

# Study Habits and university academic performance. The predictive power of on-line exams

**Carlos Gamero-Burón**

Universidad de Málaga, España <http://orcid.org/0000-0003-3336-6853> [gamero@uma.es](mailto:gamero@uma.es)

---

**Citar como:** Gamero-Burón, C. (2024). Study Habits and university academic performance. The predictive power of on-line exams. *Revista Digital de Investigación en Docencia Universitaria*, 18(1), e1826. <https://doi.org/10.19083/ridu.2024.1826>

---

**Received:** 2/06/2023. **Revised:** 6/10/2023. **Published:** 30/01/2024

## Abstract

**Introduction:** The adoption of efficient study habits is of great importance to achieve academic success in an increasingly demanding educational landscape. **Objective:** The relationship between study habits and academic performance among university students has been investigated. **Method:** The behavior of students regarding on-line tests has been taken as an indicator of study habits. From a stratified sampling, a random sample composed of 160 students enrolled in two first-year groups of the Degree in Business Administration and Management (ADE) at the University of Malaga has been obtained. Several quantitative analysis techniques are applied: descriptive and inferential analysis based on the estimation of non-linear and linear regression models. **Results:** The results obtained suggest that students who delay the time to answer these tests obtain worse grades in these tests and in future exams, a lower probability of taking the final exam of the subject, and worse grades in this last exam. **Discussion:** The set of evidence obtained highlights the concern for the study habits adopted by higher education students. To a large extent, the achievement of the objective pursued by investment in education can be compromised if students do not adopt study strategies that allow them to achieve the goals and achievements established in the programs of the subjects studied. The adoption of inadequate learning strategies can short-circuit the line that links such investment with school performance.

**Keywords:** Higher education, study habits, academic performance, online evaluation, tests online, Spain.

## Hábitos de estudio y rendimiento académico universitario. El poder predictivo de los exámenes on-line

### Resumen

**Introducción:** La adopción de hábitos de estudio eficientes resulta de gran importancia para conseguir el éxito académico ante un panorama formativo cada vez más exigente. **Objetivo:** Se ha investigado la relación entre hábitos de estudio y rendimiento académico entre alumnos universitarios. **Método:** Se ha tomado como indicador sobre hábitos el comportamiento del alumnado respecto a exámenes on-line. A partir de un muestreo estratificado, se ha obtenido una muestra aleatoria compuesta por 160 estudiantes matriculados en dos grupos de primer año del Grado en Administración y Dirección de Empresas (ADE) en la Universidad de Málaga. Se aplican diversas técnicas de análisis cuantitativo: análisis estadístico descriptivo y de inferencia estadística con base en la estimación de modelos de regresión lineal y no lineales. **Resultados:** Los resultados

### \*Correspondence:

Carlos Gamero-Burón  
[gamero@uma.es](mailto:gamero@uma.es)

obtenidos apuntan a que los alumnos que tardan en contestar esas pruebas obtienen peores notas en esos exámenes y en los futuros, una probabilidad inferior de presentarse al examen final de la asignatura y peores notas en este último examen.

**Discusión:** El conjunto de evidencias obtenidas pone en valor la preocupación por los hábitos de estudio adoptados por los alumnos de enseñanza superior. En gran medida, el alcance del objetivo perseguido por la inversión en educación puede verse comprometido si los estudiantes no adoptan estrategias de estudio que les permitan alcanzar las metas establecidas en los programas de las asignaturas cursadas. La adopción de estrategias de aprendizaje no adecuadas puede cortocircuitar la línea que vincula tal inversión con el rendimiento escolar.

**Palabras clave:** Educación superior, hábitos de estudio, rendimiento académico, evaluación on-line, tests on-line, España.

## Introduction

Higher education in Spain has undergone a spectacular expansion in recent decades. As a result, it has become a complex system whose operation absorbs a large amount of public and private resources. Some figures bear witness to this. The system is made up of 86 universities (50 of them public, twice as many as 30 years ago) and 1072 university centers ([Ministry of Universities, MU, 2023](#)). The number of universities per million inhabitants between 18 and 24 years of age is 25.7, and the net enrollment rate in this age group is 29.4%. In terms of expenditure, with data from 2019, the average per university student was 8,930 euros, which represents 33.8% of GDP per inhabitant that year ([Ministry of Education, Culture and Sport, MECD, 2022](#)). The implementation of bachelor's degrees because of the adaptation to the Bologna Plan has led to profound changes in terms of, for example, curricula, classroom pedagogy, and teacher recruitment policy. Such adaptation is ultimately justified by the attempt to improve student employability. Despite the efforts made, the figures paint a picture that could be improved. For example, the rate of Social Security affiliates in 2018 of university graduates who graduated in the 2013-2014 academic year stood at 72.8% ([Ministry of Science, Innovation and Universities, 2019](#)).

University students constitute a heterogeneous "raw material," which undoubtedly conditions the system's effectiveness. The factors behind their academic performance are very diverse. In the literature on the subject five types of variables are distinguished: identification, psy-

chological, academic, pedagogical, and socio-family variables (see, for example, [Tejedor-Tejedor & García-Valcárcel, 2007](#)). Included within the psychological determinants, an aspect not sufficiently considered in research on higher education is the study habits shown by students. Study habits can be defined as "constant modes of action with which the student reacts to new content in order to know, understand, and apply it" ([Sánchez, 2002](#)).

The acquisition of good study habits is expected to be influenced by psychological, school, and family context aspects such as the student's own personality, the work of teachers in the form of specialized workshops or tutorials, and family dedication, especially of parents at early learning ages.

The learning processes are contemplated often as "black boxes" that are difficult to decipher. Scientific concern about this issue is far from recent, although it has been less so in the university setting because it is considered that such habits are acquired during secondary education. However, at present, the growing process of democratization of education and the high figures for school failure make this issue particularly relevant. The dropout rate for the 2016-2017 cohort of new entrants in Spain reaches 33.2% while the rate of change of degree stands at 12.5% ([MU, 2023](#)).

The teaching experience that gave rise to this study took place during the academic year 2011/2012, immediately after the implementation of the new undergraduate degrees at the University of Malaga, in which the European credit system (ECTS) was adopted. One of the differentiating aspects of these new plans is the system for evaluating the level of acquisition of student competencies. Instead of considering the final exam as the

only informative instrument, a continuous evaluation is chosen. Students must carry out a set of duly supervised activities throughout the course so that the teacher can evaluate the teaching-learning process. The evaluation of such activities is an incentive for students and a way of detecting their weaknesses in the early stages of the process.

## Objective

The adoption of efficient study habits is of great importance to achieve success in the face of such a demanding educational panorama. The student must face many evaluation instruments in each subject and semester (tests, exercises, assignments, etc.), which requires rigorous planning of the time dedicated to study.

However, it is not possible to achieve continuous progress without continuous study on the part of the student. Even knowing this, a high percentage of them seem to adopt the strategy of leaving study to the last minute. The question we are trying to answer here is whether such a strategy can be considered “profitable” from the point of view of the grades obtained. The empirical evidence provided by this work suggests that the answer is negative.

During the course mentioned above, a part of the evaluation of the students of Statistics I of the first year of the Degree in Business Administration at the University of Malaga consisted of taking multiple-choice tests of the lessons that made up the program of the subject. These tests were programmed with publicity from the beginning of the course. They were taken at the end of the classes dedicated to presenting the contents of the corresponding lesson. The students had to use the Moodle platform to provide their answers, being able to choose the place and time to carry them out, always within the weekend set for this purpose.

The research assumes that the observed behavior of the students to the knowledge tests is an objective indicator of the quality of their study habits. Such behavior provides information on whether they have not finished studying the corresponding topic (in the case of not taking the test) or at the moment in which they consider the preparation of that topic to be finished (when they answer the test).

## Hypotheses

The literature reviewed on the study habits of university students uses data from student surveys designed for this purpose. Some of these studies seek to identify the determinants of this construct, highlighting aspects such as family background, socioeconomic status and environment, peer group, and class ([Ayodele & Adebisi, 2013](#)). Other research works aim at pinpointing adverse factors to the acquisition of good habits such as, for example, paid work, transportation, or social networks ([Climént, 2008](#)) or to make comparisons between groups of students studying different specialties ([Arán Jara & Ortega Triviños, 2012](#); [Rana & Kausar, 2011](#); [Salamea-Nieto & Cedillo-Chalaco, 2021](#)). With regard to the relationship between habits and academic performance, [Credé & Kuncz \(2008\)](#) provide a meta-analysis of different inventories designed to assess the goodness of such habits, finding that student motivation and study skills exhibit the strongest relationships with grades. Obtained in different contexts, evidence of a significant relationship between habits and academic results can be found in [Mas-hayekhi et al. \(2013\)](#), [Chilca \(2017\)](#), [Pineda & Alcántara \(2017\)](#), [Téjedor-Téjedor & García-Valcárcel \(2007\)](#) and [Vidal, Gálvez & Reyes-Sánchez \(2009\)](#). In turn, in [Zarate-Depraect et al. \(2018\)](#), they concluded that the absence of study habits may be a predisposing factor to academic stress.

The general working hypothesis of the research is that student behavior towards online exams contributes to predicting their future school performance. More specifically, students who do not take such exams or delay taking them when they can begin to do so:

- H1: they score worse on these tests (for those who take them).
- H2: they obtain lower grades in future tests.
- H3: obtain lower grades in the written test scheduled at the end of the first two lessons.
- H4: have a higher probability of not taking the exam corresponding to the first regular exam (June).
- H5: they obtain a lower grade in the final exam of that first round.

Intuition tells us that the strategy of studying at the last minute may not be “profitable” in terms

of grades. However, as far as we know, there is no research that addresses this particular issue empirically.

One possible explanation may be found in the lack of objective information on how our students distribute and use their time. [McFadden and Dart \(1992\)](#) and [Nonis and Hudson \(2006\)](#) analyze quantitatively the relationship between school performance and the student's ability to manage the time dedicated to school and extracurricular activities. In these studies, it is the students themselves who provide information on the latter.

## Method

### Design

The research is characterized by a multivariate and cross-sectional quantitative design. From a methodological point of view, the strategy adopted in this work consists of introducing the time at which the tests corresponding to the first two lessons of the program are taken as regressors in explanatory models of the probability of taking subsequent exams and of the grades obtained in them. Other control variables are also included.

### Participants

The experience that serves as the basis for this research focused on first-year students in groups C and D of the Statistics I course of GADE (University of Malaga) in the 2011/2012 academic year. The fact that the classes were taught by the same professor made it possible to control aspects such as the conception that the teacher has of the teaching-learning process, his ability to motivate the students and the climate that he is able to generate in the classroom.

Much of the evidence linking study habits and school performance is based on laboratory experiments, not on the classroom setting itself. This may not be accurate. In this line, [Ames and Archer \(1988\)](#) discuss the importance of considering the classroom as a reference for studying aspects related to student motivation and achievement. The total number of students enrolled in these groups was 160 (83 in Group C and 77 in Group D). Table 1 shows the characteristics of the studied group that

will be considered in the multivariate analyses.

The measurement scale for all the variables included therein is nominal. The information was provided by the Quality, Strategic Planning, and Social Responsibility Service of the University of Malaga. Information was also requested on other characteristics that, *a priori*, are related to school results: age of the student, type of studies before university and grade obtained in them, grade in the pre-university entrance exam, first choice of studies requested before entering GADE, number of credits passed in first semester subjects in the first year of GADE, and parents' level of studies and employment. We were informed by this service that the historical database does not include such data.

This informative limitation means that the results obtained in this work should be taken with the necessary caution.

**Table 1**  
*Sample Description*

Characteristic	Media
Sex:	
Woman	0.494
Man	0.506
Group:	
Group C	0.519
Group D	0.481
Historical data in the subject:	
Repeating the course	0.081
Not repeating the course	0.919
Scholarship from the Ministry:	
Not requested	0.294
Denied	0.213
Granted	0.494
Distance <sup>1</sup> :	
Residing in Malaga	0.375
Up to 25 km.	0.181
25 to 50 km.	0.206
50 to 100 km.	0.163
More than 100 km.	0.075
Total students	160

<sup>1</sup>Distance from the family home to the city of Malaga.  
Source: Prepared by the authors based on information provided by the Quality, Strategic Planning and Social Responsibility Service (University of Malaga) on Statistics I (GADE) students in the 2011/2012 academic year (Groups C and D).

## Instruments

How can we know anything about how our students study? The literature includes different inventories for the evaluation of study habits. All of them are validated instruments that aim to provide evidence on the nature and the degree of the habits, attitudes, or conditions with which the student faces their specific study task. Such instruments are based on questionnaires offered to students for their responses. Examples are the Study Habits Inventory, IHE ([Fernández Pózar, 2014](#)), or the Self-Report Habit Index, SRHI ([Verplanken & Orbell, 2003](#)).

There are incentives for the indications given by the student about their habits not to conform to reality, insofar as the students may consider their answers as compromising. In the present research, the way of assessing study habits is different from that which characterizes the instruments. It is assumed that students' behavior towards online exams is an indicator of their study habits. This behavior and not their self-statements provide information on whether they have not finished studying the corresponding topic (in the case of not taking the test) or on the moment at which they consider their preparation for the topic to be finished (when they answer the test). Therefore, it is the preference revealed by the student's behavior in relation to these knowledge tests that provides the necessary informative element for scientific research.

The variables that record the presentation to a specific exam are nominal dichotomous, taking the value 0 if negative and 1 if positive. The variables indicating the time at which the exam is taken are also dichotomous, with a value of 1 signifying presentation at a given time interval and 0 otherwise. As an indicator of school performance, the grades in the various exams have been taken, measured on an interval scale with a minimum of 0 points and a maximum of 10 points. The online tests are directly valued by the Campus Virtual platform. In the case of the partial and final exams, they are not online, and the teacher is the one who carries out the evaluation.

The singularity of the methodology followed in this study is that it does not use self-declared questions to assess study habits but rather ob-

jective indicators of attendance at exams on the subject matter taught and the number of students who have taken the exams, as well as the grades obtained. This means that, in principle, the reliability of the instrument (the degree to which repeated application of the instrument to the same subject produces the same results) cannot be assessed. As for its validity, it would be a matter of relating the indicators of the students' test-taking behavior to some validated instrument of study habits. This is a matter for future research.

## Procedure

Regarding the context of the study, as indicated above, the students participating in this study are taking the Statistics I course offered in the first year of the Business Administration program at the University of Malaga. Table 2 summarizes the main characteristics of this course as set out in its Teaching Guide.

The evaluation of the achievements in acquiring knowledge is carried out based on make-up and no make-up activities. Among the latter, there is the completion of online tests through the Virtual Campus, with a 10% of the final grade. These tests have been considered informative elements in the way students organize their study time.

As indicated above, within the set of evaluation elements of the teaching-learning process of the Statistics I subject (ADE), knowledge tests were included through the Moodle platform (Virtual Campus). Five tests of conceptual content were programmed and carried out, one for each of the lessons that make up the program of the subject, representing a total of 10% of the final grade of the course with an equal distribution among them. In this regard, [Ramírez Masferrer et al. \(2013\)](#) obtained evidence that the results of the continuous evaluation of students using Moodle as the learning environment can be satisfactory, i.e., it is shown that the student acquires knowledge and that all activities designed to be developed in a virtual environment serve to assess the level of student learning, even those that have to be performed in groups or that obtain a grade for the simple delivery of the task.

**Table 2**

*Characteristics of the Subject Statistics I (GADE) – University of Malaga*

Degree in:	Bachelor's degree in Business Administration and Management
Center:	School of Economics and Business Administration
Year:	2011/2012
Type:	Basic Training
Course:	1º
Semester:	2º
Number of groups:	5
No. of ECTS credits	6
No. of hours of student dedication:	150
No. of classroom hours:	45
Recommendations and guidance:	Daily study

**Contents of the course**

**(Chronogram)**

BLOCK I: Descriptive Statistics Applied to Business (5 weeks)

Lesson 1. Analysis of a variable (2 weeks)

Lesson 2. Conjoint analysis of two variables (1 week)

Lesson 3. Indexed Numbers (2 weeks)

BLOCK 2: Random Variable and Probabilistic Models (10 weeks)

Lesson 4. Probability and Random Variable (5 weeks)

Lesson 5. Probabilistic Models (5 weeks)

**Evaluation System**

1. Final Exam: Written test of the entire syllabus of the subject.  
Weight (% of the final grade): 70%.  
Activity that can be made-up.
2. Performance of knowledge tests through the Virtual Campus.  
Weight (% of the final grade): 10%.  
No make-up activity.
3. Performance of individual written tests in class.  
Weight (% of the final grade): 20%.  
No make-up activity.

---

*Source: Own elaboration based on the Teaching Guide of the subject for the 2011/2012 academic year.*

Each test was taken at the end of the class presentation of the corresponding topic and during the weekend closest to its completion. Students were free to choose the place and time to answer the test, although always within the time window between 18:00 hours on Friday and 22:00 hours on Sunday. This study takes as its main source of information on study habits and the behavior ex-

hibited by the students to the first two knowledge tests carried out corresponding to lessons 1 and 2, respectively (Test#1 and Test#2, hereafter). Table 3 shows the main characteristics of these tests.

As support for the preparation of each of these tests, the students were provided with face-to-face classes, face-to-face and virtual tutoring sessions, notes prepared by the professor, and re-

ference books. In addition, in order to practice taking the tests through the Virtual Campus, they had voluntary self-assessment tests, with no effect on the final grade and with questions different from those of the continuous evaluation exam. The timing of these voluntary tests was different for lessons 1 and 2. For lesson 1, the tests were kept open during the entire exam weekend. For lesson 2, these tests were closed before 18:00 on Friday, the starting time of the continuous assessment exam.

### Data Analysis

The sample that allows the empirical analysis arises from stratified sampling, with the selection of two groups out of the five existing in the Statistics I course (GADE). The assignment of students to the groups is random (distribution among groups in alphabetical order). Considering the objectives of the research and the nature of the information collected, descriptive statistical analysis and parametric statistical inference were performed with the support of the STATA statistical package for so-

cial sciences, version 14.2. Regarding inference, the results have been obtained from the estimation of both non-linear regression models (probit models) for participation in certain evaluation tests and linear models explaining the grades obtained in these tests. The probit models are suitable for modeling the probability of occurrence of an event, i.e., when the dependent variable is dichotomous: success (value 1) versus failure (value 0). Linear regression is used when the variable to be explained is measured on an interval or ratio scale. In this case, it is applied to variables that take the exam grades.

The results of the regression models are accompanied by statistical significance analysis of the coefficients (for linear regression) or by marginal effects (for probit). As goodness-of-fit indicators, the corrected coefficient of determination and the F-test for the joint significance of the model are given in the case of linear regression. For probit models, these indicators are the likelihood ratio test, the percentage of correct predictions (taking 0.5 as the threshold for the prediction rule), and the Pseudo-R2 of [McFadden \(1977\)](#).

**Table 3**  
*Configuration of the Tests corresponding to Lessons 1 and 2 Carried Out through the Virtual Campus-UMA*

	Test#1	Test#2
Timing	from 9 March 2012 18:00 to 12 March 2012 22:00	from 23 March 2012 18:00 to 25 March 2012 22:00
Number of questions	25	20
Response time	35 minutos	30 minutes
Type of questions	Matching, multi-response and T/F	
Order of questions	Automatic shuffling	
Order within the questions	Random	
Wrong answers	Penalized	
New Page	Never, all questions on one page	
Navigation Method	Free	
Attempts allowed	1	
Review options	After the test is closed (starting at 22:00 on March 12)	
Network address required	Any location	
Browser security	Full screen popup window with some JavaScript security	

Source: Own elaboration

## Results

From a methodological point of view, the empirical strategy adopted consists of introducing the time at which students take the tests corresponding to the first two lessons of the program as exogenous variables in regression models explaining the probability of taking subsequent exams (probit models) and the grades obtained in them (linear regression). Related to this, [Lassibille & Navarro \(2008\)](#) empirically study the factors related to student dropout at the University of Malaga. The models also include the characteristics listed in Table 1 as control variables. Both bivariate (descriptive) and multivariate (regression) analyses are presented.

Before this, Table 4 presents the distribution of the first tests. The picture painted by the data is very disparate. For Test#1, only 54% of the students had completed it by 19:00 on Sunday, while for Test#2, this percentage rose to 78%. The fact that the self-assessment tests (not computable for the student's grade) were open for Test#1 during the exam weekend (which was not the case for Test#2) would explain much of the substantial differences observed.

### Online Tests and Participation in Future Exams. Bivariate Analysis

Table 5 presents a purely bivariate analysis to identify whether student performance on these knowledge tests is a potential explanatory factor of such participation. At least two general conclusions emerge. First, the percentage of no-shows in future tests is much higher among those who do not participate in the tests. Second, and with some exceptions, students who complete the tests earlier exhibit higher percentages of participation in future exams than the rest.

### Online Tests and Participation in Future Exams. Multivariate Analysis

The above conclusions support some of the starting hypotheses of this research. However, before proceeding to their validity, it is necessary to perform a multivariate analysis to control for other student characteristics that could be potential explanatory factors for the observed behavior.

In this section, we present the results of the probit estimations for the probability of participation in exams scheduled after the online tests of the first two lessons. In the following, in order to save space,

**Table 4**  
*Students' Behavior with respect to the Tests of Lessons 1 and 2*

	Test#1		Test#2	
	N	%	N	%
Not submitted	21	13,1	17	10,6
Submitted	139	86,9	143	89,4
Total:	160	100,0	160	100,0
Timing of the test:				
Friday (18:00) to Saturday (16:00)	20	14,4	51	35,7
Saturday (16:00 to 24:00)	11	7,9	16	11,2
Sunday (00:00 to 19:00)	44	31,7	44	30,8
Sunday (19:00 to 21:00)	50	36,0	19	13,3
Sunday (21:00 to 22:00)	14	10,1	13	9,1
Total	139	100,0	143	100,0

Source: Own elaboration based on data obtained for the subject Statistics I, academic year 2011/2012 (Groups C and D).

only the results for participation in the final exam of the course (first round exam) are presented.

Table 6 shows the results of estimating three models that include the characteristics shown in Table 1 as regressors. Model 1 introduces additional explanatory variables that indicate the behavior of the students with respect to test #1. The estimated marginal effects seem to confirm the particular hypotheses. Specifically, it is observed that the probability of taking the final exam of students who do not take test #1 is 43 percentage points lower than that of students who take the test on Friday or Saturday morning. This marginal effect is 24 percentage points for those who take the task during the last hour of the exam. In general, it follows that the probability of taking the final exam decreases with the delay in taking the test.

Model 2, included in Table 6, introduces into the econometric specification the behavior of students with respect to test #2 as an alternative to

that exhibited for test #1. In this case, the marginal effect associated with not taking the test is even greater than that obtained previously, at minus 60 percentage points. Now, the probability of taking the final exam also decreases with the delay in taking the test, although the effect corresponding to the last hour of taking the test is not significant. This fact could be related to the fact that, for this second test, the students did not have self-assessment tests during the examination period, which could induce some “good” students to delay taking the test. In model 3, alternative regressors include variables that indicate whether the student took test#2 before, in the same time interval, or after taking test#1. Such variables could be indicative of changes in study habits. The marginal effects of these variables are not significant, although, as we will see in the following section, they are significant when it comes to explaining the grades in subsequent exams.

**Table 5**  
*Behavior in the Continuous Evaluation Tests and Participation in Future Tests*

Behavior in Test#1	Test participants	Participation		
		Test#2 (%)	Written exam Topics 1 and 2 (%)	EFirst Round Exam (%)
Participate in the test:				
Friday (18:00) to Saturday (16:00)	20	100.0	100.0	90.0
Saturday (16:00 to 24:00)	11	100.0	100.0	82.0
Sunday (00:00 to 19:00)	44	93.0	93.0	93.0
Sunday (19:00 to 21:00)	50	96.0	84.0	72.0
Sunday (21:00 to 22:00)	14	93.0	86.0	71.0
Does not participate in the test	21	48.0	67.0	38.0
Total	160	89.4	87.5	76.3

  

Behavior in Test#2	Test participants	Participation	
		Written exam Topics 1 and 2 (%)	First Round Exam (%)
Participate in the test:			
Friday (18:00) to Saturday (16:00)	51	98,0	90,0
Saturday (16:00 to 24:00)	16	100,0	88,0
Sunday (00:00 to 19:00)	44	89,0	77,0
Sunday (19:00 to 21:00)	19	79,0	68,0
Sunday (21:00 to 22:00)	13	100,0	77,0
Does not participate in the test	17	41,0	29,0
Total	160	87,5	76,3

Source: Own elaboration based on data obtained for the subject Statistics I, academic year 2011/2012 (Groups C and D).

**Study Habits and university academic performance.  
The predictive power of on-line exams**

**Table 6**  
*Probit Estimates of the Probability of Taking the First Regular Exam*

Variables	Model 1		Model 2		Model 3	
	Coefficient	Marginal effect <sup>c</sup>	Coefficient	Marginal effect <sup>c</sup>	Coefficient	Marginal effect <sup>c</sup>
Group D	0.420 <sup>^</sup>	0.101 <sup>^</sup>	0.309	0.071	0.197	0.048
Woman	0.106	0.026	0.046	0.011	0.076	0.018
Scholarship and history in the subject area <sup>a</sup> (Ref.: not requested and not repeater):						
Requested/not granted	0.606 <sup>^</sup>	0.153 <sup>*</sup>	0.739 <sup>*</sup>	0.170 <sup>*</sup>	0.606 <sup>^</sup>	0.155 <sup>^</sup>
Requested/granted	0.467 <sup>^</sup>	0.122	0.455	0.114	0.461 <sup>^</sup>	0.124 <sup>^</sup>
Unsolicited/repeater	-0.117	-0.035	-0.485	-0.149	-0.043	-0.013
Distance (Ref. family domicile in Malaga)						
Up to 25 km.	-0.677 <sup>*</sup>	-0.177 <sup>*</sup>	-0.591 <sup>^</sup>	-0.147 <sup>^</sup>	-0.663 <sup>*</sup>	-0.173 <sup>*</sup>
25 to 50 km.	-0.383	-0.093	-0.625 <sup>*</sup>	-0.157 <sup>*</sup>	-0.480	-0.119
50 to 100 km.	0.163	0.033	0.577	0.096	0.128	0.025
More than 100 km.	-0.150	-0.034	-0.003	-0.001	-0.186	-0.042
Participation in Test#1 (Ref.: Friday 18:00 to Saturday 16:00)						
Saturday (16:00 to 24:00)	-0.284	-0.054				
Sunday (00:00 to 19:00)	0.292	0.040				
Sunday (19:00 to 21:00)	-0.810 <sup>*</sup>	-0.197 <sup>**</sup>				
Sunday (21:00 to 22:00)	-0.943 <sup>*</sup>	-0.240 <sup>^</sup>				
Does not participate in the test	-1.475 <sup>***</sup>	-0.431 <sup>***</sup>				
Participation in Test#2 (Ref.: Friday 18:00 to Saturday 16:00)						
Saturday (16:00 to 24:00)			-0.179	-0.030		
Sunday (00:00 to 19:00)			-0.620 <sup>*</sup>	-0.127 <sup>*</sup>		
Sunday (19:00 to 21:00)			-1.138 <sup>***</sup>	-0.283 <sup>**</sup>		
Sunday (21:00 to 22:00)			-0.471	-0.090		
Does not participate in the test			-2.063 <sup>***</sup>	-0.596 <sup>***</sup>		
Moment comparison test#1 and test#2 (Ref.: answer in the same interval, except first interval)						
The two tests in the first interval					0.625	0.109
Delay the moment					0.026	0.006
Forward the moment					-0.019	-0.004
Does not participate in any test					-1.236 <sup>***</sup>	-0.410 <sup>***</sup>
Constant	0.968 <sup>**</sup>		1.120 <sup>***</sup>		0.740 <sup>*</sup>	
No. of observations	160		160		160	
Log likelihood	-68.95		-66.17		-69.97	
Likelihood Ratio Test	37.52 <sup>***</sup>		43.07 <sup>***</sup>		35.48 <sup>***</sup>	
% correct predictions <sup>b</sup>	79.4%		84.4%		79.5%	
Pseudo R2	0.214		0.246		0.202	

*a* The characteristic "Scholarship and History in the subject" is the result of crossing the characteristic "History in the subject" with "Ministry Scholarship", both of which are included in Table 1. There are no repeating students who have applied for scholarships.

*b* 0.5 has been taken as the threshold value for the prediction rule.

*c* Marginal effects calculated according to Greene (1999). Standard errors corrected for heteroscedasticity.

Source: Own elaboration based on data obtained for the subject Statistics I, academic year 2011/2012 (Groups C and D).

(\*\*\*) indicates statistical significance at 1%, (\*\*) at 5%, (\*) at 10%, and (°) at 15%, where the null hypothesis of each contrast supports the nullity of the coefficients (t-test) or the non-significance of the model (Likelihood Ratio Test). The expression "Ref." indicates the reference (omitted) category for a set of categorical variables defined jointly as a system of dichotomous variables.

### Online Tests and Future Grades. Bivariate Analysis

As for future grades, Table 7 shows the tests proposed for students to take and some descriptive statistics of the grades obtained.

Our interest is focused on learning something about the relationship between the study habits of the students, approximated by the time at

which they take tests #1 and #2, and the grades obtained. Table 8 shows the results of the bivariate analysis. A clear conclusion can be drawn from the figures contained therein: "Leaving the study to the last minute is not profitable in terms of grade." This result holds regardless of the test taken by the student and for both the time of participation in test #1 and test #2.

**Table 7**  
Percentage of Participants and Average Grades in Different Tests

Test	Students	Submitted (%)	Average grade	S.D.	C.V.	Min	Max
Total students	160						
Tests:							
Test#1	139	86,9	6,3	2,0	0,32	1,2	9,8
Test#2	143	89,4	7,0	2,2	0,31	0,0	10,0
Written exam Topics 1 and 2	140	87,5	5,2	2,6	0,51	0,0	9,9
First ordinary round	122	76,3	5,4	2,4	0,45	0,3	9,9

Source: Own elaboration based on data obtained for the subject Statistics I, academic year 2011/12 (Groups C and D).

**Table 8**  
Average Grades in Different Tests according to the Time of Completion of the Tests in Lessons 1 and 2

Test #1	Test#1	Test#2	Written exam Topics 1 and 2	First Round Exam
Participated in test#1				
Friday (18:00) to Saturday (16:00)	7,1	7,5	6,1	6,0
Saturday (16:00 to 24:00)	6,9	7,3	5,0	5,5
Sunday (00:00 to 19:00)	6,3	7,4	5,7	5,8
Sunday (19:00 to 21:00)	6,1	6,8	4,8	4,9
Sunday (21:00 to 22:00)	5,7	5,8	4,3	4,7
Total	6,3	7,0	5,3	5,5
Did not participate in test#1	..	6,8	3,5	4,4
Test #2	Test #1	Test #2	Written exam Topics 1 y 2	June Exam
Participated in test#2				
Friday (18:00) to Saturday (16:00)		7,9	6,1	6,6
Saturday (16:00 to 24:00)		6,8	4,7	4,8
Sunday (00:00 to 19:00)		6,7	5,0	5,1
Sunday (19:00 to 21:00)		6,5	4,7	4,4
Sunday (21:00 to 22:00)		5,5	3,4	4,0
Total		7,0	5,2	5,4
Did not participate in test#2		..	3,3	3,9

Source: Own elaboration based on data obtained for the subject Statistics I, academic year 2011/12 (Groups C and D).

### Online Tests and Future Grades. Multivariate Analysis

This section presents the results of the estimations of explanatory models of the grades obtained for the different tests taken by the student. The aim is to confirm whether the conclusion drawn in the previous paragraph holds when other potential explanatory variables of the grades are introduced in the analysis. Table 9 shows the corresponding linear regression estimates. Table 10 shows the intervals at the 95% confidence level for the coefficients associated with the variables indicating the time of submission to the exams of topic 1 and topic 2 (models 6 and 7 in Table 9). Viewed globally, the results con-

firm what was observed in the bivariate analysis previously carried out, that is, that the grades obtained in tests #1 and #2 and the subsequent tests have a negative relationship with the delay in taking those tests. Furthermore, taking as a reference those students who took the two tests in the same time interval (except for the first interval), the model shown as (8) in Table 9 shows that those students who delayed taking test #2 in relation to the time at which they took test #1 obtained a lower grade in the final exam. It is also observed that those who maintain "good" study habits (those who took both tests in the first-time interval) are those who obtain the highest grade.

**Table 9**  
*Estimation of Linear Regression Models for the Grades Obtained by Students in Different Exams*

	Test #1	Test #2	Written Exam Lessons 1 and 2			June Exam		
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Group D	0.431	0.140	0.061	-0.567	-0.531	0.600	0.568	0.362
Woman	-0.571 <sup>^</sup>	-0.268	-0.549 <sup>^</sup>	-0.476	-0.704 <sup>^</sup>	0.183	-0.293	-0.041
Scholarship (Ref.: not requested and not repeater):								
Requested/not granted	0.939 <sup>*</sup>	1.638 <sup>***</sup>	1.677 <sup>***</sup>	2.357 <sup>***</sup>	2.367 <sup>***</sup>	1.701 <sup>**</sup>	1.756 <sup>***</sup>	1.369 <sup>**</sup>
Requested/granted	0.508	0.988 <sup>**</sup>	1.113 <sup>**</sup>	1.049 <sup>*</sup>	1.007 <sup>*</sup>	0.799	0.759	0.620
Unrequested and repeater	-1.097	1.637 <sup>*</sup>	1.860 <sup>**</sup>	0.667	0.304	0.917	0.875	1.478
Distance (Ref. family home in Malaga)								
Up to 25 km.	-0.145	-0.229	-0.082	-1.023 <sup>*</sup>	-0.730	-0.430	-0.237	-0.365
25 to 50 km.	0.062	-0.349	-0.435	-0.689	-0.822 <sup>^</sup>	-0.112	-0.533	-0.267
50 to 100 km.	-0.333	-0.765	-0.576	-1.280 <sup>**</sup>	-0.793	-0.124	0.403	0.076
More than 100 km.	-0.111	-0.122	0.337	0.011	0.453	0.835	1.377 <sup>^</sup>	0.855
Submitted Test#1 (Ref.: Friday 18:00 to Saturday Saturday (16:00 to 24:00)	-0.128	-0.675		-1.434 <sup>^</sup>		-0.855		
Sunday (00:00 to 19:00)	-0.880 <sup>^</sup>	-0.168		-0.266		-0.494		
Sunday (19:00 to 21:00)	-1.224 <sup>**</sup>	-0.900 <sup>^</sup>		-1.577 <sup>**</sup>		-1.546 <sup>**</sup>		
Sunday (21:00 to 22:00)	-1.808 <sup>**</sup>	-1.731 <sup>**</sup>		-1.353		-1.881 <sup>*</sup>		
Not submitted		-1.248		-2.752 <sup>***</sup>		-2.162 <sup>*</sup>		

Submitted to Test#2								
(Ref.: Friday 18:00 to Saturday 16:00)								
Saturday (16:00 to 24:00)			-1.364**		-1.788**			-2.189***
Sunday (00:00 to 19:00)			-1.354***		-1.362**			-1.861***
Sunday (19:00 to 21:00)			-1.358**		-1.345*			-2.761***
Sunday (21:00 to 22:00)			-2.660***		-2.784***			-3.074***
Not submitted					-3.145***			-3.350***
Moving forward/delay test answers								
(Ref.: answers in the same interval except for the first one)								
Both in the first interval								1.903**
Delay the exam								-1.810**
Move the exam forward								0.459
Not submitted								-1.477^
Constant	6.987***	7.038***	7.404***	6.152***	6.234***	5.187***	5.842***	4.381***
Number of observations	139	143	143	140	140	122	122	122
R <sup>2</sup> adjusted	0.037	0.043	0.135	0.132	0.169	0.020	0.173	0.106
Test F	1.408	1.460^	2.698***	2.514***	3.023***	1.177	2.804***	2.107**

(\*\*\*) indicates statistical significance at 1%, (\*\*) at 5%, (\*) at 10% and ( ^ ) at 15% where the null hypothesis of each contrast supports the nullity of the coefficients (t-test) or the non-significance of the model as a whole (F-test). "Ref." indicates the (omitted) reference category for a set of jointly defined categorical variables. Heteroscedasticity-corrected standard errors

Source: Own elaboration based on data obtained for the subject Statistics I, academic year 2011/12 (Groups C and D)..

**Table 10.**  
Linear Regression Models for Final Exam Grades. Confidence Intervals at 95%.

Model (6) in Table 9	C.I. (95%)		Model (7) in Table 9	C.I. (95%)	
Submitted a Test#1			Presentado a Test#2		
Friday 18:00 to Saturday 16:00 <sup>a</sup>			Viernes 18:00 a Sábado 16:00a		
Saturday (16:00 to 24:00)	-2.856	1.146	Sábado (16:00 a 24:00)	-3.547	-0.831
Sunday (00:00 to 19:00)	-1.903	0.916	Domingo (00:00 a 19:00)	-2.901	-0.821
Sunday (19:00 to 21:00)	-2.984	-0.108	Domingo (19:00 a 21:00)	-4.258	-1.265
Sunday (21:00 to 22:00)	-3.862	0.100	Domingo (21:00 a 22:00)	-4.676	-1.472
Not submitted test	-4.524	0.200	No presentado a test	-5.495	-1.204

<sup>a</sup> Reference category for estimate<sup>a</sup>

Source: Own elaboration based on data obtained for the subject Statistics I, academic year 2011/12 (Groups C and D)..

## Discussion

Quality assurance in university education involves identifying and analyzing the factors that influence students' academic performance. At present, the possibility of increasing the results of the system is largely related to the availability of modern physical facilities, suitably equipped for study. Continuous efforts are also being made to improve teacher training through pedagogical training courses. Without downplaying the importance of these aspects, we feel that relatively little attention has been paid to the study habits adopted by the users of these facilities, the students. The objective largely pursued by educational spending may be compromised if students do not adopt study strategies that enable them to achieve the goals established in the programs of the subjects studied. We believe that this gives value to research on study habits insofar as the adoption of inadequate learning strategies may short-circuit the line linking investment in education with school performance.

This research aimed to provide evidence on the impact of such habits on academic performance. The way of capturing information on learning techniques differs from the usual procedure in this type of study. Thus, we have used as an indicator the preference revealed by the different behaviors in relation to knowledge tests designed in a Moodle environment. It has been assumed that such tests constitute an objective indicator of the goodness of their study habits. To our knowledge, this is the first research to adopt such an approach. We believe that this avoids the possible bias in the students' answers, resulting from considering that they may be compromising. The results suggest that the initial working hypotheses can be accepted, namely, that students who delay the time of response to the tests considered as a source of information obtain lower grades in these tests (for those who take them), lower grades in future exams, a lower probability of taking the final exam of the subject, and also worse grades in the final exam.

The evidence suggests that leaving study to the last minute rather than doing it continuously throughout the course does not pay off in terms of grades.

It seems important for the system to pay attention to the deficiencies in study habits exhibited by new students. Otherwise, adaptation to university requirements and the development of skills essential for the adequate assimilation of knowledge and the acquisition of competencies would be compromised. From a practical point of view, the design and evaluation of experiences such as the one described in this paper could contribute at a low cost to identifying students with deficiencies in this area. Such problems could be addressed through youth guidance departments, which are currently scarce in our university program. Teachers themselves could contribute to this once they are adequately trained and specialized in tutoring. More simply, the presentation and discussion in class of the results of this type of experience could lead some students to modify the way they organize their time to better face the demands of their formative adventure. From a theoretical point of view, it would seem interesting to study the relationship between the instruments presented here and those derived from the habit inventories already validated and regularly used. This would be important because the design and administration of online tests on a given subject are relatively simple to carry out.

An issue beyond the scope of this study is the assessment of the responsibility that the high school system has for poor study habits. Generally, these are generated in the early stages of learning and could be modified at such times in search of efficiency. In any case, greater coordination in this area between high school and university education seems appropriate to improve the academic performance of our students and reduce the probability of repetition in university subjects.

This work has some limitations that lead us to take its results with the necessary caution. The first refers to the size of the sample and its representativeness. Information on 160 students enrolled in groups C and D of Statistics I corresponding to the Degree in Business Administration and Management taught at the University of Malaga during the 2011/2012 academic year was used. These groups were taught by the same professor. The total number of students enrolled

was 433, distributed in four morning groups (86 students in Group A, 73 in Group B, 83 in Group C, 77 in Group D) and one afternoon group (114 in Group E). It is not to be expected that the students selected for this research would have differentiating characteristics from the rest of the morning groups, given that the assignment of students to each group was done randomly (in alphabetical order). However, this might not be the case for the afternoon group for at least two reasons. Firstly, because of the greater preference of repeating students for this group, in their attempt to make their schedules compatible with subjects from other years. Secondly, because of the over-representation with respect to the rest of the groups of students, generally older, who combine study with work and who, in general, present more difficulties for learning but a higher degree of motivation. How these facts could affect our results is uncertain.

The second limitation has to do with its lack of information on other factors, in addition to those included, that could be related to student performance. Considering the relevance of the subject under research to bring the system closer to its efficiency, the universities should make a greater effort to make available to researchers' databases with sufficient informative content to allow scientific progress. Access to anonymized micro-data files should be even easier. In addition, the standardized design of the instruments for collecting this information would allow comparative studies to be carried out between universities on a homogeneous basis.

Although this work has the limitations mentioned above, the results suggest that the initial hypotheses are acceptable from a statistical point of view. Consequently, this teaching experience based on multiple-choice examinations (simple to implement) could be used to identify "at-risk" students in the early stages of the training.

For example, starting with workshops or personalized tutoring, it would be possible to address the correction of poor study habits, and problems of lack of motivation, among others, of such students. The importance of delving deeper into the factors of the academic performance of our students deserves such an effort.

## Referencias

- Ames, C. y Archer, J. (1988). Achievement Goals in the Classroom: Students' Learning Strategies and Motivation Processes. *Journal of Educational Psychology*, 80(3), 260-267. <https://doi.org/10.1037/0022-0663.80.3.260>
- Arán Jara, M.A. y Ortega Triviños, M.L. (2012). Enfoques de aprendizaje y hábitos de estudio en estudiantes universitarios de primer año de tres carreras de la Universidad Mayor Temuco, Chile 2011. *Revista Educativa Hekademos*, 11(5), 37-46. <http://www.hekademos.com/hekademos/media/articulos/11/04.pdf>
- Ayodele, C.S. y Abebiyi, D.R. (2013). Study habits as influence of academic performance of University undergraduates in Nigeria. *Research Journal in Organizational Psychology and Educational Studies*, 2(3), 72-75. <https://acortar.link/cmP8Xn>
- Chilca, L. (2017). Autoestima, hábitos de estudio y rendimiento académico en estudiantes universitarios. *Propósitos y Representaciones*, 5(1), 71-127. doi: <http://dx.doi.org/10.20511/pyr2017.v5n1.145>
- Climént Bonilla, J.B. (2018). Factores adversos al fomento de hábitos de estudio y aprendizaje en educación superior: Un estudio de caso. *Actualidades Investigativas en Educación*, 18(3), 1-30. <http://dx.doi.org/10.15517/aie.v18i3.34122>
- Credé, M. y Kuncel, N. R. (2008). Study habits, skills, and attitudes: the third pillar supporting collegiate academic performance. *Perspective on Psychological Science*, 3(6), 425-453. <https://doi.org/10.1111/j.1745-6924.2008.00089.x>
- Fernández Pózar, F. (2014). *Inventario de hábitos de estudio*. Madrid. Publicaciones de Psicología aplicada. ed. TEA Ediciones.
- Greene, W.H. (1999): *Análisis Económico*, 3ª edición. Prentice Hall.
- Lassibille, G. y Navarro Gómez, L. (2008). Why Do Higher Education Students Drop Out? Evidence from Spain. *Education Economics*, 16(1), 89-105. <https://doi.org/10.1080/09645290701523267>
- Mashayekhi, F., Rafati, S., Mashayekhi, M., Rafati, F., Mohamadi-sardoo, M.R., y Yahaghi, E. (2014). The relationship between the study habits and the academic achievement of students in Islamic Azad University of Jiroft Branch. *International Journal of Current Research and Academic Review*, 2(6), 182-187. <http://www.ijcrar.com/vol-2-6/Fateme%20Mashayekhi,%20et%20al.pdf>
- McFadden, D. (1977). Quantitative Methods for Analyzing Travel Behaviour on Individuals: Some Recent Developments.

- Cowles Foundation Discussion Papers, 707. <https://elischolar.library.yale.edu/cowles-discussion-paper-series/707/>
- McFadden, K. y Dart, J. (1992). Time Management Skills of Undergraduate Business Students. *Journal of Education for Business*, 68(2), 84-88. <https://doi.org/10.1080/08832323.1992.10117592>
- Ministerio de Ciencia, Innovación y Universidades (2019). *Inserción laboral de los egresados universitarios 2013-14. Análisis hasta 2018*. Secretaría General Técnica del Ministerio de Ciencia, Innovación y Universidades. [https://www.universidades.gob.es/wp-content/uploads/2022/10/Insercion\\_laboral\\_egresados-2013-2014.pdf](https://www.universidades.gob.es/wp-content/uploads/2022/10/Insercion_laboral_egresados-2013-2014.pdf)
- Ministerio de Educación, Cultura y Deporte (2022). *Sistema estatal de indicadores de la educación 2015*. Instituto Nacional de Evaluación Educativa. <http://sede.educacion.gob.es/publiventa/sistema-estatal-de-indicadores-de-la-educacion-edicion-2015/educacion-espana/20423>
- Ministerio de Universidades (2023). *Datos y cifras del sistema universitario español. Curso 2022-2023*. Secretaría General de Universidades. [https://www.universidades.gob.es/wp-content/uploads/2023/04/DyC\\_2023\\_web\\_v2.pdf](https://www.universidades.gob.es/wp-content/uploads/2023/04/DyC_2023_web_v2.pdf)
- Nonis, S.A. y Hudson, G.I. (2006). Academic performance of college students: influence of time spent studying and working. *Journal of Education for Business*, 81(3), 151-159. <https://doi.org/10.3200/joeb.81.3.151-159>
- Pineda Lezama, O.B., Alcántara Galdámez, N.J. (2018). Hábitos de estudio y rendimiento académico en estudiantes universitarios. *Innovare-Revista de Ciencia y Tecnología*, 6(2), 19-34. <https://doi.org/10.5377/innovare.v6i2.5569>
- Ramírez Masferrer, J.A., Iwamura, C.K., y Escolano Sánchez, F. (2013). Evaluación continua en grupos numerosos. II Congreso Internacional sobre Aprendizaje, Innovación y Competitividad, CINAIC 2013, Madrid. <https://orcid.org/0000-0001-7813-180X>
- Rana, S.A. y Kausar, R. (2011). Comparison of Study Habits and Academic Performance of Pakistani British and White British Students. *Pakistan Journal of Social and Clinical Psychology*, 9, 21-26. <https://gcu.edu.pk/pages/gcu-press/pjscp/volumes/pjscp2011-4.pdf>
- Salamea-Nieto, R. M., y Cedillo-Chalaco, L.F. (2021). Hábitos de estudio y motivación para el aprendizaje en estudiantes universitarios. *INNOVA Research Journal*, 6(3.1), 94-113. <https://doi.org/10.33890/innova.v6.n3.1.2021.1858>
- Sánchez, C. S. (2002). *Diccionario de las Ciencias de la Educación*. 18va ed. México. ed. Aula Santillana.
- Tejedor-Tejedor, F.J. y García-Valcárcel, A. (2007). Causas del bajo rendimiento del estudiante universitario (en opinión de los profesores y alumnos). Propuestas de mejora en el marco del EEES. *Revista de Educación*, 342, 443-473. <https://sede.educacion.gob.es/publiventa/causas-del-bajo-rendimiento-del-estudiante-universitario-en-opinion-de-los-profesores-y-alumnos-propuestas-de-mejora-en-el-marco-del-eees-/sociologia/23508>
- Verplanken, B., & Orbell, S. (2003). Reflections on past behavior: A self-report index of habit strength. *Journal of Applied Social Psychology*, 33(6), 1313-1330. <https://doi.org/10.1111/j.1559-1816.2003.tb01951.x>
- Vidal, L., Gálvez, M. y Reyes-Sánchez, L.B. (2009). Análisis de Hábitos de Estudio en Alumnos de Primer Año de Ingeniería Civil Agrícola. *Formación Universitaria* 2(2), 27-33. <http://dx.doi.org/10.4067/S0718-50062009000200005>
- Zárate-Depraect, N. E.; Soto-Decuir, M.G.; Martínez-Aguirre, E.G; Castro-Castro, ML; García-Jau, R.A. y López-Leyva, N.M. (2018). Hábitos de estudio y estrés en estudiantes del área de la salud. *Revista Fundación Educativa Médica*, 21(3): 153-157. [https://scielo.isciii.es/scielo.php?script=sci\\_arttext&pid=S2014-98322018000300007](https://scielo.isciii.es/scielo.php?script=sci_arttext&pid=S2014-98322018000300007)