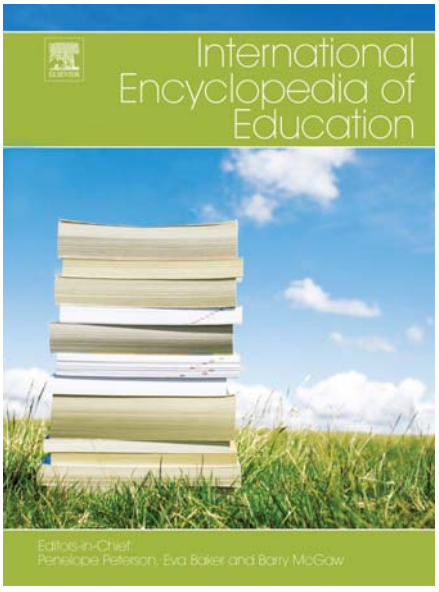

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Assessment and the Regulation of Learning

L Allal, University of Geneva, Geneva, Switzerland

Glossary

Affordances – Resources and constraints that are provided by the design of an instructional setting and can be incorporated into the learner's activities.
Formative assessment – Assessment that allows adaptation of teaching and learning activities in order to take into account students' knowledge, strategies, goals, needs, and interests.
Summative assessment – Assessment that sums up information in order to certify students' attainments at the end of a segment of an educational program.
Predictive assessment – Assessment that provides information for decisions about admission to an educational program or about placement in one of the sectors or tracks of a program.
Regulation of learning – Entails the processes of goal setting, monitoring progress towards the goal, interpretation of feedback from monitoring, adjustment of goal-directed actions and/or of the definition of the goal.

- Self-regulation: The processes of regulation are carried out by the learner
- Other-regulation: Another person (teacher, mentor, peer) intervenes in the processes of regulation

The assessment of student learning provides information that is analyzed, interpreted, and used for the regulation of educational activities. Two directions of regulation can be distinguished in association with the functions of student assessment defined in the well-known handbook edited by Bloom *et al.* (1971). The first direction concerns regulation of students' progression through the entrance, transition, and exit points of the educational system. It includes predictive or diagnostic assessments used for decisions about admission to an educational program or about placement in one of the sectors or tracks of a program. It also includes summative assessments that certify the quality of student achievement at the end of the segments of a program. These assessments, which determine students' access to educational resources and assure public recognition of their accomplishments, are based on the degree to which students' knowledge, competencies, or other attainments meet the standards fixed by the educational system. The second direction of regulation concerns the adaptation of teaching and learning activities in order to take into account students' knowledge, strategies, goals, needs, and interests. This direction of regulation is closely linked to the formative function of assessment. In the initial conception of Bloom and co-workers, formative assessment intervenes in each unit of instruction and provides feedback that guides the choice of corrective measures aimed at the remediation of learning difficulties.

The concept of regulation has introduced, particularly in the French-language literature, a broader approach to formative assessment (Allal and Mottier Lopez, 2005). It includes remediation, which is a form of retroactive regulation that intervenes when students return to a task they have failed to master and, through the use of corrective materials or other forms of assistance, devote additional time and effort to attain the instructional objectives. Regulation of learning can, however, take on two other forms. Interactive regulation occurs when formative assessment is integrated into ongoing instructional activity; it results from the student's interaction with the components of the activity – that is, with the teacher, other students, and/or with material designed to encourage active reflection and self-assessment. Proactive regulation occurs when several sources of assessment information allow the preparation of new educational activities designed to take into account differences among students. It entails differentiation of instruction to ensure enrichment and consolidation of learning, according to the needs and interests of all students, rather than focusing on remediation of learning difficulties.

The remainder of this article examines two topics: first, the models of regulation that have been developed in research on learning and their implications for the design of assessment and, second, the contributions from research on assessment aimed at promoting student learning. The conclusion looks at how the continuity between formative and summative assessment can support the regulation of learning.

Models of Regulation of Learning

All theories of learning propose a mechanism of regulation that ensures adaptation of the learner's behavior and thought processes. Well-known mechanisms include reinforcement in behaviorist theory, equilibration in Piaget's constructivism, feedback devices in cognitive models, and social mediation in sociocultural and social constructivist approaches. Although there are important differences

among these theories, they all consider the processes of regulation to be a central feature of learning.

Regulation involves four main processes: goal setting, monitoring progress toward the goal, interpretation of feedback derived from monitoring, and adjustment of goal-directed actions and/or of the definition of the goal itself. A large number of empirical studies of these processes have been carried out in research on self-regulated learning, often abbreviated as SRL (Zimmerman and Schunk, 2001). This research aims at determining the ways students regulate their learning activity, the instructional, social, and contextual factors that influence self-regulation, and the effects on student achievement and well-being. Several models have been developed to describe self-regulation as an individual psychological process. One of the most comprehensive models is the three-layer model proposed by Boekaerts (1999). The inner core of the model consists in the regulation of cognitive processing, and particularly the choice of cognitive strategies. The next layer entails the regulation of learning and the use of metacognitive knowledge and skills to direct one's learning. The outermost layer corresponds to the regulation of the self and is linked to the formulation of goals and the allocation of resources (time, effort, etc.) to their attainment. Complex linkages among the layers allow self-regulated guidance of the individual's activities.

Self-regulation is often contrasted with external regulation or other-regulation. External regulation is associated with the structural features of the learning environment that stimulate and support learning, such as the types of tasks proposed and the sequencing of tasks, the tools and other available resources, the organization of time and space in the instructional setting, and the mechanisms of feedback and reinforcement that are present. Other-regulation refers to the interventions of other persons (e.g., teachers, mentors, and peers) who provide scaffolding and interactive guidance for learning. It has been observed that, in the classroom context, there is often a complex interplay between student regulation and teacher regulation of learning (Vermunt and Verloop, 1999). Perspectives derived from social constructivism, from sociocultural theory and from work on situated cognition treat learning and teaching as interdependent dimensions of educational activity. This has led to recognition of the reciprocal, or even dialectical, relations between student self-regulation and the sources of regulation situated in the learning environment (structure of the tasks, teacher interventions, peer interactions, and assessment tools). The regulation of learning in educational settings can thus be considered fundamentally as a process of co-regulation or of shared regulation (Hadwin and Oshige, 2007). This means that student self-regulation develops in interaction with multiple sources of regulation in the learning environment and, at the same time, contributes to the deployment and exploitation of these sources in the learning activities undertaken in class. To take an example from ordinary classroom practice: the teacher's way of formulating questions provides a framework for students to learn to ask themselves questions; the questions they ask themselves frame, in turn, how they respond to the teacher and, more importantly, how they contribute to the evolving dialog.

The transition from models of individual self-regulation to models emphasizing the interplay between individual and social or contextual aspects of regulation has several implications for the design of assessment. First, it means that assessment is embodied as much in the social interactions taking place in the classroom as in the formal assessment tools and procedures that are used. Ways of structuring these interactions are therefore part of the design of assessment. A second implication is that the effects of assessment tools on learning can be amplified by their integration in social interactions. In order for an assessment tool, proposed in curriculum material or devised by the teacher, to have positive effects on student learning, it needs to become an object that students are able to appropriate. This means designing activities that allow students to discover the aims and properties of assessment tools and that encourage them to enter into discussions about the uses of assessment.

Contributions of Assessment to the Regulation of Learning

A review of the research by Black and Wiliam (1998) showing how assessment affects student learning, both positively and negatively, was the starting point for the development of the concept of assessment for learning, formulated by the Assessment Reform Group (1999). This concept includes several guiding principles for the conceptualization of assessment designed to promote learning. Assessment for learning is primarily concerned with the formative function of assessment, with how assessment is embedded in teaching and learning activities, with the quality of feedback provided by assessment, and with student involvement in assessment. Assessment for learning can, however, encompass forms of summative assessments that are devised to exert a positive influence on the way students approach learning. Shepard (2000) has described the transformations of the curriculum and the movement toward social constructivist learning theories that provide the foundations for a new vision of classroom assessment.

Integrating Assessment in Teaching and Learning

The initial conception of formative assessment, as described by Bloom and co-workers, divided instruction

into successive phases: teaching (or another form of delivery of instruction), formative testing, and remediation based on corrective material. Formative assessment can play a more pervasive role in the regulation of learning when it is integrated from the beginning in each teaching and learning activity. This implies looking for ways of embedding formative assessment in curricular materials, in teachers' ways of interacting with their classes, in the collaborative activities that students undertake in small groups, and in the individual tasks that students perform inside and outside of the classroom. Learning environments need to be designed so that they include resources and constraints (referred to as affordances in the literature on instructional design) that enhance the regulation of learning. This means the introduction of feedback at each stage of a learning activity, the use of questioning techniques that stimulate student reflection about alternative ways of carrying out a task, and the provisions of some degree of task differentiation to take into account learner interests and choices. The interactions that take place in class, between teacher and students, and among students, are the principal occasions for ongoing formative assessment.

The in-depth study carried out by Torrance and Pryor (1998) in English primary schools is an outstanding example of research on the formative assessment components present in teacher–student interactions. This study combines a social constructivist perspective on learning with an interest in the micro-sociology of classroom interaction. Although it does not frame its analyses and interpretations in terms of the concept of regulation, it provides a multitude of insights into the processes of regulation identified in the first section of this article. Torrance and Pryor's research is based on extensive audio and video recordings as well as on interviews with teachers and students. Through the presentation and interpretation of a large number of transcripts of assessment incidents, the authors reveal the patterns of interaction that embody formative assessment. They also describe the ways in which the meaning of assessment is negotiated in teacher–student dialogs and the influence exerted both on students' learning and on teachers' conception of their role. Their research is particularly important because it shows that teacher interventions in group settings can make a positive contribution to the regulation of learning for some children but not for others. It raises, in this respect, questions about the equity of interactive formative assessment. Several transcripts demonstrate, nevertheless, the power of this form of assessment when the teacher is able to appropriate individual children's words and actions and integrate them into a collective strategy for scaffolding and regulating learning. In a social constructivist interpretation, teacher–student interactions, and the processes of co-regulation they assure, are the contexts in which students construct and consolidate their individual strategies of self-regulation.

Providing Effective Feedback

In the literature on regulation of learning, feedback is information derived from monitoring the learner's progression toward a goal. It indicates how close the learner is to reaching the goal and may also provide indications on the types of obstacles to be overcome. It is the learner's or the teacher's interpretation of feedback that allows it to be used for the adjustment of goal-directed actions and/or of goal definitions. In this perspective, feedback is merely one aspect of regulation, albeit an essential one. In much of the literature on assessment, however, feedback is considered to be a system that includes several components: information about the student's present level of learning, a mechanism for comparing this level to a reference level (goal, objective, and standard to be attained), and a means for closing the gap between the two levels (Black and Wiliam, 1998). This broad conception of feedback encompasses the mechanisms of regulation that allow the student to progress.

In discussions of feedback, closing the gap generally means enabling students to adjust their behavior and understanding so as to reach the reference level of attainment defined by the educational system. There are circumstances, however, in which differentiation of the reference level may be needed in order to better take into account differences in students' needs and interests. A partial differentiation of goals, and not only of means for attaining them, does not mean a reduction of educational expectations for some categories of students but rather a more fine-tuned adaptation of goals so as to allow all children to acquire essential competencies while being able to express their individuality and cultural heritage. When feedback is integrated within a larger framework of co-regulation of learning, teachers and students discuss the goals to be attained, the criteria and standards of reference, and look for ways of personalizing goals, of making them meaningful in the learning trajectory of each individual.

A synthesis of meta-analyses on the effects of feedback has shown that it is one of the most powerful mediators available for fostering student learning (Hattie and Temperley, 2007). The average effect size of feedback is nearly 0.80, which is considerably higher than the effects of most other instructional factors. This synthesis also reveals that feedback can have powerful negative as well as positive effects on the regulation of learning. Learned helplessness and the fear of failure are as much the result of feedback as improved cognitive processing and feelings of self-efficacy. For a better understanding of the effects of feedback, Hattie and Temperley propose a model that distinguishes four types of feedback:

1. feedback about the student's level of performance or degree of understanding of a task,
2. feedback about processes (procedures, strategies, etc.) needed to understand and perform the task,

3. feedback that concerns the student's self-regulation (goal-setting, monitoring, and adaptation) with respect to the task, and
4. feedback about the self concerning the student's qualities as a learner.

Their review of the research evidence indicates that feedback about the processes involved in the task and about the student's self-regulation are more effective in promoting learning than feedback focused on task performance or on the learner as a person.

Since feedback about the learner as a person can have negative consequences, precautions need to be taken in the way information from assessment is communicated to students. Feedback that is useful for self-regulation of learning cannot, however, be entirely disconnected from feedback about the self. Learning involves the construction of one's identity, in addition to the acquisition of knowledge and skills. Moreover, all students, whatever their strengths and weaknesses, need to have the conviction that they are valued members of a learning community. This means that assessment procedures need to engage students in active reflection about what it means to be a learner and in participation with others in the construction of shared knowledge.

Involving Students in Assessment

Even in standard assessment situations based on teacher-made tests or external examinations, students not only demonstrate what they have learned but also learn new things about themselves. In this sense, self-assessment is ubiquitous; it intervenes implicitly in all assessments and continually affects students' learning and identity formation. It is possible, however, to introduce ways of conducting assessments that encourage active student involvement as well as a certain degree of student empowerment. Self-assessment tools can be embedded in curriculum materials or devised by the teacher. The impact of these tools on student self-regulation is likely to be enhanced when teachers conduct discussions that allow students to analyze the tools (their aims, their uses, and their possible misuses) and to confront the results of their ways of using them. Teachers can also go a step further and assist students in the construction of self-assessment instruments, such as a personal checklist of problems to look out for when writing texts, or a list of three questions to ask one's self when solving word problems.

Student involvement in assessment also includes various forms of peer assessment or of peer participation in the formative assessments conducted by teachers. Reciprocal peer assessment occurs when students assess the work produced by other students and then communicate their observations and suggestions for improvement. Joint peer assessment occurs when students examine a piece of work together and share their ideas on how to improve it. Peer assessment can also be integrated in whole-class discussions orchestrated by the teacher in which criteria for an activity are constructed collectively and applied to various student productions.

In addition to the use of self-assessment and peer assessment tools, student involvement can go further in regulating learning when students actively participate in reflection about learning goals and about the meaning of different learning activities. This implies looking for ways in which at least some of the standard goals of education can be adapted or personalized so as to foster their appropriation by all students, given their learning histories and cultural backgrounds.

Research, demonstrating the effects of self-assessment and peer assessment on achievement, has been conducted primarily in the context of higher education (Boud, 1995). There are, however, research findings that offer support for the implementation of student-involved assessment during the entire course of schooling, and a wide variety of procedures, practices, and tools have been developed in this direction (see Stiggins *et al.*, 2004).

Continuity between Formative and Summative Assessment

Although formative and summative assessments have clearly different goals, the question can be raised as to their possible synergy in promoting learning (Harlen, 2005). The pressure of summative assessment, particularly when it is linked to frequent standardized testing, often leaves little space for the practice of formative assessment to develop. The consequences for the regulation of learning can be highly detrimental, especially for students who encounter failure repeatedly and cease trying to exert any control over their own learning. At the same time, summative assessment is necessary as a means of assuring social recognition of students' accomplishments both in school and outside. Students themselves inevitably ask: What knowledge and skills have I in fact acquired? Also, how do they measure up to expectations in society at large?

Continuity between formative and summative assessment can be developed in several ways. The first is through the alignment of both types of assessment with the curriculum goals underlying teaching and learning in the classroom. If this alignment is clearly perceived by students, the impact on their own goal setting can be very strong. A second point of continuity concerns the development of means of reporting the results of summative assessment so as to provide students with high-quality feedback about learning outcomes. When students receive a profile of test results, a graph comparing outcomes on different parts of a test, a set of rubrics describing the

qualities of a text, or teacher comments that accompany a grade, they can use this information to regulate their subsequent investment in learning. A third point of continuity has to do with student involvement in summative assessment. This form of assessment inevitably entails a judgment formulated by a professional (teacher, examiner, or other expert) about the quality of student learning. It is possible, nevertheless, to develop some degree of active student engagement in the way summative assessment is conducted. For example, in portfolio assessment used for summative purposes (grading and certification), students can participate in the selection of the work samples to include in the portfolio and be asked to write self-reflective commentaries that accompany and put into perspective their work. In professional education, summative assessment often takes place in conferences where the self-assessment expressed by the student is confronted with the assessment formulated by the teacher or supervisor. Students' knowledge of the conditions in which summative assessment will take place can have an important influence on the regulation of their investment in leaning prior to being assessed. Teachers' knowledge of these conditions can have an equally important influence on how they organize learning activities and interact with students. To conclude: both formative and summative assessments provide explicit frames of references that guide the processes of co-regulation of student learning.

See also: Classroom Assessment Tasks and Tests; Formative Assessment; Peer and Self-assessment; The Relationship Between Assessment and the Organization and Practice of Teaching.

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Relevant Websites

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http://www.assessmentinst.com – ETS Assessment Training Institute, Portland, OR, USA.