

## Assessment

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Assessment plays a crucial role in delivering high quality instruction and ensuring the learning of all students. In order for assessment to be effective, teachers need to have clear reasons for *why* they are using the assessment tools they are using. That is, assessment must have a clear purpose in instruction: to support and enhance student learning. Assessment activities should be embedded in instruction and provide opportunities for informative feedback to both students and teachers. A variety of assessment strategies need to be employed as learning is multidimensional and cannot be adequately measured by a single instrument (Suurtamm, Koch, and Arden 2010, 400).

Assessment provides students with frequent feedback on their performance, teachers with diagnostic tools for gauging students' depth of understanding, parents with information about their children's performance in the context of program goals, and administrators with a means for measuring student achievement. Assessment should be a major component of the learning process. As students help identify goals for lessons or investigations, they gain greater awareness of what they need to learn and how they will demonstrate that learning. Engaging students in this kind of goal-setting can help them reflect on their own work, understand the standards to which they are held accountable, and take ownership of their learning.

According to the National Council of Teachers of Mathematics (NCTM), "Assessment is the process of gathering evidence about a student's knowledge of, ability to use, and disposition towards mathematics and of making inferences from the evidence for a variety purposes" (NCTM 1995, 3). The NCTM suggests four stages of developing assessment and analyzing results that interact and reinforce each other:

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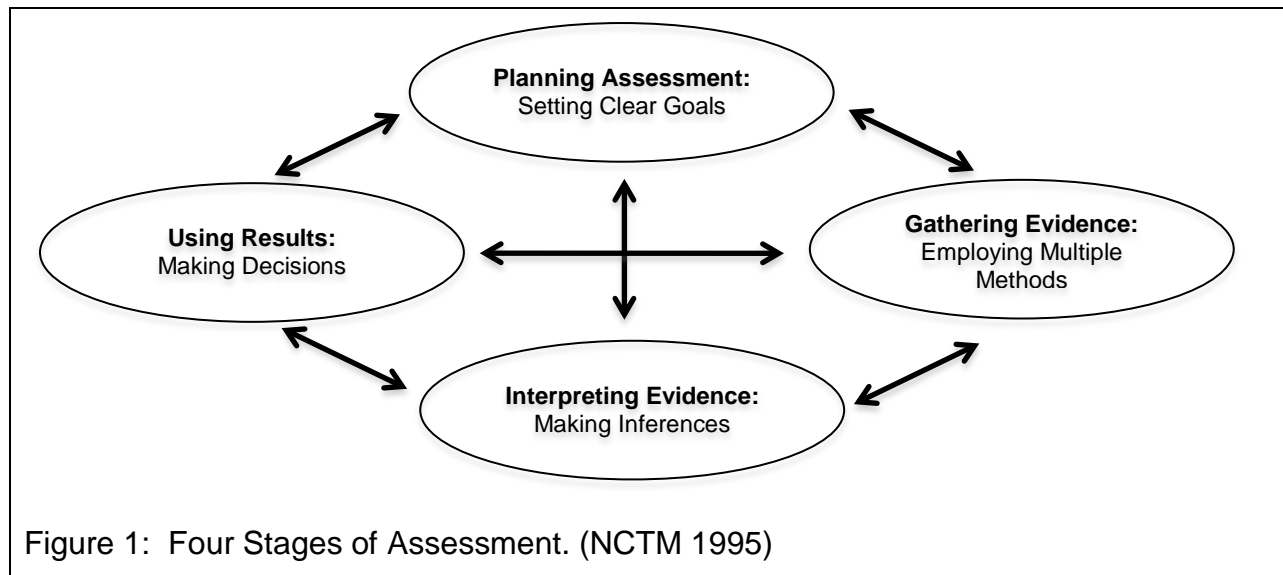


Figure 1: Four Stages of Assessment. (NCTM 1995)

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34 The purpose of this chapter is to elucidate some of the key ideas of assessment and  
35 provide examples of how to implement them in practice.

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### 37 **Purposes of Assessment**

38 As noted earlier, the purpose of assessment should be to support and enhance student  
39 learning. A particular assessment may be designed to support the students in an entire  
40 school or district, the students in a single classroom, or individual students. In any  
41 case, and regardless of the form, evidence gathered from the assessment should be  
42 used to inform instructional decisions. For example, a teacher may use a mathematics  
43 portfolio project to measure students' long-term learning and understanding of  
44 connections of big ideas in a unit; and then use inferences derived from the results to  
45 decide how to fill in apparent gaps in student understanding before a major summative  
46 test. A department or school may use interim assessments (sometimes known as  
47 benchmark assessments) to track the progress of all fifth grade students in the district  
48 and then identify schools or classrooms that seem to need the most support in  
49 improving student learning. A district may collect statewide testing data and use it to  
50 identify schools or student populations of greatest need and make targeted professional  
51 development and support available for those schools or students. If an assessment is  
52 being implemented and a clear goal or use for the results of the assessment is not

53 apparent, then the assessment practice in question should be reexamined and  
54 resources potentially redirected to creating more purposeful assessments or eliminating  
55 them altogether.

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57 At the classroom, department, and possibly school level, the purpose of assessment of  
58 individual students should be more than simply measuring “what students know.”  
59 Traditional paper-and-pencil and “high-stakes” tests have prompted teachers to  
60 emphasize basic, factual information and to provide few opportunities for students to  
61 learn how to apply knowledge (Fuchs and others 1999, 611). Assessment in  
62 mathematics must go beyond focusing on how well a student uses a memorized  
63 algorithm or procedure and must also elicit, assess, and respond to students’  
64 mathematical understandings (NCTM 1995; Suurtamm, Koch, and Arden 1999, 401).  
65 This change is essential in light of the Standards for Mathematical Practice, which  
66 require students to persevere through solving difficult problems, communicate  
67 mathematical thinking, use tools and model with mathematics, use quantities  
68 appropriately and attend to precision, and transfer patterns in reasoning and structure to  
69 new problems. The focus of assessment must then shift towards assessing content  
70 knowledge *and* practices as opposed to simply assessing content (“what students know  
71 how to do”). Assessments should ask for variety in what students produce (for  
72 example, answers and solutions, arguments and explanations, diagrams and  
73 mathematical models) to help identify both mathematics content and mathematical  
74 practice learning.

75  
76 At larger scales, assessments can track progress towards long-term learning goals for  
77 groups of students or for schools receiving instructional support. Large-scale  
78 assessments can help indicate the effectiveness of a professional development  
79 program or new instructional materials. Data from statewide summative assessments  
80 can be used to indicate schools that are performing well within an area or district and  
81 those where resources can be provided to support improvements in instruction. At the  
82 school and district level, administrators should carefully measure the impact of chosen  
83 assessment practices on the classroom; if teachers are constantly under pressure to

84 assess their students, then instruction will often reflect this and the phenomenon of  
85 “teaching to the test” can emerge. Both anecdotal and research evidence show that the  
86 undesirable outcome of teaching to the test can and does occur (Fuchs and others  
87 1999).

88

### 89 **Forms of Assessment**

90 Current mathematics education literature recognizes two major forms of assessment  
91 practices: *formative* and *summative*. The distinction between these types of  
92 assessment is based on how they are used and many forms of assessment can be  
93 used both formatively and summatively. In addition, *diagnostic assessments* are used  
94 frequently as tools for placing students into courses or identifying which students could  
95 benefit from an intervention program.

96

97 **Formative Assessment:** *Formative assessment* is a systematic process to  
98 continuously gather evidence and provide feedback about learning while instruction is  
99 under way. Formative assessment can span over a fifteen-minute individual time with  
100 one student, over a weeklong unit, or over a school year. The key feature of formative  
101 assessment is that action is taken to close a perceived gap in students’ learning based  
102 on evidence elicited by the assessment practice. As Paul Black and Dylan Wiliam state  
103 in their seminal work on the topic: “assessment becomes ‘formative assessment’ when  
104 the evidence is actually used to adapt the teaching work to meet the needs [of  
105 students]” (Black and Wiliam 2001, 2). If an assessment tool is used to gather  
106 information and there is no responsive change in instruction to address student  
107 misunderstandings, then the tool is not being used formatively. The Four Stages of  
108 Assessment come into play with formative assessment, as teachers are often involved  
109 in the creation of the assessment tool, the alignment to specific goals, the administration  
110 of the tool, and reflection on the results, as illustrated in Figure 1.

111

112 The primary purpose of formative assessment is to improve learning, not merely to audit  
113 it. It is assessment *for* learning rather than assessment *of* learning. Formative  
114 assessment is both an “instructional tool” that teachers and their students “use while

115 learning is occurring" and "an accountability tool to determine if learning has occurred"  
 116 (National Education Association [NEA] 2003, 3). In other words, to be "formative,"  
 117 assessments must inform the decisions that teachers and their students make minute  
 118 by minute in the classroom. For example, a mid-chapter quiz is usually considered a  
 119 formative assessment. However, if the result of the quiz has only been recorded in a  
 120 grade book to serve the purpose of accountability or of certifying competence, it cannot  
 121 be considered a formative assessment.

122  
 123 The table below explains some of the key components of formative assessment in more  
 124 detail.

<b>The Interrelated Dimensions of Formative Assessment</b>
<p><b>Shared learning targets and criteria for success:</b> A vision of the end point makes the journey possible. Students who have a clear picture of the learning goals and of the criteria for success are likely to have a sense of what they can and should do to make their work measure up to those criteria and goals. They also have some sense of control over their work and are poised to be strategic self-regulators.</p>
<p><b>Feedback that promotes further learning:</b> The power of formative assessment lies in its double-barreled approach, addressing both cognitive and motivational factors. To be effective, feedback comments should identify what has been done well and what still needs improvement and give guidance on how to make that improvement. Opportunities for students to respond to comments should be planned as part of the overall learning process. Feedback to any pupil should be about the particular qualities of his or her work and should avoid comparisons with other pupils.</p>
<p><b>Self-assessment and Peer Assessment:</b> Many successful innovations have developed self- and peer-assessment by pupils as ways of enhancing formative assessment. The main problem for self-assessment is not the problem of reliability and trustworthiness; in fact, it is found that pupils are generally honest and reliable in assessing both themselves and one another, and can be too hard on themselves as often as they are too kind. The main problem is different—it is that pupils can only assess themselves when they have a sufficiently clear picture of the targets that their learning is meant to attain. When pupils do acquire such an overview, they then become more committed and more effective as learners. Their own assessments become an object of discussion with their teachers and with one another. This promotes learning.</p> <p style="padding-left: 40px;">As teachers and students actively and intentionally engage in learning, the individual elements unite in a flurry of cognitive activity, working together and depending on each other. Their power comes from their combined effort.</p>
<p>(Black and others 2004, 8-21,</p>

125  
 126 Not every formative assessment tool is appropriate for every student, goal, or topic  
 127 area, and so teachers will need to differentiate their formative assessment practice  
 128 based on their experience with using the tool with their students. Furthermore, formative  
 129 assessment practices do not necessarily exist in isolation from one another; many are  
 130 often built into the lesson of the day or the weekly unit.

131  
 132 **Summative Assessment:** *Summative assessment* refers to the assessment of  
 133 learning at a particular time point and is meant to summarize a learner's development.  
 134 Summative assessments frequently come in the form of chapter or unit tests, weekly  
 135 quizzes, or end-of-term tests. In contrast to formative assessment, summative  
 136 assessment represents the state of a student's skills and knowledge at a given point in  
 137 time, and is meant to assess the effectiveness of instruction and a students learning  
 138 progress. Such assessments are not necessarily used to inform instruction.

139 Summative assessment can be used to measure the effectiveness of an instructional  
 140 program.

141  
 142 While both summative assessment and formative assessment are essential, the crucial  
 143 distinction is between assessments to determine status of learning and assessment to  
 144 promote greater learning.

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#### 146 **Characteristics of Formative and Summative Assessment**

<b>Formative Assessment (Assessment for Learning)</b>	<b>Summative Assessment (Assessment of Learning)</b>
<b>Purpose:</b> To improve learning and achievement	<b>Purpose:</b> To measure or audit attainment
Carried out while learning is in progress—day-to-day, minute-by-minute.	Carried out from time to time to create snapshots of what has happened.
Focused on the learning process and the learning progress.	Focused on the products of learning.
Viewed as an integral part of the teaching-learning process.	Viewed as something separate, an activity performed after the teaching-learning cycle.

<i>Collaborative</i> —Teachers and students know where they are headed, understand the learning needs, and use assessment information as feedback to guide and adapt what they do to meet those needs.	<i>Teacher directed</i> —Teachers assign what the students must do and then evaluate how well they complete the assignment.
<i>Fluid</i> —An ongoing process influenced by student need and teacher feedback.	<i>Rigid</i> —An unchanging measure of what the student achieved.
Teachers and students adopt the role of intentional learners.	Teachers adopt the role of auditors and students assume the role of the audited.
Teachers and students use the evidence they gather to make adjustments for continuous improvement.	Teachers use the results to make final "success or failure" decisions about a relatively fixed set of instructional activities.

147 (Moss and Brookhart 2009)

148

### 149 **Assessment Tools**

150 The list below offers several assessment tools and strategies, many of which can be  
151 used both formatively and summatively. This list is by no means exhaustive.

152 Furthermore, the various tools listed can be administered in a formal way, such as with  
153 a checklist of skills for student observation that is filled out for every student throughout  
154 a week, or quite informally, such as with a “ticket-out-the-door” mini-assessment  
155 question that is used as a gauge of student understanding of that day’s or week’s major  
156 concept.

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- 158 • *Student Observation* refers to in-classroom observation of students working on  
159 mathematics tasks, either independently or in groups. While many teachers already  
160 do this, walking around the room, actively listening to students, asking questions,  
161 directing discourse, and helping them where needed, they may not see this as a  
162 form of assessment. The instantaneous feedback to students about where to go  
163 next, what question they may want to ask themselves to gain insight into a problem,  
164 or simply correcting computational errors, results in this practice being a form of  
165 formative assessment. Teachers may focus their observations using checklists  
166 based on specific skills and concepts.

- 167 • *Graphic Organizers* such as flow charts and concept maps can be used to assess  
168 students' understanding of mathematical concepts and connections between ideas.  
169 For instance, a teacher may post several terms in the classroom and ask students to  
170 define the terms in their own words and connect each term to as many others they  
171 can, indicating so with an arrow and a description of why the terms are connected.  
172 Teachers can ask students to provide examples of terms or concepts, to explain how  
173 and why a certain algorithm or skill works, or describe situations in which a given  
174 concept applies.
- 175 • *Student Interviews* can help teachers gain insight into student thinking and to guide  
176 them in providing differentiated instruction. When teachers formally or informally  
177 discuss mathematics with students, checking for understanding of concepts or  
178 procedures, they are potentially gaining a much better understanding of a student's  
179 current ability than a paper-and-pencil test can tell them. Teachers could use such  
180 interviews as a means for assessing student progress on mastering a given  
181 standard, and the results of interviews can be factored into grading policies.
- 182 • *Journals and Learning Logs* are tools in which students do mathematical writing that  
183 serves to illuminate their current understandings. For example, a teacher may  
184 provide each student with a journal that is kept in the classroom, which is then used  
185 for students to solve an "exit problem" of the day. Or students may be asked to  
186 explain what they learned that given day or what they think the major idea of the  
187 lesson was. Such journals have a variety of uses. Teachers should not feel  
188 required to grade everything in the math journal; in fact, this may diminish its use as  
189 students feel they need to write a "correct response." Instead, teachers can simply  
190 read all or some of their students' journals to get feedback on student  
191 understanding.
- 192 • *Mathematics Portfolios* are a way to assess students' understanding of big ideas,  
193 connections between ideas, procedural knowledge, and the Standards for  
194 Mathematical Practice. A project can be explored in groups over several class  
195 periods at the end of which a "portfolio" of all the students' relevant work is included.  
196 Given the nature of the CA CCSSM and the emphasis on mathematical *practices*,



197 tools such as these will be necessary to assess students' development as problem-  
198 solvers and can be used to document students' learning over time.

- 199 • *Self- and Peer-Evaluations* give students ownership of their learning and provide  
200 teachers with insight into students' recognition of their own progress.
- 201 • *Short Tests and Quizzes*. Used to inform instruction, small-scale tests and quizzes  
202 can be used as formative assessments when seen as part of a unit or chapter. Such  
203 tests and quizzes can involve several different problem types and may or may not  
204 necessarily contribute to a student's overall course grade. However, if the results of  
205 such tools are not used to inform future instruction, then they are *not* being used  
206 formatively.
- 207 • *Performance Tasks* consist of problems or scenarios that demand students engage  
208 in thinking about a problem, encourage them to justify their thinking, and often  
209 require students to engage with other students. Administered to individual students  
210 or to groups, performance tasks are often complex problem solving activities that  
211 require students to apply prior knowledge in a given situation or to extend current  
212 knowledge in new directions. The term "performance task" is a broad one and refers  
213 to in-classroom tasks or even to assessment items [see Smarter Balanced  
214 Assessments]. Teachers may monitor students' progress on the task and give them  
215 immediate feedback as part of a larger formative assessment program.

216  
217 The CA CCSSM require students to acquire a deeper conceptual understanding of  
218 mathematics. The introduction of the Standards for Mathematical Practice increases  
219 the complexity of gathering evidence to determine student proficiency. Oftentimes  
220 referred to as projects, oral presentations, and/or written responses to open-ended  
221 real-world problems, performance tasks require a student to demonstrate  
222 mathematical learning across several content and practice standards that are  
223 considered prerequisite skills for college and career readiness (Measured  
224 Progress/ETS Collaborative 2012, 31). Various approaches can be utilized to  
225 determine student proficiency through performance tasks, including rating scales  
226 such as rubrics, checklists, and anecdotal records (Burden and Byrd 2009).  
227

**On Using Rubrics:** A rubric is a type of rating scale that allows the teacher to determine mathematical learning along a continuum. By utilizing rubrics, teachers can quantify student learning while focusing upon the pre-determined key components of the performance task. Popham (2010) suggests that scoring rubrics have three key features: 1) evaluative criteria that indicate the quality of the student’s response (usually three or four); 2) descriptions of the qualitative differences in student performance for the evaluative criteria; and 3) whether the performance task will be scored holistically (e.g., a single overall score) or analytically (e.g., points are awarded for each of the performance indicators to provide students with more specific feedback).

Van de Walle (2005) provides an example of a generic four-point rubric (below) that can be used to first sort student responses into high – low categories before assigning a point on a scale. He suggests that sharing the rubric ahead of time with students “clearly conveys what is valued” in completing the performance task (Van de Walle 2005, 84).

<b>Scoring with a Four-Point Rubric</b>			
<b>Got It</b>		<b>Not Yet</b>	
Evidence shows that the student essentially has the target concept or idea.		Student shows evidence of major misunderstanding, incorrect concept or procedure, or failure to engage in task.	
4 Excellent: Full Accomplishment	3 Proficient: Substantial Accomplishment	2 Marginal: Partial Accomplishment	1 Unsatisfactory: Little Accomplishment
Strategy and execution meet the content, process, and qualitative demands of the task. Communication is judged by effectiveness, not length. May have minor errors.	Could work to full accomplishment with minimal feedback. Errors are minor, so teacher is confident that understanding is adequate to accomplish the objective.	Part of the task is accomplished, but there is a lack of evidence of understanding or evidence of not understanding. Direct input or further teaching is required.	The task is attempted and some mathematical effort is made. There may be fragments of accomplishment but little or no success.

The Smarter Balanced Assessment Consortium provides examples of rubrics that are based upon the CCSSM, such as the following sixth grade problem and scoring rubric, that demonstrate student learning for standard 6.EE.5, and mathematical practice

standards 1, 2, and 4.

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<b>Smarter Balanced Sample Performance Task and Scoring Rubric</b>	
<p><i>Part A</i></p> <p>Ana is saving to buy a bicycle that costs \$135. She has saved \$98 and wants to know how much more money she needs to buy the bicycle.</p> <p>The equation <math>135 = x + 98</math> models this situation, where <math>x</math> represents the additional amount of money Ana needs to buy the bicycle.</p> <ul style="list-style-type: none"> <li>When substituting for <math>x</math>, which value(s), if any, from the set <math>\{0, 37, 08, 135, 233\}</math> will make the equation true?</li> <li>Explain what this means in terms of the amount of money needed and the cost of the bicycle.</li> </ul> <p><i>Part B</i></p> <p>Ana considered buying the \$135 bicycle, but then she decided to shop for a different bicycle. She knows the other bicycle she likes will cost more than \$150.</p> <p>This situation can be modeled by the following inequality.</p> $x + 98 > 150$ <ul style="list-style-type: none"> <li>Which values, if any, from <math>-250</math> to <math>250</math> will make the inequality true? If more than one value makes the inequality true, identify the least and greatest values that make the inequality true.</li> <li>Explain what this means in terms of the amount of money needed and the cost of the bicycle.</li> </ul> <p>Sample Top-Score Response:</p> <p><i>Part A</i></p> <p>The only value in the set given that makes the equation true is 37.</p> <p>This means that Ana will need exactly \$37 more to buy the bicycle.</p> <p><i>Part B</i></p> <p>The values from 53 to 250 will make the inequality true.</p> <p>This means that Ana will need from \$53 to \$250 to buy the bicycle.</p>	<p><i>Scoring Rubric:</i> Responses to this item will receive 0-3 points, based on the following:</p> <p><b>3 points:</b> The student shows a thorough understanding of equations and inequalities in a contextual scenario, as well as a thorough understanding of substituting values into equations and inequalities to verify whether or not they satisfy the equation or inequality. The student offers a correct interpretation of the equality and the inequality in the correct context of the problem. The student correctly states that 37 will satisfy the equation and that the values from 53 to 250 will satisfy the inequality.</p> <p><b>2 points:</b> The students shows a thorough understanding of substituting values into equations and inequalities to verify whether or not they satisfy the equation or inequality but limited understanding of equations or inequalities in a contextual scenario. The student correctly states that 37 will satisfy the equation and that the values from 53 to 250 will satisfy the inequality, but the student offers an incorrect interpretation of the equality or the inequality in the context of the problem.</p> <p><b>1 point:</b> The student shows a limited understanding of substituting values into equations and inequalities to verify whether or not they satisfy the equation or inequality and a limited understanding of equations and inequalities in a contextual scenario. The student correctly states that 37 will satisfy the equation, does not state that the values from 53 to 250 will satisfy the inequality, and offers incorrect t interpretations of the equality and the inequality in the context of the problem. <b>OR</b> The student correctly states that the values from 53 to 250 will satisfy the inequality, does not state that 37 satisfies the equation, and offers incorrect interpretations of the equality and the inequality in the context of the problem.</p> <p><b>0 points:</b> The student shows little or no understanding of equations and inequalities in a contextual scenario and little or no understanding of substituting values into equations and inequalities to verify whether or not they satisfy the equation or inequality. The student offers incorrect interpretations of the equality and the inequality in the context of the problem, does not state that 37 satisfies the equation, and does not state the values from 53 to 250 will satisfy the equation.</p>

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- 231 • *Unit or Chapter Assessments* measure student learning of the content and skills in a
- 232 unit or chapter. Such tests should include items that are linked to specific learning
- 233 goals, be connected to the CA CCSSM, and pay attention to the Standards for
- 234 Mathematical Practice. To effectively assess such goals, such tests should include
- 235 various types of tasks, including multiple choice, selected response (possibly more
- 236 than one response correct), short answer, and short performance tasks (see
- 237 *Performance Tasks* above).
- 238 • *Diagnostic assessments* are often broad in scope, containing a range of topics that
- 239 are prerequisites for success in a given unit, class, or grade level. Such
- 240 assessments can also identify specific areas of difficulty for students that need to be
- 241 addressed through intervention and can inform the placement of students into
- 242 intervention programs.
- 243 • *Interim Assessments* can be administered on a relatively frequent basis and are
- 244 used to measure the incremental learning of students throughout a given period of
- 245 time. These tests identify specific performance standards students have or have not
- 246 achieved and often reveal possible reasons why students have not yet progressed in
- 247 certain areas. Interim assessments are frequently used as formative assessments
- 248 as well.
- 249 • *State or National Assessments* are large-scale assessments used to gather
- 250 information about the progress of academic systems and bodies of students as a
- 251 whole. More information about the State of California's assessment system is
- 252 forthcoming. See the section below on the *Smarter Balanced Assessment*
- 253 *Consortium's* (Smarter Balanced) tests.
- 254

**A Note On Grading.** While a classroom grading policy is ultimately a local decision, a message is presented here about the overall purpose and direction of a grading policy. In *The Last Frontier: Tackling the Grading Dilemma*, from “Ahead of the Curve: The Power of Assessment to Transform Teaching and Learning,” author Ken O’Connor provides several guidelines for designing grading policies, summarized below.

- Rather than “calculating” one final grade based only on assessment methods (quizzes, tests, homework, etc.), grades should be based on and grades should be provided for specific performance standards linked to the CA CCSSM.
- O’Connor writes that individual achievement should be the primary attribute included in a student’s grade. Other aspects such as effort and participation can be graded but should not impact measures of achievement.
- Grading should be flexible enough to provide for sampling student performance, rather than including everything in a grade, and quality assessments with proper recording of student achievement should determine that performance.
- Finally, teachers should discuss with and involve students in assessment throughout the learning process.

255

**A Note on Homework.** As with grading policies, whether and how to use homework as an instructional tool and assessment tool is a local decision. However, if homework is used in a course, it should have clear standards-based goals that students can achieve on their own. It should promote student ownership of their learning, instill a sense of competence, and it should be clear and accessible to students. Some reasons for assigning homework include prelearning of concepts, checking for understanding of classroom work, practice of skills and procedures, and processing of concepts developed in class. Appropriate homework feedback can serve a formative purpose if it provides students and teacher with direction for learning. For another example, teachers may indicate to students that they should work on problems 1 through 5 first; if these problems are not difficult then students can move on. However if a student has difficulty with these first five problems, then that should serve as a warning sign that the student needs to see the teacher for further instruction. Regardless,

teachers and administrators should consider a clear purpose for homework as a means for assessment and learning. (Van de Walle 2005)

256

257 **Smarter Balanced Assessment Consortium (Smarter Balanced), Common Core**258 **Assessments.** California's participation in the Smarter Balanced Assessment

259 Consortium has resulted in a statewide assessment program designed to measure

260 students' and schools' progress towards meeting the goals of the CA CCSSM at Grades

261 3-8 and Grade 11. Smarter Balanced assessments will require students to think

262 critically, solve problems, and show a greater depth of knowledge, and will assess the

263 following four claims:

264

<b>Claim #1</b>	<p><b>Concepts &amp; Procedures: Students can explain and apply mathematical concepts and interpret and carry out mathematical procedures with precision and fluency.</b></p> <p>This claim addresses procedural skills and the conceptual understanding on which developing skills depend. It is important to assess how aware students are of how concepts link together and why mathematical procedures work the way they do. Central to understanding this claim is making the connection to these elements of the mathematical practices as stated in the CA CCSSM: MP.5, MP.6, MP.7, and MP.8.</p>
<b>Claim #2</b>	<p><b>Problem Solving: Students can solve a range of complex, well-posed problems in pure and applied mathematics, making productive use of knowledge and problem-solving strategies.</b></p> <p>Assessment items and tasks focused on Claim 2 include problems in pure mathematics and problems set in context. Problems are presented as items and tasks that are well-posed (that is, problem formulation is not necessary) and for which a solution path is not immediately obvious. These problems require students to construct their own solution pathway rather than follow a provided one. Such problems will therefore be unstructured, and students will need to select appropriate conceptual and physical tools to use.</p>
<b>Claim #3</b>	<p><b>Communicating Reasoning: Students can clearly and precisely</b></p>

	<p><b>construct viable arguments to support their own reasoning and to critique the reasoning of others.</b></p> <p>Claim 3 refers to a recurring theme in the CA CCSSM content and practice standards—the ability to construct and present a clear, logical, convincing argument. For older students, this may take the form of a rigorous, deductive proof based on clearly stated axioms. For younger students, this will involve more informal justifications. Assessment tasks that address this claim will typically present a claim and ask students to provide, for example, a justification or counterexample.</p>
<p><b>Claim #4</b></p>	<p><b>Modeling and Data Analysis: Students can analyze complex, real-world scenarios and can construct and use mathematical models to interpret and solve problems.</b></p> <p>Modeling is the bridge across the “school math”/“real world” divide that has been missing from many mathematics curricula and assessments. It is the twin of mathematical literacy, the focus of the Programme for International Student Assessment (PISA) international comparison tests in mathematics. CA CCSSM features modeling as both a mathematical practice at all grades and a content focus in higher mathematics</p>

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266 Some of the features of the Smarter Balanced assessment program are listed below.

267 More information about the assessment program can be found at [smarterbalanced.org](http://smarterbalanced.org).

268 • *Computer-Based Testing.* Schools with the capability to do so will administer tests  
 269 electronically to every student in their purview. Computer-based testing will allow for  
 270 smoother test administration, more rapid reporting of results, and the ability to utilize  
 271 computer-adaptive testing.

272 • *Computer Adaptive Testing.* The Smarter Balanced assessments make use of a  
 273 system that monitors a student’s progress while taking the assessment and gives  
 274 them harder or easier problems depending on the student’s performance on the  
 275 current item. In this way, the computer system can adjust to higher and lower  
 276 performing students to give more accurate results regarding their mathematics  
 277 performance.



- 278 • *Varied Items.* The Smarter Balanced tests allow for several types of items intended  
279 to measure different learning outcomes. For instance, a selected response item  
280 may have two correct choices out of four; a student only selecting one of those  
281 correct items would indicate a different understanding of a concept than a student  
282 who selected both of the correct responses. Constructed-response questions will be  
283 featured, as well as performance assessment tasks (which include extended-  
284 response questions) that will measure students' abilities to solve problems and use  
285 mathematics in context, thereby measuring students' progress towards employing  
286 the mathematical practice standards in addition to demonstrating knowledge of  
287 mathematics content. Finally, the assessments will feature technology-enhanced  
288 tasks that will aim to provide evidence of mathematical practices where selected and  
289 constructed response questions may not.  
290  
291