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Association between Self-Regulation of Learning, Motivation, Teaching Quality and Sports Dedication in Engineering Students

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Abstract

An association study was carried out between the self-regulation of learning in engineering students at the University of Cartagena and the variables student motivation, teaching quality and sports dedication, between 2014 and 2016. The instrument for gathering information was constituted by the survey for exogenous factors and the Self-Regulation Inventory for Learning (SRLI) for motivation and self-regulation. The results showed a significant 5% association between self-regulation for learning and student motivation.

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

Introduction

Learning is increasingly understood as an activity that students perform on their

own, proactively, and not as something that happens reactively and as a response to learning situations [1]. Students who self-regulate their learning are proactive in their efforts to learn, as they are aware of their abilities and limitations and, furthermore, their study behavior is guided by goals and strategies that help them reach them [2].

Students who self-regulate their learning process, monitor their behavior in relation to the achievement of objectives and are able to reflect on the progress and goals that are reaching [3]. Likewise, what distinguishes a student with academic success from one who does not have it is the degree of self-regulation that has [4].

Student motivation can be conceived as a complex network of cognitive, social, affective and academic elements and components involving teachers and students in order for students to learn meaningfully and meaningfully [5]. In the same way the academic context is considered as determinant in the motivational processes of the students and that affect the academic self-concept and learning [6].

In the same sense, in terms of self-regulation, it will be the teacher who acts in the first order as the facilitator of the strategies and subsequently as a motivator for the adoption of the same by the student [1]. Likewise, the teacher should analyze in detail the timing and the techniques to publicize, promote and apply metacognitive and self-regulation techniques or strategies in their students [5]. Thus, a teacher who achieves motivation in his students and who in turn makes them aware that they are autonomous in their learning, would achieve in them the development of a certain degree of interest in their learning and would be opening a path for their own students in the learning process set their goals, monitor their performance, and evaluate achievements [7].

On the other hand, the sport activity is a component of the integral formation of the student. This practice provides the opportunity to develop social skills, allows commitment to achieve objectives, facilitates solving problems and adversities, etc. [8]. Skills that are not only relevant to sport, but also to other levels of personal life [9].

In the present research the relationship between motivation, exogenous factors (teaching quality and sports dedication) and self-regulation of students' learning using the instrument designed by Lindner et al. (1993) [10]. called "Learning Self-Regulation Inventory".

Materials and Methods

Population and sample size

The study participants were regular students of the fourth semester of the programs of Civil Engineering, Systems, Chemistry and Food of the University of Cartagena.

Of the total, 75% were male and 25% female. The ages of the students were between 17 and 21 years old.

To estimate the size of the sample when it comes to a finite population of less than 100,000 individuals is calculated according to Fong et al. (2017) [1] by equation (1):

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

n: Number of elements that the sample must have
σ: 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, phases and reliability of the test

The variables used in the research were classified into two (2) categories (independent and dependent):
a. Exogenous independent variables: Teaching quality and sports dedication
b. Intrinsic Independent Variable: Motivation
c. Dependent variable: self-regulation of learning

Self-regulation of learning was assessed using the SRLI (Self-Regulation of Learning Inventory) which is a questionnaire designed by Lindner et al. (1993) [10] consisting of 80 weighted questions from 1 to 5 based on the Likert scale.

The research was carried out in three (3) phases: In the first one, the exogenous factors (teaching quality and sports dedication) and motivation were identified through a survey in order to evaluate its statistical significance with the self-regulation of learning. In the second phase, the instrument made up of the Self-Regulation Inventory for Learning (SRLI) described above was applied to the student population under study. In phase 3 the intrinsic independent variable and the independent exogenous variables were crossed with the self-regulated learning curve, constructing the bar diagram of the relational analysis.

The instrument was validated as reported by Reinhard and Bruce (1998) [11]. To determine the reliability of the test the internal consistency was determined using the Cronbach Alpha [1] according to equation (2):

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

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

The dependent variable Self-regulation of learning was classified into two categories: AB: Low self-regulation (scores below 300 points (AB <300)) and AA: High self-regulation (scores equal or greater than 300 (AA≥ 300)).

The exogenous independent variables were classified into two categories: a) Low educational quality (CBD) (CDB <22.5 points) and high educational quality (CDA) (CDA≥ 22.5 b) Sports Dedication: No Sports Dedication SDD (physical activity of this group corresponds only to the movement that they do in the University moving from one place to another <2 hours a day) and With sports dedication (CDD) (weekly physical exercise in gym or sports field ≥ 2 hours a day).

The independent intrinsic variable (motivation) was classified into two categories: a) Low motivation (MB) (MB <75 points or less) and high motivation (MA≥ 75 points out of a total of 100 points).

Statistic analysis

Initially, the Chi-Square test is performed between self-regulation and independent variables to determine which of these factors affect or relate to self-regulation learning processes in engineering students at the University of Cartagena. A graph is then obtained between self-regulation and variables with which it has a significant relationship.

Results and Discussion

According to equation 1, with a confidence level of 95%, a sample size of 201 individuals is obtained. When applying the surveys, a total of 9 students per academic period and per program (4 programs, 6 academic periods) were made homogeneously for a total of 216 respondents.

The Chi-Square test was evaluated for the analysis of the relationship between self-regulation of learning and exogenous independent variables (teaching quality, sports dedication) and motivation. Table 1 also indicates the values of p (statistical significance) where it is also observed that there is a relation of high statistical significance between Self-regulation and Student's Motivation ($p < 0.05$). This means that motivation and self-regulation correspond, ie a motivated student is more likely to be self-regulated.

Table 1 Chi-Square Test for Student Self-Regulation

Variable	Chi Square	GL	p Value
Teaching quality	1.96	1	0.161
Sports Dedication	0.65	1	0.421
Motivation	16.8	1	0.00**

** Relationship with high statistical significance at a confidence level of 95%

Likewise, this correspondence could also be verified since those students who self-regulate their learning process, continuously monitor their achievement of goals and objectives and reflect on the goals they achieve according to the statements of Kim et al. (2017) [12]. Likewise, this association shows that the metacognitive processes developed by engineering students with academic success allows them to differentiate themselves from those who do not have it in the great self-regulation that they develop [1].

In the same way, this relation allows to infer that that motivated and self-regulated student is very likely to achieve a high academic performance as proposed by Zimmerman (1989) [13] and Hoyle (2013) [14].

Figure 1 shows the bar chart between motivation and student self-regulation.

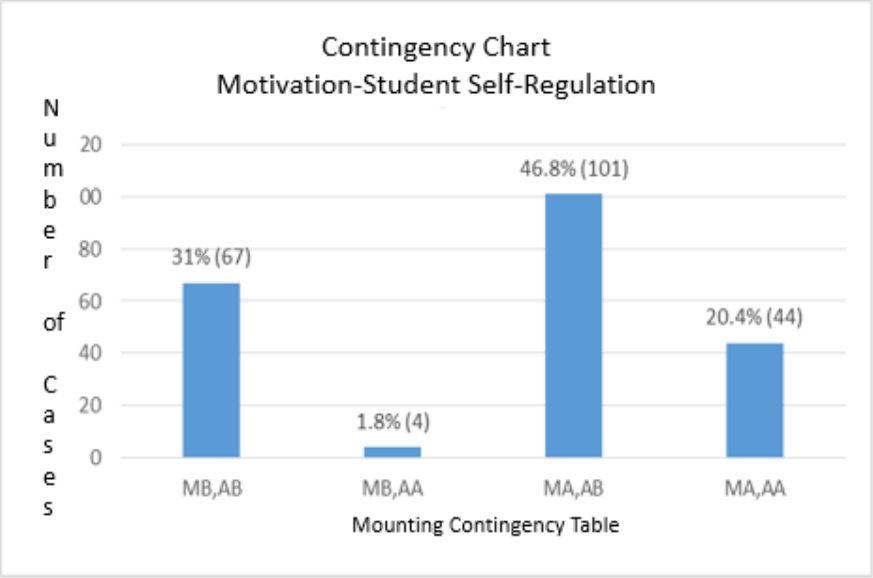

Figure 1 Joint behavior between student motivation and self-regulation

According to Figure 1, it is observed that there is a very low proportion of students with low motivation (MB) who are able to develop high self-regulation (AA) processes. In this category, there are only four cases (1.8%), which means that there

is a group of students who, despite their lack of willingness to learn, are empowered to carry out their academic activities with a high predisposition towards learning. 20.4% (44 cases) of the student population have high motivation (MA) and high self-regulation (AA), this means that approximately one fifth of students have high degrees of self-regulation of learning, a product of motivation with that face their academic learning exercise, ratifying in this group the correspondence between motivation and self-regulation and the approaches of Sanz et al. (2017) [4].

46.8% of cases of high motivation (MA) and low self-regulation (AB) (101 cases). This means that approximately half of the students considered, despite facing their learning process with high predisposition, they need to organize and plan in the search and achievement of information that allows them to achieve achievements and goals in a manner relevant to their field of discipline. This is likely to also happen due to some kind of intrinsic or extrinsic drawback. Finally, 31% corresponding to almost a third of the sample (67 cases) have a low motivation (MB) and low self-regulation (AB) which is a result that corresponds to the results of the present investigation, since as there is a correlation between these two factors then it is expected that a low motivation occasions a low self-regulation in the student.

The determined interrelationship between motivation and self-regulation of learning leads to the proposition of formative research classroom processes with two main actors: the teacher and the students, which must be articulated through research projects directed and guided by the first ones where students participate proactively as investigating agents [3].

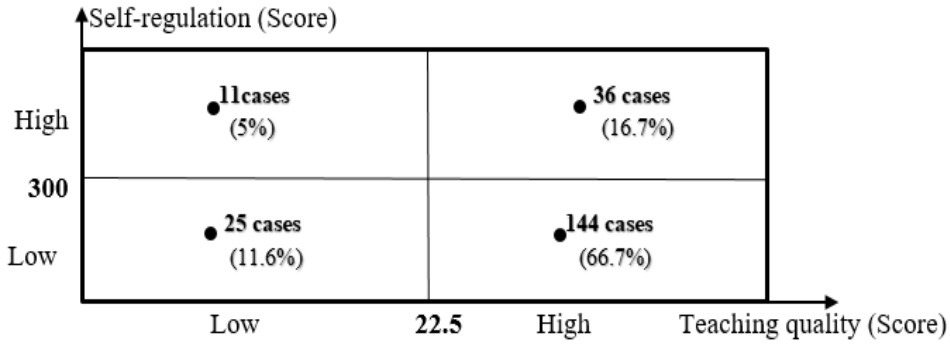

Figure 2 Contingency figure Teaching quality - Self-regulation

Figure 2 shows the contingency chart between teacher quality and self-regulation of learning, which, when assessed using the Chi-square test, shows that there is no statistically significant relationship between the exogenous teacher quality factor and self-regulation of learning ($p > 0.05$; Chi Square = 1.96).

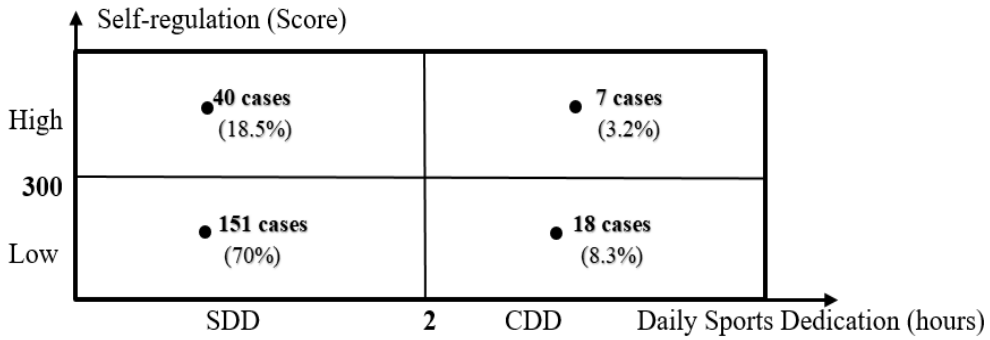

Figure 3 Contingency graph Sports Dedication-Self-regulation

Figure 3 shows the contingency graph between sports dedication and self-regulation of learning, which, when evaluated using the Chi-square test, shows that there is no statistically significant relationship between the exogenous sporting factor and self-regulation of learning ($p > 0.05$; Chi Square = 0.65).

These last two results indicate that neither the teaching quality nor the dedication to the sport affect the self-regulation processes of the engineering students, being not determinant for the academic performance, being unable to fully corroborate the affirmations of Alvarez et al. (2014) [8].

Conclusion

Based on the analysis as above, it is concluded as follow:
1. There is a statistically significant relationship at a 95% confidence level, between motivation and self-regulation of learning. This means that the engineering student possesses an intrinsic motivation that possibly comes from beliefs, predisposition to achievement, career love, personal proactiveness, and fear of public failure. In the same way, this student is able to analyze, transform concepts, meanings, develop skills and abilities that have allowed them to reach their academic goals with relative ease.
2. There is no statistically significant relationship at a 95% confidence level, between the processes of self-regulation of learning and quality of teaching. This means that although teachers are actively involved in the teaching-learning processes of students and although they are actors of quality in institutional strategic plans through innovative university models and articulated with internationalization processes do not have a significant impact on the processes of self-regulation of learning according to the results of the present study.
3. There is no statistically significant relationship between self-regulation of learning and sports dedication at a 95% confidence level in engineering students. This means that the exogenous factor of sports dedication does not affect the processes of planning and academic organization. It can not be inferred that dedication to sport allows students to achieve a high degree of optimal personal

self-realization since self-realization involves being a self-regulated student who achieves his goals with ease.

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