**Laboratory for Educational Assessment Research and InnovatioN (LEARN)**
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**Description of Project**
This proposed project will be guided by the following research questions: 1) What critical dimensions and attributes define high quality student-engaged formative assessment practices within middle-level mathematics classrooms? (2) What measures can provide valid and reliable information about high quality student-engaged formative assessment practices? (3) What are the characteristics of the classroom-settings (resources, organization of resources, and social processes), that promote high-quality student-engaged formative assessment practices?

**Theoretical and Empirical Rationale**
This project focuses on the development and technical evaluation of measures of quality student-engaged formative assessment practices. Classroom assessment is formative when information generated by assessment (formal or informal) is used by educators to adjust instruction with the intent of better meeting the needs of students and provide information to students that shapes their actions (Black & Wiliam, 1998; Popham, 2006, 2008; Sadler, 1989). Bell and Cowie (2001) described formative assessment as including three distinct types of activity: (1) gathering information about learning, (2) analyzing/interpreting the gathered information about learning, and (3) acting-on/using this information with the intention of improving student learning. Formative assessment practices are those classroom-based strategies that support or help to carry out one or more of these activities.

In a meta-analysis, Black and Wiliam (1998b) identified five specific formative assessment practices including: 1) teachers sharing the criteria for evaluating learning with their students, 2) teachers providing students with descriptive (as opposed to evaluative) feedback, 3) students self-assessing, 4) student-to-student peer assessing, and 5) use of questioning in classrooms to learn about learning. In an implementation study conducted across six schools in the United Kingdom, a sixth practice emerged, 6) students’ formative use of summative test results (Black et al., 2003). Others have identified similar practices, (see for example, Nicol & Macfarlane-Dick, 2006; Rodriguez, 2004). These six practices are characterized as student-engaged when students are the ones gathering, analyzing/interpreting and/or acting on/using information about their own learning.

There is a growing body of evidence of a significant impact on student learning when teachers engage students in formative assessment practices (Black & Wiliam, 1998a; Crooks, 1988; Rodriguez, 2004; Torrance & Pryor, 2000). In their review of over 250 empirical studies, Black and Wiliam (1998b) showed that innovations that included strengthening formative assessment practices produced significant learning gains with effect sizes ranging between 0.4and 0.7; “among the largest ever reported for sustained educational interventions,” (Black, Harrison, Lee, Marshall, & Wiliam, 2003, p. 9). Studies reviewed by these authors showed that students who started the furthest behind gained the most (Black & Wiliam, 1998b). “Most reviewers of the Black and Wiliam meta-analysis conclude that both the caliber of methodological rigor employed and the high quality of the judgments used throughout render this important review worthy of our confidence,” (Popham, 2008, p. 20).
Despite the promise of student-engaged formative assessment practices as a facilitator of student learning and achievement, major gaps exist within the field and literature. First, there is an absence of technically sound instruments to measure the quality with which teachers engage in the process and practices of formative assessment in situ. Second, there is scant information about which formative assessment practices are used during instruction, the critical features of those practices, and how their implementation influences student learning. Third, too little is understood about the classroom-setting characteristics (resources, organization of resources, and social processes) needed to support formative assessment practices that are student-engaged. Through this proposed research project we seek to address each of these issues through the development of the measurement instruments necessary for researchers and practitioners to look inside classrooms to study student-engaged formative assessment practices and unpack how they operate in situ. This project stands to make a significant contribution to our understanding of the process and practices of formative assessment and the conditions necessary to support its implementation on a wider scale.

**Conceptual Framework**

The conceptual framework guiding this project builds on Tseng and Seidman’s (2007) theoretical framework for understanding social settings which includes three classroom-setting components (resources, organization of resources, and social processes, and setting level outcomes. We added a student outcome component. While all three components of the classroom-setting are important, social processes, including student-engaged formative assessment practices, are at the center of the system because the daily interactions between teachers and students have the greatest influence on student learning (Cohen, Raudenbush, & Ball, 2003; Tseng & Seidman, 2007). Since this project focuses on student-engaged formative assessment practices the framework also builds on the conceptual work of Brookhart (1997, 2004) and Nicol and Macfarlane-Dick (2006) which included: classroom assessment environment; student characteristics; assessment task characteristics; and student motivation, effort and achievement.

**Constructs**

**Resources.** In our model, the presence and organization of various resources within the classroom context are critical mediators of student engaged formative-assessment practices. The most critical resource mediating student-engaged formative assessment practices is teacher formative assessment practices (e.g. providing descriptive feedback rather than grades on assignments, asking students to assess their own assignments). Other resources include: formative assessment tools (e.g. student-created rubrics for writing assignments, sheets used by students to track the progress of their learning against classroom learning goals over time), students characteristics (e.g. student motivation/goal orientation), teacher expectations (e.g. do they make clear that all students are expected to meet the essential learning targets for the class), assessment tasks (i.e. the use of tasks that elicit different types of thinking from students and provide students opportunities to interpret responses), and student work (e.g. posting student work that exemplifies different aspects of a learning target).

**Organization of Resources.** Three key aspects of how resources are organized will also be considered: (1) social organization (e.g. how students are grouped or group themselves based on learning needs); (2) physical organization (e.g. learning targets and exemplars of student work posted on walls); and (3) time allocation (e.g. how much time is provided for student-engaged formative assessment practices).
Social Processes. The primary focus of this study will be on the six previously described student-engaged formative assessment practices. As part of these practices we will examine classroom participation norms, rules, and roles (including, the relationships between teacher-student, student-student; and patterns of participation; Tseng & Seidman, 2007). For example, at the classroom level, we will study the locus of responsibility for learning in classrooms. Locus of responsibility in the classroom has been operationally defined as the degree to which teachers involve students in decision-making (Ames, 1992). When teachers engage students in decision-making, cognition and responsibility for learning is both learner-centered and distributed across the classroom.

Outcomes. In the proposed conceptual framework, the outcomes are focused at the student level. We will consider two outcomes: the degree to which students have become agents in their own mathematics learning (e.g., students choose learning tactics that meet their needs) as well as improvements in student mathematics achievement.

Activities
Research Methods and Data Analysis Plan

We plan to employ a two-phased, mixed methods research design to this project. The RA requested through these funds will participate in the first phase of the project. A multi-site embedded case study approach will be taken to identify critical dimensions and attributes of high quality student-engaged formative assessment practices, and to describe the accompanying classroom activity system. Phase I will focus on the identification of the critical dimensions and attributes that define high quality student-engaged formative assessment practices. The RA will work with LEARN faculty to conduct classroom observations, collect video data over-time, conduct in-person student and teacher interviews, analyze classroom artifacts, and analyze student achievement data. During Phase II (in subsequent years), the analysis done during Phase I will be used to develop and then technically evaluate more affordable and easy-to-use surrogate measures of student-engaged formative assessment practices and the relevant aspects of middle school mathematics classroom-settings that support their use.

During Phase I we will employ a qualitative multi-site embedded case study design (Yin, 2003), with middle school mathematics classrooms as the unit of analysis. Through this design, multiple sources of evidence will be collected about each of eight middle-level mathematics classrooms based on a common case study protocol to establish a chain of evidence regarding the constructs of interest (Yin, 2003). This helps to establish both the validity of the constructs as well as reliability of the findings across cases. Analysis will follow the logic of replication, “analogous to that used in multiple experiments,” (Yin, 2003, p. 47). That is, the study will start with a series of propositions about high-quality student-engaged formative assessment practices within middle-level mathematics classrooms based on a review of the literature. Through an iterative process of comparing a case against the propositions, revising the statements, and then comparing the next case, a chain of reasoning will be established regarding the critical dimensions and attributes of student engaged formative assessment practices in middle school mathematics classrooms, as well as the critical aspects of the classroom activity system that contribute to practices being highly effective. This will help to establish the internal and external validity of the findings (Yin, 2003).

Data Collection. We will use a purposeful sampling strategy to select middle school mathematics classrooms where formative assessment practices are likely to be occurring (Heath, 1983, Morse, 1994; Patton, 2002; Ulin, Robinson, Talley & McNeil, 2002). The selected classrooms will come from a larger pool of over 200 educators who have received professional development on formative assessment
practices. Middle school mathematics classrooms will be identified in which student-engaged formative assessment practices and corresponding improvement in students’ learning have been previously observed and documented (Proctor, 2008; RMC Research, 2007). Initially, eight classrooms will be identified as rich cases that manifest high quality student-engaged formative assessment practices, the phenomenon of interest (see Patton, 2002; LeCompte & Schensul, 1999). Additional cases may be added if necessary to develop consistent patterns across cases using the logic of replication described above (Yin, 2003). Data collection will include: over-time video-taping of classrooms, direct classroom observations, analyses of classroom artifacts, in-person student and teacher interviews, and gathering of student test data.

Data Analysis. Data will be analyzed using coding systems that will illuminate the student engaged formative assessment practices evident in these classrooms, and the social process and tools employed as part of the practices. We will build on coding systems developed and tested in previous studies focusing on formative assessment (Ruiz-Primo & Furtak, 2006, 2007; Sands, O’Brien & Ruiz-Primo, 2009). These data will also allow us to confirm the setting- and student-level outcomes from these practices. Inter-rater agreement in the coding process will be evaluated using Cohen’s kappa. We expect that careful coding and analysis across the components of the classroom activity system will lead to the identification of the critical aspects that determine the quality of student-engaged formative assessment practices.

Timeline
Along with LEARN faculty, the Research Assistant will begin to collect data from the beginning of the Fall, 2010 school year and continue through the end of academic year. We will begin by capturing daily video clips of mathematic instruction. This will be augmented by classroom observation at least once per month. Year-long data collection will help to capture both how educators “set-up” these practices with a new class of students, and how the practices change over time. Interviews of teachers and students will be conducted twice throughout the year. Data analysis will parallel the timelines of data collection and continue through the summer of 2010.

Expected Final Products Outcomes
If funded, this first year of research will lead to a set of draft tools with which we will then move to the second phase of the research project. Over time, this line of research will lead to the following planned products: 1) Benchmark measures of student-engaged formative assessment practices, and the resources and social processes that support those practices; 2) Surrogate measures; 3) Technical reports on both the benchmark and surrogate measures; and 4) A manual detailing how to use the surrogate measures, the resources needed to implement each instrument, training required, and number of observations needed to obtain dependable measures. The manual will guide and facilitate self-reflection among practitioners as they implement these practices in their classrooms. Our goal is to develop instruments that are not only affordable and scalable, but also guide teachers in their everyday instructional practice.