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Practical Distance Work and Higher Education: Analysis of the Effects of Formative Assessment on Performance in Certificate Assessment

ABSTRACT

The quality of training systems in higher education, and more specifically the types of assessment offered, have often been the subject of analysis and/or revision with a view to making learning more qualitative. In fact, the present article aims at analysing the effects of formative assessment on the performance of students in the 3rd year of university education. For this purpose, an experimental group is formed and subjected to formative assessment. A control group, exempt from the latter, is formed in order to control the effect of our device. The analysis of our results indicates that the formative test has a real regulatory function.

Keywords: formative assessment, certificate assessment, higher education, performance.

Introduction

Currently, the university is concerned with evaluation in all its multiplicity (Allal, 2015). Indeed, the question of the effectiveness of the evaluation systems proposed there, on numerous occasions, has been the subject of questioning and discussion (Lebrun et al., 2011). This practice, considered as a complex pedagogical act (Gérard, 2013), occupies an important place within the teaching-learning process (Gérard & Roegiers, 2011). In fact, any training process, if it is to be qualitative in nature, must include this pedagogical practice. From then on, academics are no longer exempt from evaluation, and it is up to the professors in charge of administering their courses to propose one

or another form of evaluation within their teaching units in order to respect a pedagogical alignment (Biggs, 2003).

Among these assessments, teachers have a duty to design formative and certificative assessments (Romainville et al., 2015). With over thirty years of documentation, the literature on the potential of formative assessments continues to attribute virtues to it, presenting it as a highly effective instrument for improving learning in all disciplines (Perrenoud, 2001a; CERI, 2008). Indeed, numerous studies confirm the positive effects of this practice in various fields such as French or mathematics, as well as at different levels of education: primary, secondary, and higher education (CERI, 2008; MacMilan et al., 2013; Hanover Research, 2014; Klute et al., 2017). The second modality, by virtue of its status, naturally does not enjoy the same qualifiers (De Ketele, 2010).

However, despite its proven effectiveness, formative assessment is optional from the point of view of success insofar as it does not oblige students to show the required level of mastery in order to benefit from certification. On the other hand, the certifying evaluation does not induce such a potential, but forces a certain mastery of contents in order to open the way to certification (Perrenoud, 2001b; De Ketele, 2010).

In view of this paradoxical situation, the present study investigates the implementation of these two types of evaluation in higher education with a view to analysing the effects of formative evaluation on certificative evaluation with third-year university students. Our feedback and the analysis of the results will shed some light on the effects of formative assessment and more specifically contribute to the epistemological field related to assessment practice in higher education.

Theoretical framework

Review of the literature

The following review of the literature is divided into two parts, which aim to capture the notion of evaluation as we approach it here. The first part of the review discusses the importance of evaluation and the role it plays. In the second part, it questions the notions of formative and certificative evaluation with a view to identifying their different characteristics and subtleties.

Epistemological perspective

Assessment is an integral part of our educational system. Closely linked to the curriculum, it is a fundamental element of the learning process and has become an integral part of educational institutions at all levels. Indeed, the autonomous character of a school can only be conceived on the condition that this autonomy is framed and accompanied by an effective evaluation system (Yebbou, 2015). Indeed, characterised by a growing presence in our education systems, evaluation has renovated the teaching-learning process by transforming it into "a teaching-learning-evaluation process" (Gerard & Roegiers, 2011, p.76).

In terms of definition, consultation of empirical research reveals models specific to each author, but all converge in the same direction (Figari, Remaud & Tourmen, 2014). De Ketele (2010) details the stages of this process. According to him, this process aims to (1) gather a set of information, (2) confront this set of information with a set of criteria by means of an appropriate approach, (3) to attribute meaning to the results of this confrontation, and (4) to be able to base a decision consistent with the function targeted by the evaluation. For Gerard (2013), the act of assessment is a complex operation, insofar as it leads to important decisions for learning and for the future of learners. These acts and postures refer not only to didactic competences for teachers, but also to know-how and *savoir-être* at the level of social interactions inside and outside the classroom.

Evaluation takes three forms, each with its own function: formative evaluation, certificative evaluation and orientation or prognostic evaluation (Perrenoud, 2001b; De Ketele, 2010). Given the purpose of this research, the following section looks at the articulation between the first two modalities: formative and certificative.

Formative evaluation

It is a process that must allow decisions to be made with a view to improving ongoing learning (De Ketele, 2010). The identification of errors, the emission of explanatory hypotheses on their sources or the anticipation of actions to remedy them are at the heart of the process. Whereas in certification assessment, errors are sanctioned because learning is considered to have come to an end, in regulation assessment, the status of errors changes since identifying them and working on them is the driving force behind learning (Mottier-Lopez, 2015). Therefore, formative assessment is characterised by a process of collecting-interpreting-using clues related to students' learning and the way they learn, with a view to supporting ongoing learning and improving their future performance

(CTREQ, 2022). In this context, it can neither lead to a certificate-type mark nor contribute to the ranking of students (Mougenot, 2015). As such, various types of formative assessments exist. The following section looks at this subject.

Types of formative evaluations

Formative assessment can take different forms and offer several strengths (Mougenot, 2015). Therefore, Kluthe et al. (2017) distinguish between (1) peer-led assessment and (2) self-led assessment. The first modality offers students the opportunity to evaluate or to monitor their own or their peers' work, performance, strategies, and progress. For example, self- or peer-assessment is a form of student-led formative assessment. The second modality allows educators or computer systems to assess or monitor students' performance, strategies or progress. An assessment that is automatically corrected by a computer programme is a form of self-directed assessment. In relation to this test effect, Thomas et al. (2016) show that it is not the score on self-assessment tests that has a significant impact on the quality of learning, but the number of attempts that proves to be a positive predictor. Boumazguida et al. (2018) show the same result by exploiting students' learning traces in a distance environment.

Forms of regulation of formative evaluations

For Allal (1991), the regulation resulting from formative evaluation can take several forms. We have classified three of them in the Table 1.

Table 1. Forms of regulation from formative evaluation according

Interactive regulation	Is integrated into the situation and allows for an immediate change in the student's activity. This regulation is most often informal.
Retroactive regulation	It follows an assessment and aims at the implementation of remedial activities. It therefore implies a return to objectives that have not been mastered. It is therefore said to be "deferred".
Proactive regulation	The latter is also deferred and leads to learning consolidation perspectives.

Source: Allal, 1991.

This regulation cannot be separated from feedback (Clark, 2012), as this feedback to the learner allows him/her to correct his/her learning accordingly (Endrizzi & Rey, 2008).

Certificate evaluation

Certifying assessment, unlike its formative counterpart, therefore comes into play when it is necessary to attest to a learner's mastery of the objectives of a training course at the end of it (Gérard, 2013). In addition, it makes it possible to prove that individuals have mastered a certain amount of knowledge (Gérard, 2013). In fact, where error was tolerated with formative assessment, it is no longer tolerated here given its certifying nature: its mission is to inform society that individuals who have come out of an education system have the expected skills. In this case, the certificate-based assessment has an administrative rather than a regulatory function (De Ketele, 2010). It should be noted, however, that there can also be certification during the course of learning whenever a set of objectives has been worked on (Perrenoud, 2001a). The following section will describe and detail the different variants related to this evaluation.

Types of certificate evaluation

For Bonami (2005), certificate evaluation can be divided into two forms: internal and external tests. Both correspond to evaluation approaches designed and implemented by persons external or internal to educational institutions. Like formative evaluation, they guarantee several functions that are organised as follows: (1) diagnostic for decision-making; (2) certifying the achievement of objectives; (3) mobilisation on objectives; (4) accountability.

Working Methodology

Background

The present research took place during the academic year 2021–2022, at the University of Mons located in the province of Hainaut, Belgium. It was conducted with a group of 434 third-year university students. We investigate the effect of administering a formative assessment on performance in the certificate assessment. For the design of the experiment, the students were divided into two distinct groups: one group that completed at least one item of the formative assessment and the other group that did not complete the test. Thus, a first group of 347 students was subjected to both a formative and a certificative assessment. The second group, consisting of 87 students, was exempted from the formative evaluation and was therefore subjected only to the certificative evaluation. Insofar as the objective of formative assessment is to assess the

learners' mastery of a content and to guide their progress towards the targeted competences (Wiliam, 2010), we question the effectiveness of our assessment device (Lebrun et al., 2011). We hypothesise that subjects who take the formative test will perform better on the certificate test than those who do not take the formative test.

Course of action

This scientific investigation was carried out in four stages: (1) the development of the tests; (2) the administration of the formative questionnaires for one group; (3) the administration of the feedback for the same group; (4) the administration of the certification tests for both groups.

In accordance with what was said during our literary review, our formative assessment has been designed so that it can "support the regulation of teaching and learning in progress" (Mottier-Lopez, 2015, p. 2). It is therefore administered to students in the middle of their academic career. It is directed by others (Klute et al., 2017), if necessary, by a computer system offering retroactive regulation to students (Allal, 1991).

Our certificate evaluation is an internal type of certificate evaluation (Bonami, 2005). Consequently, it was designed by the teachers and assistants of the University of Mons who are responsible for this course. It was therefore administered at the end of all the courses related to this teaching unit (Gérard, 2013).

The formative and certificate tests are similar in every respect and consist of ten questions. The first three questions are "drop-down" questions, the next four questions are short answers, and the last three questions are "numerical" questions. These two tasks allow students to apply what they already know from a theoretical point of view to concrete cases. They develop the competence to analyse a training situation. This individual activity takes place exclusively on Moodle and is divided into two phases:

1. analysis of an initial teaching sequence with a formative test, available for one week, for which the students receive feedback the following week.
2. analysis of a second teaching sequence, this time a test that counts towards the evaluation, available for one month.
   The feedback is specific to each evaluation question and is automated.

Results

Research Question 1: Do students who are given a formative assessment increase their score in a certificate assessment on the same topic?

Table 2. Descriptive statistics: means and relative gain of scores on the formative and certificate tests of the experimental group

	Formative test scores			Certificate test scores			Average relative gain
	m(/20)	CV	N	m(/20)	CV	N	GR (%)
Total	9.98	4.57	346	13.88	3.38	346	38.91

Source: Authors' own elaboration.

Descriptively, we note that the students who were subjected to the formative test evolve positively on their total score on the certificate test. They obtained an average relative gain[1] of 38.91%, exceeding the 30% threshold attesting to real learning (D'Hainaut, 1975). Moreover, the decrease in the coefficient of variation (CV) attests to the fact that the initial gaps between students tend to decrease. Given that the data are not normally distributed, we use a parametric procedure for inferential analysis. The Wilcoxon test indicates that students who completed the formative test improved significantly on the certification test (W = 4927, p<.001).

Research Question 2: Do students who have been subjected to formative assessment perform better on the certificate assessment than a group of students who have not been subjected to formative assessment?

In the following, we consider a group that received the formative test and a group of students who did not take the proposed formative test. We compare the scores on the certificate test of each of these two groups.

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[1]   "The relative gain is calculated by the following formula (post-test score - pre-test score) / (maximum score - pre-test score) × 100. It is the ratio of what the student has gained to what he or she could have gained at maximum. It is independent of the starting level and, since the starting level is equal, it is proportional to the performance. One can consider that the relative gain is proportional to what he wants to measure. (D'Hainaut, 1975, pp. 158–159).

Table 3. Descriptive statistics: means and relative gain in certification test scores for the two groups

	Group that benefited from the formative test			Group that did not open the formative test		
	m(/20)	CV	N	m(/20)	CV	N
Total	13.84	3.38	346	11.15	3.88	87

Source: Authors' own elaboration.

The students who took the formative test had a higher mean score on the certificate test (m = 13.84) than the group that did not take the formative test (m = 11.15). The data from the two groups are not normally distributed. Therefore, we perform a Mann-Whitney test, a non-parametric procedure corresponding to the Student's t-test for independent samples. We find that the scores on the certification test differ significantly between the two groups (U = 90047.5, p<.001). It would seem, therefore, that the It would seem that the formative test allows learners who have taken the formative test to obtain better results on the certification test than students who have not taken the formative test.

Discussion and perspectives

Assessment is an essential part of the "teaching-learning" process (Gérard & Roegiers, 2011). This complex pedagogical act (Gérard, 2013) is part of the tasks that a teacher must carry out (Romainville et al., 2015) as it allows to ensure that the students have understood correctly and that the objectives defined have been achieved (Wiliam, 2014). Although many virtues are attributed to formative assessment (MacMilan et al., 2013; Klute et al., 2017), the same cannot be said for certificate assessment (De Ketele, 2010).

In this context, our research investigates the effect of an externally directed formative assessment (Klute et al., 2017) on performance in a certificate assessment.

The results outlined above indicate significant effects of formative assessment in terms of learning and are consistent with the literature (CERI, 2008; Hanover Research, 2014). We believe that this difference in performance can be attributed to the potential of formative assessment as a regulatory agent (De Ketele, 2010). Indeed, the feedback given to learners who have completed the formative test (Clark, 2012) informs them of the errors they have made and their degree of mastery, allowing them to correct their learning if necessary

(Endrizzi & Rey, 2008). Our system, which consists of the joint use of a formative assessment followed by a certificate assessment, allows us to reduce the gap between the level of performance achieved by the learner and the target level of performance (Wiliam, 2010).

To conclude, the results of the group that did not receive the formative test confirm our introductory remarks according to which the certificate evaluation forces a certain mastery of the contents (Perrenoud, 2001b; De Ketele, 2010), but weaker in comparison to the group that was subjected to the formative test.

It would be relevant to submit an opinion questionnaire to students who did not take the formative test in order to understand the reasons for not taking the test. Furthermore, it would have been useful to collect students' perceptions of the usefulness of the formative assessment on their performance.

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