Assessment of learning: From feedback to self-regulation. The role of technologies

La evaluación del aprendizaje: de la retroalimentación a la autorregulación. El papel de las tecnologías

García-Jiménez, Eduardo
Universidad de Sevilla

Resumen

Este artículo recoge una revisión sobre la evaluación en el ámbito universitario focalizada sobre la información que se aporta a los estudiantes a partir del análisis de sus resultados de aprendizaje. Para ello, define conceptos como retroalimentación, proalimentación y autorregulación del aprendizaje y los sitúa dentro del proceso de evaluación. Tras segmentar dicho proceso en sus componentes fundamentales, este trabajo se detiene en la relación entre el modo en que se aporta información sobre la evaluación (con especial atención al papel de las TIC) y la forma en que dicha información se utiliza por parte de los estudiantes, considerando variables que afectan a sus antecedentes académicos, sus metas académicas o las estrategias de aprendizaje que utiliza para lograr los resultados de aprendizaje esperados en su currículo formativo. El artículo analiza diferentes alternativas para alinear esas variables y desarrollar un proceso sistemático que conduzca a la autorregulación del aprendizaje de los estudiantes. En ellas se contemplan diferentes formas de participación de los estudiantes en la evaluación (coevaluación, evaluación entre iguales y autoevaluación) y sus consecuencias en el análisis y aprovechamiento de los resultados de la evaluación. El trabajo concluye destacando el papel de las políticas sobre la evaluación del aprendizaje y sus implicaciones en el desarrollo de los procesos de participación de los estudiantes en la evaluación.

Palabras clave:

Evaluación formativa; retroalimentación; autorregulación; educación superior

Abstract

This article presents a review of the assessment in the university focused on the information that is provided to students from the analysis of learning outcomes. To do this, define concepts such as feedback, feedforward and self-regulated learning and places within the assessment process. After segmenting the process into its fundamental components, this work stops at the relationship between how assessment information (with special attention to the role of ICT) and the form is provided that such information is used by the students considering variables that affect academic background, academic goals and learning strategies used to achieve the expected learning outcomes in their training curriculum. The article discusses different ways to align these variables and develops a systematic process leading towards self-regulated learning of students. In these different forms of student participation in the assessment process (co-assessment, peer peer assessment and self-assessment) and their implications for the analysis and use of assessment results they are contemplated. The paper concludes by highlighting the role of policy on assessment of learning and its implications for the development of the processes of student participation in assessment.

Keywords:

Formative assessment; feedback; self-regulation; higher education

Autor de contacto / Corresponding author

García-Jiménez, Eduardo. Facultad de Ciencias de la Educación. Departamento de Métodos de Investigación y Diagnóstico en Educación. Calle Pirotecnia, s/n. 41013 Sevilla (España). egarji@us.es

In an already classic idea in the short history of educational evaluation, Alkin (1969) noted that assessment *per se* made no sense, so that its value was precisely in using that information to make decisions. In that sense, we could say that what gives meaning to assessment is the information is returned to the program, the institution, to teaching or to learning. This is mainly information about results (though there are other possibilities that we will explore here) which returns to the process. Based on this information, administrations, curriculum designers, institutions, interest groups and people involved in a given context can make decisions on the merit and value of what has been assessed or for improving their performances.

The information returned in assessment, which is known as 'feedback', is present both at taking stock of the actions carried out as well as upon restarting them. In that sense, feedback caters equally to purposes, formative and summative, which have been attributed to assessment going back to Scriven (1967). However, though present in both types of assessment, the level of information provided by feedback is different in each one of them. Thus, the degree of specificity, complexity and level of development of the information provided by feedback is different depending on the formative or summative role to which assessment responds.

Feedback is at least two things: transmitter and receiver. In the Assyrian silo or Watt's steam engine, the return of part of the energy output of a process or a system to its entry regulates its operation and improves its performance. Nonetheless, unlike physical processes, when assessing learning, the return of information to the student from the analysis of the results does not ensure a change in his or her learning process (Kulhavi, 1977, Kluger & DeNisi, 1996; Hounsell, McCune, Litjens & Hounsell, 2005). In fact, as will be seen in this article, the academic background, the student's learning style and other variables end up influencing the way in which a student uses the information about the assessment results.

At university level, both the Dublin Descriptors as well as the European Qualifications Framework, require learning outcomes that translate into student autonomy to progressively direct their own learning. These expectations on student achievement have modified the design of academic programs in countries like Spain (cfr. Royal Decree 1393/2007, as amended by Royal Decree 861/2010) and have changed the planning of the subjects taught and of learning assessment (Miguel, 2006; Feisal Cardenas, 2015).

In order to meet those expectations and considering the contingency of the receiver when using feedback, it becomes necessary to question the purpose responded to by the information regarding the assessment outcomes and the means used to make it available to students. This questioning does not mean abandoning feedback as a systematic strategy of regulation of teaching and learning processes but rather to complement it with other forms of information returning to students after assessment has occurred. Alternative strategies would have to bet on a type of information regarding assessment that facilitates self-regulated learning. In this article we will look carefully at feedforward, a strategy that goes beyond assessment results with the intention of promoting greater autonomy in students (Orsmond, Maw, Park, Gomez & Crook, 2013), and calling for the participation of new agents in the assessment process who supplement or replace the traditional role played by teachers.

In the process which goes from the student response in accordance with the demands arising from the feedback to the self-regulation of learning, ICT is a very useful tool. As we will see in this article, ICTs can provide assessment information lending immediacy and authenticity to the communication between transmitter and receiver (JISC, 2010).

Formative assessment and summative assessment: Is the distinction necessary?

Almost half a century ago, Scriven (1967) drew a distinction that has marked in many ways the nature and practice of learning assessment. Scriven introduced the concepts of formative assessment and summative assessment under the consideration that assessment could play different roles in the course development. Assessment may have a formative role in the on-going improvement of the curriculum" so that during formative assessment "the evaluation feedback loop stays *within* the developmental agency (its consultants), and [that it] serves to improve the product "(Scriven, 1967, p. 62). But also a summative role exists, so that the assessment process "may serve to enable administrators to decide whether the entire finished curriculum, redefined by use of the evaluation process of assessment in its first role [summative], represents a sufficiently significant advance on the available alternatives to justify the expense of adoption by a school education system " (Scriven, 1967, pp. 62-63). In this case, the information is provided by external assessment and serves "to improve *utilization* or *recognition*" of the educational product. The transfer of these ideas to the field of learning assessment was done very shortly after by Bloom (1969). In this case, formative assessment was attributed the role of facilitating feedback and thus promoting corrections during the process of teaching and learning, while summative assessment had the mission of evaluating the learning achieved by students at the end of a course or one of its phases (Gil Flores & Garcia-Jimenez, 2015).

The initial distinction of the two functions of assessment as done by Scriven has led to erroneous interpretations of the terms 'summative' and 'formative' and an irreconcilable separation between assessment practices associated with one and another term. Bloom, Hastings, and Madaus (1971) created this dichotomy (Wiliam & Black 1996: 537) based on three fundamental aspects: The distinguishing characteristics have to do with

purpose (expected uses), portion of the course covered (time), and level of generalization sought by the items in the examination used to collect data for the evaluation (Bloom, Hastings & Madaus 1971, p. 61).

The reference to generalization, "perhaps *level of generalization* is the factor which differentiates summative from formative evaluation most sharply" (p. 62), is understandable considering that for these authors the tests are central in their work. In fact, Bloom, Hastings and Madaus (1971) used the expression "tests for formative purposes" or "test of a summative nature".

The dichotomy between both terms has expanded over time ending up with summative assessment being considered as a disreputable practice in classrooms, the complete opposite of formative assessment, which would be seen as an "antiseptic version" that distances us from the terror which the term "assessment" provoked in us (Taras, 2005). Nonetheless, when the distinctive components of a learning assessment process are analyzed, the separation between the two functions of assessment is not so obvious (both are processes, students can be provided with feedback, etc.) and the separation can be interpreted more in terms of continuity.

From the theoretical analysis done by Taras (2005, 2009) regarding the terms of summative assessment (SA) and formative assessment (EF) it follows that these two functions are actually two consecutive stages of the assessment process which complement each other. The starting point of his analysis are the definitions of formative assessment as expressed by Sadler (1989, p.120): Formative assessment is concerned with how judgments about the quality of student responses (performances, pieces, or works) can be used to shape and improve the student's competence by short-circuiting the randomness and inefficiency of trial-and-error learning

As Taras points out (2005), from Sadler's definition it follows ('can be used') that the feedback which has been considered the hallmark of formative assessment is also

possible in summative evaluation. Thus, in a summative evaluation supported in a written multiple choice test students can be offered

pertaining to the information that has been acquired, the successes and errors experienced or the grade obtained (see Figure 1).

Figure 1. Comparative steps for Summative and Formative Assessment

Scriven 1967	Sadler 1989

1. a weighted set of goal scales
2. gathering and combining of performance data
3. to yield either comparative or numerical ratings
4. in the *justification* of
  (a) the data-gathering instruments
  (b) the weightings
  (c) the selection of goals
	1. concept of standards, goals or reference levels
	2. compare actual level with standard

1 + 2 + 3 + 4 = SA	1 + 2 = SA Feedback possible only after SA 3. appropriate action to close the gap 1 + 2 + 3 = FA

From Taras (2005, p. 473)

If we look at what is shown in Figure 1, it follows that: a) an assessment that fulfills an exclusively summative function would have to center on the valuation which results from comparing a student's work with the standard; b) it is not possible to carry out a formative evaluation without first performing a summative evaluation. In an assessment that meets only a formative function, the summative assessment may be implied so that only the educational purpose of the evaluation (Taras, 2009) is declared.

The dichotomy established between the two functions of assessment is not supported from a theoretical point of view and is not useful in practice. When teachers, impelled by education authorities and/or universities, try to meet both expected functions of assessment they are forced to conduct a formative assessment to improve the work of his or her students and a summative assessment that allows them to provide a grade or mark. This approach to assessment creates inconsistencies (often pointed out by pupils) while increasing the dedication of the teacher who has to repeat and duplicate the process of assessment.Experience in many countries indicates that very few teachers are able or willing to operate parallel assessment systems—one designed to serve a

'summative' function and one designed to serve a 'formative' function. On this assumption, the incompatibility of 'formative' and 'summative' functions of assessment leads inevitably to one of two policy prescriptions. (William, 2000, p. 3).

If the commitment of the government and/or universities is that the assessment meets at once and the same summative and formative functions of assessment , perhaps the idea of having the summative assessment function carryied out by entities external to the institutions themselves should be considered (William, 2000), or that this be done by academic from other universities. Although the latter is a reality in universities with fewer students in each course it seems impractical in others that have higher numbers of students.
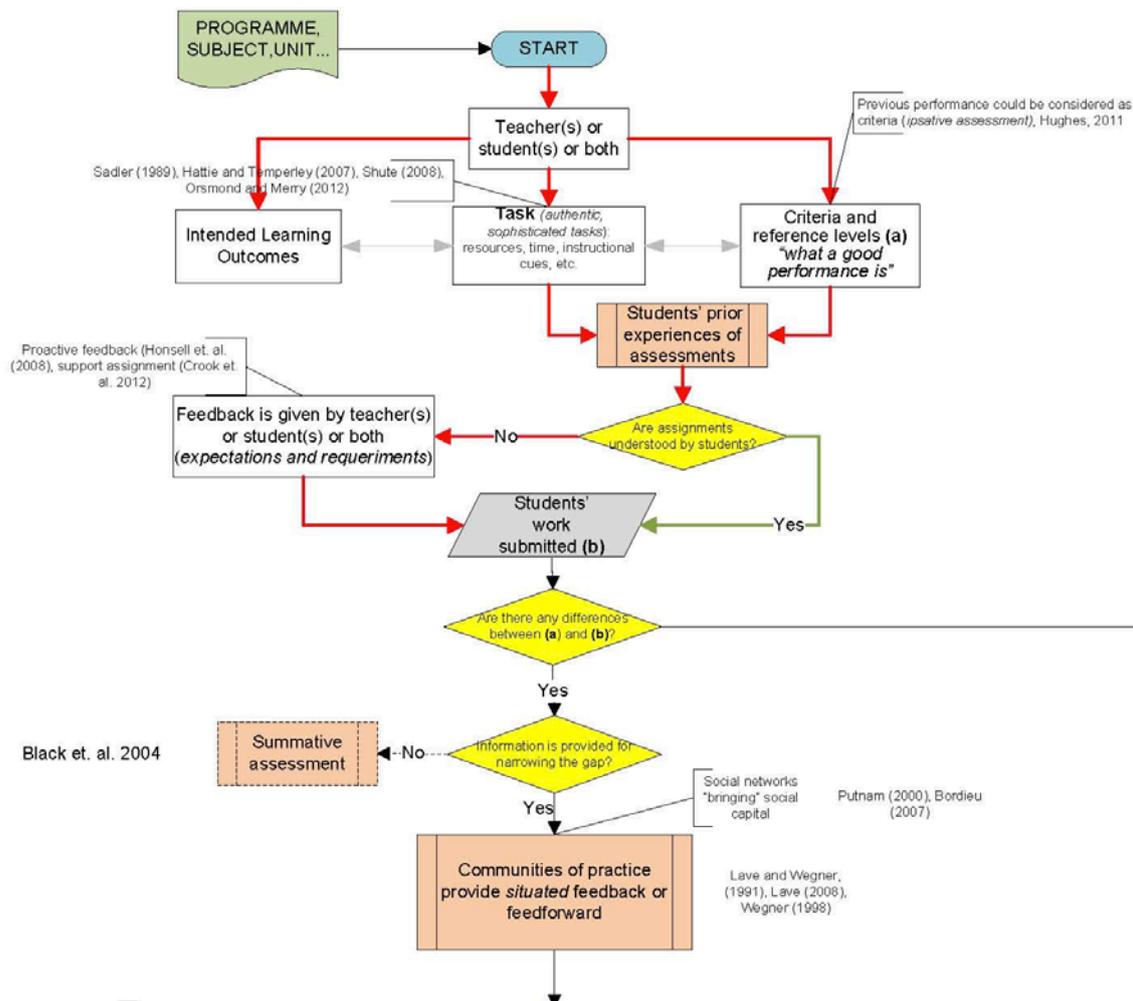
The assessment process

Assessment is a process which is located, in the sense used by Lave and Wenger (1991), and interactive. Therefore it is not independent of the context in which it is found nor of those who carry it out. Thus, the planning and implementation of an assessment requires the adoption of decisions that are not outside an academic context that favors or limits collaboration among teachers, student participation in the assessment or the involvement of family, friends or other agent.

Some of these decisions involve determining what the role the assessment plays, what the expected learning outcomes in a subject are and what the individual learning goals are as set by the students. Similarly, those decisions affect the design or selection of learning tasks that students must complete. Likewise, those decisions affect the establishing of assessment criteria and standards, how and when the given assessment tasks are to be completed, the use of certain assessment tools, the type of information that students will receive once their work has been evaluated and, where appropriate, they affect the score given to the student's work (Garcia-Jimenez & Gomez Ruiz Gallego Noche, 2015).

Qualification frameworks of higher education in countries that make up the European Higher Education Area, defined in accordance with the Dublin descriptors (Joint Quality Initiative Meeting, 2004), progressively guide the expected learning outcomes are for those who complete different levels of training, from the Bachelor's to the Doctorate Degree. An analysis of Dublin Descriptors can be infer that the university systems take up the challenge of making their graduates advance progressively towards personal and professional autonomy. Consequently, curricula developed and carried out by universities should help achieve this challenge and, therefore, assessment should contribute as well, encouraging self-regulation in student learning. To achieve this, the assessment process should be sustainable, thus it should "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Boud, 2000, p. 151).

Figure 2. The process of assessing learning (Part 1)- Continue in figure 5

As shown in Figure 2, the activities proposed to assess student learning or assessment tasks are one of the key elements upon which the assessment process is built. Assessment tasks in higher education should be authentic tasks; that is, they should bring students closer to the professional world and the skills that are put into use in this world, making an impact on student learning ("consequential validity"), whereby the more authentic a task is and the more authentic the context is, the more likely that students will focus on what is meaningful, linking new knowledge with prior knowledge, relating knowledge from different courses, relating theoretical ideas to daily life experiences, etc.; in short, that the students adopt a "deep approach" when studying (Gullkers, Bastiaens, Kirschner & Kester 2006). Moreover, the assessment tasks should also have some degree of complexity and sophistication; that is, they should assess higher order skills or abilities (analysis, decision making, judgment making, etc.) in a more effective way than conventional examinations and facilitate the development of a formative assessment (Boyle & Hutchinson, 2009).

At times students do not understand the task assigned to them well and, especially, are sometimes unaware of the level of demand that the teacher or, where appropriate, other colleagues expect the assessment task to have upon completion (Gibbs & Simpson, 2004; Guilkers, Bastiaens & Kirschner, 2004; Orsmond, Merry & Callaghan, 2011). In this sense, there is research that emphasizes the importance of "anticipatory feedback" that may reveal to students where other students (from previous years) found it difficult to solve a task. As well, this feedback can give hints for current students to not commit certain errors besides offering advice and, above all, creating a relationship of trust so that the student knows that he or she can count on the teacher as a source for information and guidance regarding the task (Hounsell et al., 2008).

Other key elements in the evaluation process are the criteria and standards. A criterion of assessment is an objective of quality which allows for assessment of a student's achievement, for example in terms of accuracy, adequacy, consistency, creativity, appropriateness, etc. For its part, a reference level sets what will be considered a job well done and it can be expressed or not in terms of a standard (the minimum level or threshold).

In order to simplify the description of the assessment process and make it more relevant to the information that is provided to the student after the assessment of their activity, we have omitted other equally important elements of the assessment process such as the means, techniques and assessment tools (see Garcia-Jimenez & Gomez Gallego-Noche-Ruiz, 2015 for a detailed description). The first item alludes to how they will collect evidence on student performance, whereas the assessment techniques and instruments specify the strategy and tools that enable assessing a student's performance based on the criteria and standards previously set (Rodríguez Gómez Saiz & Ibarra, 2011).

The information is provided to students after assessment has taken place - feedback - which usually has an institutional character and comes from teachers or students. Nonetheless, students can also receive this information from external bodies such as the community of practice (Orsmond, Merry & Callaghan, 2011) where he or she studies, lives, practices sport or spends their free time.

The *'communities of practice'* help students develop skills that identify what one does in a given occupation and help a person to have a satisfying work experience (Wenger, 1998): teaching a child to read, performing an accounting audit, drafting the specifications of a project, controlling production in an industrial plant, etc. These communities of practice in universities would be formed by classmates, other students, friends, family members or professionals who maintain a relationship among each other, do things together and share some perspective of how to do them (mutual engagement); they also have the same initiative: 'make money', 'do things right', 'know how to argue and plead', 'have fun', 'produce a return on an effort', etc., (joint enterprise); and a repertoire of shared resources in the form of

gestures, routines, tools, ways of dressing, arguments, past events, etc., (shared repertoire). For example, external practices done by students would be an attempt to bring communities of practice to the university context and vice versa.

By taking into consideration the existence of communities of practice we are affirming that feedback and feedforward (which we will refer to below) occur not only in the classroom but also in the student residence hall, in students' flats, in the home or in other settings where students spend their time and, of course, in social networks. Consequently, the two worlds - academic and extra-academic - provide students with opportunities to learn how to improve their academic (and professional) performance. This turns retro and feedforward into more than a matter of "teachers" that provide information to help students improve their work and involves the students in improving their own work and that of their peers. In short, it is about developing in students a process of identification with the university and with the professional field closely-associated with their studies and which can receive other students, graduates and practitioners in this area (Fig. 2).

In varying degrees, students are part of these communities of practice. In them students give up part of their individuality in exchange for acquiring an identification with a community that provides them with resources with which to face their learning process in and out of the university (process identity).

An element which is present at different times of the assessment process shown in Figure 2 is the participation of students in the assessment. This participation has been gradually integrated into mainstream learning assessment practices as well as the forms of assessment policy of some universities (Quesada, Garcia-Jimenez & Gomez-Ruiz, in press). Such participation can be integrated at any time in the assessment process; thus, in the design of the assessment (in the definition of the criteria and standards, assessment tasks, the means or instruments of assessment), in its execution (under the modalities of self-evaluation, peer review and peer assessment)

and/or scoring (Rodriguez Ibarra and Garcia-Jimenez, 2013).

The nature of feedback

In its most orthodox formulation, feedback is defined as "information about the gap between the actual level and the reference level of a system parameter which is used to alter the gap in some way" (Ramaprasad, 1983, p.4). In educational terms we can define it as information that is used to reduce the difference between the learning outcomes achieved by a student and the expected learning outcomes. Adhering to the elements of Ramaprasad's definition, the reference level set would be represented by a hearing which is considered to be a good example of a proper pronunciation of those phonemes. The current level of student competency would be the repetition of his or her previous performance. The difference between the reference level and the current level would be given, for example, by the pronunciation errors committed by the student during the repetition of the performance. Thus, the feedback would be that information regarding student performance when orally repeating a discourse in a foreign language that the student himself used in order to improve his pronunciation; for example, to reduce the difference between the reference level and the current level of pronunciation. If the information about a given difference is not used, this difference cannot be considered feedback.

Feedback can have as a focus a result (the student's pronunciation), an input (a student's dedication to accurately pronouncing the phonemes) or a process (procedures that students use to practice their pronunciation). Also, two types of feedback can be differentiated. Thus, when information is offered to the students about how well they are carrying out an assessment task (resolution of doubts, error correction, guidance, etc.) while they are doing this, with the intention of helping them to improve, such feedback can be considered *intrinsic* to the teaching and learning process. Conversely, if the feedback is provided after analyzing the performances of students and follows a plan on how the information is going

to be returned to the students, then feedback is *extrinsic* to the process (Laurillard, 2002). It is in the latter type of feedback that this article is centered.

The necessary conditions for extrinsic feedback are (Ramaprasad, 1983, p. 6):

1. The availability of data on the reference level of the system parameter.
2. The availability of data on the actual level of the system parameter.
3. The availability of a mechanism for comparing the data on the reference level with that on the actual level to generate information about the gap between the two levels.

As noted above, feedback is effective to the extent that the information provided to the student be used by him. To do this, feedback must generate cognitive mechanisms in the student, which lead him or her to modify his previous effort. Research in this area has identified three cognitive mechanisms for consideration (Shute, 2008).

A first cognitive mechanism of feedback is its *potential to reduce the student's uncertainty* as to how well or badly he has done an assessment task and, therefore, its *motivator potential* which encourages him to make the necessary effort to reduce the distance that separates him from a task well done.

A second cognitive mechanism associated to feedback is its *ability to help students*, especially those with a somewhat lower level of competence, *who can feel overwhelmed at the high level of demand of some assessment tasks*. In this sense, a simple presentation of examples of the expected reference level can help to reduce the cognitive load.

Lastly, feedback can provide information to the student to help him to *correct misconceptions and misguided or wrong procedures and modify learning strategies*. In the latter case, the feedback encourages self-regulation in the student when learning. By self-regulation, let us here understand "the control the individual takes over his thoughts, actions, emotions and motivation, and through

personal strategies to achieve the goals that have been set" (Panadero & Alonso-Tapia, 2014, pp. 450-451).

In the assessment process set out in Figure 2, feedback is an integral part of such a process. In this sense, the type of feedback a student is provided regarding his or her performance is determined by the summative and/or formative function that an educator or a researcher intends to give the assessment. Similarly, the feedback that the student is provided with is affected by the complexity of the proposed assessment tasks but also by the assessment means and tools that generate information on student performance in a given set of tasks. For example, if the proposed assessment task is for the student carry out a text summary, the information that the student needs to improve his summary is likely to be less elaborate than when the student has to design a project or in the case of group problem-solving with multiple stages. In the first case the assessment instrument used to determine the student's performance will also be less demanding than in the second.

The *very characteristics of a student* who receives information also affect decisions about how that information should be so that he may use it and improve his performance. Thus, *the learning goals and objectives* set by the student should be taken into account, so that a student who intends to highten his command of a given skill or competency will require a different type of information then other student who merely seeks to achieve the standard (Salmerón, Gutierrez-Braojos, Rodriguez & Salmeron-Vilchez, 2011). The ZPD (zone of proximal development) of student learning (how close or how far it is to reach competency) as well as their performance in similar areas/skills, can determine the type of information, the means to offer it or its frequency. Other features to consider are related to *student motivation* toward the assessment task and, of course, one's learning style. Thus, the interaction of *learning styles* with the processes of self-regulation is critical in order for the information provided by the assessment to help improve student performance (Vermunt & Verloop, 1999; Evans, 2013).

Figure 3. The feedback process
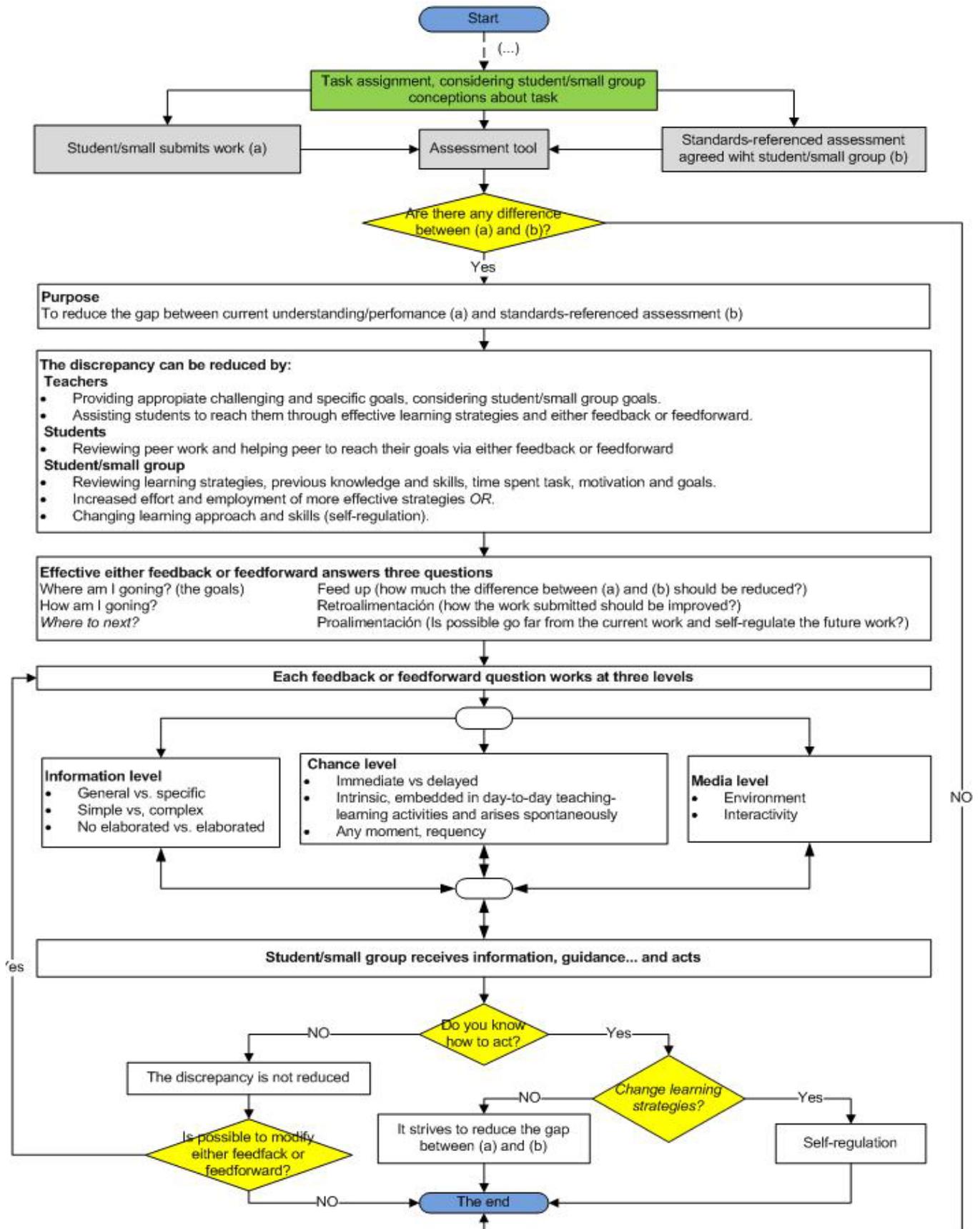
The very nature of feedback, the assessment process carried out and the characteristics of the student determine that the information that can be offered to students on their performance appear in different forms. Thus, feedback can present itself in different levels of detail and complexity, be offered more or less frequently, at different times, using different means (Figure 3) and involving the student in order to improve his performance or even to change his way of learning.

As shown in Figure 3, the feedback process is a part of the assessment process that can be carried out by different agents (teachers, classmates or students themselves) in order to reduce the gap between the work done by the student and what is considered to be a job well done. Depending on the issues that the information responds to, information which is available to the students and used for reaching the reference level, feedback can help a student to define his or her learning goals (feed up), to improve their performance (feedback) or to self-regulate learning (feedforward).

The types of information provided to the student act on three levels: a) the information may be more or less specific, thus giving details or general guidelines, and it can be simple (for example, a template of correct answers) or complex (e.g., tutoring); the information can be provided in the most favorable situation, immediately or deferred (e.g., computerized feedback vs. a type such as 'try again'), and it can be continuous or not (e.g., after each step of a task or at its end); and information can be transmitted orally, face to face, or may rely on different means using pencil and paper or ICT (Figure 4). In the latter case, the development of technologies which provide information to students after the assessment is growing and dizzying. Thus, learning management systems (LMS, for its acronym in English) such as Moodle, Blackboard, etc., and the use of audio and/or video systems are changing not only the environment but the type of interactions that take place between teachers and students after an assessment process (Garcia-Jimenez & Gomez Gallego-Noche-Ruiz, 2015).

Once a student receives information, he could choose not to use it or make use of it in different ways. If the student does not understand it, he will most likely ignore it and will not improve his performance; when he knows how to use the information received, he may limit himself to achieving the reference level set for the task or he may go further and change his way of learning.

The information that assessment can provide the student is in great part conditioned by the assessment tasks and the instruments that are used. Thus, for example, using a test with true/false questions, the student is more likely receive non-elaborated information -surely a verification-; however, if the questions are multiple choice, though the information is most likely non-elaborated, other types of information can be offered, besides the verification type, as a correct answer or an analysis of the right and wrong answers.

Similarly, the chosen task of assessment and/or assessment tool may also condition the means used to provide information to students. For example, if the assessment task requires the student to assume a certain level of autonomous answer production (e.g., a project, a critical commentary, a final-year project or an internship report), oral, podcast-style messages or even short video clips with commentary could be used in addition to written commentaries.

Moreover, considering the type of assessment task and/or tool as a reference for decision-making, planning can also include which are the best moments for providing information. For example, if the assessment task is done only once or is not progressive (the student completes it once even if he spends from one hour to several weeks) the information is likely to be discrete, i.e., it will be introduced after the student has completed the task. However, if the assessment task is progressive, where students complete it in several stages and have access to the work done they have completed in each stage, the assessment can provide cyclical or continuous information (see Figure 4).

Figure 4. Organization of information provided to the student from assessment
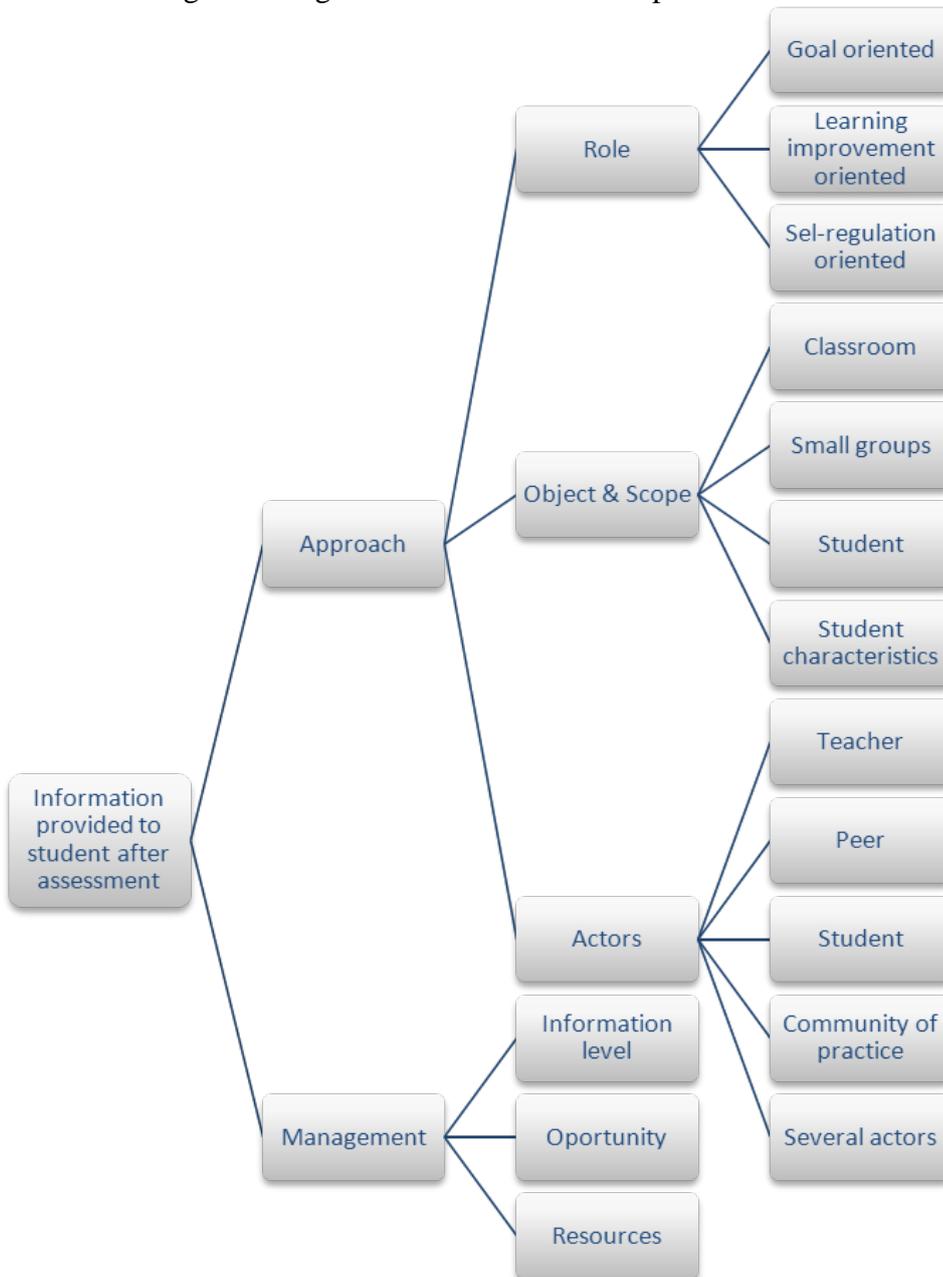
From Garcia-Jimenez & Rodriguez Ibarra, 2014, p. 12

Given the importance of the feedback process, it is worth looking at the level of information provided to the student after the assessment. For this reason, we will look at the different levels of information that can be provided to the student as have been gathered in the computer application DIPEVAL (http://dipeval.uca.es) developed in the framework of the INEVALCO project (Innovation Assessment skills) as proposed by Shute (2008). Table 1 shows a classification of levels of information that can be provided to the students through this application.

Table 1. Levels of information in the feedback process

LEVELS OF INFORMATION	TYPES OF FEEDBACK
NON-ELABORATED The student will only be provided with information about the quality of their answers	Verification: the student is informed about the accuracy of his responses, in terms of right / wrong or the total percentage of correct answers
	Correct answer: the student is informed only about what the right answer to a specific problem is
	Try again: the student is informed about the wrong answer and is allowed to one or more attempts to answer
	Identification of error: wrong answers are highlighted but without providing the student the correct answer.
ELABORATED The student is given an explanation of why an answer was correct, giving him or her some guidance to help improve their learning	Isolation attribute: presents the student information directed at the central attributes of the concept or skill being studied
	Contingent theme: provides students with information related to the topic under study while he is studying it. Such feedback may simply involve review material
	Contingent response: focuses on the specific answer given by the student. It can describe why the answer is wrong or right. This type of feedback does not involve a systematic analysis of the error
	Tips, hints or warnings: guides the student in the right direction (e.g., strategic advice on what to do in the next step or examples or demonstrations). It avoids explicitly presenting the correct answer
	Errors / Misconceptions: they require diagnosis and error analysis. They provide information about specific errors or misconceptions (that is, what is wrong and why)
	Information Tutorial: includes verification, error identification and strategic advice on how to proceed. Usually, the correct answer is not provided.

From feedback to self-regulated learning

As has already been mentioned above, the use students make of the information regarding the quality of his performance is one of the key issues when analyzing the process of assessment. The research results on the views of students relating to feedback shows them to be dissatisfied with the quality and quantity of information received (Hounsell et al., 2005). For them, only feedback that provides information about the details of the work they have done or that allows them to learn better is considered to be truly useful (MacLellan, 2001). Students also find that the messages provided through feedback are extremely complex and difficult to decipher, so they need help in order to understand how to use them (Nicol & MacFarlane-Dick, 2006).

The explanation for these opinions may lie in the fact that the feedback is provided by teachers is usually geared toward students achieving a somewhat nebulous goals ('do more', 'do it better'), so "students receive little feedback that is aimed at improving the processes which allow for completing an assessment task or at the meta-cognitive attributes of the task (reflection, control, review, etc.)" (Garcia-Jimenez, Gallego-Noche

& Gomez-Ruiz, 2015 115). For Hattie and Timperley (2007), teachers consider that feedback should focus on commenting on students and not on their learning, which dilutes the potential benefits of feedback. Gibbs and Simpson (2004) justify the position of teachers by noting that teachers are under enormous time pressure, due to the phenomenon of 'modularity' of subjects, a greater number of students per class and a greater diversity for students and in such circumstances it is difficult for them to provide feedback that is seen as meaningful and useful for students.

Based on these findings, the question arises of the need for the information which is provided to students to be of the elaborated type, included in some of the types listed in Figure 7. However, the level of information only deals with part of the problem and leaves out the very purpose of feedback and its viability. In fact, both issues respond to the same idea: the purpose that is fulfilled by the information given to the student through his assessment evaluation is a function of the role the student plays in the creation and use of such information.

Figure 5 shows us the different purposes met by the information provided to the student in relation to the roles that teachers, peers and the students themselves play in the assessment process as well as scenarios that are generated from the use students make of such information. In "A", the professor leads the process before students who do not require a high level of self-regulation, who do not need be integrated into a community of practice (or even marginalized in it) or who, according to certain research, perform low (Hattie & Timperley, 2007, p. 94). It is a typical feedback process guided by the teacher and one in which peers or other students have little influence on the student's work. The teacher provides students with information and guidance on what to review or modify in the context of a specific assessment task. According to the diagram in Figure 5, this type of information provides direction to student learning.

However, in this type of feedback, the student has the last word (Hounsell et al. 2005: 64). Consequently, the fact that students are provided information regarding what and how to check their work is not a guarantee that they act under the in accordance with the given guidance (Hounsell et al. 2005, p. 49). Feedback is not always developed under a scheme in which the teacher says what needs to be corrected or improved and the students follow their guidance and improve the task. On the contrary, in the face of feedback, students can accept, modify or reject the information they receive to help them improve the quality of their work (Kulhavi, 1977, Kluger & DeNisi, 1996: 260).

Figure 5. The evaluation process (Part 2): In the feedforward feedback (Come from Figure 1)
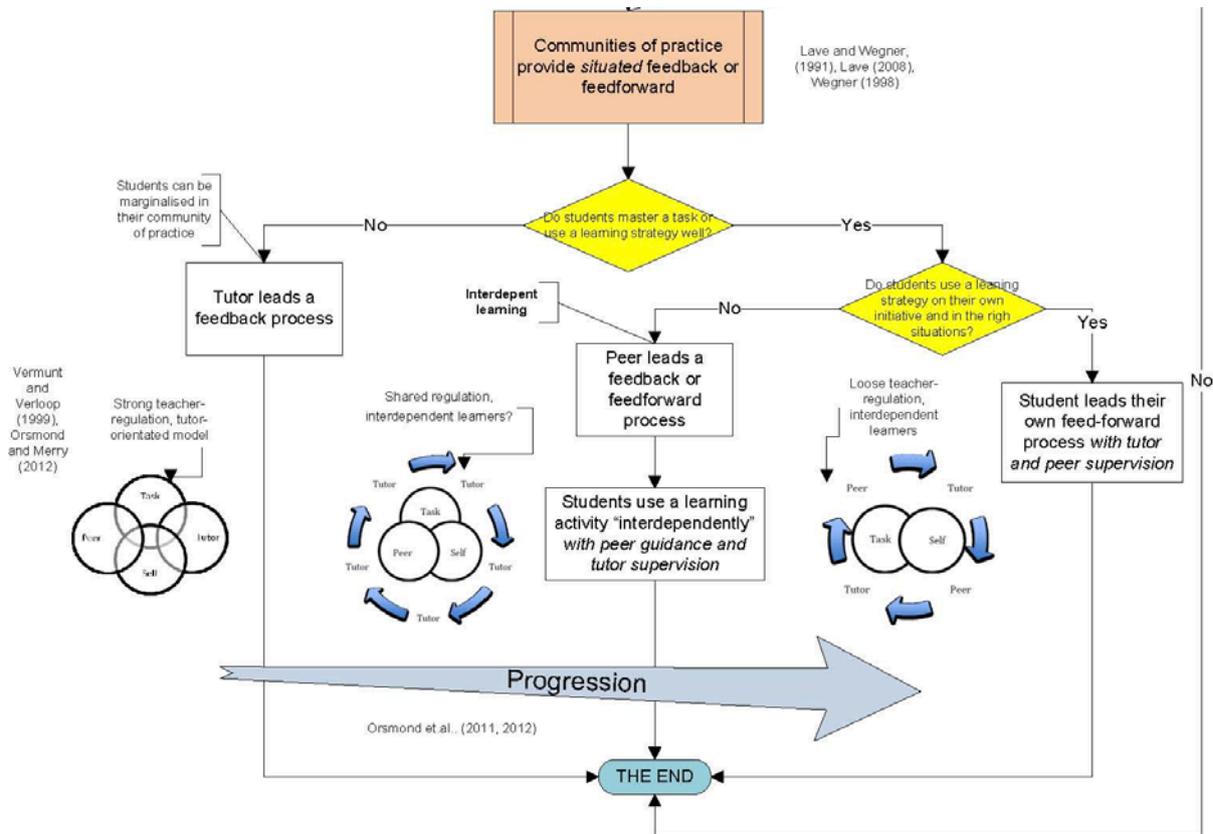
In "B", leadership in the process of improving the assessment task is shared by teachers and by peers as well as by other members of their community of practice. Learning is an 'interdependent' activity in which the student and his companions mutually 'take ownership of' knowledge, strategies, last-minute resources, experiences, examples, etc., and they use them to improve the assessment tasks (Garcia-Jimenez Gallego-Noche & Gomez-Ruiz, 2015).

In "C", when information which is provided to students plays a facilitating role, they learn to check their own work and focus by themselves on how they should approach the current task and future ones, too. In this case, more than feedback what is taking place is feedforward, i.e., the student makes use of information regarding his work, created through dialogue with his teacher with his peers, to decide how he should best regulate his learning in order to reach the level of fixed reference. Feedforward helps students to generalize what he has learned to new tasks and situations that have not yet arisen (Figure 5). In this sense, feedforward encourages the student "to get outside the circle" and start a progressive "spiral" of self-regulation (Hounsell, McCune, Hounsell & Litjens (2008). Self-regulation should be understood as a process by which students choose what they want to learn and at what level of depth and then try to track what they have learned, controlling and modifying, when necessary, their learning strategies.

The third scenario described requires teachers to yield responsibility to the students for the assessment of learning and to prepare the students to assume this responsibility by giving them the necessary knowledge and skills and trusting in their ability. Students could learn to identify for themselves what they need to learn, to set learning goals, to keep track of what they are learning, to modify their learning strategies when they are not appropriate and to judge the quality of their

work taking into account of a set of contextual factors (Boud & Falkinov, 2006, pp. 402-403).

The three scenarios presented are part of a continuum that goes from feedback to feedforward (Carless, Salter, Yang and Lam, 2011). The validity of one of them or even the presence in the classroom of more than one scenario depends on various factors related to the curriculum, the subject, the course, the institutional context and the professional context linked to the field of training and, of course the characteristics of teachers and students.

The self-regulated learning process has been analyzed considering its socio-cognitive components from works such as those by Zimmerman (1989, 2000, 2013) and Zimmerman and Moyla (2009) that have progressively developed several models to explain the process. Zimmerman considers three phases in the cognitive development of self-regulation: a planning phase, which includes elements such as task analysis by the student or their beliefs, values, interests and goals; an implementation phase, which entails self-observation and self-control by the student; and a phase of self-reflection, in which the student performs self-reactions and self-judgments. From a multi-level perspective, Zimmerman discusses self-regulation considering different levels of regulation, ranging from observation, emulation and self-control to self-regulation itself and for each of these levels he considers the social origins of self-regulation (the social model of reference), the adaptation of the individual to the social context in which he or she operates and which determine his response to a task or group role in the development of self-regulatory abilities. A critical review of this multi-level model can be found in Panadero and Alonso-Tapia (2014).

The role of ICT in the process of feedback and feedforward

In 2006, Nicol and MacFarlane-Dick (2006) published seven principles for good feedback development. Their proposal, based on different empirical works, has become one of the most influential in the field of learning assessment in higher education. One of these principles states the need to promote dialogue between the teacher and/or students regarding learning. Nonetheless, as the authors acknowledge, this dialogue is hampered in groups with many students. To overcome this drawback, two possible solutions are provided. One of them is to work in small groups which encourages dialogue between students within each group; the other involves the use of a technology, which promotes dialogue without compromising the dedication of students or teachers. At that time, Nicol and MacFarlane-Dick (2006) exemplify their argument in favor of using technologies, referring to devices such as the buttons used in multiple-choice tests. These devices, given that they instantaneously provide information on how student responses to a question are distributed, could be used to encourage dialogue between students with proposals such as "convince your peers that your answer is correct".

Using virtual platforms that facilitate information management and student and teacher knowledge in the processes of feedback does not represent anything new at this time. So, Moodle, Blackboard and similar platforms have been progressively incorporating tools to facilitate feedback from written texts (email, chat, forums, quizzes and tests, etc.) or interactions in visual or oral form (short messaging, video conferencing , etc.). For example, using Blackboard, you may create a multiple choice test and offer the student who completes it feedback with a certain level of detail. Thus, students not only have access to their score and the identification of their correct answers but also an explanation of each of the modes of response (correct and incorrect) associated with each test question. This type of automated feedback, despite its simplicity, is well received by students who value its immediacy and timeliness (Garcia-Jimenez & Mirmán Flores, 2014). There is no doubt that automation of feedback from computer-assisted testing is a reality in the classroom

(Wieling & Hofman, 2010; Wilson, Boyd, Chen & Jamal, 2010), which comes to show that it is possible to organize feedback for large groups of students while the teacher designs tasks to be completed by students (exams, individual or group work, etc.). This type of feedback, despite its limitations, overcomes drawbacks of feedback through pencil and paper as illegibility of comments and is a good alternative when giving information to students pertaining to the quality of their work. (Price, 2007; Walker, 2009).

Since the publication of the work by Nicol and MacFarlane-Dick, advances in the use of technology for facilitating feedback processes of learning and self-regulation have been constant. So, we could say that "technology is rethinking how feedback is managed and conceived, enabling students, classmates and teachers to use new ways to communicate through live or delayed dialogue able to improve or enhance learning" (Garcia - Jiménez, Gallego-Noche & Gomez-Ruiz, 2015: 118).

Tools developed in virtual environments to promote written feedback have opened new possibilities for students and teachers; from phone and computer applications with free access, like Evernote, which allows for the exchange of written notes (which may be accompanied by photographs or videos) to new developments in virtual platforms. In the latter case, it is now possible for students to be able to modify tasks from the feedback received, and for teachers to be able to manage the information they make availabe to or hide from students depending on how they are able to reflect on their work. Similarly, teachers can also identify what they must change and develop a plan of action to improve this and may also provide both a common feedback template for all students (based on the assessment criteria) as well as specific and personalized feedback for each student. Similarly, the commitment to the use of feedback supported by the use of audio and video recordings has been gaining ground in

recent years to where they are used for recording and storing performance and subsequent analysis and review, for presenting models of good work or for sending information or guidance on a task (cfr. Garcia-Jimenez & Gomez Gallego-Noche-Ruiz, 2015 for a more detailed review of these tools).

Again, two projects directed by Nicol and developed at the University of Strathclyde, REAP project (Re-engineering Assessment Practices in Higher Education) and the PEER project (Evaluation in Education Peer Review) have led many of the changes in this area which have taken place in recent years. The most important contribution of these projects lies not so much in the deployment of new technological resources as in developing a foundation to substantiate how these resources should be used to encourage dialogue about learning and therefore get students to progress towards learning self-regulation from incorporating students as a source of information on the quality of the work done by their peers.

The use of different technology tools, especially audio and video recordings, has enabled the management of the information generated from the interactions that take place among equals and from student performance in assessment tasks. In this sense, more and more applications have been generated for different devices. Thus, it is worth pointing out tools related to virtual platforms (Workshoop and EvalCOMIX in Moodle, SPA in Blackboard) as well as specific applications such as Aropa (developed at the University of Auckland), Calibrated Peer Review (a web tool, now in its sixth edition developed by the University of California), PeerMark (Turnitin application that allows students to read, review and rate or evaluate one or more documents prepared by his classmates) or Praze (developed by the University of Melbourne to automate and manage peer review).

In the development of technologies that support the assessment of the learning process, from the definition of the task and the criteria to feedback, a special reference should be

made of the work done by the Joint Information Systems Committee (JISC) in the UK. In the last decade it has supported the development of projects -some already mentioned like PEER or REAP- whose ultimate goal was to establish the development of technological resources for learning assessment. Thus, mention should be made of projects such as e-AFFECT and FASTECH which allow for the management, note taking, assessing and feedback to students through audio and video recordings, the iTEAM project, which has developed an electronic voting system that includes a control box for the student or the SGCAL project, which provides resources using the Youtube video channel to facilitate assessment and peer review. Some of these projects, such as e-AFFECT, are part of a more ambitious idea which aims to develop learning assessment using ICT. This idea has resulted in the concept of 'electronic management of assessment' (EMA), a term that describes the way in which technology is used throughout the assessment life cycle to support the delivery of the tasks by the student, assess and score these tasks and provide feedback to the student.

New tools provide not only immediacy to the feedback process and reliability to the management of information provided by student peers but also proximity and detail. Thus, the use of audio and video have a positive effect on those who receive feedback, thanks to the specific qualities of the voice. This transmits to the student not only a message about the quality of their work, but other elements that denote concern, satisfaction, doubts, firmness, etc. on behalf of the person who has reviewed or assessed his work. Thus, " the option of feedback by digital audio or video can make feedback a more personal and instructive experience for many learners" (JISC, 2010, p. 14). Also, due to the ease with which one can record the information and access it time and again, in audio and / or video, many students find that feedback through the audio and video is more detailed and useful. In contrast, written

feedback is perceived as short, confusing and difficult to recover (JISC, 2010).

Discussion

This work has been developed from the idea that university institutions, through their training proposals, should promote self-regulation of student learning. The challenge set by the Dublin Descriptors means gradually making students more and more able to decide what to learn and how to deal with the challenges posed by the access to new knowledge or its generation and regulating learning strategies and assessing progress.

On the way to self-regulated learning, students can count on the cooperating of peers and the community of practice, built around an area of professional development and, of course, on the support and supervision of their teachers. The speed and manner in which the distance is closed between the expected results and those achieved by students depend on factors such as the professional training curriculum itself, the social and labor context in which the training received by the student is placed, the characteristics of the students themselves (learning style, motivation, etc.) or the quality of the interactions that take place in the classroom between teachers and students.

In this road that the student must travel towards self-regulation of learning, the actions of the universities themselves are crucial. A starting point would be represented by their own institutional policy defined by the university regarding assessment. We are not referring to the examination regulations or the rules of remaining in college -documents widespread among Spanish universities- rather it is a matter of an institutional statement and principles of action on learning assessment, of the type included in the document titled *Assessment 2020: Seven propositions for reform in higher education assessment* (Boud, 2010). This document is a statement of principles that can guide policy of Australian universities and guide reforms to be undertaken in the future in the field of learning assessment.

The definition of an institutional policy on the assessment of learning is a practice that can be found on the official websites of UK universities such as Durham, Edinburgh, Strathclyde, London Metropolitan University, Plymonth, Reading or Sussex; also at universities in Canada and British Columbia, Chapman, McMaster and Toronto, and Sydney of Australia, Macquarie, Auckland or Dunkin or the United States and North Carolina State University and Minnesota (Rodríguez Gómez, Ibarra Saiz & García Jimenez, 2013, p. 208).

In the definition of this institutional policy, many universities have made student participation in learning assessment a key issue. Thus, universities define how they will address the assessment process under the consideration of the different forms of student participation (co-assessment, peer assessment or self-assessment) and of the rights and responsibilities that teachers, tutors and students have in this process. Furthermore, in those universities where the modalities as peer review are more widespread, you may find guides, guidelines and recommendations for students to offer adequate feedback. Thus, in the UK, the University of Strathclyde has developed different materials through the PEER project, as have the University of Reading and the University of Sussex. In the Australian case, it should be noted that the University of Auckland has developed materials for peer review within the Aropa project, but we could also cite others, such as the Technology University of Sydney (UTS) and Griffith University, which has also created materials for self-assessment processes (Quesada, Garcia-Jimenez & Gomez-Ruiz, in press).

The commitment to technology as a tool for providing information to students regarding assessment results is becoming more and more solid. Through technology, designers are opting for (with a commercial intent or not) applications, podcasts, videos or Youtube channels that students and teachers can used indiscriminately. Similarly, institutions of higher education have already incorporated these technologies especially when they are integrated into virtual environments with which they were already familiar (Blackboard, Moodle, etc.). And, in a less systematic but not less effective way, those who use freely available apps (Evernote, Instagram, WhatsApp, Facebook, etc.) are also committing to this path. This last option is a turning point in the way of providing feedback and feedforward retro without establishing barriers between student, peers, teachers and the communities of practice.

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Author	**To know more / Saber más**

Garcia-Jimenez, Eduardo (egarji@us.es).
Professor of Research Methods and Diagnosis in Education at the University of Seville and member of EVALfor evaluation research in learning contexts (SEJ-509). In recent years his work has focused on the development of procedures and assessment tools in education, through applications, for use by teachers working in different educational stages such as EvalCOMIX, DIPEVAL and HEVAFOR. His mailing address is:: Universidad de Sevilla. Facultad de Ciencias de la Educación. Departamento de Métodos de Investigación y Diagnóstico en Educación. Calle Pirotecnia, s/n. 41013 Sevilla (Spain)

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