Multidisciplinary Journal for Education, Social and Technological Sciences

https://doi.org/10.4995/muse.2018.9777
ISSN: 2341-2593

PRESENT AND FUTURE OF THE E-LEARNING IN ECONOMICS SCHOOLS AND FACULTIES

T. Casasús Estellés, A. Ivars Escortell, M.I. López Rodríguez

Dpto. de Matemáticas para la Economía y la Empresa, Universitat de València, Avda. dels Tarongers s/n, 46022, València, Spain. e-mail: Casasus@uv.es; phone:963828373

Dpto. de Economía Aplicada, Universitat de València, Avda. dels Tarongers s/n, 46022,València, Spain. e-mail: Antonia.Ivars@uv.es: phone: 963828617

Dpto. de Economía Aplicada, Universitat de València, Avda. dels Tarongers s/n, 46022, València, Spain. e-mail: Maria.I.Lopez@uv.es; phone: 963828617

Received: 2018-01-03; Accepted: 2018-03-24

Abstract

The goal of this paper is to justify/motivate the existence of MOOCs of quantitative subjects, particularly of Mathematics and Statistics, in the degrees taught in Faculties of Economics and Business, complementary to the standard university courses. The changes in curricula carried out in Spain in the last decade have boosted access to these faculties' degrees for all kind of students. However, some of these students lack skills and abilities enough to successfully tackle the first university Mathematics and Statistics courses, as these are currently designed. Empirical studies support the use of multimedia material as a very effective supporting tool for successful learning.

Thus, after assessing the student's academic performance in quantitative subjects before and after the introduction of the Bologna process, and obtaining worrying results, the implementation of the use ICTs on a regular basis is proposed in order to optimize the teaching-learning process.

The data used in the study correspond to those obtained for students of the degree of Tourism and the degree in International Business, two degrees with very different characteristics and that, therefore, reflect a great diversity of the students of the Faculty of Economics of the University of Valencia.

Keywords

MOOCs, TICs, movies, clickers, quantitative subjects

https://doi.org/10.4995/muse.2018.9777
ISSN: 2341-2593

1. Introduction

The work presented here is due to a situation that, for a few years now, has been confirmed and accepted as a fact in the Spanish university: the scarce level of knowledge of a quantitative nature of the newly admitted students, who access to the area of Social Sciences . Students are faced with serious difficulties to be able to follow fluently the matters related to Mathematics and Statistics, taught in the first years of faculty. In particular, in the case we will deal with, students who access the degrees offered by the Faculty of Economics of the University of Valencia, present a pre-university level that is not enough to successfully tackle subjects with mathematical content and / or statistical. This sometimes leads to a sense of failure, both for teachers and for students. The problem is accentuated if one observes the high dropout rates in the first courses.

This perception is not given as an isolated case. In (Cabrera, 2015) a compilation table of factors and variables related to abandonment is described. In this table prior knowledge appears as one of the educational factors related to abandonment.

This problem has prompted certain university teachers to look for ICTs and new pedagogical tools, as a help to alleviate the detected situation as much as possible.

The study of this work focuses on a particular case, the Faculty of Economics of the Universitat de València. However, concern for the results of students in quantitative matters is a recurring theme in the meetings of university teachers. See, for example, the papers presented at the annual meetings of the Spanish Association of University Teachers of Mathematics (ASEPUMA) for the Economy and Business, www.asepuma.org. In these meetings, a section is dedicated specially to teaching proposals that motivate and facilitate the work of the student. In this sense, for example, (Masero, 2016) presents a didactic proposal based on ICTs and active methodologies focused on students.

In the case of the authors, the experience of years in the teaching of quantitative subjects has allowed us to have a general vision about the evolution of university studies since the

https://doi.org/10.4995/muse.2018.9777
ISSN: 2341-2593

nineties. From this perspective, the objective that we set out in this paper is to justify our vision of where, and for which reason, e-learning and, consequently, MOOCs, will be introduced inevitably and necessary in regulated studies of economics and business. Because of this, we will rely fundamentally on the analysis of the use of ICTs evolution in the degrees of the faculties of economics, from the last years of the bachelor's degrees to the present.

The structure of this work is the following: in sections 2 and 3, we analyze which factors are significant in the academic performance of our students in two temporary spaces, before the implementation of the degrees and after their implementation.

The results obtained, in favor of the use of ICTs, lead us, in section 4, to analyze whether the situation is still present, when the incorporation of the e-learning methodology has become widespread

Finally, in section 5 we present the conclusions obtained.

2. Pre-Bolonia precedents

Doing a bit of history, and focusing on the particular case of the Faculty of Economics of the Universitat de València, the background of the current situation can be said to have started in the 2003-2004 academic year. In this course, an Educational Innovation Project (EIP) was launched that involved the two centers with the highest volume of enrollment, and consequently of teaching activity, of the Universitat de València, the faculties of Economy and Law. The EIP we refer to, is the implementation of the double degree of Business Administration - Law (BA-Law) (Dasí et al., 2007, López, Diez and Ivars, 2010), a project that began to take shape in March 2003 in response to the call made public by the Universitat de València, a call that aimed to develop experiences of educational innovation in the context of the European convergence. In the 2003/04 academic year, a first pilot group was launched in which, during the seven promotions that took the degree course, in addition to implement the ECTS credit as a unit of

https://doi.org/10.4995/muse.2018.9777
ISSN: 2341-2593

measurement, all the tools that would characterize the Bologna plan were introduced, as if a laboratory (a teaching one in this case) will be: evaluation of skills, skills, joint schedules, coordination, incorporation of ICTs in the teaching-learning process, etc.

The observation and analysis of the results that were obtained gave way to numerous studies with different objectives: to predict what might be the strengths / weaknesses of the Bologna plan; detect the factors that, being related to ICTs, significantly influenced academic performance, etc.

One of the results obtained from a survey made to the first year students of the 5th class (Ivars et al., 2009) concluded that the option of baccalaureate course (OPCBACHI) had an influence on the average grade obtained, this being higher in students coming from the baccalaureate of Biomedical Studies, followed by those who had taken the options of Technology, Social and ultimately those who came from a Bachelor of Humanities. Table 1 contains some of the parameters obtained:

Table 1. Descriptive average grade according to options of baccalaureate

	Minimum	Maximum	Average	Typical deviation	Pearson V.C.	Median
Biomedical	4,67	9,6	7,89	1,31	0,17	8
Technological	3,88	9,33	7,64	1,74	0,23	7,97
Humanities	2,67	9,67	6,91	1,66	0,24	7,17
Social	3,17	9,83	7,51	1,35	0,18	7,77

Own elaboration

The results are shown in Figure 1:

https://doi.org/10.4995/muse.2018.9777
ISSN: 2341-2593

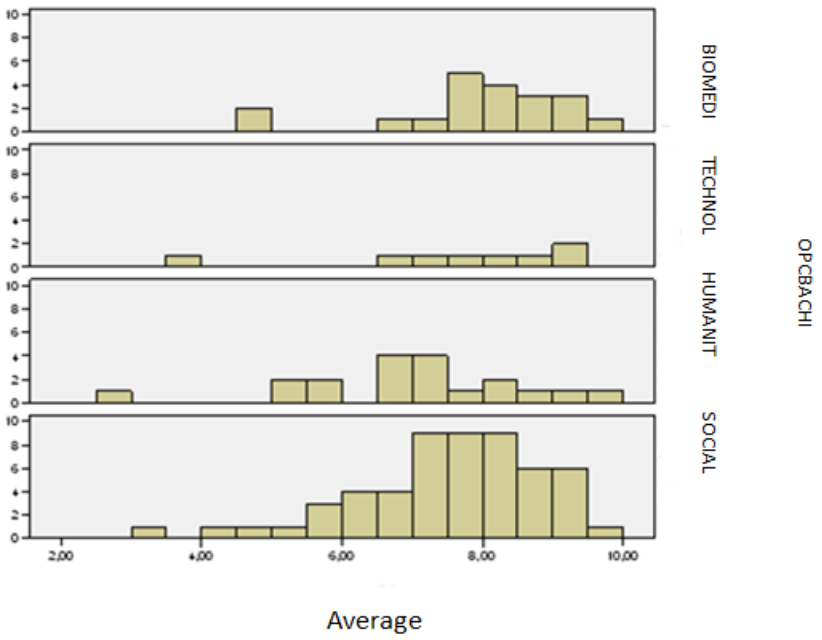


Figure1. Graphical representation of the average mark according to options of baccalaureate. Own elaboration.

There were also clear differences between the grades according to the level of studies of the parents, obtaining better results those students whose parents were highly educated.

As in the case of the previous factor (OPCBACHI), Table 2 and Figure 2 contain the results of a descriptive analysis and the graphic representation of the average grade according to the level of studies of the parents (ESTUMADREPADRE2[1]).

Table 2. Descriptive average grade according to the level of studies of the parents.

	Minimum	Maximum	Average	Typical Deviation	Pearson C.V.	Median
PARENTS LEVEL=2	3,17	9,6	7,802	1,36	0,18	8

[1] We consider the characteristic ESTUMADREPADRE as the level of studies of the parents (obtained considering the sum of the level of studies of the mother and the father, each one of them at 5 levels ordered from lowest to highest). And according to operative criteria, the cases in which the characteristic "ESTUMADREPADRE" took the value 8, 9 and 10 were grouped, giving rise to the characteristic ESTUMADREPADRE2.

.

https://doi.org/10.4995/muse.2018.9777
ISSN: 2341-2593

PARENTS LEVEL=3	6	9,37	8,061	0,96	0,12	7,9
PARENTS LEVEL=4	4,17	9,17	7,356	1,47	0,20	7,57
PARENTS LEVEL=5	4,67	8,17	6,091	1,16	0,19	5,93
PARENTS LEVEL=6	2,67	9,33	6,761	1,75	0,26	6,92
PARENTS LEVEL=7	4,87	9,83	7,024	1,68	0,24	7
PARENTS LEVEL≥8	7,13	9,67	8,267	0,81	0,18	8,17

Own elaboration

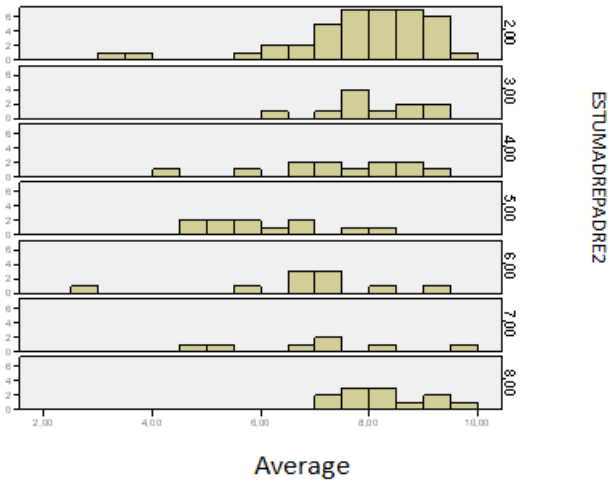


Figure 2. Graphical representation of the average mark according to ESTUMADREPADRE2. Own elaboration

The careful observation of these results led us to the application of the ANOVA technique (sig = 0.001) that confirmed the differences between the different cases.

However, among the items considered in this study, the pre-university level of quantitative nature was not taken into account, since it was understood that this level was the appropriate to tackle successfully the subjects that depended on the said content. Moreover, the agents responsible for the entrance exams to the university (PAU) communicated this fact year after year to the university services. In this sense, the

https://doi.org/10.4995/muse.2018.9777
ISSN: 2341-2593

conclusions of Casasús and Crespo (2004) show the "useless/invalid indicative value of the results obtained in the tests of selectivity", being a great difference between the levels that could be expected by the grades obtained in the PAU and the ones that were really reached in the Mathematics course of the first year of the degree[2].

In the introduction of the new methodologies that began in that period, activities that required cooperative work and self-learning gained strength. See, for example, (Esteban et al, 2009) as an example of activities that would be a starting point for new methodologies used later in the Bologna era.

3. Post-Bolonia precedents

It should be remembered that the Bologna Declaration, carried out in 1999, was the beginning of the process of building the European Higher Education Area (EHEA). In addition, in the case of Spanish universities, the implementation of this process was covered by Royal Executive Order 1393/2007, of October 29th, which laid the foundations for the structures of official university education, granting autonomy to the Universities in the development of study plans.

In the case of the Universitat de València, on July 27th, 2010, in agreement of the Government Council of the Universitat de València 158/2010, the general guidelines that allowed the implementation of the Dual Degree Programs (PDT) were approved. One of the PDT that began its journey in this university (2010-2011 academic year) was the double degree ADE-Law, being this the logical successor of the previous double ADE-Law.

[2] See Annex A with the result of a questionnaire in the first day at a lecture of Mathematics I (academic year 2003/2004) in the Faculty of Economics, for a student with a qualification of 10 in the Mathematics exam in the PAU.

https://doi.org/10.4995/muse.2018.9777
ISSN: 2341-2593

In addition, the start-up of the Bologna process was accompanied by a notable increase in ICTs (Agudo, Hernández-Linares, Rico and Sánchez, 2014) and tools based on so-called simulation games (Bezanilla et al., 2014; Méndez, García-Pernía y Cortés, 2014, Urquidi Martín and Calabor Prieto, 2014).

Once the degrees were implemented, an increase in the deficit of the pre-university level was detected, as well as a decrease in interest on the part of the students in subjects with a mathematical load. A comparative study of the academic results between the bachelor's degrees and the new degrees (López et al., 2016) tried to corroborate / discard this "sensation". To do this, the data corresponding to the academic performance of the ADE-Law PIE students and the ADE-Derecho PDT were selected. The selection of these degrees was considered adequate given that both programs had similar characteristics

1. Obtaining two degrees: Bachelor / Bachelor in Business Administration and Bachelor / Graduate in Law.

2. Integration into the curriculum of the contents of each degree.

3. Equality in the requirements required of students to continue within the program.

4. Use of ECTS credits as a unit of measurement.

Thus, the possible differences detected at the performance level, most likely due to other factors not considered, among them the pre-university level of quantitative character of the students who accessed the degrees offered by the Faculty of Economics. Therefore, the analysis carried out focused on a subject that required such a requirement. In the analysis carried out, almost all the factors constituting the inputs in the teaching-learning process remained constant: subject matter, methodology used, didactic material, timetable, evaluation system, use of pedagogical tool (group activity), ..., concluding the existence of two factors that marked significant differences in student performance (sig = 0.0093 for factor TT (Type of degree) and sig. = 0.0097 for AG (Assistance to group

https://doi.org/10.4995/muse.2018.9777
ISSN: 2341-2593

activity)), in favor of the students of the double degree and of those who attended the group activity:

1. "Type of degree", at two levels: double degree (DL) and double degree (DG).

2. "Attendance to the group activity", at two levels: "the student did attend", and "the student did NOT participate in the said activity".

These results can be corroborated from the observation of Least Significant Difference (LSD) for both factors

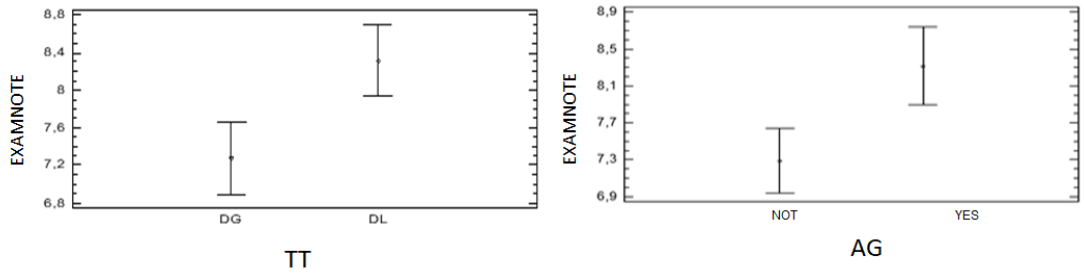


Figure 3. LSD intervals for TT and AG factors (response variable: Examination Mark "). Own elaboration.

As it can be verified, the non-overlap of the aforementioned intervals makes it possible to reject the hypothesis of equality of average scores for both inputs, the mark being higher for the students who belonged to the double degree and for those who had attended the group activity.

4. Current situation

In order to study if the situation described in the previous section is generalizable to the rest of the degrees, a basic quantitative test has been carried out for the students of other groups of the same faculty. This test, conducted on the first day of class, is a continuation of those that we have been doing since 2008. This has allowed us to have a good database, from which we have extracted some of the conclusions previously stated.

https://doi.org/10.4995/muse.2018.9777
ISSN: 2341-2593

Initially, the information was collected in written format, and was carried out since 2014 using the Electronic Voting System (EVS).

Tables 3 and 4 summarize some of the results obtained and that were carried out in the degrees of Tourism and International Business (GIB), among others. The structure of the information presented is as follows:

1. In the first column the statement of the question is collected.
2. In the second column the possible answers (only one is correct).
3. The rest of the columns present the percentage of correct answers, according to the promotions (three from Tourism, Table 3, and one from GIB, Table 4)

Table 3. Survey conducted with EVS to students of the Tourism Degree.

QUESTION	Answer Options	% success (2014/15)	% success (2015/16)	% success (2016/17)
1.- The characteristic A= "number of times you get face when flipping a coin 1200 times" is type:	a) Attribute b) Ordinal c) Discrete Variable d) Continuous Variable	29,63%	53,57%	86,67%
2.- The output of 1, 4 and 10 is:	a) 15 b) 9 c) 10	27,78%	15,09%	21,43%
3.- The typical deviation of 1, 2, 3, 4 and 5 is	a) 5 b) 1,41 c) 1	44,44%		25,49%

https://doi.org/10.4995/muse.2018.9777
ISSN: 2341-2593

QUESTION	Answer Options	% success (2014/15)	% success (2015/16)	% success (2016/17)
4.- Knowing that variable X takes the values: X1 =2, X2=4, X3=6, X4=8, X5=10 then, the value of $\sum_{i=1}^{3} x_i^2$ is:	a) 12 b) 144 c) 56	32,08%	66,04%	45,65%
5.- Given the functions: a) Y = 8X - 5X + 3 b) Y = X4 + 8X c)Y = X + 1/X The corresponding to the line equation is	a) The a) b) The a) and c) c) All	22,00%	10,71%	29,41%

Own elaboration

Table 4. Survey conducted with EVS to students of GIB.

Answer	Answer Options	% success (2016/17)
1. –The variance of 1, 4 y 10 is:	a) 9 b) 3'74 c) 14	46,67%
2.- When analyzing the dispersion of the following two groups of values: Group A: {2, 4, 6, 8, 10} and Group B: {4, 8, 12, 16, 20} It is possible to conclude:	a) Both groups have the same variance. b) Variance of group B is twice the variance of group A. c) Variance of group B is 4 times the variance of group A.	7'55%

https://doi.org/10.4995/muse.2018.9777
ISSN: 2341-2593

Answer	Answer Options	% success (2016/17)
3.- It is known that the average salaries (in hundreds of €) per month in two companies X and Y are $\overline{X} = 7$ and $\overline{Y} = 11$ with a dispersion of $S_x^2 = 9$ and $S_Y = 3$. If a worker of company X has a monthly salary of € 700 and another, of company Y, of € 1100. Which of the two workers has a relatively lower monthly salary?	a) Worker of company X b) Worker of company Y c) Both workers have, relatively, the same monthly salary.	17'24%

Own elaboration

From this information we can deduce the low percentage of correct answers, even in the case of questions with a mathematical load corresponding to lower levels than the baccalaureate one. For example, in the fifth question asked to the students of Tourism, the difficulty was in identifying the general form of the equation of a line. None of the three promotions considered exceeded 30% of success.

In the case of GIB students, the situation becomes worse if one takes into account that the results presented correspond to a second test carried out in the fifth week of the course, after having emphasized basic descriptive concepts. Note that the number of correct answers does not reach 50% in the question referring to a measure of elementary dispersion (the variance), nor to 20% in a simple question of categorization (several questions of this type had been previously resolved).

The reason for the choice of these degrees lies, basically, in that they are two degrees with very different characteristics, and therefore they collected a great diversity of students, making a fairly representative sample of the students of the Faculty of Economics. Some differences of interest between both degrees are:

1. The entry mark is very different, about 7 out of 14 in Tourism students and 12, out of 14, in the case of GIB students, which, in principle, should have an impact on

https://doi.org/10.4995/muse.2018.9777
ISSN: 2341-2593

their level of pre-university knowledge, in general, and consequently in the quantitative ones, in particular.

2. Election of the degree for completely different reasons, many of those enrolled in Tourism have chosen it as their last option, while the GIB is usually their first choice since they have enough access mark to choose what they want. Obviously this affects their motivation when it comes to continuing studies.
3. Different number of credits in the syllabus, 6 credits for the students of Tourism for the subject of descriptive statistics without any mathematics credit, and 4.5 for the students of GIB for the subject of descriptive statistics, probability and introduction to the inference and 6 mathematics credits.

Figures 4 and 5 show the results of the three Tourism classes for each question (Figure 4) and the distribution of the percentage of responses to the three possible options of the second question formulated to the GIB students (Figure 5).

It is noteworthy, in the case of Figure 4, that only three percentages of the fourteen represented exceed 50%.

Figure 5 shows that the students answer the incorrect answers in a high percentage (options a and b) and only 7.55% the right answer.

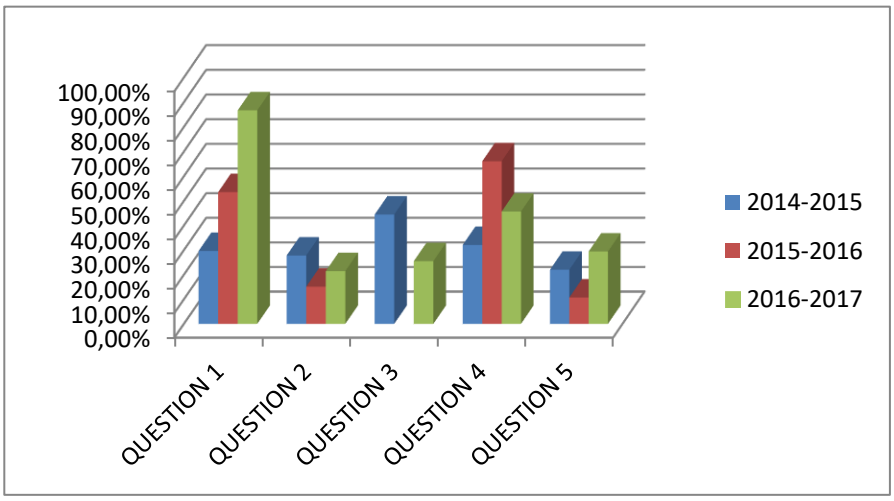


Figure 4. Success Percentage per question in Tourism Classes. Own elaboration

https://doi.org/10.4995/muse.2018.9777
ISSN: 2341-2593

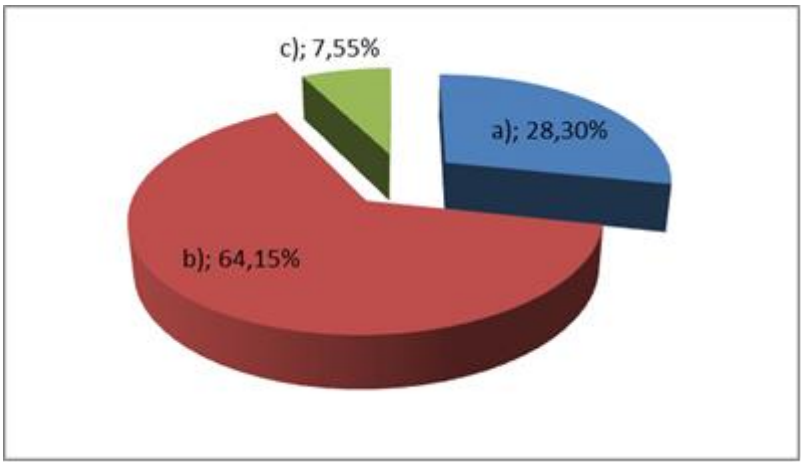


Figure 5. Answer percentage, Question 2, GIB Course. Own elaboration.

The generalized verification of results such as those described above, together with the possibilities currently offered by new technologies and the help of the Servei de Formació Permanent i Innovació Educativa led us to the development of new instruments that complemented and supported the regulated courses we teach at the university. In particular, the movies produced are hosted on the University's website (mmedia.uv.es) and we can state that they have been very well received (we consider proof of this, in addition to the favorable comments of the students, the increase in their attention in class, the decrease in absenteeism and the number of visits the movies had); these data are shown in Table 5[3].

[3] The values contained in Table 5 are biased, because after entering the video links on the website of the educational innovation project to which the authors belong (http://pages.uv.es/piclickers/cat/MenuH_mUVies.wiki) all the visits were not reorded in the mmedia.uv.es counter

https://doi.org/10.4995/muse.2018.9777
ISSN: 2341-2593

Table 5. List of movie titles and number of registered visits.

TITTLE	VISIT NUMBER
a) Methodology for obtaining confidence intervals	151
b) Confidence interval for the average of a normal population with unknown variance and small sample	1332
c) Determination of n to estimate the average of a Normal population with known variance.	191
d) Confidence Intervalfor the average of a Normal with known variance	225
e) Confidence Interval for the difference of averages	111
f) Use of Pearson's Chi-two tables.	132
g) Use of table t of Student	355
h) Use of tables F of Snedecor	509
i) Confidence interval for the ratio of variances of two normal populations	383
j) Use of Normal Distribution Tables	231
k) Clickers Project	704
l) Evolution of the inter-professional minimum wage 1992-2014	270
m) Obtaining information from the INE regarding the CPI	304
n) Application on the link of two series of indexes with a different base period	250

Own elaboration

Being aware that these recordings, made at a first moment, only solved partially the deficiencies detected in the subject matter of the subject of the degree, but not the pre-university gap detected, and coinciding with the first call for MOOC courses for

https://doi.org/10.4995/muse.2018.9777
ISSN: 2341-2593

teachers of the University of València, we decided to participate by presenting a proposal that would allow us to develop a MOOC whose content would cover the deficiencies detected, a proposal that was approved.

In the MOOC that we are finishing right now we have taken into account some of the deficiencies detected in the elaboration of previously recorded movies, somewhat long in some cases. In this sense, (Guo, et al., 2014) perform a study on how the design of the videos affects the ability of the video to attract the student, one of its results being that the short videos are more effective. Thus, the MOOC developed is in line with the cited authors, since the videos meet the following requirements:

1. They are of short duration (an average of about 5-8 minutes).
2. The image of the teacher and the slide are inserted.
3. The explanation developed by the teachers is shown on a Tablet, as a blackboard.

Specifically, the MOOC developed consists of nine modules of about 6 lessons each, together with the complementary material that has been considered necessary (links, bibliography, self-evaluating issues / problems, evaluation test ...). The lessons are of mathematical-statistical content at the pre-university basic level, and with them the student is asked to complete the knowledge that will be necessary to continue with satisfaction his/her university studies.

Students can take their own pace, as well as skip some lessons if they already know them, and address in particular the one they need. From our point of view, it would be like having a book and consulting a chapter when necessary, although the content as a whole has coherence and can be fully studied as an introductory course to the university.

As can be inferred from the above, our objective at this time is not to convert our classes into inverted classes or flipped classroom, but we agree with (Aguado, 2017) that the "use of a MOOC as a complement to regulated training" can be an opportunity for students, with advantages such as:

1. The possibility of accessing the available materials at any time.

https://doi.org/10.4995/muse.2018.9777
ISSN: 2341-2593

2. The realization of tests that allows them to check the assimilation of the subject.

3. The access to the material individually and at their own pace.

It is even more important in this case, in which the MOOC developed is, for our economics and business degrees, a necessary tool, almost essential, for the correct follow-up of the subjects of quantitative content (as we have seen in the previous sections).

The process of preparing this and any other MOOC related to the regulated degrees requires the participation of both the corresponding universities and the agents involved, mainly teachers. Aguado (2017) states that the effort involved in planning, organizing and carrying out a MOOC requires a significant involvement that not all teachers are willing to take on, especially in these times when teaching is much less valued than researching .

This statement is in line with what years ago concluded (Kindelán, 2009), who after affirming the need for teaching and research tasks should go hand in hand in the daily work of university teachers, recognized that the current teaching model is giving priority to research to the detriment of teaching.

5. Conclusions

After the comparative study carried out between undergraduate and graduate degrees, it has been detected the fact that undergraduate students in economics graduates presented a higher performance than graduates in subjects of a quantitative nature. It also detects a downward trend in the pre-Bologna era, sharpened later in the post-Bologna era. In addition, this situation is prolonged / aggravated in the following courses. The study reveals a low level of quantitative knowledge in almost all the degrees offered by the Faculty of Economics. As an example, the results of three Tourism promotions and one of International Business have been exposed, providing conclusions that are, at least, worrying.

https://doi.org/10.4995/muse.2018.9777
ISSN: 2341-2593

The deep concern that produces the evidence obtained, together with the widespread use of new technologies in society, and in particular in young people, has led us to the use of ICTs that complement the usual teaching in the university. In particular, the use of a tool such as MOOCs gives us a great opportunity to help students with difficulties in following certain subjects (in our case, quantitative subjects), or to follow a complete course of introduction to the quantitative subjects as a training for the university, if for some reason they had not completed it.

ICTs in general, as well as MOOCs in particular, seem to postulate, if we follow the development of this work, as the precursors of future models of mass education, online and open, which are being considered as a very useful tool in education, both regulated or not. Aguado (2017) argues that the use of a MOOC as a complement to formal training can be an opportunity for students and our response to the question posed by (García Aretio, 2015) about MOOCs such as tsunami, revolution or old fashion would be that have come to stay, in the current format or in future formats.

6. References

Aguado, J. (2017). ¿Pueden los MOOC favorecer el aprendizaje disminuyendo las tasas de abandono universitario? Revista Iberoamericana de Educación a Distancia, 20(1), 125-143.

Agudo, J., Hernández Linares, R., Rico, M., & Sánchez, H. (2014). Seguimiento y autoevaluación en el aula universitaria con una Tablet PC. Revista Complutense de Educación, 25(2), 245-270.

Bezanilla, M., Arranz, S., Rayón, A., Rubio, I., Menchaca, I., Guenaga, M., & Aguilar, E. (2014). Propuesta de evaluación en competencias genéricas mediante un juego serio. New Aprroaches in Educational Research, 3(1), 44-54. doi:10.7821/naer.3.3.

https://doi.org/10.4995/muse.2018.9777
ISSN: 2341-2593

Cabrera, L. (2015). Efectos del proceso de Bolonia en la reducción del abandono de estudios universitarios: datos para la reflexión y propuestas de mejora. Revista Fuenntes, 16, 39-62. doi:http://dx.doi.org/10.12795/revistafuentes.2015.i16.02

Casasús, T., & Crespo, E. (2004). Titulación ADE-Derecho: Primer análisis de una experiencia. Actas de las XII Jornadas de ASEPUMA. Murcia.

http://asepuma.org/XII/comunica/casasus_crespo.pdf Consultado el de 1 junio de 2017.

Dasí, A., García, J., Huguet, A., Juan, R., Montagud, M., & Gollnert, G. (2007). Innovación educativa en la Universidad: ADE-Derecho. (U. d. València, Ed.) Valencia: PUV.

Esteban, J., Bachero, J., Ivars, A., & López, M. (2009). Descripción de una actividad grupal en el PIE de ADE-Derecho de la Universitat de València.

http://www.uv.es/motiva2/Ponencias%20Motiva2009/docs/62.pdf. Consultado el 7 de junio de 2017.

García Aretio, L. (2015). MOOC: ¿tsunami, revolución o moda? Revista Iberoamericada de Educación a distancia, 18(1), 9-21.

García Aretio, L. (2017). Los MOOC están muy vivos. REspuestas a algunas preguntas. Revista Iberoamericana de Educación a Distancia, 20(1), 9-27.

Guo, P., Kim, J., & Rubin, R. (2014). How Video Production Affects Student Engagement: An Empirical Study of MOOC Videos. Proceedings of the First ACM Conference on Learning at Scale. doi:10.1145/2556325.2566239

Ivars, A., López, M., & Ruiz, F. (2009). ADE-Derecho en la Universitat de València: estudio de una experiencia piloto. Delta Publicaciones Universitarias.

Kindelán, M. (2009). Una perspectiva sobre el binomio enseñanza-investigación en la universidad del s. XXI. Revista Complutense de Educación , 27-45.

https://doi.org/10.4995/muse.2018.9777
ISSN: 2341-2593

https://revistas.ucm.es/index.php/RCED/article/viewFile/41190/39391. Consultado el 8 de junio de 2017.

López, I., Díez, R., & Ivars, A. (2010). La docencia de la Estadística en el PIE de ADE-Derecho: El volument de trabajo del alumno y el profesor. @tic.revista d'innovació educativa, 5, 4-17.

López, M., Palací, D., & Palací, J. (2016). Disminución del rendimiento académico con el Plan Bolonia respecto al plan anterior en España. Revista Complutense de Educación, 633-651.

http://dx.doi.org/10.5209/rev_RCED.2016.v27.n2.46915. Consultado el 25 de mayo de 2017.

Masero, I. (2016). Una propuesta didáctica basada en la TIC y las metodologías activas centradas en el alumno para el desarrollo de competencias. Anales de ASEPUMA, 24. Granada.

Méndez, L., García-Pernía, M., & Cortés, S. (2014). Comunidades virtuales en el Instituto. Descubriendo la gramática interna del videojuego. New Approaches in Educational Research, 3(1), 2-11. doi:10.7821/naer.3.3. 2-10

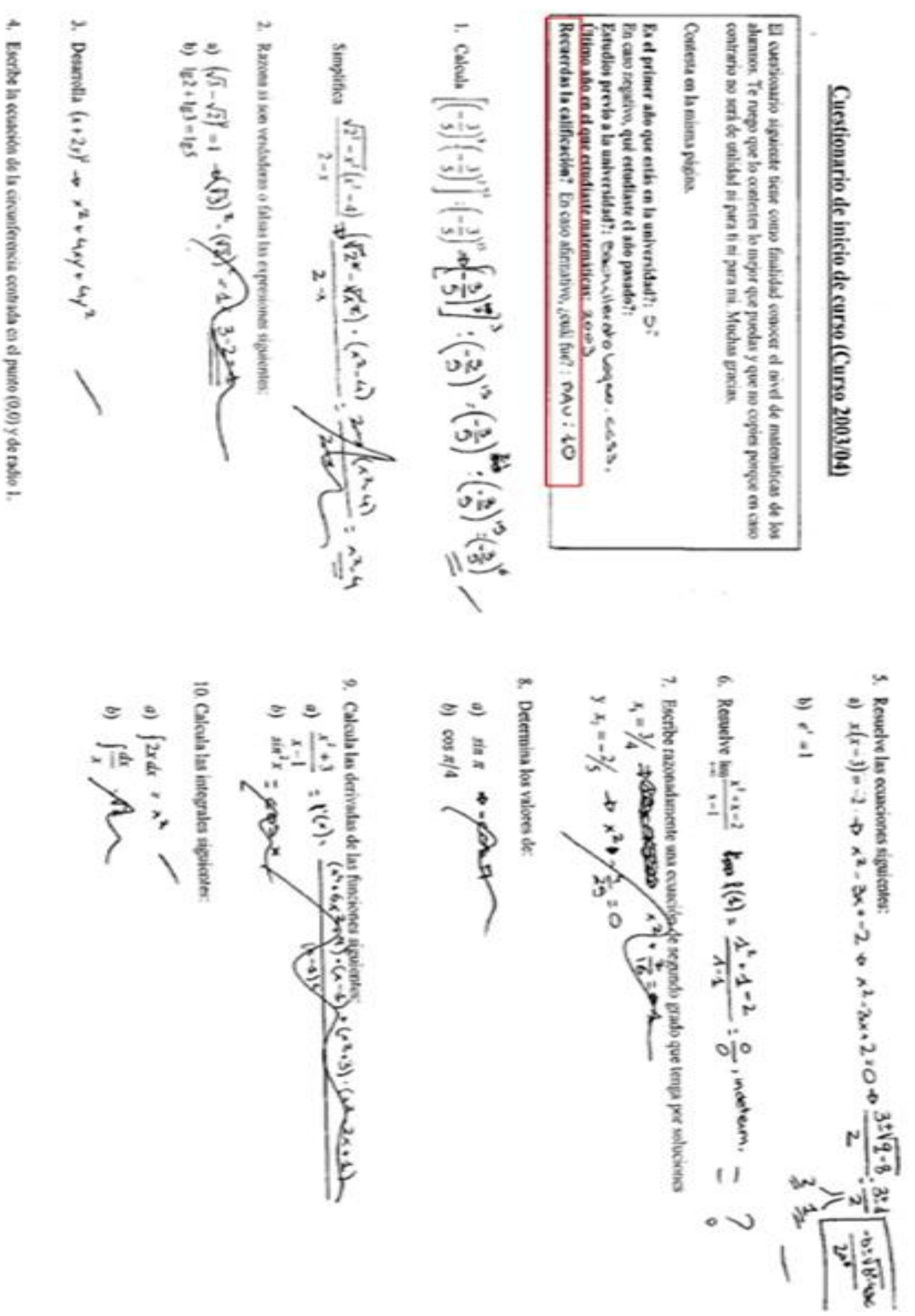
Urquidi Martín, A., & Calabor Prieto, M. (2014). Aprendizaje a través de juegos de simulación: un estudio de los factores que determinan su eficacia pedagógica. EDUTEC. Revista Electrónica de Tecnología Educativa, 47.

http://www.edutec.es/revista/index.php/edutec-e/article/view/75/pdf_6. Consultado el 25 de mayo de 2017.

Multidisciplinary Journal for Education,
Social and Technological Sciences

https://doi.org/10.4995/muse.2018.9777
ISSN: 2341-2593

ANNEX A



Cuestionario de inicio de curso (Curso 2003/04)

El cuestionario siguiente tiene como finalidad conocer el nivel de matemáticas de los alumnos. Te ruego que lo contestes lo mejor que puedas y que no copies porque en caso contrario no será de utilidad ni para ti ni para mi. Muchas gracias.

Contesta en la misma página.

Es el primer año que estás en la universidad?: Sí
En caso negativo, qué estudiaste el año pasado?:
Estudios previo a la universidad?:
Último año en el que estudiaste matemáticas: 2003
Recuerdas la calificación? En caso afirmativo, ¿cuál fue?: PAU: 10

1. Calcula $\left[\left(-\frac{3}{5}\right)^{5}\left(-\frac{3}{5}\right)^{7}\right]^{3}:\left(-\frac{3}{5}\right)^{15}$

Simplifica $\frac{\sqrt{2^{2}-x^{2}}\,(x^{2}-4)}{2-x}$

2. Razona si son verdaderas o falsas las expresiones siguientes:
a) $(\sqrt{3}-\sqrt{2})^{2}=1$
b) $\lg 2+\lg 3=\lg 5$

3. Desarrolla $(x+2y)^{2}$

4. Escribe la ecuación de la circunferencia centrada en el punto (0,0) y de radio 1.

5. Resuelve las ecuaciones siguientes:
a) $x(x-3)=-2$
b) $e^{x}=1$

6. Resuelve $\lim_{x\to 1}\frac{x^{2}+x-2}{x-1}$

7. Escribe razonadamente una ecuación de segundo grado que tenga por soluciones $x_1=3/4$ y $x_2=-2/5$

8. Determina los valores de:
a) $\sin\pi$
b) $\cos\pi/4$

9. Calcula las derivadas de las funciones siguientes:
a) $\frac{x^{2}+3}{x-1}$
b) $\sin^{2}x$

10. Calcula las integrales siguientes:
a) $\int 2x\,dx$
b) $\int\frac{dx}{x}$