



# Analysis of assessment opportunities of learning spaces: On-line versus face to face methodologies



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## ABSTRACT

In the last decade, new methodologies have been introduced in higher education, based on Information and Communication Technologies (ICTs), with the aim of promoting a new teaching based on learning. Moreover, the new standards under the European Higher Education Area, show the relevance of using the concept of competences as a basis for learning outcomes. In order to measure and evaluate the students' learning outcomes, assessment methods become a key tool in teaching and learning systems.

In this context, several forms of assessment have been introduced in higher education where ICTs have changed the traditional assessment. Therefore, a key concept is to detect the implications of the different teaching methodologies (face to face and on-line) and assessment activities in the learning process of students.

This paper develops a methodology, based on information theory measures, that allows us to determine which assessment activity involves a better discrimination of students' levels of acquired competences in a subject of Business Administration and Management degree. The results show that continuous assessment methodology, based on ICTs, have a positive impact in the learning process and in the obtained grades in the final exam.

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## 1. Introduction

European higher education institutions have accepted the challenge in constructing the European Higher Education Area (EHEA) under the fundamental principles laid down in the Bologna Magna Charta Universitatum of 1988 (Bologna, Italy, 18 September 1988). Therefore, universities and higher education centres across Europe are undertaking reforms to construct the EHEA. The new standards show the relevance of using the concept of competences as a basis for learning outcomes which represent a dynamic combination of knowledge, understanding, skills and abilities achieved through a planned educational process.

In this context, in order to measure and evaluate the students' knowledge, skills and attitudes in higher education, assessment methods become a key tool in teaching and learning systems (Wakeford, 1999).

Several forms of assessment have been introduced in higher education in the last decade (Çalışkan & Kaşıkçı, 2010; O'Donovan, Price, & Rust, 2004). The main characteristic is that the traditional assessment (pre/post-tests, portfolios, final exam among others) is

changed by the integration of ICTs (Jou & Wang, 2013) (such as, self-tests quiz tools, discussion forums or e-portfolios). The creation of virtual environments allows students to have many additional opportunities to interact dynamically with other students, opportunities which are enhanced through formative assessment (Gikandi, Morrow, & Davos, 2011; Oosterhof, Conrad, & Ely, 2008). Besides, these new educational environments involve high knowledgeable individuals and the development of new skills in students that allow them to be self-regulated learners with communication and cooperation abilities (Dochy, Segers, & Sluijsmans, 1999).

Therefore, ICTs are a key element in obtaining and transmitting information about different types of knowledge. These technologies facilitate the creation of explicit knowledge through the collection, storage and transmission of quantitative data. Besides, they also facilitate the creation of tacit knowledge by means of the interactions between students.

In this context, as learning and instruction are increasingly competence-based, using just one single assessment method is not sufficient to determine competence acquisition (Bartman, Batiaens, Kirschner, & Vlauten, 2007). Assessment activities not only should evaluate students at the end of the course but also should be able to evaluate student's learning progression (Falchikov, 2005). In that sense, a continuous assessment based on

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ICTs contributes to value the effort and work developed by students throughout the course. The expectation is that students will improve their performance on final exam if they complete continuous activities.

In this paper, we expose our experience in the development of new assessment methods in the course of *Introduction to Economic Statistics* under their implementation of the first year of the Bologna process. It is based on face to face and online activities and therefore the evaluation of the course considers both types of methodologies.

Moreover, a good assessment strategy should evaluate the desired performance standards, academic standard or the students' levels of competence but also discriminate among students.

The objective of this paper is to determine which assessment activity allows a better discrimination of the students by examining their results with information theory measures. More specifically, we use the information index based on Shannon's measure of entropy (Shannon, 1948). This paper offers a different approach to value the relevance of every explicit assessment form in which students have to show their achievement. The assessment strategy is not seen from student's point of view and how they perceived it but from teacher's point of view and how the discrimination power of all these activities is developed.

The paper is structured as follows: first, we describe the teaching methodologies (face to face and online) established in the analyzed subject. After that, we point out the proposed methodology for evaluating the applied assessments methods. It also contains a brief description of some of the uncertainty measures provided by the Information Theory. The employed research methodology allows us to establish a discussion and to reach some conclusions about the advantages and limitations of the developed educations methods and their impacts in the final academic results.

## 2. Materials and methods

### 2.1. Description of teaching material

This study took place in a first-year course on Economic Statistics. The course is a basic training, integrated in Quantitative Methods in a Business Administration and Management degree. It is a course common to the degrees in Economics, Accounting and Finance and Labour Relations and Human Resources, which are also part of the course catalog of the School of Economics and Business.

The competences of this subject are established in the following learning outcomes: (a) application of descriptive statistical tools to solve problems in economics and business, (b) description of basic concepts related to socio-economic statistics, (c) ability to access the main sources of statistical information and interpretation of results and (d) ability to handle the spreadsheet to solve statistical problems.

The syllabus of *Introduction to Economic Statistics* includes 12 items that correspond to weekly teaching units. The items are grouped into three thematic blocks: a first block, corresponding to lessons 1–4, focuses on the study of univariate statistics. The second block, which covers lessons 5–7, studies sets of variables and their relationships. The common feature of the third block, corresponding to lessons 8–12, is the analysis of variables from a temporal approach.

With the aim of obtaining the proposal learning outcomes, face to face and online methodologies have been used. Face-to-face teaching is based on two types of activities: lectures and classroom practices, with weekly sessions of an hour and a half each. These

activities are complemented by practical sessions in the computer lab and tutorial group.

In this context, the work plan for the activities is established in function of:

- *Lectures*: These classes consider the overall motivation of the subject. They are based on real situations in the economic field and give an overview of the theoretical part of each lesson, with particular attention to the key concepts and the most important developments.
- *Classroom practices*: Each group of students is divided into two subgroups for classroom practice sessions. These sessions solve theoretical and practical issues and statistical assumptions related to economics and business with the support of the tools introduced in the lectures.
- *Sessions in the computer lab and tutorial groups*: Each group of students is divided into three subgroups in order to perform three practice sessions in the computer lab. These sessions focus on the databases of socioeconomic surveys that require the use of software tools for processing and analysis. The worksheet is the main tool in this part.

The sessions present the basics of the spreadsheet, focusing on the functions and procedures that enable the resolution of statistical problems. The knowledge acquired in these sessions provides students with the skills to work independently with spreadsheets and solve the cases that are proposed during the course. In addition, the small size of the groups for these sessions facilitates the tracking of the activities of the proposed individual assignments of the continuous assessment.

The teaching methodology and work plan are based on the Virtual Campus, by means of Moodle platform, in two ways:

- As the reference site to look up and download educational resources, since students have access to all the materials necessary for the monitoring of the course beforehand: lectures presentations, instructions and data bases for practice sessions, a collection of suggested exercises for autonomous work and solved problems in every part of the program.
- As an area of active participation for the student in the process of learning: self-assessment tests, discussion forums, carrying out tasks, on-line tutorials, etc.

Therefore, online communication is strongly encouraged in the learning process of *Introduction to Economic Statistics*, trying to avoid the risk of students' isolation. Tutorials are provided in several ways, such as e-mails and forums, and according to our experience all of them are intensively used by students. In general terms, online assistance connects students with their tutors, providing quick answers to their questions and comments while forums are mainly used for interactive debates trying to encourage students' participation. All of these ICTs allow students to acquire a practical approach of the subject content, to develop skills of teamwork and to create new knowledge in a faster way by means of the interaction with other students and/or teachers.

The objective of these established online activities in the analyzed subject is to promote the development of capabilities that allows students to create tacit and explicit knowledge and to facilitate its incorporation in the labour market. Self-esteem, autonomy-self, ability to communicate, understanding critical, social skills or moral reasons are emphasized in Business and Economy degree.

Finally, the evaluation system of *Introduction to Economic Statistics* has been designed trying to achieve coherence with the whole teaching–learning process. More specifically, final grades are obtained according to the following criteria:

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