

## Original Paper

# Academic Self-Regulation in Three Children with ADHD

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### Abstract

*The current research aimed to submit a proposal for an intervention based on behavior modification training in academic self-regulation program for elementary school students in order to improve their academic performance. The program was developed through a quantitative methodology in which data were collected through field observations, interval rate records, permanent products and the application of the Self-Regulation Assessment in School Activities Questionnaire (Flores & Cerino, 2000); 22 sixth-grade students participated, divided into two groups (experimental/control) from an urban private elementary school in Merida, Yucatan, Mexico. Within the experimental group, work was focused on three children with disorder Attention Deficit (ADD) and disorder attention deficit with hyperactivity (ADHD) through behavior modification to ensure greater control over their learning process. The results show the effectiveness of the intervention in the students, since it is possible to increase self-regulation in the academic field. From the improvements found in academic performance, it can be concluded that the knowledge of students about their own ability in problem solving and supporting actions that impact on their tasks' outcomes, are aspects that make a difference have an effect on the academic performance which is reflected in the scorings.*

### Keywords

*academic self-regulation, elementary education, children, academic performance, ADHD*

## 1. Introduction

The self-regulation processes can reach to the level of elementary education and according to Zimmerman, there is empirical, qualitative and experimental evidence of it (Ramdass & Zimmerman, 2011). Within the sphere of global education, researchers have been concerned into looking for ways to support to the students in their learning process; for example, Zimmeman, in 1986, began to theorize on the four phases of this process which include the domain of the academic skills: observation, imitation, automatic control

and self-regulation. In 1990, he began to link self-regulating strategies with the perception of self-efficacy. As a result of numerous studies conducted by the author in collaboration with Bandura and Martinez Pons on academic self-regulation processes and their relationship to intervention programs, it has been shown that students who make use of their self-regulation processes such as the implementation of learning strategies, goal setting, self-monitoring and adoption of self-efficacy beliefs, manage to predict their success and influence in their self-motivation process (Zimmerman, 2006).

In addition, the Joint Committee on Learning Disabilities of The United States (Bender, 1992) provides a definition which acknowledges for the first time the possibility of a relationship between learning difficulties and the self-regulation issues. This recognition is related to the findings which evidence that children with learning disabilities lack self-regulating strategies, including thoughts, feelings and self-actions systematically oriented to achieving their educational goals (Zimmerman, 2001).

There are several reasons why a student may fail to self-regulate in any given subject, for example, perhaps he/she does not ascribe value to a task or any other activity to commit and decide to do it; ignores how set goals or manage the time to achieve them; holds negative beliefs about the subjects or his/her ability to learn about them; he/she doesn't know how to use social resources in a favorable way; or thinks that success in the task depends on circumstances beyond his/her control. All these possible causes describe situations often experienced by students with learning disabilities (Flores, 2008; Flores & Macotela, 2002).

On another hand, learning difficulties vary in degree of seriousness and can be associated to a central nervous system dysfunction, as well as family or instructional factors. The latter refer to schools where the professors' orders and directions are expressed unclearly, directions are given quickly or the importance of content retention is not highlighted to the students (Macotela, as cited in Pedroza, 1995). It has also been determined that learning disabilities can interact with other emotional or cultural issues, and that basic psychological processes associated with these issues can be observed, such as: perception, attention, motivation, psychomotor skills, socialization, thinking, memory, self-regulation, affection, etc. Given the conflicts students with learning disabilities face, most of them live repeated experiences of failure and frustration, so they display attitudes that are detrimental to their performance in school activities: fear of making mistakes and feelings of hopelessness due to the constant failures, loss of interest in school activities and lack of behavior control. In addition, it is possible that they feel distrust to ask for support or to interact with peers or adults, have conflicts with the authorities, tendency to disobey school rules or engage in socially inappropriate activities. The sum of school experiences and hardships as apprentices allow us to understand why it is hard for them to adapt in complying with orders, following written instructions or verbal directions and developing good work habits in the school tasks. This means that the student behavior cannot be understood alone and out of the context in which it occurs (Flores & Macotela, 2002).

As a consequence, it is very likely that students diagnosed with ADD or ADHD, with limited basic processes like attention and control, have academic difficulties and display poor academic performance,

which was characteristic of the three children who participated in the current research. Therefore, the challenge is how to teach a student with learning disabilities to self-regulate, which goes hand in hand with the intervention objective conducted in this research.

There are proposals in Mexico, to help students take control of their learning as the Reaching Success in Secondary School Program (PAES by its initials in Spanish), which helps students with learning disabilities to monitor their own learning, recognize and use their strengths in order to develop their academic skills and to improve their skills as students (Flores & Macotela, 2003).

In Yucatan, there have been some studies on self-regulation and academic achievement at secondary school level, which found that there are differences between students who have good school performance and engage in a greater number of self-regulating actions compared to those who show lower school performance (Alfaro Tun, 2006). Another study demonstrated the importance of including self-regulation within the syllabi and the role teachers should play in the self-regulatory acquisition process through teaching and learning (Oses Bargas, Aguayo Chan, Duarte Briceño, & Ortega, 2014).

In accordance to the approaches made, a measure that allows evaluating the level of backwardness or advance of the national education by States, is the obtained from the National Evaluation of the Academic Achievement in School Centers (ENLACE by its initials in Spanish). On the one hand, school achievement consists of the direct and indirect variables named by Cohen (2002) as well as intra and cross-cutting ones, which are defined as the internal and external factors that influence the achievement development to accomplish an optimal educational quality. To conceptualize scholastic achievement, addressing the criteria of transparency and accountability is paramount, as they are fundamental instruments for detecting inequalities, explaining advances or limitations and supporting planning processes and decision-making, among others (Cervera Gomez, Lizarraga Bustamante, & Sanchez Guillen, 2008).

Based on the results of this test, the current state of the elementary level students' performance at national level does not provide an encouraging picture. A summary from the results of year 2010, for the three tests taken by the students of Mexico corresponding to the subjects of Spanish, Mathematics and History of the four grades evaluated in the exam (third, fourth, fifth and sixth grade of elementary school), the highest proportion is clustered in the "Elementary" category, being the second lowest of the four categories considered in the test. Likewise, the percentage accumulated in the two lowest performance categories: "Insufficient" and "Elementary", is defined between 56.5% and 80.0%. Specifically, the sixth grade group—who take part in this research—shows the following performance in the subjects of Spanish, Mathematics and History, respectively: Insufficient = 11.3%, 11.5%, 15.6%; Elementary = 49.7%, 58.1%, 64.1%; Good = 35.6%, 25.3%, 17.9%; Excellent = 3.3%, 5.1%, 2.4%. Indeed, only in sixth grade there is a slight improvement compared to the former three degrees due to the fact that the proportion of students with results in the "Insufficient" category shows a reduction in the Spanish and Mathematics subjects. Nevertheless, this improvement is moderate because there is no increase in any of

the two higher performance categories: “Good” and “Excellent” (Salazar-Elena, Flores, Florez, Luna, & Valenti, 2013).

Therefore, it is a priority to provide students all those strategies that will help them to improve their performance among which training in self-regulation could be included.

## 2. Methods

### 2.1 Objectives

- Establish the level of academic self-regulation in sixth grade primary school students from a private school of Merida, Yucatan.
- Design an intervention program using cognitive and behavioral techniques, and training in academic self-regulation to improve academic performance.
- Assess the effectiveness of the intervention based on a behavior modification where cognitive and behavioral techniques were engaged and training in academic self-regulation was given to sixth grade students of elementary school, particularly to children with ADHD.

### 2.2 Hypothesis

- $H_{11}$ : There is a statistically significant difference in the level of academic self-regulation between the experimental and the control groups before an intervention program.
- $H_{12}$ : There is a statistically significant difference in the level of academic self-regulation between the experimental and the control groups before and after an intervention program.
- $H_{13}$ : There is a statistically significant difference in the level of academic self-regulation between the experimental group and the control group before an intervention program.

A behavioral applied analysis with an A-B-A design was conducted. Three children formed the experimental group and the rest of them were the control group.

### 2.3 Participants

A total of 22 sixth-grade primary school students participated: Seven of them in the experimental group (all of them male) and 15 students in the control group (9 girls and 6 boys). In the experimental group, one student had been diagnosed with attention deficit (ADD) and two had attention deficit with hyperactivity (ADHD); one of them was under medication.

In the diagnostic phase, 22 students who were the sixth grade group of a primary school participated, and from the results, they were divided into control and experimental groups. The experimental group was formed by students who met two of the following four criteria: 1) having an total average score below 3.5 in the self-regulation instrument, 2) a minimum of two factors (out of the five that formed it) below the mean value, 3) an average score of the fourth bi-monthly period below the group average of 8.8, or 4) being diagnosed with ADD. The control group was composed of the rest of the group that did not meet two of the aforementioned criteria.

## 2.4 Instruments

*Self-Regulation Evaluation Questionnaire in School Activities* (CEAAE by its initials in Spanish), by Flores and Cerino (2000). It measures five factors: 1) Beliefs towards tasks, 2) Support strategies, 3) Cognitive strategies, 4) Metacognitive strategies, and 5) Motivation. The instrument consists of 54 items presented in a Likert type scale with five response options ranging from 1 (not like me at all) to 5 (very similar to me). According to the authors, the scale has a Cronbach's alpha of 0.72, which is acceptable to regard it as reliable.

*Interval rate record.* It is a technique used in behavior modification which consists of recording the presence or absence of a response, or discrete or continuous behavior within a time interval or short time intervals. Each observation session is divided in equal periods of time (intervals) in which the occurrence of a behavior is recorded. In this study, these records were used to observe the behavior of "remaining seated" in the child with ADHD from the experimental group.

*Permanent product record.* It is considered as the result of behaviors that leave permanent physical evidence over time, such as schoolwork that the group teacher assigned to work at home. It has been called a method of ex post-facto data collection because the measurement takes place after the behavior has occurred.

## 2.5 Variables

*Self-Regulation Program.* Conceptually defined as the set of cognitive and metacognitive study strategies, related to academic performance, with the aim of improving the level of self-regulated learning in the participating students. Operationally, it was defined as the eight intervention sessions in which activities, exercises, presentations and strategies were conducted.

*Behavior Modification Program.* Conceptually defined as the set of strategies and behavioral techniques to promote the accomplishment of tasks (children with ADD) and remain seated in an appropriate way (child with ADHD). Operationally, it considered the use of economy tokens, positive reinforcement, shaping, incompatible responses and stimulus change.

*Self-regulation.* Conceptually defined as the degree in which a student has an active role in the learning process; its elements are: cognition, metacognition, motivation, conduct and the context (Zimmerman, 1989; Zimmerman, Pintrich, Dembo, Junge, & Lynch, as cited in Peñalosa, Landa, & Vega, 2006). Operationally, it was defined as the scorings obtained in the five factors of the Self-Regulation Evaluation Questionnaire in School Activities (Flores & Cerino, 2000): 1) Beliefs towards tasks, 2) Support strategies, 3) Cognitive strategies, 4) Metacognitive strategies, and 5) Motivation.

*Academic Performance.* Conceptually defined as the measurement of capabilities that a subject displays, establishing an estimate of what has been learned as a result of an instruction process (Pizarro, as cited in Osorio, 2011). Operationally, it considered the average score of each student in the two-month period before and after the intervention; to assess the effectiveness of the workshop, the used criterion was the group average score of both bi-monthly periods, to determine if the sixth-grade classroom students in the experimental group were located above or below it.

*Task accomplishment.* Conceptually defined as the fact of delivering in good time and in an appropriate manner the teacher assignments to do at home. Operationally, it was considered the amount of delivered tasks.

*Remaining seated.* Conceptually defined as being in the respective seat during the course of the different classes without putting one or two legs up or resting their feet on a Chair. Operationally, it was considered as the number of times that the behavior occurred.

### 3. Results

In descriptive terms, as shown in Table 1, all factors are above the theoretical mean value ( $M = 3.0$ ), however, when individually analyzed by student, it presents modifications. Similarly, it can be seen that the factor with the highest mean is *motivation* with 3.87 and the lowest is *Beliefs towards the tasks* with a mean value of 3.05.

**Table 1. Descriptive Analysis of the Academic Self-Regulation Factors of Sixth Graders**

Factors	<i>M</i>	<i>SD</i>
Beliefs towards tasks	3.05	0.56
Support strategies	3.54	0.51
Cognitive strategies	3.67	0.55
Metacognitive strategies	3.53	0.62
Motivation	3.87	0.43
Total	3.64	0.29

Table 2 shows the scores of each student in each of the factors and the total of self-regulation. As it can be observed, in the experimental group students diagnosed with ADD or ADHD were included.

**Table 2. Descriptive Analysis of the Academic Self-Regulation Factors in the Pretest for each Student**

Student	<i>M</i>						Fourth
	Self-regulation factors					Total	period
	Beliefs	Support	Cognitive	Metacognitive	Motivation		Average
	towards	strategies	strategies	strategies			
	tasks						
	Experimental group						
SER	<b>2.00</b>	4.40	4.33	<b>2.89</b>	3.29	<b>3.48</b>	8.6
IV	<b>2.40</b>	<b>2.70</b>	3.11	3.67	3.81	<b>3.33</b>	8.7
SA*	3.60	3.50	<b>2.89</b>	3.89	3.90	3.63	8.5

CH	<b>2.80</b>	<b>2.80</b>	3.78	<b>2.78</b>	4.10	<b>3.46</b>	9.6
AL*	3.00	3.40	<b>2.67</b>	3.11	3.19	<b>3.11</b>	8.9
GU	<b>2.40</b>	3.10	<b>2.78</b>	<b>2.89</b>	3.48	<b>3.09</b>	9.7
PE*	3.40	3.90	3.33	<b>2.44</b>	3.33	<b>3.30</b>	8.3
Control group							
GA	<b>2.60</b>	3.10	4.33	4.44	4.29	3.94	8.9
SA	<b>2.80</b>	3.00	3.56	3.44	3.95	3.52	9.5
GE	<b>2.60</b>	3.90	3.78	3.89	4.33	3.93	9.6
AR	3.40	3.70	3.56	3.56	4.67	4.00	9.7
VAP	3.40	3.80	3.67	<b>2.89</b>	3.86	3.61	10
DAG	3.40	3.30	3.11	<b>2.78</b>	3.67	<b>3.33</b>	9.9
SEB	3.00	3.60	3.67	3.67	3.67	3.59	9.4
KI	<b>2.80</b>	<b>2.60</b>	4.00	4.33	4.71	3.96	9.7
VAM	3.40	3.90	4.67	4.44	3.71	4.00	9.1
CA	<b>2.40</b>	3.70	3.67	4.33	4.24	3.89	9.6
ST	4.00	4.50	4.11	3.44	4.10	4.06	9.6
MA	3.20	3.60	4.44	3.89	3.62	3.76	9.2
EM	3.00	3.70	4.00	4.11	4.33	4.00	9.9
FR	3.20	4.20	4.11	4.00	3.29	3.70	8.3
RI	4.40	3.60	3.33	<b>2.89</b>	3.71	3.56	8.9

\* Participants with ADD or ADDH.

To find significant differences in the levels of academic self-regulation between the pretest and the post-test in the experimental and the control groups, the t-Student test for related samples was used, obtaining the results seen in Table 3. In the control group, statistically significant differences were found in *Motivation* and in *Total academic self-regulation*, showing a reduction of both scorings. In the experimental group, there were significant differences in *Cognitive strategies*, *Metacognitive strategies*, and *Total academic self-regulation*. According to this,  $H_{i2}$  is partially accepted. As a result of this analysis, it is inferred that there was an improvement in the self-regulation level of the experimental group after the intervention based on cognitive, metacognitive and motivational strategies.

**Table 3. Pretest-Posttest Differences in Academic Self-Regulation**

Factors	<i>M</i>		<i>t</i>	<i>gl</i>	<i>p</i>
	Pretest	Posttest			
Control group					
Beliefs towards tasks	3.17	3.28	-0.684	14	0.505

Support strategies	3.61	3.49	0.703	14	0.494
Cognitive strategies	3.86	3.72	0.864	14	0.402
Metacognitive strategies	3.74	3.57	0.694	14	0.499
Motivation	4.00	3.51	2.552	14	0.023
Total	3.79	3.53	2.219	14	<b>0.044*</b>
Experimental group					
Beliefs towards tasks	2.80	3.25	-1.106	6	0.311
Support strategies	3.40	3.45	-0.145	6	0.890
Cognitive strategies	3.26	4.00	-3.413	6	<b>0.014*</b>
Metacognitive strategies	3.09	3.69	-2.465	6	<b>0.049*</b>
Motivation	3.58	4.03	-2.099	6	0.081
Total	3.34	3.79	-5.630	6	<b>0.001*</b>

\* $p \leq 0.05$ .

Regarding the finding of significant differences in the self-regulation level between the experimental and the control groups before and after the intervention program, the t-Student test was applied for unrelated samples. As a result of this analysis, statistically significant differences were found between the two groups in the pretest, where the control group displayed the highest level of self-regulation compared to the experimental group (Table 4), therefore,  $H_{i1}$  is accepted.

In relation to the posttest, no significant differences were found between the two groups, so  $H_{i3}$  is rejected. Nevertheless, in a descriptive way, an increase in the scorings of the experimental group can be observed.

**Table 4. Pretest-Posttest Differences between the Experimental Group and the Control Group**

Phase	<i>M</i>		<i>t</i>	<i>gl</i>	<i>p</i>
	Experimental	Control			
Pretest	3.34	3.79	-4.506	20	<b>0.000*</b>
Posttest	3.79	3.53	1.421	20	0.171

\* $p \leq 0.05$ .

To establish the relationship between academic self-regulation and academic performance in the experimental group, taking into account the number of participants, a nonparametric correlation analysis of Spearman's Rho was conducted; the results showed that -in this case- there was no significant correlation between these variables.



**Table 5. Correlation of Academic Self-Regulation and Academic Performance**

Student	Pretest		<i>z</i>	<i>P</i>	Posttest		<i>z</i>	<i>p</i>
	Academic self-regulation	Bimonthly average scoring			Academic self-regulation	Bimonthly average scoring		
SES	3.48	8.6			3.98	8.8		
IV	3.33	8.7			3.44	8.9		
SA*	3.63	8.5			3.24	8.2		
CH	3.46	9.6	-.500	.253	3.43	9.4	.505	.248
AL*	3.11	8.9			3.35	8.8		
GU	3.09	9.7			3.35	9.6		
PE*	3.30	8.3			3.09	8.2		

(\*) Students with ADD or ADHD.

Finally, with respect to the behavior modification program that took place prior to the intervention on academic self-regulation, the student's behavior of *remaining seated*, student AL in baseline phase achieved a score of 40%, increasing its presence to a 73.65%; which means that it improved by 33.65%. On the case of the conducts *fulfillment of tasks at home*, the baselines of the three subjects was the following one: AL = 60,99%, SA = 88,23%, PE = 77,35%. However, after the intervention an improvement in the case of AL of 6,71% was recorded, thus fulfilling its tasks in house by 67,70%.

#### 4. Discussion

The intention of the present work consisted on evaluating the effectiveness of a behavior modification program and training in academic self-regulation to improve the academic performance in a group of sixth grade elementary school students, who presented shortfalls in the aforementioned variables.

In order to reach this objective a diagnosis was conducted where the results allowed to design an intervention program adapted to the students' needs and focused on teaching learning strategies which were effective to obtain better results in the academic performance.

The results obtained in the research development were favorable in demonstrating statistically significant differences in the self-regulation level of the experimental group under the intervention. However, since this difference was reflected in the general scoring and not in all factors of the applied questionnaire, the need to conduct long term research regarding in the academic self-regulation topic and teaching students different strategies for effective learning should be considered. It is not appropriate ensuring a progressive increase in the overall level of academic regulation of students, since this may be limited to generating positive effects in school activities if it is not reinforced within the classroom, as it was

observed in the control group in the posttest results where their final scores did not increase, but rather decreased.

The increase in the level of academic self-regulation of the students who participated in the program determined a slight improvement in the academic performance reflected in the bi-monthly average scores after the intervention, despite there was no statistically significant correlation between these two variables. However, in some cases there were no improvements in the students' bi-monthly average scores, but they were found at their self-regulation level. It is worth mentioning that the fact of not having a significant group increase in terms of academic performance may be due to what De la Fuente, Pichardo, Justicia and Berben (2008) point out about the evaluation systems, which lack sufficient sensitivity to capture the ways of learning, knowledge and competence of students.

From the improvements that were observed in the academic performance, it is concluded that students' knowledge about their own ability to solve problems and carry out favorable actions that generate good results in their tasks, are aspects that mark the difference and have positive effect in the academic performance which is further reflected in their grades, as well as the knowledge of effective study strategies and the positive self-efficacy that the environment and their own motivation generates them.

The results obtained in the research are consistent with other studies such as the one conducted by Alfaro Tun (2006), where differences were found between students who have good school performance and who engage in a greater number of self-regulatory actions compared to students who display poor performance. Also, the obtained results agree with the studies developed by Zimmerman (2006) in collaboration with other authors such as Bandura and Martinez Pons, which showed that students who make use of their self-regulation processes as the implementation of learning strategies, goal planning, self-monitoring and adoption of self-efficacy beliefs, are able to participate in their own success and self-motivation process.

As established by Zimmerman (2001), their findings show that children with learning problems lack self-regulatory strategies (such as thoughts, feelings and actions aimed at achieving their academic goals), similar to what happened with participants with ADD or ADHD in the current research, which presented low academic performance and inadequate self-regulation.

Regarding these three students who had a neurological disorder such as those already mentioned, academic performance did not present significant changes and self-regulation level increased considerably in one of them. So it is inferred that the practice of effective learning strategies and the change of thinking, will and motivation that students can experience does not occur in a short period of time, but rather with the collaboration of teachers and parents to aid in the regulation of children's learning - over time - so that significant changes are observed at the time of bringing the theory and what has been learned to the real scenarios of school and home.

Based on the obtained results, the research objectives are met and the intervention is evaluated as favorable, focused on the teaching of cognitive, Metacognitive and motivation strategies in the participant group (sixth grade, elementary-private, urban). Therefore, it can be established that if these

strategies are not taught, reinforced and promoted inside and outside the classroom, it will not only hamper academic students regulation, but it may even worsen as it did in the control group and generate conflicts in other areas such as the emotional. Based on this experience, the following recommendations are provided:

- (a) Involving all students in intervention programs for better academic self-regulation because, although there are students who have a fairly good academic performance, they do not believe in themselves or employ strategies that can generate thoughts or unfavorable behaviors. Above all, it is important to include students who have poor overall academic performance and not just in a specific grade.
- (b) Taking into account the conviction, participation and involvement of teachers and parents involved in the education of children and meet in a positive manner the role that corresponds to them, which will help to increase the chances of producing positive changes in children's learning and be reflected in what currently evaluates the performance and knowledge of them. Without a doubt, the collaborative work of teachers and parents in education is one of the main goals in most school subjects.
- (c) Training teachers, letting them know about the subject of academic self-regulation and teaching them to promote effective strategies in the classroom so that students can achieve better academic results. It is important that teachers have theoretical knowledge and are able to implement support strategies in their activities and daily speeches to reinforce and motivate their students. Therefore, it is essential to offer spaces for teachers to know about the subject, have more sessions and longer lasting with students and change the perspective that this could perhaps hinder the teachers' work related to their subjects.
- (d) Conducting further research which confirms the effectiveness of promoting proper academic self-regulation and the need to involve the entire educational community.
- (e) Creating instruments that measure more accurately academic self-regulation and the factors that intervene in it to obtain finer elements that help to better interpret the results and represent reality more accurately.
- (f) Finally, it is recommended adding behavioral techniques in the classroom to modify behaviors and motivate students who have difficulties or suffer a neurological or behavioral disorder, since the effectiveness of these techniques has been shown.

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