

# **Association Between Self-Regulation of Learning, Student Attitude, Provenance and Age in Engineering Students**

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## **Abstract**

The relationship between the self-regulated learning inventory (SRLI) and the factors student attitude, collegiate origin and age in 960 students of engineering programs in universities of the city of Cartagena between the years 2014 and 2016 were analyzed; Through the  $\chi^2$  independence test. Initially the instrument was validated; The self-regulation for learning and the independent variables were analyzed: age, attitude and collegial origin, and finally a mosaic chart was drawn between SRLI and variables with which a significant relationship was obtained. The results indicate that the instrument is valid according to the Alpha values of Cronbach and that there is an important association between SRLI and the variables attitude and student origin; Showing that students with a high student attitude and coming from public schools, are those who generally have very good self-regulation of learning.

**Keywords:** engineering students, higher education, Self-regulated learning, university students

## **Introduction**

Self-regulation of learning is the process that involves the organization and planning of the learning process. In this process, teaching-learning approaches, are characterized by the impact of the metacognitive process as a mediator between the student's motivation and the learning strategies he uses to study [1]. In university students, it is possible to develop competences which are an essential part of the training and professional profile of each degree, in which metacognitive, cognitive, instrumental, specific competences and proactive attitudes for the knowledge society are fostered [2,3].

The attitude is related to some moral components and conceptions relative to the nature of the human being and requires a personal commitment that allows him to react to different situations such as: trust or distrust, tolerance and intolerance, respect or criticism, honesty or dishonesty, prudence or Recklessness among other aspects [4].

The collegial origin is an autonomous factor of each school, where the foundations are laid to build a learning model that allows to generate and make more dynamic and fluid in the student the process of transition between middle and higher education [5]. This model begins with the process of postulating, diagnosing and analyzing the strategy used in the teaching-learning process in order to define in the short, medium and long term processes of continuous improvement that are articulated with follow-up instances and that impact on the feedback of the same [6].

Self-regulation and the way the student focuses on his / her learning process are considered to be age-related as older students are more inclined to use a deeper approach to learning during their academic year than a cursory approach [7]. A relationship between age and learning approaches is considered and the main cause of this pattern of behavior is the fact that students are more motivated by their own Convictions or intrinsic reasons among the more mature they are [8].

This study aimed to analyze the association between self-regulation of learning, student attitude, provenance and age in engineering students. In addition to verifying the use of the self-regulation inventory of learning.

## **Materials and Methods**

### **Population and sample size**

The study population corresponds to 960 regular students of the third Semester of

the Engineering program of the city of Cartagena de indias (Colombia), during the years 2014 and 2016.

The type of sampling used was the simple random and, when it was a finite sample, equation (1) was used to estimate the sample size [9].

$$n = \frac{\sigma^2 N p q}{e^2 (N - 1) + \sigma^2 p q} \quad (1)$$

n: Number of elements that the sample must have

$\sigma$ : Level of confidence or risk chosen

p: Probability that an element is selected (% estimated)

q: Probability that an element is not selected ( $q = p$ )

e: Error allowed

N: Number of population elements

### Variables and data collection

Dependent Variable: Self-regulation for learning. The self-regulated Inventory for Learning (SRLI) designed Lindner et al. (1993) [10], which specifically values self-regulation for learning and consists of 80 questions assessed on the basis of the Likert scale divided into four subscales (Executive, Cognitive, Motivation and Environmental Control) [11]. The instrument was validated as reported by Reinhard and Bruce (1998) [12].

To determine the internal consistency (reliability) of the test equation (2) was used:

$$\alpha = \frac{k}{k - 1} \left( \frac{1 - \sum S_i^2}{S_{sum}^2} \right) \quad (2)$$

Where k is the number of test items,  $S_i^2$  is the variance of the items (from 1 ... i) and  $S_{sum}^2$  is the variance of the total test.

The coefficient measures the reliability of the test according to two terms: the number of items (or length of the test) and the proportion of the total variance of the test due to the covariance between its parts. This means that reliability depends on the length of the test and the covariance between its items.

The SRLI was classified into two categories: Good (those less than 300 points ( $X \leq 300$ )) and Very Good (those exceeding 300 ( $X > 300$ ))

Independent variables: age, student origin (public school) and student attitude; Which is measured by the executive subscale and classified into two categories: B: Good ( $171 < AEB \leq 213.75$  points) and MB: Very good ( $213.75 < AEMB \leq 285$ ).

### Statistic analysis

The  $\chi^2$  test between self-regulation for learning (SRLI) and the variables: student attitude, school background and age were used to determine which of these factors influence self-regulation for learning. Subsequently, a mosaic chart is obtained between the self-regulation for learning and the variables with which a significant relationship was obtained and thus, to identify the meaning of these associations. Statistical analyzes were performed in statistical software R 3.3.2.

### Results and Discussion

Taking into account that the population size is 950 students, having a confidence level of 95% and a maximum error of 6% and taking  $p = 0.5$ ; The required sample size was 209 individuals.

The reliability of the Self-Regulated Learning Inventory questionnaire according to each of the scales that make it up, gave the following results that are shown in Table 1.

Table 1 Reliability values for the different subscales

Subscale	Executive	Cognitive	Motivational	Environmental Control
Alpha value	0,89	0,89	0,93	0,90

It is observed that the Alpha values for the different subscales are between 0.89 and 0.93. These values indicate a high degree of internal consistency. To determine the value of the score obtained by each student in the Self-Regulation Inventory for Learning (SRLI) each scale was quantified separately and the total score corresponds to the sum of the score obtained in each of them.

The  $\chi^2$  test was performed between self-regulation of learning and the variables student attitude, age and student background. Table 2 shows the p values for the  $\chi^2$  independence test between learning self-regulation and the different variables; It is observed that there is a highly significant relationship between self-regulation of learning and the variable student attitude (p value <0.05). This confirms the proposition [13] that considers self-regulation and self-sufficiency to be determinants of academic success.

Table 2 Chi Square Test for student self-regulation

Variable	Chi Square	GL	P Value
Student attitude	31.28	1	0.00**
Student origin	8.95	1	0.0028**
Age	0,0014	1	0.9699

\*\*Highly significant relationship

The statistically significant relationship between the student's Attitude of Engineering and the Self-Regulation of Learning Inventory has allowed them to achieve goals, achievements, results and be able to master situations that require specific disciplinary competencies which has led them to academic [14]. In the same way, these students can be considered organized and articulated with elements of academic planning [13]. It is also possible to say that the engineering students of the University of Cartagena are effective regulating their metacognitive processes, independent at the moment of advancing their learning process and successful in the classrooms, which has fostered motivational and self-regulating behaviors [15].

The significant relationship between self-regulation for learning and student provenance (P value <0.05) indicates that it is from secondary education where the student begins to acquire previous knowledge and generic competences which allows him to begin to build his Project of academic life in the University. This is why in the present investigation it is verified that the collegial origin is predictive of the academic performance in the engineering students of the University of Cartagena [16].

Age does not have an important association with self-regulation of learning (P value > 0.05); This indicates that age does not influence the behavior of learning self-regulation in engineering students.

Next, Figure 1 shows the mosaic chart between self-regulation of learning and the variables age and student attitude.



Figure 1 Graph of mosaics between self-regulation and student attitude

According to Figure 1, it is observed that students who present high student attitude, present a very good self-regulation. This indicates that the facts of the students show a high attitude with respect to the learning, obtain a very good self-regulation of the learning.

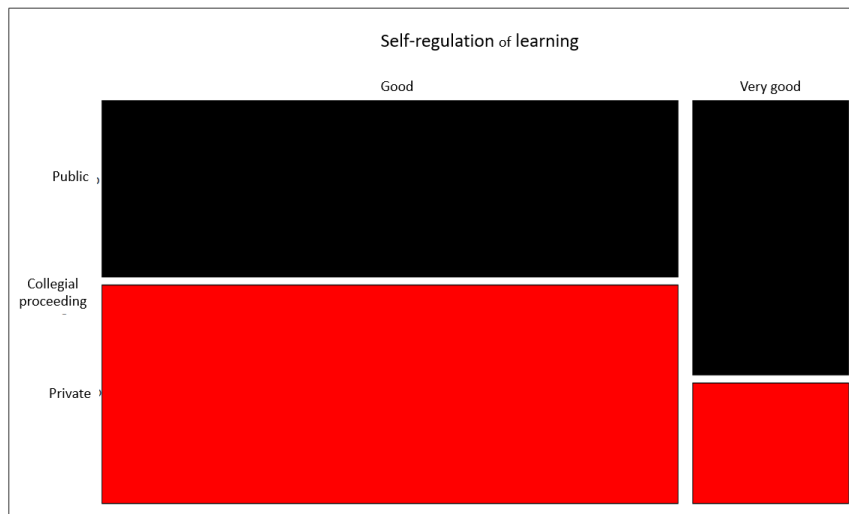


Figure 2 Graph of mosaics between self-regulation and collegial origin

It is observed in Figure 2 that self-regulation for learning is higher for students coming from public schools.

## Conclusion

Based on the analysis as above, it is concluded as follow:

1. The SRLI can be considered as a reliable tool that allows students to identify and strengthen their weaknesses in teaching-learning processes in engineering programs.
2. The results indicate a statistically significant relationship between the SRLI and Student Attitude at a 95% confidence level. This means that the attitude towards learning that the engineering student adopts, makes him self-regulated in his academic exercise, which allows him to achieve the goals and results that are proposed with relative ease.
3. There is a significant association between the SRLI and the student's collegiate background at a 95% confidence level, with students coming from public schools generally having very high self-regulation for learning.
4. There was no relationship between age and student learning approaches, since there is no statistically significant relationship between age and self-regulation of learning (SRLI).

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