

EVALUATION OF TRANSVERSAL COMPETENCIES: PILOT PROJECT IN A MATHS COURSE FOR FIRST-YEAR BUSINESS DEGREE STUDENTS

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Abstract

The aim of this communication is to describe the results of a pilot project for the assessment of the transversal competency "*the capacity for learning and responsibility*". This competency is centred on the capacity for the analysis, synthesis, overview, and practical application of newly acquired knowledge. It is proposed by the University of Barcelona in its undergraduate degree courses, through multidisciplinary teaching teams. The goal of the pilot project is to evaluate this competency.

We worked with a group of students in a first-year Business Degree maths course, during the first semester of the 2012/2013 academic year. The development of the project was in two stages: (i) design of a specific task to share with the same students in the following semester when the subject would be economic history; and (ii) the elaboration of an evaluation rubric in which we defined the content, the aspects to evaluate, the evaluation criteria, and the marking scale. The attainment of the expectations of quality on the specific task was scored following this rubric, which provided a single basis for the precise and fair assessment by the instructor and for the students' own self-evaluation.

We conclude by describing the main findings of the experience. There particularly stood out the high score in the students' self-evaluation given to one aspect of the competency – their capacity for learning – in stark contrast to their instructor's quite negative evaluation. This means that we have to work both to improve teaching practice and to identify the optimal competency evaluation methodology.

Keywords: Transversal competencies, evaluation, higher education.

1 INTRODUCTION AND MOTIVATION

One of the transversal competencies that the University of Barcelona proposes in its undergraduate degree courses is that of "the capacity for learning and responsibility" (including the capacity to analyse, synthesize, and form an overview of a field, and put that knowledge into practice, and the capacity to make decisions and adapt to new situations).

In order to evaluate this competency, the University is carrying out a project with multidisciplinary teaching teams¹ in which the subjects involved are Mathematics (first semester of Year 1), Economic History (second semester of Year 1), and World Economics (first semester of Year 2). The first phase of the project was initiated with the subject of Mathematics in the Business Administration degree course of 2012-2013.

First, we designed a specific activity corresponding to a test of continuing evaluation. The activity is related to the economic content of using the Lorenz curve to examine income distribution inequality, and will have continuity in the following semester in the Economic History course.

Second, we developed a rubric to standardize the evaluation not only of the knowledge acquired of the content of the subject being taught, but also of the acquisition of the aforementioned competency. In it, we define the content, the aspects evaluated, the evaluation criteria, and the marking scale. This rubric has provided a basis for the instructors' evaluation to be fairer and more precise.

At the same time, we proceeded to get the students to make a self-evaluation using this same rubric.

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The objective of the present communication is to describe the development of this experience and report its main results, so as to allow the instructors to better identify the evaluation methodology and improve their teaching practice, and the students to see what criteria are followed when they are evaluated.

2 MODEL OF THE EVALUATION OF CONTENT AND COMPETENCIES

The proposed activity refers to the analysis of a Lorenz curve. Based on this activity, we elaborated a rubric to standardize the evaluation not only of the knowledge acquired of this specific content, but also of the degree of acquisition of the competency of the capacity for learning and responsibility.

The rubric contains two elements:

1. Performance criteria related to evaluation.
2. Results criteria corresponding to different levels of attainment.

The performance criteria are grouped into seven sections:

Performance criteria	Evaluation	L* / TC**
1. Identify the type of function you are working with, and its domain	10%	L
2. Set and formulate the problem	30%	L
3. Solve the problem	30%	L
4. Interpret the result	20%	TC
5. Present the activity in accordance with the set requisites	4%	TC
6. Writing	4%	TC
7. Teamwork	2%	TC

* Learning the content.

** Transversal competency.

The first three criteria are used to assess the learning of this specific Mathematics content. To this end, the tasks set in the activity are:

1. Plotting the function and determining its domain.
2. Applying the concepts of the point derivative and point elasticity of the function.
3. Determining the point which maximizes the difference between the perfect equality reference line with the inequality of income distribution (Lorenz curve).

In the evaluation, these criteria have a weight of 70% in the final mark.

The four remaining criteria are taken to evaluate the acquisition of the competency, namely:

1. Application and interpretation of the theoretical knowledge to get an overview of the problem being analysed.
2. Responsibility in the presentation of the activity in terms of compliance with the deadline and format requirements.
3. Written expression.
4. Teamwork.

In the evaluation, these criteria have a weight of 30% in the final mark.

With respect to the performance criteria corresponding to different levels of attainment, these were implemented in the form of descriptors denoting full, partial, or no learning of the content and of the acquisition of the target competency. In particular, the rubric includes descriptors with:

- Two levels of achievement if the performance criterion supports just a full or null attainment dichotomy.
- Four levels of achievement if the criterion supports a gradual attainment of the objective.

The rubric was made available to the students together with the enunciation of the activity. The intention was that they should see that there was a fairly objective system for the evaluation of their work, and that they could self-evaluate their learning through a consultation available to them on the subject's virtual campus. To this end, once the activity had been handed in, its correct solution was made available to them. Table 1 below presents the rubric.

Table 1: Evaluation of the learning (L) and of the transversal competency (TC) involved in the activity.

N	Performance Criteria	Tasks	Descriptors				L*	TC**
			1 (0 points)	2 (0–3 points)	3 (3.1–4.9 points)	4 (5– points)		
1	Identify the type of function and its domain of definition. (10%)	· Plot the function in Excel (Lorenz curve). · Determination of the domain from the economic standpoint.	NO correct identification of the type of function and NO properly defined domain.	YES, identifies the type of function, but NO properly defined domain.	NO identification of the type of function, but YES, of the domain.	YES, correctly identifies the type of function, & YES well defined domain.	X	
2	Order the steps to follow to formulate and solve the problem. (20%)	· Apply the definitions of derivative and elasticity of a function. · Apply the necessary and sufficient conditions for the optimum of a function.	The sequence is NOT correct.	Some parts are correct but mostly the sequence is not correct.	The sequence is correct but incomplete.	YES, the correct sequence.	X	
3	Calculate the solution mathematically. (30%)	· Calculate the value of the point derivative and the point elasticity. · Find the optimum point. · Check the result graphically.	NO part is calculated correctly.	Some calculations, but NO correct calculation of derivatives, and therefore neither of the elasticity or the optimum.	Derivative calculations correct but mistake in the elasticity or the optimum.	YES, correct solution.	X	
4	Interpret the solution. (20%)	· Interpret the result both mathematically and economically.	NOT correctly interpreted.			YES, correctly interpreted.		X
5	Hand in the work following the presentation and deadline requirements. (4%)	· Hand in the work with the required format. · Respond to the self-evaluation consultation.	Does not meet the requirements			Meets the requirements.		X
6	Present the work well organized and well written. (4%)	· Hand in the work well organized, no spelling mistakes, easy to read.	Absolutely disagreeable to read (presentation with mistakes, messy, only some parts done,...).	Presentation with serious misspellings and incomplete in parts.	Presentation correct but incomplete in parts.	Proper presentation and completion of the entire work.		X
7	Teamwork. (2%)	· The presentation coincides with those of the other team members.	There is NO evidence of teamwork.			YES, evidence of teamwork.		X

* Learning the content.

** Transversal competency.

3 APPLICATION OF THE MODEL TO FIRST YEAR UNDERGRADUATES OF BUSINESS ADMINISTRATION IN THEIR MATHS COURSE

The sample for the pilot project consisted of a group of students of the Mathematics course during the first semester of 2012-2013. The group initially comprised 105 students, of whom 74 (70.48%) did the activity. They were organized into 35 teams, mostly of two students (29 teams consisted of 2 members and 5 of 3 members). Only one student presented the activity individually.

The mean scores obtained in the instructor's evaluation of the activity and in the students' own self-evaluation are listed in Table 2 below.

Table 2: Results of the instructor's evaluation and the self-evaluations.

Performance criterion 1	Performance criterion 2		Performance criterion 3		Performance criterion 4		Performance criterion 5		Performance criterion 6		Performance criterion 7		EVALUATION			
Understanding 10,00%	Relate concepts 30,00%		Relate concepts 30,00%		Interpretation 20,00%		Responsibility 4,00%		Writing 4,00%		Teamwork 2,00%		100,00%			
	INST	STUD	INST	STUD	INST	STUD	INST	STUD	INST	STUD	INST	STUD	INST	STUD		
Average	5,41%	8,97%	26,99%	25,48%	25,07%	27,12%	7,47%	18,63%	4,00%	4,00%	2,90%	3,45%	1,97%	1,96%	73,81%	89,62%
St.dev.	2,67%	1,99%	5,19%	6,46%	6,88%	6,12%	5,34%	5,09%	0,00%	0,00%	1,19%	1,07%	0,23%	0,26%	15,70%	13,44%

Note that the instructor's evaluation of the activity integrates both that of the subject content and that of the acquisition of the competency. The weight we give to the former is 70%, and 30% to the latter (20% for the ability to apply and interpret the theoretical knowledge to get an overview of the problem, and 10% for responsibility). This relative weighting of content and competency reflects the consideration on our part that the subject being studied is both instrumental in nature and of the first year, so that the acquisition of the competency is still at an early stage. For this reason, competency will be assigned a greater relative weight in the following activity (when the subject will be Economic History).

One observes that the mean score of the instructor's evaluations was 73.81% (maximum 100%) while that of the students' was 89.62%. The differences between the two are best seen graphically:

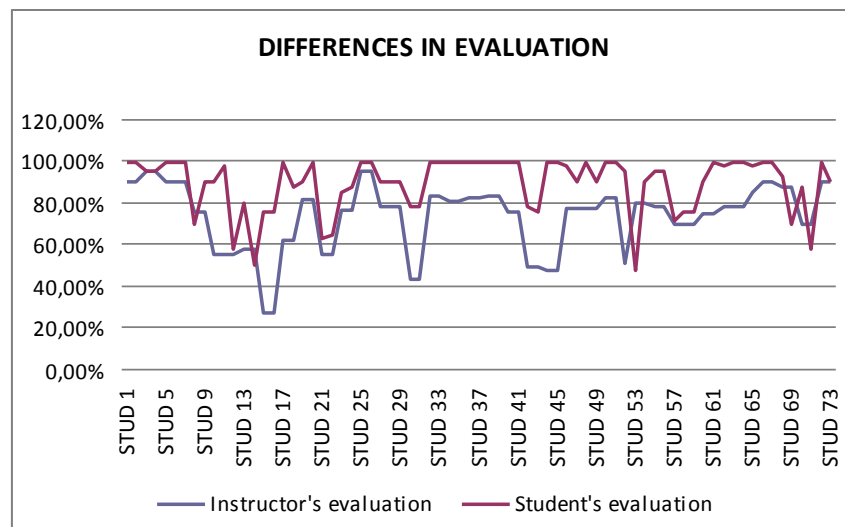


Figure 1: Differences in evaluation between instructor and students.

In the first three criteria, the largest difference occurs in Criterion 1. This is related to the comprehension of the statement of the activity. The mean score given by the instructor was 5.41% (maximum 10%), while that given by the students each to themselves was 8.97%.

Criteria 2 and 3 however, which refer to relating and applying concepts, show near coincidence between the scores of the instructor and those of the students, both being approximately 26% (maximum 30%).

Criterion 4 presented the greatest difference in the evaluations. This assesses the analysis and interpretation of results (precisely the aspect most closely related to the competency of learning and responsibility). The instructor's mean score was 7.47% (maximum 20%) – indeed the students would fail in this section – while the students' mean score was an almost perfect 18.63%. This is shown graphically in Figure 2 below.

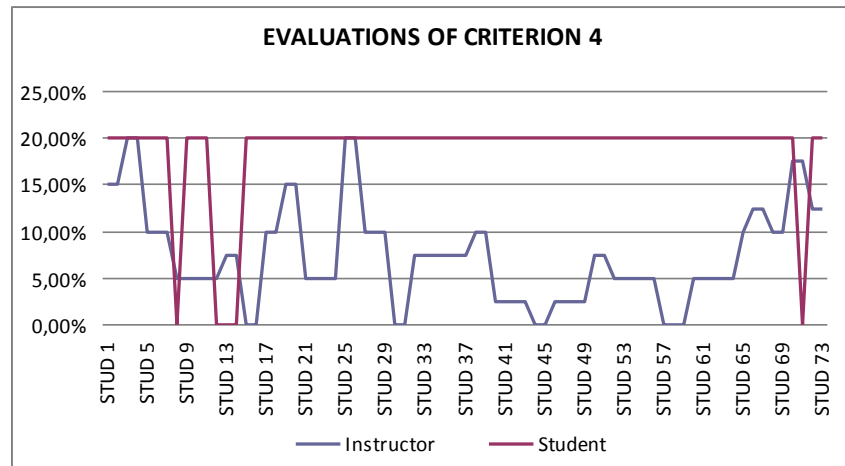


Figure 2: Differences between the instructor's and the students' evaluations of Criterion 4.

With respect to the aspects of responsibility represented by meeting the deadline and fulfilling the format requirements, neither the instructor nor the students penalized this aspect at all. The instructor's explanation was that very little time was made available for the students to hand in the activity, and hence many of them simply found themselves unable to finish it on time. The result was that, in this case, there were no evaluation differences between instructor and students, both assigning the maximum score in all cases.

Regarding the writing, the instructor's mean score for the evaluations was 2.90% (maximum 4%), while that of the students was 3.45%.

Finally, with regard to the evaluation of teamwork based on the coincidence of the self-evaluation of all the members of a group, and on the evaluation of the individual participant and that of the other team members, in almost all cases the maximum score was assigned by both the instructor and the students.

4 CONCLUSIONS

From the instructor's point of view, this experience has served to standardize the evaluation criteria, and to gain awareness of the need to evaluate the competencies that the students are intended to acquire as well as their learning of the course content. In the present case, our focus has been on a particular transversal competency, one that is set out by the University for all undergraduate courses.

Some aspects of the experience clearly need to be improved. For instance, we need to look for further or alternative evidence that teamwork has actually functioned. Also we need to propose the activity halfway through the course instead of at the end, since we would then expect greater levels of participation and better results.

From the students' point of view, the availability of a standardized evaluation system allows them to understand the instructional objectives underlying the activity and helps foster their self-learning.

There stands out the students' euphoria or optimism in their self-evaluations. We believe therefore that in the second semester, with the Economic History course, we should put particular effort into reducing the deviations between the instructor's and the students' evaluations.

The task of learning content and competencies is one that has to be carried out smoothly and gradually over all the subject courses that are taught in a Business Administration undergraduate degree program.

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