspective. *Contemporary Educational Psychology* *25*, 105-115.

Recibido: 07-12-2019
Aceptado: 04-05-2020