Improvement of Continuous Assessment in Large Groups. 
Application to a Technological Subject in Higher Education

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Abstract

Continuous assessment is intended to improve student learning. However, it may lead to worsen student learning results under some circumstances, that could be hidden under better rates of students who pass the subject and better grades. Student grades in a technological subject of higher education were analyzed over sixteen years. When continuous assessment was applied, an important decrease on final exam grades was found, as students knew that they need a lower exam performance to pass the subject. Efforts made by students to attend lectures, to solve exercises collected in class, and to do additional work at home didn’t compensate their lower dedication to study the final exam. Probably the good grades obtained in the test of the continuous assessment gave students the erroneous impression they had a better preparation. But for high level technological engineering subjects, where partial skills have to be joined to achieve a final objective, the learning can’t be achieved without a final effort to put together all the contents. It's also possible that students relax knowing that they need an inferior pass mark on the final exam. To solve this negative effect, an improvement of the continuous assessment had to be carried out, and minimum mark in the exam had to be required. Learning results were improved by this modification. In addition, the student motivation to attend lectures and to prepare the exam increases.

1. Introduction

In the Spanish process for convergence towards the European Higher Education Area (EHEA), assessment of learning has entered in a new dimension. The professor has to assess the assimilation of knowledge and development of skills by the students while they remain in the learning process. In this context, continuous assessment has been adopted by Spanish universities, in the belief that assessing students throughout the course with periodic testing will ease their assimilation of contents and progressive development of skills.

It has been stated that the continuous assessment has advantages, such as [1]:

• To allow the students a gradual assimilation of the contents and progressive development of skills.
• To inform on the learning process.
• To be a student-centered learning system.
• To better prepare the students for the final exam, as it will be similar to the term tests carried out during the course.

But confronting these advantages, a number of drawbacks have also been identified, such as [2]:

• The need of a not too ambitious theoretical content in the course programs.
Continuous assessment is applicable only for small groups. Individualized attention to the student requires more dedication from the professor and this is complicated in the case of a large number of students in a group.

Since there must be a link between what the student must learn and what is actually being evaluated, the faculty must set the most appropriate forms of assessment to achieve the development of the required skills. To design a continuous assessment system, different evaluative activities with different relative weights must be defined [3, 4]. It has to be decided if the final grade is obtained only by the continuous assessment results, or performing also a final exam. A final exam is highly recommended for high level technological subjects, where partial skills have to be joined to achieve a final objective. Partial skills can be evaluated by continuous assessment, but their aggregation towards the final objective can be only evaluated in a final exam.

This article contrasts the learning of students in two different evaluation systems. In the first system, the student’s grade depends only on the final exam result. In the second system, in addition to the final exam, a continuous assessment was implemented, and the student’s grade depends on the combination of the final exam result and the continuous assessment result. The continuous assessment is enhanced through an array of different activities and tests during the course.

2. Study case

The results of assessing the subject Hydraulic Engineering Systems are presented. Objectives, context, and contents of this subject are described, and the assessment results over 16 academic years are analyzed. This analysis leads to interesting conclusions.

2.1. Subject description

The subject Hydraulic Engineering Systems is taught in the 5th year of the Civil Engineering degree (Ingeniero de Caminos, Canales y Puertos, ICCP) at the Technical University of Madrid. The degree comprises six years of studies, plus a final project. In the Spanish academic and professional system, the ICCP degree concedes the highest level of skills to legally develop a professional activity in all fields of civil engineering. Therefore, the curriculum of this degree is fixed by law. After the adaptation to the EHEA, the ICCP degree will be a Master of Science (2 years), which requires the completion of a previous Civil Engineering bachelor degree (4 years).

The subject has a highly technological content, and students need to have a very solid scientific (2 years) and technical (2 years) previous training. The basic data of the subject are:

- Core subject, with annual duration (2 terms).
- 120 hours of lectures (4 hours per week, during 30 weeks), which convey about 500 hours of work per student (equivalent to 19 ECTS).
- The objective of the subject is that students acquire the following skills: planning, developing, projecting, managing the construction, operating and maintaining any civil engineering hydraulic system.
- Contents: the first term (15 weeks) is devoted to dams; the second term (15 weeks) is devoted to channels, pipes, pumping schemes, hydropower and irrigation.
- The average number of students of this subject is 450 per year.
2.2. Assessment methods

The traditional assessment system in Spanish education is the only by final exam method, and the grade obtained in the subject by the student is directly the grade obtained on the final exam. There are usually three final exams: an ordinary final exam at the end of the second term (May or June), and two resit exams (one in September, and the other in December) for the students who failed the ordinary final exam. The range of grades varies between 0 and 10 points, being 0 point a very poor performance and 10 points an excellent performance. The pass mark is 5 points.

Recently, as a consequence of the Bologna process, the continuous assessment method has been also implemented. This assessment method takes into account additional activities performed by the student during the term, as attendance to the lectures, small class tests, homework, etc. A ordinary final exam may also be performed, but its weight is reduced to get the overall grade of the student. Two resit exams have to be offered (by law) to students who failed the subject, but in these cases the grade of the student in the subject is directly the grade on the resit exam.

For the subject Hydraulic Engineering Systems, assessment has been performed as follows:

- From 1994-1995 to 2001-2002 the assessment method was only by final exam.
- Since 2002-2003 the assessment method has been continuous assessment. Up to 40 different exercises and small test are performed in the class room. Test are proposed randomly without previous advice to the students. The student must answer, in about 10 minutes, a few theoretical of practical questions using the concepts explained in the current lecture or in the immediately previous ones. This method begun in 2002-2003, but it was not completely implemented until 2004-2005.

2.3. Validity of the data

It’s important to remark that the main conditions in which the subject has been taught during these 16 academic years hasn’t vary:

- Students have the same profile and background. When registered in Hydraulic Engineering Systems, all students have had the same scientific and technical training of four years.
- There haven't be important changes in the faculty of this subject, and new staff has the same background and profile.
- The contents of the subject have been progressively adapted to the advances produced in technology during this period. The orientation of the subject and the skills that students are required to acquire haven't change.
- The scheme of the final exams has been the same during the period of study, having similar duration, number of exercises and weights of the theoretical and practical parts.

The only significant variation for this subject has been the introduction of the continuous assessment method in 2002-2003. Therefore, if changes are observed in the performance of students over the years, they must be a direct consequence of the assessment method.

2.4. Analysis of results

Data of these 16 years are summarized in the next three figures. The rate of students who passed the subject is presented in Figure 1, showing the students who passed after the ordinary final exam or after the two resit exams. This figure shows that after the academic year 2002-2003 there is an important increase in the number of students who passed the subject (about 20%), mainly after the
The increase indicates that, under the continuous assessment system, more students are capable to reach the passing mark (set in 5 points).

**Fig. 1.** Rate of students who passed the subject.

Figure 2 shows the average grades obtained by the students who passed the subject. It can be seen that, for every type of exam (ordinary final exam and resit exams), the average grade is very steady throughout the academic years. Average grade on the ordinary final exam is about 0.82 points (6.93 minus 6.11) above average grade on resit exams. This means that students are better prepared for the ordinary final exam than for the resit exams. There is no significant difference in the average grades before and after the academic year 2002-2003, when continuous evaluation was implemented. It can be concluded that the assessment system makes no difference in the final grades of students.

**Fig. 2.** Grades obtained by the students who passed the subject.
Figure 3 represents the average grades obtained by the students who passed the subject and the average grades obtained on the ordinary final exam. Both grades are equal for the academic year 2001-2002 and before, since the grade on the subject is directly the grade obtained on the final exam. In the academic years 2002-2003 and 2003-2004 the continuous assessment was been implemented, and grades on the subject and on the ordinary final exam begun to diverge. After the academic year 2004-2005, when the continuous assessment was fully implemented, the average grade obtained by the students (6.93 on the average) on the subject remains almost equal to that in former years, but the average grade obtained on the final exam (5.32 points) was lower than before. Since there were no changes in the contents of the subject, faculty, teaching methodology, students’ background, nor in the type of examination, this significant fall of almost 25% in the grade seems to be directly related to the assessment system.

![Grades by students who passed the subject after the ordinary final exam](image)

**Fig. 3.** Grades obtained by the students who passed the subject after the ordinary final exam.

### 2.5. Conclusions for the study case

The study case shows that when a continuous assessment system is implemented, the number of students who reach the pass mark increases about 20%, but the average grade of the students remains almost equal. However, the students’ average grade on the final exam decreases almost 25%, which means a lower preparation.

At least, three reasons can be inferred to explain this non predicted fact:

- Continuous assessment involves, necessarily, by its very essence, a knowledge assessment very parcelled out in small doses. The student can get a good grade when solving a particular issue on that day, not always related to that of previous days. The student may lose the overview of the subject. This occurs mainly in highly technological engineering subjects, when parts need to be geared together to solve a specific problem.

- Continuous assessment is better applied when the group has fewer students. In large groups, professors are unable to give enough personal attention and to assess the skill development for every student.
• The student may pass the subject with an inferior grade in the final exam. Therefore the student may relax his effort, adjusting his work for the final exam just to overcome the passing mark.

Finally, for a technological subject, the problems of continuous assessment are minimized when periodic tests (such as checkpoints along the course) or midcourse exams are performed, in which the student is forced to understand the subject as a whole. We also consider that a final exam, with a significant weight in the final grade of the student, has always to be performed, and that a minimum mark in this exam has to be obtained to pass the subject.

3. Conclusions

The continuous assessment system is imposed under the belief that it improves student learning because it requires continued work. More students pass the subject under continuous assessment systems, and even they may get higher grades. These circumstances are associated to the higher development of skills supposedly obtained under this evaluation system. But, for high level technological subjects, continuous evaluation can sometimes be really leading to a lower level of learning, masked under the guise of higher rates of students who pass the subject or higher grades. This disadvantage is minimized if a final exam is also performed, so that the student must understands the subject as a whole and link together all parts of the course. But the case study shown in this article proves that, even when a final exam is also performed, continuous assessment do not necessarily convey a higher level of knowledge by the average student, but the opposite. To avoid this problem, some additional measures have to be adopted, as to set a minimum mark on the final exam for the student to pass the subject.

References


