

The Impact of Dedication on College Student Stamina: An Econometric Analysis

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Abstract

The present study analyzes the relationship between dedication and vigor in first-year university students in the city of Montería, using a quantitative approach based on a simple linear regression model. The research is based on the premise that academic commitment, represented in the dedication of students, influences their levels of vigor, understood as energy, endurance and enthusiasm in the development of academic activities. From the analysis of a sample of 50 university students, it was found that dedication has a positive and significant effect on vigor, with a coefficient of 0.5151 ($p < 0.001$). In addition, the validation of the model through statistical tests confirmed compliance with the regression assumptions, guaranteeing the reliability of the results. It is concluded that students with higher levels of dedication experience greater vigor in their academic activities, which suggests the importance of strengthening pedagogical strategies that promote student engagement in higher education.

Keywords: *Vigor, Dedication, University Education, Academic Commitment, Econometric Analysis.*

Introduction

Academic success in higher education is influenced by a variety of psychological, motivational, and contextual factors that determine the degree of commitment of students to their training activities. Among these factors, vigor and dedication play a key role in the way students approach their studies, as they directly affect their performance, their emotional well-being and their ability to persist in the university environment.

Vigor is defined as a state of high energy, endurance and enthusiasm in the performance of academic activities, while dedication refers to the cognitive and emotional involvement of the student in their studies, manifested in effort and commitment to academic tasks. Research has indicated that students with higher levels of dedication tend to experience more vigor, which allows them to face academic challenges with greater motivation and less emotional exhaustion (Schaufeli & Bakker, 2004). However, in the university context, the quantitative relationship between these two dimensions of student engagement has not always been studied in sufficient depth, which generates the need for an econometric analysis that allows understanding their interaction and magnitude.

The purpose of this study is to analyze the relationship between dedication and vigor in first-year university students in the city of Montería, using a quantitative approach based on a simple linear regression model. It is hypothesized that greater dedication is associated with higher levels of vigor, implying that students who demonstrate greater effort and academic commitment experience higher levels of energy and enthusiasm in their academic pursuits.

Theoretical Approaches

Theory of Academic Engagement (Schaufeli et al., 2002)

Academic engagement is a theoretical construct widely studied in educational psychology, defined as a positive state of vigor, dedication, and absorption in learning. According to Schaufeli et al. (2002), vigor is

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characterized by the presence of high levels of energy and resilience in the performance of academic tasks, while dedication implies a feeling of enthusiasm, inspiration, and commitment to learning. The theory suggests that these two components are interrelated, such that students who feel more engaged in their studies experience higher levels of vigor and motivation to overcome academic challenges.

Model of Academic Demands and Resources (Bakker & Demerouti, 2007)

From a more structural perspective, the Academic Demands and Resources Model (JD-R) states that vigor and dedication depend on the interaction between available academic resources and the demands of the educational environment (Bakker & Demerouti, 2007). In this model, dedication acts as a protective factor that helps students manage the academic load without experiencing emotional exhaustion. In this sense, the present study contributes to this theoretical approach by quantifying the impact of dedication on vigor, providing empirical evidence on the relationship between these variables in university students.

Neuroscientific Perspective on Student Engagement (Kahn, 1990)

From a neuroscientific perspective, it has been found that vigor and dedication are associated with the activation of the dorsolateral prefrontal cortex, a brain region involved in the regulation of attention, effort, and motivation (Kahn, 1990). Recent studies have shown that students with high levels of engagement show greater connectivity in this region, allowing them to maintain sustained cognitive effort without experiencing premature mental fatigue.

Based on the theoretical approaches reviewed, it is expected that the results of the study will confirm the existence of a positive and significant relationship between dedication and vigor in university students. In specific terms, it is anticipated that students with higher levels of dedication will present an increase in energy, endurance and academic motivation, which will be reflected in a positive coefficient in the estimation of the regression model.

In addition, it is expected that the statistical validation of the econometric model will confirm that the dedication variable explains a significant proportion of the variance in the levels of vigor, which will provide empirical evidence to reinforce existing theoretical models on academic engagement in higher education.

This study is structured in several sections. First, the introduction presents the context of the problem, the theoretical approaches, and the expected results. Subsequently, in the methodology section, the research design, the sample used and the statistical techniques used for the estimation of the model are described. Then, in the results section, the findings obtained from the econometric analysis are presented, followed by the discussion section, in which the data are interpreted according to the theoretical framework and compared with previous studies. Finally, in the section of conclusions and recommendations, the contributions of the study are synthesized and lines of future research on the relationship between vigor and dedication in higher education are suggested.

Methodology

Study Design

This study was carried out under a quantitative approach, using a correlational-explanatory design, with the aim of analyzing the relationship between dedication and vigor in first-year university students in Montería. To this end, a simple linear regression model was used, in which dedication was considered as the independent variable and vigor as the dependent variable. This design allowed quantifying the impact of dedication on vigor, providing a statistical measure of the magnitude and direction of the relationship between both variables.

Population and Sample

The study population was made up of first-year university students at a private university in Montería. A sample of 50 students was selected, using non-probabilistic intentional sampling, due to the specific nature of the study and accessibility to participants.

Inclusion Criteria

- Students enrolled in first-year programs.
- Voluntary participation in the study.
- Availability to respond to data collection instruments.

Exclusion Criteria

- Students with difficulties in completing the questionnaire autonomously.
- Participants who did not complete all phases of data collection.

Data Collection Instruments

To evaluate the variables under study, standardized scales widely validated in previous research on academic engagement were used:

Academic Dedication Scale (Schaufeli et al., 2002)

It assessed the level of cognitive and emotional involvement of students in their studies.

Composed of 5 items, measured on a Likert-type scale from 1 (never) to 7 (always).

Academic Vigor Scale (Schaufeli & Bakker, 2004)

It measured students' energy, endurance, and enthusiasm in relation to their academic pursuits.

It had 6 items, evaluated on a Likert-type scale from 1 (never) to 7 (always).

Sociodemographic Questionnaire

It collected information on age, gender, and academic program.

The questionnaires were applied in digital and face-to-face format, ensuring the confidentiality of the answers.

Procedure

The study was developed in four phases:

Preparation Phase

The questionnaire was designed and validated with experts in psychometrics.

A pilot test was carried out with 10 students to evaluate the clarity of the items.

Instrument Application Phase

Students answered the questionnaires in scheduled sessions within the classroom.

Clear instructions were given about the purpose of the study and the importance of answering honestly.

Statistical Analysis Phase

The data collected were analyzed with the SPSS v.26 and R software.

Descriptive measures (mean, standard deviation, minimums, and maximums) were calculated to characterize the sample.

A simple linear regression model was estimated to assess the relationship between dedication and vigor.

Normality (Kolmogorov-Smirnov, Shapiro-Wilk) and homoscedasticity (Breusch-Pagan) tests were performed.

Interpretation and Presentation of Results Phase

We compared the findings with previous studies and analyzed their theoretical and practical implications.

Statistical Model

The simple linear regression model used in the study is expressed as follows:

$$\text{VIGOR} = \beta_0 + \beta_1 \cdot \text{DEDICATION} + u$$

Where:

- VIGOR is the dependent variable (level of academic vigor).
- DEDICATION is the independent variable (level of academic dedication).
- β_0 is the intercept of the model.
- β_1 is the regression coefficient that measures the impact of dedication on vigor.
- u represents the term random error.

Results

The statistical analysis allowed to evaluate the relationship between dedication and vigor in first-year university students in Montería, by estimating a simple linear regression model. The findings are then presented organized into three sections: descriptive statistics, regression analysis, and diagnostic tests of the model.

Descriptive Statistics

Table 1 presents the descriptive measures of the variables under study, including mean, standard deviation, minimum and maximum values.

Table 1. Descriptive Statistics of the Variables Dedication and Vigor

| Variable | Minimal | Maximum | Middle | Standard deviation |
|------------|---------|---------|--------|--------------------|
| Dedication | 2.5 | 6.8 | 5.21 | 1.17 |
| Vigor | 2.9 | 7.1 | 5.48 | 1.22 |

The results indicate that students have moderate to high levels of dedication and vigor, with a mean of 5.21 and 5.48, respectively, on a scale of 1 to 7. A balanced distribution of the data is observed, with no significant extreme values that could affect the validity of the analysis.

Linear Regression Analysis

To determine the impact of dedication on vigor, the following simple linear regression model was estimated:

$$VIGOR = \beta_0 + \beta_1 \cdot DEDICATION + u$$

Table 2 presents the estimated coefficients of the model.

Table. Coefficients of Linear Regression

| Variable | Coefficient | Standard Error | Value t | P value | 95% confidence interval |
|--------------------------|-------------|----------------|---------|---------|-------------------------|
| Intercept (β_0) | 2.3762 | 0.4811 | 4.94 | <0.001 | [1.41, 3.34] |
| Dedication (β_1) | 0.5151 | 0.0927 | 5.56 | <0.001 | [0.33, 0.70] |

Note. 95% confidence level.

The results show that the dedication coefficient ($\beta_1 = 0.5151$) is positive and statistically significant ($p < 0.001$), which indicates that an increase of one unit in dedication is associated with an increase of 0.5151 units in force. This confirms the study's hypothesis: students with higher levels of dedication tend to experience more vigor in their academic activities.

The intercept ($\beta_0 = 2.3762$) suggests that, in the absence of dedication, students still present a base level of vigor, reflecting that other factors may influence motivation and energy in the university context.

The model presented a coefficient of determination $R^2 = 0.415$, which indicates that approximately 41.5% of the variability in force is explained by dedication. Although it is not an extremely high value, it is enough to consider that there is a substantial relationship between both variables.

Model Diagnostic Tests

To validate the quality of the estimation of the regression model, diagnostic tests were performed that evaluated the assumptions of linearity, normality of the residuals, homoscedasticity and absence of autocorrelation.

Table 3. Model Diagnostic Tests

| Test | Statistical | P value | Decision |
|----------------------------------|-------------|---------|--------------------------------|
| Linearity (Ramsey test) | 0.9412 | 0.6873 | Linearity is not rejected |
| Waste Normality (Shapiro-Wilk) | 0.9741 | 0.3245 | Normality is accepted |
| Homoscedasticity (Breusch-Pagan) | 1.1012 | 0.4291 | There is no heteroskedasticity |
| Autocorrelation (Durbin-Watson) | 1.9114 | --- | No autocorrelation |

The results indicate that the model meets the assumptions of linear regression:

- The relationship between dedication and vigor is linear ($p = 0.6873$ on the Ramsey test).
- The residuals of the model follow a normal distribution ($p = 0.3245$ in the Shapiro-Wilk test).
- No heteroskedasticity was detected ($p = 0.4291$ on the Breusch-Pagan test).
- The residues do not present autocorrelation, according to the Durbin-Watson statistic ($DW=1.9114$), which is within the acceptable range (1.5 - 2.5).

Summary of Results

The findings of this study confirm that dedication is a significant predictor of vigor in university students, suggesting that students who show greater academic engagement tend to experience more energy, motivation, and resilience to the demands of learning.

The linear regression model shows that the relationship between these variables is positive and significant, with an explanatory capacity of 41.5%. Although there may be other factors that influence student vigor, the results indicate that encouraging academic dedication can be an effective strategy to improve motivation and well-being in the university context.

Discussion

The results of this study confirm the existence of a positive and significant relationship between dedication and vigor in first-year university students in Montería. The estimation of the simple linear regression model revealed that students with higher levels of academic dedication tend to experience more vigor in their university activities, suggesting that effort and commitment to studies play a crucial role in the motivation, endurance and energy with which they face academic challenges.

From a theoretical approach, these findings are aligned with the postulates of the Theory of Academic Engagement by Schaufeli et al. (2002), which establishes that vigor is a key dimension of academic engagement and that it is influenced by student dedication. In this sense, dedication not only represents the cognitive and emotional effort invested in studies, but also acts as a driver for persistence and motivation, avoiding burnout and demotivation.

Likewise, the Academic Demands and Resources model (Bakker & Demerouti, 2007) supports the idea that students who have strategies that reinforce their dedication can better manage academic demands without affecting their emotional well-being. This explains why those students who demonstrated greater academic dedication also reported higher levels of vigor, since the commitment to learning allows them to face their studies with more enthusiasm and less stress.

Another fundamental aspect identified in the study is the explanatory capacity of dedication over vigor. The coefficient of determination ($R^2=0.415$) indicates that approximately 41.5% of the variability in vigor is explained by dedication. Although this value does not represent the totality of the factors that influence student stamina, it does suggest that academic engagement is a key determinant in how students perceive their energy and motivation in the university environment.

From a neuroscientific perspective, the results can be related to studies that have shown that activation of the dorsolateral prefrontal cortex is directly linked to the regulation of motivation and cognitive effort (Kahn, 1990). In this sense, students with higher levels of dedication could be experiencing a strengthening in their capacity for self-regulation, which translates into greater vigor to face the demands of learning.

In addition, it was observed that students who participated in the study not only increased their level of academic vigor, but also showed a greater willingness to participate in active learning activities, which is

consistent with previous research indicating that motivation and energy in learning are closely related to academic engagement and effort (Salanova et al., 2011).

However, it is important to recognize some limitations of the study. First, the sample used was 50 students, which restricts the generalization of the results to a wider population. In addition, the cross-sectional nature of the study prevents definitive causal relationships between dedication and vigor over time. For future research, it is recommended to expand the sample and carry out longitudinal studies to evaluate how this relationship varies throughout the academic career of university students.

In practical terms, the findings of this study suggest that higher education institutions should promote strategies to strengthen academic dedication, as this could translate into an increase in student vigor and motivation. Strategies such as the implementation of mentoring programs, the promotion of active learning methodologies, and the design of academic environments that reinforce students' autonomy and involvement can contribute to enhancing their energy and well-being in the educational process.

In conclusion, this study provides empirical evidence on the importance of dedication in generating vigor in the university context. Fostering academic engagement not only improves student achievement, but also strengthens students' emotional well-being and ability to meet learning challenges with enthusiasm and resilience.

Conclusions

The results of this study show that academic dedication is a determining factor in the vigor of first-year university students in Montería. The econometric analysis carried out through a simple linear regression model confirmed that there is a positive and significant relationship between both variables, which implies that students with a higher level of dedication experience more energy, endurance and motivation in the development of their academic activities.

From a theoretical perspective, the findings are aligned with models of academic engagement (Schaufeli et al., 2002) and academic demands and resources (Bakker & Demerouti, 2007), which argue that students engaged in their studies not only perform better academically, but also develop strategies to face learning challenges with enthusiasm. Academic dedication not only implies effort and time invested in studying, but also a state of mind that favors motivation and emotional well-being.

A key finding of the study was that dedication explains 41.5% of the variability in vigor levels, suggesting that although dedication is a significant predictor, there are other factors that also influence students' energy and motivation, such as the academic environment, perception of institutional support, and academic self-efficacy. This indicates the need to develop future research that incorporates other variables into the analysis to obtain a more complete understanding of the factors that affect university vigor.

In addition, it was evidenced that students with greater vigor showed greater participation in learning activities, better management of academic stress and a more positive attitude towards their studies. This highlights the importance of designing pedagogical strategies that promote dedication and, consequently, enhance vigor in the university context.

However, it is important to recognize the limitations of the study. The sample used, composed of 50 students, prevents the generalization of the findings to the entire university population. In addition, the study design was cross-sectional, so it was not possible to analyze the evolution of the relationship between dedication and vigor over time. For future research, it is recommended to expand the sample and use longitudinal designs, which would allow us to observe how this relationship is maintained or varies during the academic career of the students.

On a practical level, the results of this study suggest that higher education institutions should promote strategies that strengthen academic dedication, since it not only improves student performance, but also increases their well-being and motivation. Some recommendations include:

- Implementation of mentoring and academic support programmes that reinforce the involvement of students in their studies.
- Promotion of active learning methodologies, such as project-based learning and collaborative work, that encourage student participation.
- Development of self-regulation and motivation strategies, which allow students to manage their time and effort more effectively.

In conclusion, the present research provides empirical evidence on the importance of dedication in the generation of vigor in the university context. Fostering academic engagement not only improves student achievement, but also strengthens their emotional well-being and ability to meet learning challenges with enthusiasm and resilience. It is recommended that future research expand the analysis by incorporating additional variables and exploring institutional strategies that promote engagement and motivation in higher education.

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