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The Common Core Standards for Mathematical Practice: Teachers' Initial Perceptions and Implementation Considerations

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Abstract

Teachers' responses to surveys involving two prompts after their first in-depth reading of the Standards for Mathematical Practice (SMP) in professional development settings are reported. Specifically addressing calls for research on how teachers are viewing their role in the implementation of the Common Core State Standards for Mathematics, and in particular the SMP, these data highlight what terminology teachers potentially focus on in reading the descriptions of the SMP. Additionally, the data highlight the roles that teachers envision themselves taking as they plan for and implement the SMP in their classrooms. We provide analysis of the teachers' responses, as well as discussion and suggestions for mathematics education leaders as they engage classroom teachers and other leaders in considering the implications for implementing the SMP with respect to student and teacher classroom roles.

The Common Core State Standards of Mathematics (CCSSM) have been established as a guide for mathematics education in the United States. This curriculum framework defines "what students should understand and be able to do in their study of mathematics" (Common Core State Standards Initiative [CCSSI], 2010, p. 4). As of this writing, "forty-five states, the District of Columbia, four territories, and the Department of Defense Education Activity have adopted the Common Core State Standards" (CCSSI, 2014). Largely influenced by both the National Council of Teachers of Mathematics' process standards (NCTM, 2000) and the National Research Council's report *Adding It Up* (NRC, 2001), the CCSSM articulates eight Standards for Mathematical Practice (SMP) that "describe varieties of expertise that mathematics educators at all levels should develop in their students" (p.6). In describing this expertise, the beginning three words of each of the eight SMP are, "Mathematically proficient students." This phrasing is supported by a paragraph for each standard explicating what students are to do in their mathematical experiences to develop the necessary proficiency related to each SMP.

The SMP are listed in Table 1 (next page), and for brevity, only the title of each standard is given. Although the SMP describe proficiencies students should develop, little is said regarding how teachers should facilitate and develop these proficiencies with their students. However, standards documents addressing the teaching of mathematics to develop similar proficiencies have been published within the past quarter century (NCTM, 1989, 1991, 2000). In particular, researchers have investigated the degree of teacher awareness of the various previous NCTM standards documents, and the alignment between standards and teachers' beliefs (LaBerge, Sons, & Zollman, 1999; Markward, 1996; Mudge 1993; Perrin, 2012; Zollman & Mason, 1992). These studies indicated that there was a broad range with respect to teachers' awareness and familiarity of the NCTM standard

Table 1: Standards for Mathematical Practice

Standard for Mathematical Practice #	Title
1	Make sense of problems and persevere in solving them.
2	Reason abstractly and quantitatively.
3	Construct viable arguments and critique the reasoning of others.
4	Model with mathematics.
5	Use appropriate tools strategically.
6	Attend to precision.
7	Look for and make use of structure.
8	Look for and express regularity in repeated reasoning.

documents. Furthermore, in examining the alignment between the philosophies implied by the standards and teachers' beliefs, the studies found varying degrees of alignment with the NCTM standards documents. However, with the recent publication of the CCSSM, studies of teachers' understandings and perceptions of the CCSSM in general, and SMP in particular, with regard to their influence on teachers' professional practice are only emerging or nonexistent (see, Heck et al., 2011).

Consequently, we utilized professional development opportunities to conduct research specific to the CCSSM and SMP to inform our own professional development practices. In particular, we endeavored to ascertain what teachers of mathematics glean from initial readings of the SMP. In order to engage teachers in professional development related to the CCSSM and the SMP, we initially must know what the teachers identified in their initial reading of the SMP, and how they believe they can implement, or are implementing, the ideas outlined therein. In this paper, we present our findings and discussions based on our research related to the following two questions:

1) When teachers initially read the SMP, what do they report as noteworthy?

2) When teachers initially read the SMP, what aspects of each standard do teachers identify as influencing their intentions to address the SMP in their instruction?

The analysis of teachers' responses to the prompts given to the teachers provides a measure of what was viewed as noteworthy and what aspects they see as influencing their intentions to implement SMP. The wording of these research questions is mirrored by the questions for which the teachers were asked to self-report.

Recent Recommendations for CCSSM and Standards Research

Our research questions and analysis of data were informed through examining policy documents that offered timely perspectives related to the release of the CCSSM. Research on the CCSSM, implementation thereof, and effects on teachers' practice and student outcomes are identified as key areas in reports, and by various national organizations. In mid-2010, NCTM, the National Council of Supervisors of Mathematics (NCSM), the Association of State Supervisors of Mathematics (ASSM), and the Association of Mathematics Teacher Educators (AMTE) released a joint public statement on supporting the implementation of the CCSSM. In this public statement, these organizations "strongly encourage and support both research about the standards themselves (e.g., research on specific learning trajectories and grade placement of specific content) and their implementation" (NCTM, NCSM, ASSM, & AMTE, 2010, para. 5).

In identifying areas for such research, Heck et al. (2011) pointedly noted that the NRC framework (2002), developed for investigating the influence of standards documents, foundationally acknowledges that standards documents "are unlikely to have a direct impact on student learning, but come to influence teaching and learning by first influencing key components of the education system, including curriculum, assessment, and teachers" (p. 2). Building on the NRC framework, Heck and colleagues outlined a priority research agenda specifically for understanding the influence and implementation of the CCSSM. In their report, Heck et al. described four areas of research study: case studies, investigations of relationships, status studies, and studies to improve the standards. Within each of these areas, they provided a variety of study types and foci. For example, they identified five priority areas for case studies, four for investigations of relationships, and four for status studies, while no specific priority is given for studies to improve the standards. Our work is situated in Priority Case Study Focus #5: Teacher responses to the

CCSSM, the only priority area dealing directly with teachers. This focus area outlined the following.

Since teachers' knowledge, interpretations, self-efficacy, beliefs, dispositions, and skill, as well as their specific intentions and plans, affect what transpires in classrooms, it is critical to understand how teachers respond to the CCSSM, and what kinds of classroom learning opportunities for their students result. (Heck et al., 2011, p. 13)

Within this priority case study focus, the research and discussions presented in this paper largely align with the following areas that Heck et al. outlined to focus studies undertaken to investigate teacher responses to the CCSSM: "What implications do teachers see for their mathematics instruction? What aspects of their mathematics instruction do they see as validated by the CCSSM, and what aspects do they consider in need of change based on the CCSSM?" (p.13). Our work represents teachers' initial full reading of the SMP. In particular, our first research question aligns with identifying potential aspects of their instruction that the teachers feel are either validated by the SMP or needing of change (vis-à-vis the language of "eye catching"). Our second research question aligns with teachers self-identifying the implications the SMP have for their instruction (vis-à-vis the language of "influencing intentions"). Although not a word-for-word reproduction of Heck et al.'s language, the research and discussion presented here provide baseline data of how teachers perceived (and potentially continue to perceive) the SMP as affecting their mathematics instruction.

Methods

A total of 23 teachers participated in this study. Each teacher participated in one of two different in-service professional development (PD) settings. There was variation in the grade levels self-identified as the teachers' primary teaching responsibility, the range spanned Early Elementary (K-2) through College or University. However, 17 of the 23 teachers reported primary teaching responsibilities at either the middle school (5) or high school level (12). All teachers had at least one year of prior experience teaching in the same large urban district[1]; however, demographic information with regard to specific school building assignments in the district was not gathered.

In each PD setting, the PD facilitator surveyed the participants with the sole purpose of gathering formative assessment data to inform the PD activities specific to the CCSSM. Before providing the participants with the portion of the CCSSM document containing descriptions of the SMP, the sentiment expressed by all of the participants in each setting indicated that *not one participant* had more than briefly skimmed the SMP descriptions. As such, each participant's "familiarity" with the SMP was considered as "not read" (as defined by Perrin, 2012). The participants in each setting first read the descriptions of the eight SMP, the titles of which are listed in Table 1. The full descriptions of the SMP that the participants read can be found on pages 6 through 8 of the CCSSM document (CCSSI, 2010). The participants were instructed to read, and were observed reading, each SMP description in its entirety. Sufficient time was provided for participants to read the three-page document and to formulate appropriate responses to two prompts: Prompt 1 – *Name one or two things that caught your eye as you read the standard*; Prompt 2 – *What is one way you are, or plan on being, more intentional about this standard in your teaching?* Participants responded anonymously (by way of a Google Form) to these prompts. Given the context as described here, we believe the responses presented in this paper reflect the perspectives of in-service teachers' initial complete reading of each SMP.

During the PD experiences, the facilitator immediately used the data he had gathered in real-time through the Google Form to engage the participants in discussions centered on the anonymous responses. The discussions generated by the facilitator's formative use of the data were informative for both the participants and facilitator. These discussions led the facilitator to engage in subsequent discussions with colleagues, and upon further examination of the data collected, led to a deeper investigation of the literature.

Using our research questions to guide our data analysis, we compiled and qualitatively examined each participant's response. Analysis of participants' responses to the two prompts was conducted using Grounded Theory principles (Strauss & Corbin, 1998) in which primary analysis and coding focused on identifying emerging and cross-cutting themes that were later reorganized and further classified.

[1] 2012-2013 Ethnic distribution for Grades PreK-12 for the district has been reported as follows: Hispanic (43.4%), Caucasian (30.2%), African American (12.0%), Asian (6.6%), and Other (7.8%).

Table 2: Classifications and Counts of Responses for Prompt 1

Standard for Mathematical Practice	Classification	Number of Times Identified
1. Make sense of problems and persevere in solving them	Making Sense; Checking Answers; Persevere; Explaining (Ability to)	8 7 7 4
2. Reason abstractly and quantitatively	(Coherent) Representations; Meaning of Quantities; Abstract Thinking/Reasoning; Contextualize/Decontextualize	7 7 5 4
3. Construct viable arguments and critique the reasoning of others	Listen/Read/Ask; Distinguish Correct and Flawed logic; Justify Answers/Conclusions; Construct Arguments; Critique	7 5 4 3 3
4. Model with mathematics	Solve Problems in Everyday Life; Assumption, Approximation, Revision	10 5
5. Use appropriate tools strategically	Consider tools; Tools to Deepen Understanding; Use Tools Strategically	10 5 5
6. Attend to precision	Definitions and Symbols; Precision; Carefulness	10 9 5
7. Look for and make use of structure	Patterns, Structures, Connections; Auxiliary Line; Respondent Provided Specific Example	13 3 3
8. Look for and express regularity in repeated reasoning	Repeated/Repetition; Shortcuts; Maintain Oversight of Process	13 6 5

For reliability purposes, one member of our team conducted initial analyses, and the two other team members conducted secondary analyses of the emerging themes, codes, and classifications defined in the initial analysis. Any discrepancies among the three analyses were discussed and reconciled through face-to-face and electronic communications. Reconciliation efforts were specifically focused on further defining and refining classifications of themes that emerged from the teachers' responses to the two prompts.

Due to the degree to which the SMP descriptions vary, emerging themes and codes for participants' responses for Prompt 1 were classified for each individual SMP. Conversely, although the standards differ, participants' responses to Prompt 2 related to how they intended to implement the SMP were such that emerging themes were categorized by one overarching classification scheme for all eight SMP.

Results

Classifying Responses to Prompt 1

In examining participants' responses to Prompt 1 – *Name one or two things that caught your eye as you read the standard* – we determined that if a participant's response was categorized under two or more classifications, each was counted. In other words, in examining the data presented in Table 2, if a participant's response to SMP 1 mentioned ideas related to perseverance *and* making sense, then that one participant's response was counted under the number of times each of those was identified. The words used as

themes for the classifications in Table 2 are directly related to wording found in the description of each SMP. Counts were not recorded as to whether or not a response was unrelated to the standard, or if no response was made. Consequently, the total of the number of times themes were identified per standard is not always 23 (the total number of participants) in Table 2. For example, 24 themes emerged and were cross cut, linked, and categorized into the three classifications for SMP 8. For SMP 4, 5, and 7, we were only able to classify emerging themes totaling 15, 20, and 19, respectively. This perceived lack of response was most often indicative of responses that simply did not address the standard. However, overall, many of the phrases and verbiage found in the SMP descriptions appeared to strike teachers as noteworthy.

Classifying Responses to Prompt 2

Two overarching constructs emerged as themes in examining participants' responses to Prompt 2 – *What is one way you are, or plan on being, more intentional about this standard in your teaching?* – student oriented versus teacher oriented perspectives of teaching. In other words, participants' plans for implementing the SMP in their teaching practices were classified as either an action a participant was personally going to take to modify a practice in teaching mathematics (teacher oriented), or an action a participant was going to take to modify practices of students in learning mathematics (student oriented).

The student-oriented responses were further classified into two categories. A "student allowance" action (SOA) is a

Table 3: Classification Categories for Prompt 2

Classification Category	Example Participant Responses per Classification
0. No response or response did not address Prompt 2	Quantitatively is the easy part, thinking abstractly is the harder part. This seems like an oxymoron.
1. SOA – Student Oriented, Allowances	Allow students to develop reasoning and concepts through problem solving and exploring a variety of contexts. Giving my students more time to struggle with and interpret the meaning of problems themselves. Allow students to develop their own thoughts despite the scary paths they may travel.
2. SON – Student Oriented, Need, Self-Action, Student Responsibility	Making sure that students understand symbols and equations in order to be able to read problems and translate into mathematical equations. Students don't often realize the importance of details. They need their eyes opened to the repercussions. Students must know all aspects of a problem and not just a few cases.
3. TOA – Teacher Oriented, Assessment	I will award and/or acknowledge students for partial success rather than all or nothing. Visualizing a concept is very important to understanding a concept and being able to visually diagram a concept is a step that must be completed and evaluated to ensure students are picking up the intended concept in the lesson.
4. TOP – Teacher Oriented, Pedagogical/Instructional	I will do all steps to the problems out loud and explain why I did the steps and what I was thinking. I plan on making sure that I find ways to connect what I am teaching to real world application. I will teach students to give "constructive" criticism. I need to stop giving students my answer so fast. Initially, I should model the problem solving steps I use to approach a problem.

teacher action oriented towards something the student would be allowed to do. A "student need, self-action, responsibility" action (SON) is a teacher intention to promote student action identified by the teacher as necessary to achieve a particular SMP.

The teacher-oriented responses were further classified into two categories. A "teacher assessment" action (TOA) is a teacher action that the participant would take to purposefully assess student progress towards an SMP, whether in a formative or summative manner. A "teacher pedagogical/instructional" action (TOP) is an action the participant intended to take specific to his or her instructional methods as related to the SMP.

Table 3 presents the four classification categories that emerged along with actual responses that were classified within each category.

In Table 4, we provide the counts for participant responses in each classification category. In some of the more lengthy responses, multiple themes emerged that allowed the response to be classified into two or more categories. Conversely, in a few instances a response did not address the standard or was left blank. Consequently, the total number of responses per standard in Table 4 is not always 23. Furthermore, as indicated by the Totals row in Table 4, a total of 205 separate themes within responses were classified into these categories.

Discussion

What Participants Identified as Noteworthy

When initially reading the descriptions of the eight SMP, the participants identified different noteworthy items. In fact, although the authors of the standards included key elements in each standard, the participants identified certain wording at the expense of other parts of the standard. For example, SMP 1 states that, "Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends" (p. 6). Interestingly, 4 of the 26 (15.3%) responses were categorized as Explaining (ability to). However, in our reading of the standard, the ability to "explain" in this standard specifically pertains to, and directly follows language related to "proficiency." In other words, nearly 85% of the responses did not identify this explicit proficiency oriented language as being particularly noteworthy for SMP 1.

Table 4: Counts Per Classification Category for Prompt 2

Standard for Mathematical Practice	Counts Per Classification Category					
	0. No	1. SOA	2. SON	3. TOA	4. TOP	Totals
1. Make sense of problems and persevere in solving them	0	8	6	2	15	31
2. Reason abstractly and quantitatively	1	2	6	3	15	27
3. Construct viable arguments and critique the reasoning of others	1	1	10	1	12	25
4. Model with mathematics	0	0	4	1	18	23
5. Use appropriate tools strategically	1	5	3	1	15	25
6. Attend to precision	1	1	3	4	17	26
7. Look for and make use of structure	3	1	4	0	17	25
8. Look for and express regularity in repeated reasoning	1	1	3	2	16	23
Totals	8	19	39	14	125	205
Percent Category of Overall Total	4%	9%	19%	7%	61%	

Interestingly with regard to SMP 2, responses mostly identified with either representations or the meaning of quantities. However, the constructs of contextualizing and decontextualizing were identified the least by the teachers in SMP 2. The use of representations to understand the meaning of quantities through the constructs of contextualizing and decontextualizing was recently identified as a key component to understanding SMP 2 (Olson & Olson, 2013).

Although many of the responses of noteworthy aspects of the SMP were interesting by the very nature of the variety of what participants identified in their initial reading of the descriptions, one term stood out in our analysis, shortcuts. Of the 24 responses to SMP 8, 6 identified shortcuts as a noteworthy aspect of this SMP. That is, one-quarter of the responses identifying noteworthy aspects of *look for and express regularity in repeated reasoning* focused on the notion of shortcuts. This is especially interesting in that for almost all of the discussion in SMP 8, the examples focus on the regularity in repetitive reasoning and how this may lead to a generalization of a mathematical idea. Perhaps this emphasis by some participants on shortcuts in SMP 8 could be a focus to better understand how participants' beliefs about the nature of mathematics obscure or reaffirm their mathematical interpretations of standards documents, and particularly more process-oriented standards such as the SMP.

Participants' Intentions in Implementing the SMP

Examining the data in Table 4, the number of responses coded as *Teacher Oriented – Pedagogical/Instructional* (TOP) is consistently larger than the number of responses for any of the other classifications. This focus on teacher-oriented pedagogical and instructional moves is perhaps not entirely unexpected. When implementing the standards, participants likely perceived the way in which they can bring SMP into the classroom is through controlling their instructional and pedagogical choices. However, these instructional choices are qualitatively different than the instructional choices that involve student-oriented actions, which are arguably more consistent with student-centered instructional choices. In fact, such teacher-oriented instructional actions were largely consistent with the first example statement for TOP in Table 3: *I will do all steps to the problem out loud and explain why I did the steps and what I was thinking.* That is, in general, the TOP category encompassed teacher actions that we identified as being analogous to a teacher stating, "I will do the mathematics I know for my students to illustrate how the SMP are important in mathematics learning."

Of the eight SMP, only two standards (SMP 1 and 3) involved responses coded for TOP that were less than 50% of the total responses for that standard. For the other six SMP, the percentage of total responses for the specific standard coded TOP ranged from 56% (SMP 2) to 78% (SMP 4). Overall, of the total number of responses, 61% were coded as TOP. That is, for the 205 distinct responses of how these teachers envisioned implementing the SMP, 61% of those responses (125 out of 205) involved teacher actions driven by what the participant intended to do in the classroom setting to show how mathematics learning involves the eight SMP.

Potential reasons for such identification with a TOP perspective might be best analyzed through the perspective of SMP 4. As noted, 78% (18 out of 23) of the responses for SMP 4 were coded for teacher-oriented pedagogical actions. SMP 4 is the standard that most discusses the importance of mathematical modeling as a process of doing and learning mathematics. Our interpretation of the data through our collective anecdotal experiences is that perhaps in their initial reading, participants envisioned that they are the ones responsible for modeling how to do mathematics in classroom settings. Similarly, if interpreted more as developing mathematical models to explain and predict phenomena in real-world settings, perhaps the participants still felt an initial compulsion to show students how such modeling is done through completing models and activities for the students as a way of exemplifying such processes. We interpret such compulsions as a likely by-product of the *apprenticeship of observation* (Lortie, 1975) that all teachers have experienced in their own lives as students of mathematics.

Similar feelings of needing to provide students with a teacher-oriented instructional perspective on learning mathematics through the SMP likely underpin responses to SMP 7 and SMP 8 that were coded as TOP. In particular, responses to each of these standards comprised 68% and 70% of the total responses for each of the standards, respectively. In other words, participants likely felt the need to show students the structure of the mathematics for which they should be looking (SMP 7), or to show them how regularity in repeated reasoning can lead to generalizations (SMP 8), and eventually "shortcuts" – the term identified by some of the participants as noteworthy.

Many participants' responses were categorized as student-oriented actions. Specifically, for SMP 1, 26% of the responses were coded for student-oriented allowances, and 19% were categorized as student-oriented need, self-action, and responsibility. That is, 45% of the responses to SMP 1 involved participants envisioning implementing the standard through a student-centered perspective. Perhaps SMP 1 allows for more student-centered implementation of the standards, as it is difficult to imagine how students will persevere and make sense of problems unless they are actively engaged in the learning and solving processes.

Lastly, 40% of the responses to SMP 3 (construct viable arguments and critique the reasoning of others) were coded as student-oriented need, self-action, and responsibility; 20% of the responses to SMP 5 (using tools strategically) were categorized as student-oriented allowances. In other words, in their initial reading, participants identified SMP 5 as a way in which they can allow students to take more ownership of their learning through the appropriate choice of tools; participants identified SMP 3 as a way in which they can promote student actions, and self-action, to take responsibility for constructing (for themselves) viable arguments and engaging classmates in critiques of mathematical ideas.

Through analyzing the participants' responses, we maintain that in their initial reading of the SMP, participants viewed some of the standards as more easily incorporated into student-centered learning environments. Furthermore, we also argue that participants' viewed other standards as perhaps more difficult to implement beyond direct instructional actions likely due to a myriad of reasons, not least of which is the way in which they experienced *modeling with mathematics, seeing structure in mathematical concepts, and were shown regularity in mathematical reasoning* throughout their own learning of mathematics content (i.e., the SMP viewed through the lens of their own apprenticeship of observation).

It is important to note that we are not arguing against or for the importance of teachers employing direct instructional actions versus student-centered actions in their classrooms to connect and provide meaningful exposition to introduce, augment, or summarize mathematics discussions. In fact, much literature exists on the importance of a variety of instructional approaches in mathematics classrooms, such as the Knowledge of How People Learn framework presented by the NRC (2000, p. 22). However, the preponderance of responses categorized as TOP indicated to us that when engaging teachers in discussions related to implementing the SMP, thoughtful challenges must be posed to teachers so they have the opportunities to re-consider what classroom actions are available in order for students to engage in mathematical study via the SMP.

Summary and Implications for Mathematics Education Leaders

Importantly, although little is currently known about how teachers have interpreted their future actions through reading the eight SMP, our work is well aligned with other efforts to engage teachers in such thinking and discussion. In particular, an NCSM resource provided on the organization's website is Illustrating the Standards for Mathematical Practice (NCSM, 2014). In one resource on the website, *6-8 Comparing Linear Functions – Presentation*, professional development participants are prompted to:

1. Individually review the Standards for Mathematical Practice.
2. Choose a partner at your table and discuss a new insight you had into the Standards for Mathematical Practice.
3. Then discuss the following question: What implications might the Standards for Mathematical Practice have on your classroom? (NCSM, 2014, slide 8)

In other words, the framework we provided here for how we utilized prompts for facilitating PD experiences is not necessarily novel. However, in collecting the varied participants' responses, and investigating the data through focused qualitative analyses, we believe important beliefs underlying teachers' instructional practices have been identified through their initial reading of the SMP. Such frameworks, we feel, are useful vehicles to use when engaging in PD experiences with the SMP so that those providing the PD have an opportunity to gather formative assessment data relative to understanding the beliefs of teachers related to their reading of the SMP.

Based on our work with these teachers, and examining the data, we argue it is critical for mathematics education leaders, teacher educators, and professional development facilitators to be sensitized to the potential that the likely prevailing approach to implementing the SMP will be from a teacher-oriented perspective. Such a perspective is

important for PD leaders to continually be cognizant of, and thoughtfully engage and challenge teachers in alternative pedagogical approaches when facilitating discussion around the SMP. Not only are the teachers we surveyed viewing the SMP through the lens of what they must do instructionally for students to be proficient with the SMP, they are in large part also *not* viewing the SMP through the lens of what they will allow their students to do to so that the students can fully engage in the range of mathematical experiences delineated by the SMP.

The data serve as a reminder that even though PD may be provided from student-centered perspectives, teachers likely engage with PD from various TOP perspectives. That is, even when descriptions of mathematical practice are explicated, as is the case with the SMP, there will likely be a disconnect between the written word and teacher practice that must be acknowledged and bridged by mathematics education leaders and facilitators in an effort to make clear the perspectives that both the teachers and leaders bring to standards implementation. While the SMP are discussed before the Standards for Mathematical Content in the CCSSM, the simple fact of having three pages of SMP in the CCSSM will not, alone, produce the paradigm shift needed in teachers' instructional practices to move them from "what I will do to *show* my students a SMP" to "what I will do to *allow* my students to experience, for themselves, the interconnectedness of all of the SMP." Significant dialog regarding implementation efforts must be facilitated for teachers' understandings of each SMP to be explicated, challenged, and critiqued in thoughtful, respectful, and meaningfully beneficial ways so that a vision for instruction can emerge in which students are constantly and consistently engaged in mathematical study through the SMP. ✪

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