

HOW DOES THE USE OF DIGITAL PLATFORMS IMPACT ON STUDENTS MARKS AT HIGH EDUCATION?

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Abstract

More and more universities use educational digital platforms to support teaching. Due to the covid-19 crisis, and with the online teaching approval, the usage of digital platforms in universities has gone from being an option to a necessity. Therefore, efforts have been made to promote the use of existing platforms in each university. This has required teachers not only to make an effort to transform and adapt in record time all the presential teaching to virtual teaching, but also has required professors to learn how to use some of the features of existing digital platforms that were not familiar to them. However, did using this type of platforms positively impact on high education students marks? This study aims to determine if such impact existed in engineering schools. More concretely, this paper focus on engineering students from different grades and levels from the Universitat Politècnica de València in Spain, and on the use of the PoliformaT digital platform, which is an adaptation of Sakai platform for the mentioned university. Statistics data provided by PoliformaT about the number of visits, number of events with the platform, and downloaded documents per student for several subjects from the School of Industrial Engineering and the School of Informatics for the course 2019-2020 are analysed. Multiple linear regression models on marks obtained by students and their activity on PoliformaT platform have been built to determine if the usage of digital platforms has any relation with the students' marks. A varied casuistry is observed in the results. Relations of the analysed items with marks have been identified in some of the analysed subjects, still these relations being moderate. In this sense, some unconsidered factors might be influencing these relations, being appropriate to analyse them in future research. On the other hand, it is necessary to re-analyse this same scenario in future courses when both, students and professors, have enough usage level of the employed teaching tools. Next course we expect that some of the deficiencies identified in this first study will be reduced after both actors become familiar to these digital tools.

Keywords: Digital tools, statistical analysis, high education, virtual teaching.

1 INTRODUCTION

Recent studies have confirmed the widespread use of Learning Management System, also known as digital platforms, in the Spanish university system [1]. These platforms were designed to allow teachers to customize their own online courses effectively, without the need for advanced web programming skills [2]. Through these platforms, face-to-face teaching has been combined with e-learning, taking advantage of internet infrastructures to impart virtual teaching actions without the need for students and teachers to coincide in space and time [3]. However, the full potential of these platforms has not been used, so far.

During the academic year 2019-2020, and due to the pandemic provoked by the virus COVID-19, face-to-face teaching had to be transformed into virtual teaching from one day to the next. This has not only forced teachers to adapt their teaching methodology to this new paradigm, but also to both teachers and students having to learn new functionalities from previously used platforms and to use new digital platforms.

In this context, this paper aims to answer the research question: Does the use of digital platforms impact on the marks obtained by students? To find it out, the relationship between the marks obtained by students and different indicators that measure the use they have made of digital platforms is established for different subjects belonging to engineering degrees from the Universitat Politècnica de València in Spain.

In this university a digital platform called PoliformaT, that is powered by Sakai, has been used since 2006 [4]. PoliformaT include multiple functionalities in each of its sites, which are mainly destined to subjects or degrees. Some of the most notable features of the PoliformaT platform are:

- Announcements, from where teachers can launch public statements to students.
- Internal mail, from where teachers and students can exchange private emails.
- Resources, where teachers can upload and students can download the materials of the subject (for example slides, papers, documents).
- Shared space, where students and teachers can exchange files privately.
- Tasks, where students can submit activities requested by teachers.
- Exams, where teachers can design exams to be completed by students.
- Marks, where teachers publish the marks obtained by students.

The potential of all these functionalities had not been fully exploited before the pandemic. In other words, a large part of the teaching staff used PoliformaT simply to make the subject material available in the Resources section and to receive Tasks sent by students. However, during the pandemic, the rest of its features have begun to be used to a greater extent. Therefore, this paper analyses subjects taught in the academic year 2019-2020 before the pandemic where the teaching was basically face-to-face (semester A) and during the pandemic where the teaching became virtual (semester B).

The rest of the paper is structured as follows. Section 2 displays the methodology used to carry out an analysis of a multiple regression model between marks obtained by students and three indicators that measure the interaction of students with the digital platform. This methodology is applied in Section 3 to eleven subjects taught at the School of Industrial Engineering and the School of Informatics from the Universitat Politècnica de València. Finally, main conclusions are outlined in Section 4 and future research lines are proposed.

2 METHODOLOGY

This paper is focused in solving the Research Question: Does using digital platforms positively impact on high education students marks? For that, a multiple regression model on the marks obtained by students in the engineering area and diverse indicators about their use of the platform PoliformaT was made, for each subject analysed. The methodology employed to develop this study is comprised by four steps (Fig. 1).



Figure 1. Methodology.

First, a set of subjects from Engineering Degrees is selected to carry out the multiple regression model analysis. Secondly, the marks obtained by students as well as indicators of their use of the PoliformaT platform are extracted. Then, a multiple regression model is used in each subject to study the potential relation between a set of independent variables related to the use of the digital platforms and the marks obtained by students. Finally, results obtained are analysed to determine if making a greater use of the PoliformaT platform implies obtaining better marks.

3 RESULTS

The methodology presented in Section 2 is applied to eleven subjects from different Bachelor's and Master's degrees from the engineering area in the Universitat Politècnica de València. Below are four subsections aligned with the four steps of the methodology presented.

3.1 Selection of subjects

The subjects selected in this paper belong to diverse bachelor's and master's degrees taught at the School of Industrial Engineering or the School of Informatics from the Universitat Politècnica de València. All of them have been taught during the academic year 2019-2020 at least by one of the authors of the paper. In addition, all these subjects have made use of the digital platform PoliformaT. Table 1 collects the main characteristics of the selected subjects such as the school, degree, degree's year, and semester in which they were taught, and the credits and number of students that compose them.

Table 1. Characteristics of subjects.

School	Degree	Subject	Year	Semester	No. of credits	No. of students
School of Informatics	Bachelor's Double Degree in Business Administration and Management + Informatics	Ethics and Professionalism	3	A	4.5	36
	Bachelor's Degree in Informatics Engineering	Integrated Information Systems in Organizations	4	A	4.5	80
	Master's Degree in Informatics Engineering	IT Governance	1	A	4.5	27
School of Industrial Engineering	Bachelor's Degree in Industrial Engineering	Statistics	1	B	6	286
	Bachelor's Degree in Biomedical Engineering	Statistics	2	A	6	48
	Bachelor's Degree in Industrial Organization Engineering	Work Study	2	A	4.5	81
		Quantitative Methods for Industrial Organization	3	AB	9	69
		Production and Stock Planning	3	A	4.5	69
		Business Process Management. Implementation, Development and Simulation	4	B	6	32
	Master's Degree in Industrial Engineering	Operations Management	1	A	4.5	320
Master's Degree in Advanced Engineering in Production, Logistics and Supply Chain Management	Business Process Management	1	B	4	27	

3.2 Data extraction

The second step consists in extracting the needed data for the multiple regression model between the students marks and indicators for the use that students made of PoliformaT. This platform provides with several statistical reports and data per subject. However, this study focuses only on nominative data, since the extracted information must be subsequently related to the marks obtained by each of the students. There are only three indicators about the use of PoliformaT related to nominative data, which are:

- Visits: it indicates the number of times a student has entered the subject site in PoliformaT during the academic year.
- Events: it indicates the number of times a student has interacted with the platform on the subject site during the academic year. Some examples of interactions are review announcement, submit task, write message in forum, read message in forum, vote survey, read resource, send mail, start taking an exam, submit an exam...
- Resources: it indicates the number of times a student downloads a resource available on the PoliformaT subject site.

Once this information has been extracted, it is organized in such a way that it is possible to access to the final mark, as well as to the indicators for visits, events, and resources for each student and subject. A brief example of the information extracted for three students in one of the subjects is shown in Table 2.

Table 2. Example of extracted data.

<i>Student</i>	<i>Mark</i>	<i>Visits</i>	<i>Events</i>	<i>Resources</i>
a	6.98	1,101	827	375
b	7.26	438	1,462	707
c	6.50	417	844	384
...

3.3 Statistical analysis

On the third step, a multiple regression model is applied to data obtained for each of the subjects. The multiple regression model can be used to assess the relation that several independent variables have on a dependent variable. In this study, marks obtained by students at each subject are considered as the dependent variable of the model. The independent variables of the model are related to the indicators of the use of the digital platform: visits (V), events (E), resources (R).

In this analysis, not only the linear effect of these indicators on the dependent variable is analyzed, but also their interactions (visits*events (V*R), visits*resources (V*R), events*resources (E*R)), and quadratic relationships (visits² (V²), events² (E²), and resources² (R²)). A Forward Selection stepwise methodology has been used for model building, in order to sequentially include those most statistically significant variables, until no more can be included, for some Type I risk (α). Table 3 indicates which of these independent variables are related to the marks of each subject.

3.4 Analysis of results

Results show that marks of five subjects are not related to any of the considered indicators of the use of PoliformaT. The rest of subjects are related to at least one indicator of the use of PoliformaT. It draws attention that all subjects taught in the School of Informatics some type of relationship has been found between marks and the indicators of the use of PoliformaT. By contrast, only three of the subjects from the School of Industrial Engineering show relation between the use of PoliformaT and marks obtained by students.

The analysis carried out for the different subjects showed that the percentage of the variability of the marks explained by the indicators of the use of PoliformaT is not much: they range from 15.23% to 31.97% for those subjects in which a relation between marks and the indicators of the use of PoliformaT is established.

Table 3. Relation between independent variables and marks per subject.

<i>Subject</i>	<i>V</i>	<i>E</i>	<i>R</i>	<i>V*E</i>	<i>V*R</i>	<i>E*R</i>	<i>V²</i>	<i>E²</i>	<i>R²</i>
Ethics and Professionalism	X								
Integrated Information Systems in Organizations		X							
IT Governance				X					
Statistics (Industrial Eng.)	X		X				X		
Statistics (Biomedical Eng.)									
Work Study									
Quantitative Methods for Industrial Organization	X								
Production and Stock Planning									
Business Process Management. Implementation, Development and Simulation									
Operations Management									
Business Process Management	X								

This means that there is still a large part of the students' marks that cannot be explained by the indicators of the use of the digital platform but depend on many other factors that have not been included in this analysis.

Therefore, does the use of digital platforms impact on the marks obtained by students? Results show that it depends on the subject and it seems that there is no relationship with the degree, year or semester in which each of these subjects are taught.

4 CONCLUSIONS

This paper has analysed the potential relation between the use of digital platforms by students and the marks they obtain. More specifically, this study focuses on subjects that belong to different engineering degrees in the School of Industrial Engineering and the School of Informatics from the Universitat Politècnica de València, where the digital platform PoliformaT is used.

To determine if there is some type of relationship between the students' marks and various indicators of the use that students make of PoliformaT, a multiple regression model has been carried out. Results shows different casuistries in the analysed subjects.

Approximately half of the analysed subjects show no relationship between marks and the use given to PoliformaT. In the rest of subjects, a maximum of 32% of the variability of the marks for the subject under study is explained with the use of the digital platform. From this it can be derived that marks probably depend on other factors that have not been considered in this paper.

In future works, this same study could be replicated with data from the academic year 2020-2021, in which it is assumed that teachers and students will have better adapted to the use of digital platforms. This study could also be extended by incorporating in the model other independent variables such as the marks obtained by students in the university entrance exam, and indicators for the use that students have made on online teaching platforms. With this, an attempt would be made to determine what other factors influence the marks obtained by students.

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