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Chapter 17
The Role of Classroom Assessment in Supporting Self-Regulated Learning

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Abstract Self-regulation of learning occurs when learners set goals and then systematically carry out cognitive, affective, and behavioral practices and procedures that move them closer to those goals. Self-regulated learning (SRL) depends, in part, on information gleaned from classroom assessments about student learning and achievement. In this chapter we will discuss how classroom assessment is or could be used to support SRL. We will draw on the literatures on classroom assessment and SRL in order to demonstrate how assessment contributes to each phase of self-regulation, defined here as: (1) goal setting, (2) progress monitoring, and (3) revision and adjustment. For example, the goal-setting phase is influenced by the learning goals and success criteria shared by a teacher. The progress-monitoring phase is affected by feedback provided via formative and summative assessments. The revision-and-adjustment phase is affected by opportunities teachers give students to use feedback and decisions students make based on that feedback. This chapter demonstrates the close relationship between classroom assessment and SRL by reviewing research evidence for each phase, and makes the case that assessment can support the self-regulation of learning in classroom settings. The chapter also addresses challenges of implementing classroom assessment practices that support SRL.

17.1 Introduction

Classroom assessment includes assessment by classroom teachers for both formative and summative classroom purposes. Formative classroom assessment strategies, or assessment for learning (AfL), are used by both teachers and students to

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further student learning. Summative classroom assessment, or grading, is usually a function reserved for the teacher and is done for the purpose of certifying and reporting learning. These functions blur a bit in the classroom context, as students use both kinds of assessment to inform the self-regulation of learning. Thus classroom assessment is one of the other sources, besides the self, that influence the regulation of learning (Allal 2010). This chapter examines how features of classroom assessment such as success criteria, feedback, and opportunities for revision influence the process of self-regulation of learning and, therefore, influence student learning.

17.2 Self-Regulation of Learning

Self-regulation of learning occurs when learners set goals and then systematically carry out cognitive, affective, and behavioral practices and procedures that move them closer to those goals (Zimmerman and Schunk 2011). Current theories of formative assessment also recognize that the agency for learning resides with the student (Andrade 2010). Self-regulated learning (SRL) depends, in part, on information gleaned from classroom assessments about student learning and achievement: This is a likely explanation for research findings that suggest formative assessment is a potential influence on SRL (Nicol and Macfarlane-Dick 2006). In this chapter, we discuss how classroom assessment in general and formative assessment in particular are, or could be, used to support SRL.

Scholarship on self-regulation organizes cognitive, metacognitive, and motivational aspects into a general view of how learners understand and then pursue learning goals. Different theorists have presented models of how students activate cognition, metacognition, and motivation in order to learn. Three influential models are a nested view (Boekaerts 1999), an information processing view (Winne and Hadwin 1998), and a phase or cyclical view (Pintrich and Zusho 2002; Zimmerman 2011). Phase views of SRL allow theorists to place cognitive, metacognitive, and motivational constructs into a sequence of events that occur as students self-regulate. For example, Pintrich and Zusho (2002) organize the phases and areas of self-regulation into four phases: (1) forethought, planning, and activation, (2) monitoring, (3) control, and (4) reaction and reflection, which include making attributions of success or failure. For another example, Winne (2011) describes self-regulated learning as 'unfolding over four weakly sequenced and recursive phases' (p. 20). In Phase One, the learner defines the task and its affordances and constraints. In Phase Two, the learner sets goals and plans. During Phase Three, the learner engages with the task, and in Phase Four the learner evaluates his or her work, which can result in making revisions or adjustments to the work.

A phase view of SRL affords a way to crosswalk the classroom assessment literature, since assessment also can be described as having three main phases, also

cyclical in nature: (1) goal setting, (2) monitoring via feedback, and (3) revision or adjustment. The similarities between the phases of SRL and classroom assessment are clear: Both SRL and classroom assessment involve setting goals, monitoring/evaluating progress toward those goals, and reacting to feedback about gaps between goals and progress by making adjustments to teaching, learning, and/or work products. As with SRL, the differences between the monitoring and revision/control phases make sense conceptually but are difficult to separate empirically.

SRL and classroom assessment, especially formative assessment, have overlapping aims but distinct bodies of research and classroom practices—at least until now. A goal of this chapter is to better understand how what we know about SRL can inform classroom practice, and vice versa. We will do so by examining research on the relationship between SRL and the three phases of classroom assessment: (1) goal setting, (2) progress monitoring, and (3) revision and adjustment. There are currently only a few studies that directly examine this relationship, but the results are promising.

17.3 Classroom Assessment and Self-Regulated Learning

Successful formative assessment practices work because they support learner autonomy (Black et al. 2006). Feedback gleaned from classroom assessments can provoke students to self-regulate their learning by providing evaluations of their understanding and performances. Ideally, those evaluations lead students to assess whether particular strategies are effective in meeting their learning goals and to make adjustments to their knowledge, motivation, behavior, and even context. Under the right conditions, sources of feedback include not only teachers but also students themselves, their peers, and computer-based technologies designed to deliver instant automated feedback. In the remainder of this chapter, we describe how feedback from a variety of sources can or could be used to support self-regulated learning. We show that successful students use formative assessment information, as well as some information from classroom-based summative assessment, in support of the self-regulation of learning.

Our focus is on cognitive processes but it is important to note that motivation is also an important component of SRL and a phenomenon that is highly susceptible to influence from assessments, particularly summative grades. Unlike formative feedback, summative assessment has gained a reputation for having unintended, often destructive consequences for both learning and motivation. For example, research showing that grades negatively influence performance and motivation (Butler 1987; Butler and Nisan 1986; Lipnevich and Smith 2008) implies that grades can trigger counterproductive regulatory processes, especially for low-achieving students.

17.4 Phase One: Goal Setting

Classroom assessment serves a clear purpose in terms of goal setting. Perhaps the most obvious instantiation is the setting of learning goals by teachers. Variously called learning intentions, learning goals, and learning targets in current scholarship on assessment and self-regulated learning, goals describe the skills, concepts, and dispositions that constitute the intended consequences of teaching and learning. Modern theories of regulated learning consider goals to be fundamental to regulatory proficiency and success (Hadwin et al. 2011; Winne 2011; Zimmerman 2011), and theories of classroom assessment consider teachers' learning goals for students to be the basis of good assessment (Allal 2010; McMillan 2011; Nicol and Macfarlane-Dick 2006; Stiggins 2008). If feedback is to be beneficial, students must have a clear understanding of the goal or standard for a performance, and be able to compare their performance with that standard, after which they can take relevant action in order to close any gaps (Hattie and Timperley 2007).

Portfolios are a form of classroom assessment that tends to highlight goal setting by students. Although quite limited, the research on portfolios suggests a positive relationship between goal setting and students' performance (Belgrad 2013). Ideally, teachers and students discuss the goals to be attained, as well as the criteria and standards for particular assessments (Allal 2010).

The classroom assessment literature places a special emphasis on success criteria (Heritage 2010; Moss et al. 2013; Torrance and Pryor 2001). In contrast with learning goals, which tend to be broad, success criteria describe the qualities of excellent student work on a particular assignment. Success criteria can be communicated to students in a variety of ways, including via rubrics (Andrade 2000; Brookhart 2013a), exemplars, or worked examples that imply success criteria (Hattie 2009). Success criteria can be co-constructed with students, as for example when teachers and students together create a rubric (Andrade et al. 2008).

In a study that employed rubrics and/or exemplar research proposals, Lipnevich et al. (2014) found that providing 100 undergraduates[1] with rubrics, exemplars, or both was associated with significant improvements in student performance, with rubrics edging out the exemplars only and rubrics + exemplars conditions in terms of effect size (rubrics only Cohen's $d = 1.54$; exemplars only Cohen's $d = 1.04$; rubrics + exemplars Cohen's $d = 1.04$). Similarly, Andrade and her colleagues (Andrade et al. 2008, 2010) found that providing elementary and middle school students with model papers and rubrics, combined with a scaffolded process of self-assessment, was related to statistically significant and practically meaningful differences between the performance of the students in the treatment and comparison groups (elementary school Cohen's $d = 0.87$; middle school Cohen's $d = 0.66$). Taken together, these studies strongly suggest that sharing success

[1]Throughout the chapter, the grades mentioned correspond to the U.S. K–12 system (or equivalent systems elsewhere), with students 5–18 years old, and the term undergraduates refers to students in Bachelor level university studies.

criteria with students can promote learning in both primary school and higher education.

Students' understandings of their teachers' criteria can influence their regulation of their learning (Butler and Cartier 2004; Butler and Schnellert 2015). For example, a student who interprets a reading assignment as a memorization task will plan to use low-level cognitive processes and consider himself or herself successful once key terms are memorized. In contrast, another student who interprets the same assignment as requiring comprehension and application will employ sophisticated comprehension strategies and define success as being able to explain and transfer the content of the text. Thus, teachers cannot assume that success criteria will be uniformly adopted and applied by students: Efforts must be made to ensure accurate and effective interpretations of the criteria (Butler and Cartier 2004).

Students also set their own learning goals, particularly achievement goals. Brookhart (2013b) discusses the relationships between students' achievement goals, motivation, and performance. She makes the case that classroom assessment evidence can be both the *goal* of motivated learning (e.g., a student wants to be able to turn in a high-quality lab report in a science class) and the *means* to that goal (therefore, the student works at learning the science content and the laboratory procedure; he or she sets a goal that is monitored during ongoing work toward the assessment). Part of the energy behind formative assessment's effects is derived from the simultaneous influence of classroom assessment on motivation and on achievement. The same evidence of where a student is going, where he or she is now, and what he or she should do next facilitates the student's cognition and at the same time supports motivation (self-agency) based on the feeling that what to do next is in sight and attainable. More research is needed on the relationship between unit-, lesson-, and task-specific goal setting by students and achievement, particularly since goals students set commit them to pursuing one particular outcome over another (Hadwin et al. 2011).

17.5 Phase Two: Progress Monitoring

A central purpose of both classroom assessment and self-regulation is to monitor learners' progress toward goals and provide feedback that can be used to deepen learning and improve performance. Monitoring progress toward goals can be a process of thinking about one's own thinking, or a related but distinct process of formatively or summatively evaluating the product-based evidence of learning against the standards for it. The former version of progress monitoring is known as metacognition and is largely internal to the learner. The latter version of progress monitoring is feedback and involves the solicitation of critiques from oneself and from others, often via classroom assessments.

Classroom assessment can support progress monitoring by addressing the three key questions identified by Hattie and Timperley (2007): Where am I going?, How

am I going?, and Where to next? Hattie and Timperley's model includes four types of feedback:

1. Task level: How well tasks are understood and performed.
2. Process level: The main processes needed to understand and perform tasks.
3. Self-regulation level: Self-monitoring, regulating, and directing of actions.
4. Self level: Personal evaluations of the learner.

They argue that self-level feedback (e.g., 'Good girl') is the least effective because it contains little task-related information. Feedback about processing and self-regulation are 'powerful in terms of deep processing and mastery of tasks,' and 'task feedback is powerful when the task information subsequently is useful for improving strategy processing or enhancing self-regulation (which it too rarely does)' (p. 91). Given what is known about how SRL is enhanced when learners receive feedback about strategy use (Zimmerman 2002), classroom assessments that provide process and self-regulation-level feedback could be quite effective in promoting both achievement and SRL. Feedback targeted at any level can come from a variety of sources, including students themselves, their peers, teachers, and technology.

17.5.1 Self-Generated Feedback

Good self-regulators evaluate their own performance and make adaptive attributions linked to deeper processing, better learning and achievement, positive affect, positive efficacy and expectancy judgments, persistence, and effort (Pintrich 2000). In a classroom context, this type of self-regulation can look like self-assessment, which is a process during which students reflect on the quality of their work, judge the degree to which it reflects explicitly stated goals or criteria, and revise their work accordingly (Andrade 2010). Self-assessment is a core element of self-regulation (Brown and Harris 2013) because it involves awareness of the goals of a task and checking one's progress toward them.

Brown and Harris's (2013) survey of research on self-assessment led them to conclude that there is evidence of a link between self-assessment and better self-regulation skills, 'provided such self-evaluation involves deep engagement with the processes affiliated with self-regulation (i.e., goal setting, self-monitoring, and evaluation against valid, objective standards)' (p. 386). For example, Panadero and his colleagues have explored the relationship between both task-level and process-level self-assessment and SRL in secondary students (Panadero et al. 2012) and undergraduates (Panadero et al. 2013, 2014; Panadero and Romero 2014). They used rubrics to scaffold self-generated task-level feedback and scripts (i.e., guides to the processes required by a task) for process-level feedback. The results suggest that, in general, students who engaged in self-assessment of their learning were more self-regulated, as measured by self-report questionnaires and/or think aloud

protocols, than were students in the comparison groups. Effect sizes were very small but statistically significant. Process-level self-assessment tended to be more closely associated with SRL than task-level self-assessment. This is probably the case because, as Brown and Harris put it, process-level self-assessment engages students with the processes affiliated with self-regulation. You get what you assess, as the saying goes.

Although many students probably do not explicitly self-assess in terms of task criteria, thereby missing an opportunity for self-regulated learning, the process is eminently teachable. Self-assessment has been investigated for its contribution to learning and performance in many contexts, including elementary and middle school writing, middle school mathematics, and high school social studies and technology. Andrade et al. (2008) had third and fourth graders read a model written assignment and generate a list of criteria as a class. Using rubrics based on those criteria, they self-assessed drafts of their stories and essays. Controlling for previous writing ability, the group that used the rubrics for self-assessment wrote better overall than a comparison group that self-assessed without formal criteria (Cohen's $d = 0.87$). Andrade et al. (2010) replicated these findings with middle school students in fifth, sixth, and seventh grade (Cohen's $d = 0.66$).

Ross et al. (2002) taught fifth- and sixth-grade students self-evaluation skills in mathematics, also using a method based on criteria. Their self-assessment instruction involved students in defining criteria, taught them how to apply the criteria, gave students feedback on these self- assessments against criteria, and helped students develop action plans based on the self- assessments. Controlling for previous problem-solving ability, students who self-assessed using criteria outscored a comparison group at solving mathematics problems.

Ross and Starling (2008) used the same four-component self-assessment training based on criteria with secondary students in a ninth-grade geography class. Students were learning to solve geography problems using global information systems (GIS) software, so the learning goals were about both accurate use of the software and using it to solve geography problems. Controlling for pretest computer self-efficacy, the treatment group outscored a comparison group on three different measures: production of a map using the software, a report explaining their problem-solving strategies, and an exam measuring knowledge of the mapping program. The largest difference was for the problem-solving explanations.

There is also limited evidence of a link between criteria-referenced self-assessment and self-efficacy, at least for girls. Self-efficacy, or the belief that one can succeed at a particular task (Bandura 2003), is a component of self-regulated learning that has an association with other motivational components of SRL such as task interest and persistence, as well as with relevant strategy use (Schunk and Usher 2011). Andrade et al. (2009) investigated the relationship between self-assessment according to a rubric and elementary and middle school students' ($N = 268$) self-efficacy for writing. Students in the treatment group reviewed a model essay and

used a rubric to self-assess their drafts. Self-efficacy ratings were collected three times: before, during, and after writing the first draft. The results revealed interactions between gender and self-assessment: Average self-efficacy ratings increased as students wrote, regardless of gender or condition, but the increase in the self-efficacy of girls in the treatment group was much larger than the increase for girls in the comparison group (multivariate F (2, 169) = 3.61, p = 0.03). There were no such differences for the boys (multivariate F (2, 99) = 0.07, p = 0.94), suggesting that rubric-referenced self-assessment was associated only with the self-efficacy of girls. However, other studies found no clear relationship between self-assessment and self-efficacy (Meusen-Beekman et al. 2014; Panadero et al. 2013). This may be because other mediating variables exist, for example the degree to which students achieve their goals.

17.5.2 Self- or Peer-Generated Feedback

Students' peers can also play a role in progress monitoring. Meusen-Beekman et al. (2014) conducted a study of the relationship between self-regulated learning and peer or self-assessment with 695 sixth grade students in The Netherlands. Students in the treatment condition, which lasted 27 weeks, engaged in peer or self-assessment of three writing assignments. They also co-created the criteria for their writing tasks, set goals, made plans, and used checklists to monitor their progress. In these ways, the students provided themselves and each other with both task- and process-level feedback.

Analysis of the data from student self-report questionnaires, focus groups, and teacher observations suggest that the treatment had a statistically significant, positive association with self-regulation and intrinsic motivation, with no differences between the peer- and self-assessment conditions. Together with research done by Panadero and his colleagues on rubrics and scripts (Panadero et al. 2014), the results of Meusen-Beekman et al.'s (2014) study support claims that formative peer and self-assessment can scaffold self-regulation, particularly when the feedback received from either source is focused on both the criteria for the task at hand and the processes employed to produce work that meets them. It might be important to note, however, that the control condition in Meusen-Beekman et al.'s study did not allow for revision, which could have suppressed students' self-regulation and motivation.

Similarly, Graham et al. (2012) found that involving students in prewriting activities, peer assistance, clarifying goals, and assessment with feedback was an important series of writing interventions that raised writing achievement. Graham et al. called this kind of intervention 'scaffolding writing' (p. 887), but it also may be described as formative assessment.

17.5.3 Interpretation of Feedback During Progress Monitoring

We have long known that the action taken by a learner in response to feedback depends, in part, on the way in which it was received (Black and Wiliam 1998), because a learner's response to feedback involves interpretation of that feedback. Most research on the nature of learners' interpretations of feedback has focused on the effects of feedback on affect, particularly motivation (Brookhart 2013b). Empirical studies of the effects of students' interpretations of feedback on learning and achievement are scarce.

Draper (2009) developed a theoretical argument that stresses how students' interpretations of ambiguous feedback determine whether that feedback is useful or not. He postulates at least six possible interpretations of feedback:

1. Technical knowledge or method (e.g., concluding that one did not use the best information or method to complete the task, both of which can be improved).
2. Effort (e.g., deciding that one did not leave enough time to do a task well).
3. Method of learning about a task (e.g., realizing that one did not seek out the right information about the task, or did not understand the criteria for the task).
4. Ability (e.g., believing that one does not have the necessary aptitude to succeed at a task).
5. Random (e.g., assuming nothing was done incorrectly so success is possible next time without adjustment or revision).
6. The judgment process was wrong (e.g., determining that the feedback was incorrect).

It is very likely that students' self-regulatory responses to feedback are determined by the type of interpretation they make of a given instance of feedback. Research that tests this or related theories, and the ways in which classroom assessment can influence students' interpretations of feedback and subsequent attempts to regulate their learning, is needed.

17.5.4 Feedback from Grades

Some students are very effective self-regulators, and there is evidence that these students use feedback from all sources, including grades, for specific information about the content of an assessment as well as for general information about how to study or do project work better. Brookhart (2001) interviewed successful students in high school English and Anatomy classes to learn their perspectives on the formative and summative aspects of classroom assessments. These students, mostly

from honors classes in a well-resourced high school, were taking challenging classes and were invested in their education and in getting good grades. Students were asked about specific graded tests or assignments. A striking finding was that they considered all assessment to be formative to some degree. They considered studying for a test or doing a project as a contribution to their learning. They looked for ways to transfer their current learning to future study. They intentionally worked at self-monitoring, reflecting on 'how well they did,' a phrase they used to mean both the grade they received and what they thought they learned.

Although high-achieving students like those in Brookhart's (2001) study report using formal evaluations for the purposes of progress monitoring, too few students actually do so. In fact, some very unsuccessful students also use summative outcomes to regulate their learning in unhelpful ways by developing learned helplessness (Dweck 1976). Fortunately, scaffolding can be put in place to help students use grades or scores to monitor their progress. For instance, Brookhart et al. (2004) studied third graders learning their 0–9 multiplication facts. Every week for ten weeks, they took a 100-fact, 5-minute timed test. Each week they predicted what their next score would be, and then graphed their actual score next to it, using a bar graph. At the time of prediction they also used a reflection sheet to set a learning goal for the next week (e.g., 'do the 8 tables better') and plan a strategy for reaching that goal ('practice with flash cards'). The reflection sheet led them to set the goal and strategy based on how they thought their previous week's goal and strategy had worked.

An analysis of the students' reflections showed that most students expressed a mastery goal orientation. Students learned their multiplication facts quickly and enjoyed the reflection, especially graphing their 'steps' (their grades) each week. Students who achieved 100 % before the ten weeks challenged themselves to do the test in four and then three minutes rather than stop the project. This project combined features of formative and summative assessment; students tracked their progress and used the results formatively, but their grades were also derived from their performance on the timed tests.

If students are to use grades to monitor their achievement, then those grades must reflect meaningful standards of learning and students' progress toward them (Guskey 2009). For the past 10 years or so, a movement known as standards-based grading has been gaining momentum in U.S. schools. Teachers using traditional grading practices often combine appraisals of effort and behavior, as well as learning, into a grade. In contrast, teachers who employ standards-based or learning-focused grading assess student work in terms of achievement alone and report measures of effort and behavior separately. Grades should be useful for the progress-monitoring phase of self-regulation of learning. If students are to use their grades in an evidentiary process to regulate ever more learning, the grades need to be evidence of having learned or not learned.

17.6 Phase Three: Revision and Adjustment

In terms of self-regulated learning, revision and adjustment refer to the types of cognitive and metacognitive activities in which students engage in order to adapt and change their thinking, including selecting and using cognitive strategies (Pintrich 2000). Attribution of success and failure is another aspect of this phase (Pintrich and Zusho 2002). Attributions are both cognitive and motivational in nature, and linked to academic achievement. Feedback and evaluation from any source can affect students' attributions (Oren 2001). For instance, Dweck (2006) has shown that teachers can change the way children come to understand their abilities related to an activity simply through the choice of feedback they offer in moment-to-moment feedback: Praising students for their intelligence (e.g., 'You are so smart') tends to induce a fixed mindset, while praise focused on effort or process (engagement, perseverance, effective strategy use, or improvement, e.g., 'You worked hard to improve this') fosters a growth mindset.

From a classroom assessment perspective, the revision and adjustment phase of learning can involve revision of student work, particularly after receiving feedback. We know very little about the adjustments to goal-directed action that students make in light of classroom assessment. This lack of information about what students actually do in response to feedback reflects the fact that research has tended to employ measures of outcomes and products rather than of the processes of learning and revision. Research is needed on the adjustments that students make to their work and learning processes (if any) in response to both formative and summative assessment.

One issue on which there is consensus is that if feedback is to be useful, it must be focused on criteria, describe reasonable next steps, and followed by opportunities to close the gap between current and desired performance through retakes or revision (Andrade 2010; Boud 2000; Brookhart 2013a; Nicol and Macfarlane-Dick 2006). Unfortunately, teachers often move on to the next topic or assignment, citing time pressures that prevent resubmission after feedback. When self- or peer-generated feedback followed by revision is part of a regular class routine, however, students share the feedback burden with teachers (Lipnevich et al. 2014), and the likelihood of self-regulation is greater.

17.7 Implications for Classroom Practice

Ample research has shown that supporting students in learning to use self-regulation strategies is related to subsequent improvements in academic achievement, especially when instruction in SRL begins in the late childhood or early adolescent years (de Boer et al. 2012). Given the similarities between classroom assessment and SRL, and burgeoning evidence of an influence of the former on the latter, an obvious practical implication is to use assessments, especially

formative assessments, as a form of SRL instruction. This might be a simple matter of framing: Rather than telling students to peer or self-assess in order to get a better grade, we can explain that seeking feedback from oneself and others is a learning skill that, when honed into a habit, is a hallmark of successful learners.

Clear learning goals and criteria are the foundation on which both formative assessment and SRL rest. Students cannot accurately evaluate their progress without an understanding of the standards held by their teacher (Allal 2010; McMillan 2011; Nicol and Macfarlane-Dick 2006; Stiggins 2008). Educators are beginning to grasp the importance of communicating learning goals to their students, but anecdotal evidence from professional development work, as well as some research (Antoniou and James 2014; Saito and Inoi 2015; Wylie and Lyon 2015), suggests that teachers have a much harder time conceptualizing and communicating task-specific success criteria. From the point of view of a student who has not yet reached a learning goal, however, a goal without criteria is not very useful. A clear implication for practice is for teachers to develop skills in conceptualizing, communicating, and using success criteria.

Learning goals and success criteria are not enough, however. Another clear implication for practice is to employ assessments that present students with process- and self-regulation-oriented feedback. Findings by Panadero and colleagues (Panadero et al. 2012, 2013, 2014) suggest that process-oriented scripts tend to be more highly associated with SRL than rubrics. These findings support Hattie and Timperley's (2007) claims regarding the power of feedback that informs students about how to effectively engage in tasks and how to monitor and regulate their progress. A related implication is that opportunities to revise are essential if assessment is to lead to self-regulated learning.

A less obvious practical implication of our discussion of the relationship between assessment and SRL is the need to carefully scaffold constructive interpretations of feedback and attributions of success or failure. We cannot assume that students always eagerly receive information about their achievement, whether formative or summative, and happily apply it in ways that deepen their learning and improve their products. Tools and procedures are needed that increase the likelihood of interpretations of feedback that result in beneficial self-regulatory responses.

17.8 Challenges of Implementation

Classroom assessment plays a pivotal role in student goal setting, progress monitoring, and revision and adjustment. As the literature shows, assessment can support the self-regulation of learning in classroom settings if it provides students with ways to participate in all three phases with intentionality and ownership. The literature has also identified a major challenge for implementation, namely, a typical classroom environment focused on grading rather than learning that sets up assessments as trials that only some can win (Covington 1992). A related

challenge is the need for teachers to turn conventional instructional and assessment planning on its head and approach these tasks from the students' point of view (Andrade 2010). By so doing, teachers can maximize the likelihood that students will have the opportunities and tools they need to take ownership of their own learning by self-regulating it.

To meet these challenges, teachers and administrators will need assessment literacy, including understanding the purposes of assessment, the value of it, and effective, student-centered classroom practices. Teachers often use assessment tasks designed by someone else without a deep understanding of the content or the reasons for the design choices. This could limit the kind of process or SRL feedback they are able to give to students. In addition, even assessment for learning can end up being teacher centered rather than student centered (Jonsson et al. 2015), or, through teacher misconceptions, can end up not being formative at all. For example, in one study, 20 % of reported 'formative assessment' was not, in fact, formative (e.g., giving points for a participation grade to students who answered random questions; Wylie and Lyon 2015). When such things happen, students experience an evaluative rather than a learning-focused classroom environment. Assessment literacy, including a deep understanding of the formative assessment process and students' and teachers' roles in it, is needed in order to overcome these pitfalls.

Promoting assessment literacy requires a two-pronged approach in which teachers learn, and have the opportunity to apply, sound assessment strategies, not only in workshops but in their regular classrooms, and at the same time work to empower students as owners of their own learning who are capable of, and practice, self-assessment. This kind of professional development takes time, requires participatory professional development techniques, and requires modeling the same kind of assessment teachers need to practice.

Developing, communicating, and using success criteria with students is one of the central aspects of formative assessment, but teachers are much better at describing learning goals for students than articulating the criteria that indicate deep learning or high quality work (Antoniou and James 2014; Wylie and Lyon 2015). Professional development that focuses on success criteria in the context of formative assessment is imperative. The authors' experiences suggests one good way to help teachers develop success criteria that are about learning, rather than about the requirements for the task, involves analyzing good examples of student work, and critiquing and revising poor examples.

Another challenge is related to the need for assessments that focus on process. The development of self-regulated learning benefits from feedback about strategy use and the benefits of using them (Zimmerman 2002), but teachers tend to provide feedback about performance, not processes. Students need feedback about both performance and process (Hattie and Timperley 2007; Panadero et al. 2012). Teachers have a difficult time giving descriptive feedback in time for students to extend their learning and amend their performances, instead of giving feedback that explains summative evaluations (Wylie and Lyon 2015). The provision of effective, process-oriented feedback is an aspect of assessment for learning that needs to be addressed head-on in professional development. Professional development that

proceeds from analyzing examples of others' feedback through practicing and analyzing one's own feedback can be effective.

Finally, there is the inexorable pull of standardized tests in the U.S. context (Berliner and Nichols 2007) and elsewhere (e.g., Scotland; Hayward 2015), including in Confucian-heritage settings with traditions of high-stakes examinations (Carless 2011; Ratnam-Lim and Tan 2015). Teachers' and students' beliefs about the importance of learning and students' self-regulation of learning must be very robust indeed to stand up to the pressure of high-stakes examinations. Classroom assessment that facilitates learner autonomy and self-regulation has never been more needed than now, given the current prominence of standardized tests.

17.9 Conclusion

Covington (1992) reviewed several decades' worth of literature to demonstrate that all students, especially lower achievers, can be successful learners if they are given opportunities to understand their own learning, set their own goals, pursue appropriately leveled tasks, and receive feedback targeted to their needs. The key is students having some control over what and how they learn and receiving sufficient information to strengthen their effort-outcome beliefs and thus their attribution of success to their own efforts. Classroom assessment can play a large part in creating the conditions for student agency identified by Covington. In fact, because assessment is an integral part of most classroom activities, and SRL strategy instruction is most effective when it is embedded in an authentic learning context (Paris and Paris 2001), classroom assessment presents a unique opportunity to support students in becoming successful learners—if it is intentionally used to do so.

References

Allal, L. (2010). Assessment and the regulation of learning. In P. Peterson, E. Baker, & B. McGraw (Eds.), *International encyclopedia of education* (Vol. 3, pp. 348–352). Oxford: Elsevier.

Andrade, H. (2000). Using rubrics to promote thinking and learning. *Educational Leadership, 57* (5), 13–18.

Andrade, H. (2010). Students as the definitive source of formative assessment: Academic self-assessment and the self-regulation of learning. In H. Andrade & G. Cizek (Eds.), *Handbook of formative assessment* (pp. 90–105). New York: Routledge.

Andrade, H., Du, Y., & Mycek, K. (2010). Rubric-referenced self-assessment and middle school students' writing. *Assessment in Education: Principles, Policy and Practice, 17*(2), 199–214.

Andrade, H., Du, Y., & Wang, X. (2008). Putting rubrics to the test: The effect of a model, criteria generation, and rubric-referenced self-assessment on elementary school students' writing. *Educational Measurement: Issues and Practices, 27*(2), 3–13.

Andrade, H., Wang, X., Du, Y., & Akawi, R. (2009). Rubric-referenced self-assessment and self-efficacy for writing. *The Journal of Educational Research, 102*(4), 287–302.

Dweck, C. S. (1976). Children's interpretation of evaluative feedback: The effect of social cues on learned helplessness. *Merrill-Palmer Quarterly, 22*(2), 105–109.

Graham, S., Kiuhara, S., McKeown, D., & Harris, K. R. (2012). A meta-analysis of writing instruction for students in the elementary grades. *Journal of Educational Psychology, 104*, 879–896.

Guskey, T. R. (Ed.). (2009). *Practical solutions for serious problems in standards-based grading*. Thousand Oaks, CA: Corwin Press.

Hadwin, A., Järvelä, S., & Miller, M. (2011). Self-regulated, co-regulated, and socially shared regulation of learning. In B. Zimmerman & D. Schunk (Eds.), *Handbook of self-regulation of learning and performance* (pp. 65–86). New York: Routledge.

Hattie, J. (2009). *Visible learning: A synthesis of over 800 meta-analyses relating to achievement*. New York: Routledge.

Hattie, J., & Timperley, H. (2007). The power of feedback. *Review of Educational Research, 77*, 81–112.

Hayward, L. (2015). Assessment is learning: The preposition vanishes. *Assessment in Education: Principles, Policy & Practice, 22*(1), 27–43. doi:10.1080/0969594X.2014.984656.

Heritage, M. (2010). *Attributes of effective formative assessment*. Washington, DC: Council of Chief State Officers.

Jonsson, A., Lundahl, C., & Holmgren, A. (2015). Evaluating a large-scale implementation of assessment for learning in Sweden. *Assessment in Education: Principles, Policy and Practice, 22*(1), 104–121.

Lipnevich, A., & Smith, J. (2008). *Response to assessment feedback: The effects of grades, praise, and source of information. Research report RR-08-30*. Princeton, NJ: Educational Testing Service.

Lipnevich, A. A., McCallen, L. N., Miles, K. P., & Smith, J. K. (2014). Mind the gap! Students' use of exemplars and detailed rubrics as formative assessment. *Instructional Science, 42*(4), 539–559.

McMillan, J. (2011). *Classroom assessment: Principles and practice for effective standards-based instruction*. New York: Pearson.

Meusen-Beekman, K., Joosten-ten Brinke, D., & Boshuizen, H. (2014). *The effects of formative assessment on self-regulated learning skills by sixth grade pupils*. Paper presented at the Conference of EARLI SIG1: Assessment and Evaluation, Madrid, Spain.

Moss, C., Brookhart, S., & Long, B. (2013). Administrators' roles in helping teachers use formative assessment information. *Applied Measurement in Education, 26*, 205–218.

Nicol, D., & Macfarlane-Dick, D. (2006). Formative assessment and self-regulated learning: A model and seven principles of good feedback practice. *Studies in Higher Education, 31*(2), 199–218.

Oren, D. (2001). Evaluation systems and attributional tendencies in the classroom: A sociological approach. *Journal of Educational Research, 76*(5), 307–312.

Panadero, E., Alonso-Tapia, J., & Huertas, J. A. (2012). Rubrics and self-assessment scripts effects on self-regulation, learning and self-efficacy in secondary education. *Learning and Individual Differences, 22*(6), 806–813. doi:10.1016/j.lin-dif.2012.04.007.

Panadero, E., Alonso-Tapia, J., & Huertas, J. A. (2014). Rubrics vs. self-assessment scripts: Effects on first year university students' self-regulation and performance. *Journal for the Study of Education and Development, 3*(7), 149–183. doi:10.1080/02103702.2014.881655

Panadero, E., Alonso-Tapia, J., & Reche, E. (2013). Rubrics vs. self-assessment scripts effect on self-regulation, performance and self-efficacy in pre-service teachers. *Studies in Educational Evaluation, 39*(3), 125–132. doi:10.1016/j.stueduc.2013.04.001.

Panadero, E., & Romero, M. (2014). To rubric or not to rubric? The effects of self-assessment on self-regulation, performance and self-efficacy. *Assessment in Education: Principles, Policy & Practice, 21*(2), 133–148. doi:10.1080/0969594X.2013.877872.

Paris, S. G., & Paris, A. H. (2001). Classroom applications of research on self-regulated learning. *Educational Psychologist, 36*(2), 89–101.

Pintrich, P., & Zusho, A. (2002). The development of academic self-regulation: The role of cognitive and motivational factors. In J. Eccles & A. Wigfield (Eds.), *Development of achievement motivation* (pp. 249–284). San Diego, CA: Academic Press.

Pintrich, P. R. (2000). Multiple goals, multiple pathways: The role of goal orientation in learning and achievement. *Journal of Educational Psychology, 92*, 544–555.

Ratnam-Lim, C. T. L., & Tan, K. H. K. (2015). Large-scale implementation of formative assessment practices in an examination-oriented culture. *Assessment in Education; Principles, Policy & Practice, 22*(1), 61–78. doi:10.1080/0969594X.2014.1001319

Ross, J. A., Hogaboam-Gray, A., & Rolheiser, C. (2002). Student self-evaluation in grade 5-6 mathematics: Effects on problem-solving achievement. *Educational Assessment, 8*, 43–58.

Ross, J. A., & Starling, M. (2008). Self-assessment in a technology-supported environment: The case of grade 9 geography. *Assessment in Education: Principles, Policy and Practice, 15*(2), 183–199.

Saito, H., & Inoi, S. (2015). *Junior and senior high school EFL teachers' use of formative assessment: A mixed method study*. Paper presented at the Language Testing Research Colloquium, Toronto.

Schunk, D., & Usher, E. (2011). Assessing self-efficacy for self-regulated learning. In B. Zimmerman & D. Schunk, (Eds.), *Handbook of self-regulation of learning and performance* (pp. 282–297). New York: Routledge.

Stiggins, R. (2008). *An introduction to student-involved assessment FOR learning*. Upper Saddle River, NJ: Pearson Education.

Torrance, H., & Pryor, J. (2001). Developing formative assessment in the classroom: Using action research to explore and modify theory. *British Educational Research Journal, 27*(5), 615–631.

Winne, P. (2011). A cognitive and metacognitive analysis of self-regulated learning. In B. J. Zimmerman & D. H. Schunk (Eds.), *Handbook of self-regulation of learning and performances* (pp. 15–32). New York: Routledge.

Winne, P. H., & Hadwin, A. F. (1998). Studying as self-regulated learning. In D. J. Hacker, J. Dunlosky, & A. C. Graesser (Eds.), *Metacognition in educational theory and practice* (pp. 277–304). Mahwah, NJ: Lawrence Erlbaum.

Wylie, E. C., & Lyon, C. J. (2015). The fidelity of formative assessment implementation: Issues of breadth and quality. *Assessment in Education: Principles, Policy & Practice, 22*(1), 140–160. doi:10.1080/0969594X.2014.990416.

Zimmerman, B. (2011). Motivational sources and outcomes of self-regulated learning and performance. In B. Zimmerman & D. Schunk (Eds.), *Handbook of self-regulation of learning and performance* (pp. 49–64). New York: Routledge.

Zimmerman, B., & Schunk, D. (Eds.). (2011). *Handbook of self-regulation of learning and performance*. New York: Routledge.

Zimmerman, B. J. (2002). Achieving self-regulation: The trial and triumph of adolescence. In F. Pajares & T. Urdan (Eds.), *Academic motivation of adolescents*. Greenwich, CT: Information Age Publishing.