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R & D Connections

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Formative Assessment — Supporting Students' Learning

By Caroline Wylie and Christine Lyon[1]

Summative assessment: Summative assessment is a measure of learning at a particular point in time.

Formative assessment: Formative assessment takes place before or during the instruction with the explicit purpose of eliciting evidence that can be used by students and teachers to improve the current learning.

Learning progressions: A description of qualitative change in a student's level of sophistication for a key concept, process, strategy, practice, or habit of mind. Change in student standing on such a progression may be due to a variety of factors, including maturation and instruction. Each progression is presumed to hold for most, but not all, students, and to be provisional, subject to empirical verification and theoretical challenge.

"But doesn't ETS just make tests?" This is a question we often hear when people learn where we work. Our reply is usually that it is true that ETS does significant work on tests that have an impact on high-stakes decisions (e.g., the *Praxis Series*™ assessments, the *GRE*® tests, and international language tests such as the *TOEIC*® and *TOEFL*® tests), but that we also work on many other kinds of assessments and conduct research in diverse areas from statistical modeling to teaching quality to automated scoring technologies and formative assessment. This is in line with ETS's mission that calls on us to "promote learning and performance" and "support education and professional development" — goals that are much broader than just developing tests affecting high-stakes decisions. To fully realize the mission, we must value and advance connections between teaching, learning, and assessment.

What is formative assessment?

Assessment is a broad term that can be used for many different contexts and purposes. In K–12 settings, it can apply to large-scale assessments with associated high stakes such as those taken under standardized conditions by all students in a particular grade, district or state. It can also apply to assessments that contribute to an end-of-unit or end-of-course grade that are controlled at the school or teacher level. In either case, the assessment can be thought of as summative. In other words, summative assessment is a measure of learning at a particular point in time. This type of assessment data is static and can be used to make judgments about student learning of the curriculum, but because of when the data are collected it allows for very limited opportunities to further influence learning.

By contrast, another type of assessment, formative assessment, *takes place before or during the instruction* with the explicit purpose of eliciting evidence that can be used to improve the current learning. One widely accepted definition of formative assessment describes it as a classroom-based process in which students and teachers collect evidence of learning in order to understand current learning progress and to make adjustments to learning or to teaching as necessary (CCSSO, 2008; Black, Harrison, Lee, Marshall, & Wiliam, 2003). Such adjustments could include the development

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of a new learning experience that specifically addresses concepts that students struggled with, tailoring classroom questions to reveal why a particular concept was difficult, the provision of peer or teacher feedback to support revisions of student work, and asking students to evaluate their learning progress to identify strengths and weaknesses. Each of these adjustments can be structured in several ways in order to target individual students, small groups, or the entire class. These adjustments or "interventions" can in some cases be seamlessly woven into the instructional flow, while in other cases a teacher may need to review the assessment evidence and make adjustments while preparing for the next lesson.

Need for professional development …

Regardless of how one enacts quality formative assessment, the focus will always be on promoting learning by targeting teacher (and peer) support for specific student needs. For formative assessment to be effective, classroom practices that assume students simply learn what the teacher presents to them must be interrupted and replaced with a process that tailors support to student learning needs. For example, when teachers become more aware of students' learning progress, and in some cases their struggles in learning, the next step in the process requires action from the teacher to help students either overcome the struggles or reach even higher. That action may require the teacher to change future lesson plans to spend additional time on those areas with which students are struggling or with those students who are struggling, and the additional collection of follow-up evidence to determine whether the action taken was successful. Furthermore, while some changes can be made during the planning of subsequent lessons, other times a teacher may need to make changes to instructional plans during a lesson itself. Teachers need a wide repertoire of strategies for eliciting evidence, the knowledge to fit student responses into a larger schema of appropriate responses and common errors or misconceptions, and a range of follow-up strategies for taking action either between lessons or during a lesson. *Professional development must therefore be an important component of any approach that seeks to increase the effective use of formative assessment.* To be successful, professional development should help teachers develop an understanding of how to collect, analyze and interpret evidence of student learning, how to make strategic adjustments, and how to provide feedback to support this learning.

… and more research

Implementing formative assessment may require changes on the part of both teachers and students. The nature of these changes, how they interact with other classroom processes, and the knowledge and skills required is not fully understood; *hence the need for ongoing formative assessment research* around questions such as these:

- What kinds of assessment, domain, and instructional knowledge do teachers need in order to engage in formative assessment?
- What kinds of assessment, domain, and instructional knowledge do teachers need in order to interpret and act in appropriate ways on evidence of student progress?

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- How do we help teachers vary the quantity or nature of evidence of student learning according to the kinds of inferences they want to make?
- How do teachers develop classroom routines to help them process evidence on the fly from students?
- What kinds of assessment tasks can support teachers in collecting and analyzing quality evidence?
- What kinds of feedback do teachers need in order to improve the quality and frequency of formative assessment in day-to-day practice? And how can that feedback be provided in order to be most effective?
- How can pre-service education prepare beginning teachers so that they have a formative assessment mindset and are equipped with appropriate tools, knowledge, and strategies?

Research on formative assessment at ETS

Three aspects of current ETS research relate to formative assessment: research projects that focus on the nature of tasks and materials to support teachers' use of formative assessment, research projects that examine features of professional development that support teachers' changing practices, and research projects that focus on the design of classroom observation protocols that identify and support the use of formative assessment practices.

1. *The nature of tasks and materials to support teachers' use of formative assessment*

This area of research investigates assessment tools that can support and strengthen a successful enactment of the formative assessment process by both teachers and students. It does so by focusing on content-rich tools that support the elicitation and analysis of evidence of student learning. There is a growing body of literature that highlights content knowledge as a critical construct for the effective implementation of the formative assessment process. Such knowledge is critical to the development and selection of tasks that provide meaningful information. It is also crucial for the ability to analyze evidence from student responses to those tasks, and finally, for the ability to draw appropriate inferences about where the students stand according to the analysis, and then choose instruction suitable for the next steps (Bennett, 2011; Coffrey, Hammer, Levin, & Grant, 2011). This makes it necessary for ETS to learn how to support teachers in the content-heavy aspects of formative assessment.

Providing access to assessment resources, which teachers can incorporate directly into their instructional practice, generates one critical point of leverage. Those resources need to be educative by themselves — that is, they should educate teachers by demonstrating good formative assessment practices, both in the content of the tasks and through support materials that provide descriptions or contexts of use. These content-specific resources address some of the concerns that a "domain-independent" approach to formative assessment is not sufficiently robust to maximize the impact on student learning. These resources also address

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the need to increase or integrate content knowledge for teaching (CKT) with formative assessment, especially in feedback loops (Coffrey, Hammer, Levin, & Grant, 2011; Bennett, 2011). Finally, the resources are a response to calls for embedding formative assessment in the curriculum and including classroom tasks and support materials that are domain specific (Sheppard, 2006, 2008; Shavelson, 2008).

One example of this work was a project[2] funded by the Institute of Education Sciences (IES) that focused on the role of diagnostic questions built around common student misconceptions in mathematics and science. These diagnostic, multiple-choice questions were designed to be used as single questions during instruction. They were to act as catalysts for classroom discussions by providing insight into a particular aspect of student thinking at the start of a discussion, or to assess student understanding during the discussion. The targeted questions provided assessment information to the teachers and students at key segments of a lesson, while echoing the educative role mentioned above by highlighting common student misconceptions (Wylie & Ciofalo, 2008).

More recent work in this area originated with the *CBAL*™ Initiative (Cognitively Based Assessment *of*, *for*, and *as* Learning — see the next section) and grew into another IES-funded project[3] that focuses on the role of *learning progressions* in task design.

> Learning progressions are defined in CBAL as "a description of qualitative change in a student's level of sophistication for a key concept, process, strategy, practice, or habit of mind. Change in student standing on such a progression may be due to a variety of factors, including maturation and instruction. Each progression is presumed to be modal, i.e., to hold for most, but not all, students. Finally, it is provisional, subject to empirical verification and theoretical challenge."[4]

This definition aligns with work outside of ETS on learning progressions (Heritage, 2007; Clements & Sarama, 2004; Fuson, Carroll, & Drueck, 2000). For example, one learning progression (Rittle-Johnson, Taylor, Matthews, & McEldoon, 2010) focuses on how students understand the equals sign. There are three levels of understanding highlighted in this progression: *At the basic level*, students see the equals sign as an operation signal telling them that they need to do something, such as add or subtract. While students can make sense of a number statement such as 7 + 4 = __, they are confused by the mathematically identical statement __ = 7 + 4. *At the intermediate level*, students recognize that the equals sign signals balance between the two sides of an equation; *at the highest level*, students understand that they can maintain balance within an equation by performing the same operation to both sides.

[2] Grant reference R305K040051.
[3] Grant reference R305A100518.
[4] **http://elalp.cbalwiki.ets.org/Outline+of+Provisional+Learning+Progressions**

"The current political climate is ripe with opportunities to change instructional practices. The development of the Common Core State Standards and the work of two national consortia (Smarter Balanced and The Partnership for Assessment of Readiness for College and Careers) are changing the expectations for student learning and the way learning will be assessed."

One might ask how learning progressions support formative assessment. One way to characterize the formative assessment process is to think of it as allowing teachers to answer three questions:

1. What are the learning goals for my students?
2. Where are the students right now with respect to those goals?
3. How can I close the gap between where they need to be and their current location? (Ramaprasad, 1983; Wiliam, 2004).

Learning progressions directly support the first two of these questions, and to some extent the third. In terms of understanding where students are headed, learning progressions provide both *long-term goals* through the full scope of the learning progression, and *near-term goals* by offering a way to characterize students' current level of understanding and the next appropriate step. Assessment tools built around learning progressions can then be used by both students and teachers to inform their understanding of students' current learning, and to plan instruction that can move their understanding along the progression. Finally, learning progressions can help close the gap between the students' current and intended learning by providing clear descriptions of the conceptual jumps needed to move between levels of learning. This articulation of key ideas will help teachers identify what to do or to focus on in order to close the gap between intended and current learning (Arieli-Attali, Wylie, & Bauer, 2012).

A current IES project (Arieli-Attali, Wylie, & Bauer, 2012) focuses on the development and collection of preliminary validity evidence for two forms of formative assessment, along with a study of how teachers might use these assessments. *The first* form is an online locator test, which a teacher would use at the start of the year to get evidence of students' standing with respect to a number of related learning progressions. *The second* form uses incremental tasks that focus on the transition between two levels in a specific learning progression. These tasks can be used to collect more targeted evidence of student thinking and to help move students from one level of the learning progression to the next. A teacher can individualize the use of incremental tasks, since different students will be at different transition points within a learning progression. Future work will focus on understanding how to support teachers' use of these resources as part of their ongoing formative assessment practices, along with gathering additional validity evidence for the learning progressions used in the study.

2. *Professional development that supports changes in teaching practice*

This area of research examines forms of professional development that are necessary in order to support changes in teaching practice, especially changes in formative assessment practices. In this research, we seek to understand what types of support teachers need to increase the quality and frequency of formative assessment in day-to-day instruction. Research has shown that teachers who attend a one-off professional development workshop, or are merely provided with new instructional materials, make few changes to their practice (e.g., Desimone, Porter,

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Garet, Yoon, & Birman, 2002; Ingvarson, Meiers, & Beavis, 2005). These findings indicate that it may not be enough to provide materials and tasks for these changes to happen, which means that teachers will need support and ongoing professional development.

Existing research identifies core characteristics of professional development programs that are linked to changes in teaching practice (Darling-Hammond et al., 2009; pp. 9–11). These characteristics include professional development that is:

(1) intensive, ongoing, and connected to practice,

(2) focused on teaching and learning of specific curriculum content,

(3) aligned with school improvement priorities and goals, and

(4) aimed at building strong working relationships among teachers.

These characteristics align well with a more recent publication that describes *job-embedded professional development* (Croft, Coggshall, Dolan, Powers, & Killion, 2010). The authors consider it critical that job-embedded professional development is grounded in day-to-day teaching practice, is designed to enhance the teachers' content-specific instructional practices, is based in the school or classroom, is integrated into the workday, and requires collaborative inquiry-based work focused on solving authentic and immediate problems related to teaching and learning. This implies that it is not enough to expose teachers to new ideas and resources (e.g., rich formative assessment tasks) for them to change practice. *They must also be provided with ongoing time to practice, reflect, and adjust to new routines*.

The current political climate is ripe with opportunities to change instructional practices. The development of the Common Core State Standards and the work of two national consortia (Smarter Balanced and The Partnership for Assessment of Readiness for College and Careers) are changing the expectations for student learning and the way learning will be assessed. Both consortia plan to use the Common Core State Standards, newly developed assessment components, and data from the assessments to inform and direct instruction in positive ways. Both also recognize the importance of formative assessment and professional development in this process, but the current approach values the provision of model tasks, sample assessments, and student data, *while paying less attention to ongoing professional learning*. Critics of the current approach point to the need for a greater emphasis on the process of formative assessment (Heritage, 2010) and additional professional development (Hirsh, 2012) in order to fully harness the value of the Common Core State Standards and the potential impact that effective formative assessment can have on student learning.

ETS is responding to this need in several ways. *First*, a number of research projects have studied how professional development can be used to increase teachers' use of formative assessment strategies across content areas. We have, for example — in a project focused on the creation of effective and scalable professional development for teachers — investigated the structures, focus, and materials needed in order to engage teachers in meaningful ways with formative assessment

(Lyon & Wylie, 2009; Wylie, Lyon, & Mavronikolas, 2008). We also have investigated the types of support schools and districts need when working to provide time for teachers to participate in the *learn-practice-reflect-revise cycle,* which is necessary for changing teaching practice (Wylie & Lyon, 2009). Finally, in a project funded by the Bill & Melinda Gates Foundation, we have examined the implementation and impact of a two-year professional development program on teachers' knowledge and practice of formative assessment (Lyon, Wylie, & Mavronikolas, 2011). Across these studies, we found that teachers can change their teaching practice in ways consistent with a process view of formative assessment as long as they are provided with information, structures, support, and sufficient time.

Second, ETS has initiated research centered on the necessary professional development to support teachers' use of a combination of formative assessment strategies and content-rich formative assessment tasks. The CBAL Initiative (Bennett & Gitomer, 2009) has components that include formative assessment, summative assessment, and professional support that align with many of the specifications required by the two assessment consortia. The CBAL assessments are grounded in a rich, research-based framework that hypothesizes how students learn core skills over time. These frameworks include learning progressions and can be mapped back to the Common Core State Standards. The CBAL Initiative also includes a set of summative assessments designed as a series of authentic activities that reinforce and enrich learning, and can be used to document students' progress with respect to core skills. Next — and most relevant to this conversation — CBAL includes a series of formative tasks that are closely aligned to the summative assessments. Finally, the CBAL Initiative has begun to investigate the types of support necessary to ensure a deep understanding and implementation of the entire system.

The professional support for the CBAL formative assessment tasks has been, to date, conceptualized in two ways that are both consistent with the literature. *The first approach* occurs in two phases: *Phase one* includes intensive initial learning and *phase two* includes context-specific, job-embedded, ongoing learning. This format is currently being implemented in several pilot sites where participating teachers attend an initial summer workshop and then participate — sometimes with developers — in periodic communities of practice to discuss implementation, reflect on practice, and revise both the tasks and teaching practice. The initial workshop provides an overview of a wide range of topics that a teacher may need help with, assuming that supporting materials (e.g., teacher handbooks) will fill in the gaps and then provide a resource that they can return to during the year. *The second approach,* which is currently being conceptualized, is more targeted. It begins by articulating the knowledge base teachers need to use the CBAL tasks in support of their formative assessment process: pedagogical knowledge, content knowledge, and content knowledge for teaching. Gaps in any part of this knowledge base can become stumbling blocks to the proper implementation of formative assessment. Such gaps could be addressed through a series of short, targeted videos along with suggestions on how to facilitate subsequent school based development opportunities (e.g., coaching, peer observations, learning

communities). With this approach, teachers can get targeted support for those areas that are specific to their individual needs, although we need more research on the best ways to help teachers identify learning opportunities that match their needs. Future work will focus on how to balance issues of scalability of professional development with the need for customization and differentiation among teachers. The role of technology and the use of virtual learning communities may provide opportunities for teachers to work with colleagues who have similar needs or development foci. Understanding how to effectively use such technologies will be critical.

3. *Classroom observations with a formative assessment focus*

This area of formative assessment research addresses classroom observations and teacher behavior. There are many classroom observation protocols available. Some focus on teaching particular content areas (The Mathematical Quality of Instruction, or MQI, developed at the University of Michigan and Harvard University; The Protocol for Language Arts Teaching Observation, PLATO, developed at Stanford University), while others take a more neutral approach to content when describing quality teaching (Danielson, 2011; Pianti, LaParo, & Hamre, 2008). There are aspects of teaching practice that cut across these protocols, but each one represents a particular set of values or perspectives. One could, for example, focus on teacher and student interactions, or alternatively on the quality of the teacher's discussion of the content and how he or she uses multiple representations of content ideas. The various approaches could lead to different views of the quality of the observed instruction.

Some protocols for classroom observation ignore formative assessment since it was not part of the lens through which they viewed quality teaching and learning (e.g., CLASS) while others include assessment as one of multiple aspects of instruction (e.g., Danielson's Framework for Teaching observation protocol).

It is critical — for several reasons — to develop an *observation measure* that specifically supports the practice of formative assessment. We must, to begin with, be able to determine *whether a particular approach will have an impact on classroom practice*. Such judgments require reliable classroom measures that can supplement teacher or student self-report measures. It is, second, *crucial to express quality as observable characteristics* when defining the practice of formative assessment. These definitions allow observers to not only identify the use of formative assessment but make a judgment regarding the quality of the formative assessment. We must finally have *a quality protocol for formative assessment* if we are to improve teaching quality. The research literature tells us that formative assessment can have a positive impact on student learning when applied consistently and with fidelity, but that teachers are not yet utilizing formative assessment to the fullest extent possible (Wylie & Lyon, 2012).

An observation protocol focused on formative assessment could provide a shared definition of formative assessment, specify how it would play out in practice, and can lead to opportunities for teachers to receive feedback on this critical aspect

of their classroom practice. Currently, teacher evaluation is receiving considerable attention, and classroom observations are an important part of many, if not most, of these evaluation systems. As we noted elsewhere,

> *... we recommend that schools and districts examine the classroom observation protocols that they are currently using to determine whether feedback based on a classroom observation rated by the protocol would include clear feedback on the use of formative assessment. We hypothesize that until teachers are consistently given feedback that unambiguously addresses their formative assessment practices, improving their formative assessment practices may be a low priority"* (Wylie & Lyon, 2012).

Once observation protocols are in place, we can then investigate the type of feedback, the conditions under which feedback is provided, and whether the effectiveness of the feedback is impacted by the role of the provider in order to understand how most effectively to support teacher improvements in this domain.

The authors of this article are currently engaged in a small project for the FAST SCASS (Formative Assessment for Students and Teachers, State Collaborative on Assessment of Student Standards), which is a working group under the auspices of the Council of Chief State School Officers (CCSSO). The goal of this project is to develop an observation protocol for formative assessment practices. The primary purpose of this observation protocol is to generate formative feedback that supports the improvement of formative assessment practices. We are using the FAST SCASS definition of formative assessment and the attributes of effective formative assessment (McManus & CCSSO, 2008) to develop a set of classroom behaviors (CCSSO, 2008). These behaviors can be used for teacher self-evaluation, to guide peer observations, and to develop student surveys of practice. We recommend a brief teacher post-observation interview to illuminate or clarify some *high-inference behaviors*, since aspects of the teacher's decision-making process may not always be observable, or occur during the course of a single lesson. This protocol will be piloted by FAST SCASS members and feedback will be used to inform a revised version. Future work may involve a study that investigates the use of this protocol as part of a teacher's improvement or professional development plan, or to guide discussions in learning communities.

Conclusion/Discussion

Although ETS may be best known for producing tests that impact high-stakes decisions, we also are conducting research focused on formative assessment. The field itself is beginning to move beyond defining and describing what formative assessment practice is, and is now more focused on supporting the development and refinement of formative assessment practices. We are contributing to this body of work through the creation of quality assessment tools that teachers can use during instruction to support the collection of evidence of student learning, exploration of a variety of professional development approaches that support the development

and deepening of teachers' formative assessment practices, and the development of instruments to define and measure the effectiveness of these tools and approaches.

Next steps for this work may include research that cuts across the three strands discussed above. For example, feedback can play a role in the use of quality assessment tools, as can professional development designed to increase the quality and frequency of formative assessment, and the use of observation protocols. While more is understood about how students receive and act on feedback, less is known about the impact of feedback on teachers' practices. How can professional development approaches provide teachers with feedback? What types of feedback are provided by observation systems? Are specific types of feedback more effective in changing teacher practice? In addition, as technology-enhanced assessments become more common, we will need to explore teachers' roles in interpreting student results and the value of automatically generated feedback. Teachers will need to not only understand and interpret the information but also determine which feedback to share with students, how to share the feedback, and how to help students interpret feedback from the system. Finally, we will need to explore more fully the role of learning progressions in a variety of projects and contexts: What is the appropriate grain size or amount of detail for a level within a learning progression? How can we efficiently collect validity evidence to support new learning progressions? What professional development is needed to help both teachers and students make optimal use of them? How can they best be used to inform assessment design?

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