Criteria for High-Quality Assessment

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Abstract

States and school districts across the nation are making critical decisions about student assessments as they move to implement the Common Core State Standards (CCSS), adopted by 45 states. The Standards feature an increased focus on deeper learning, or students' ability to analyze, synthesize, compare, connect, critique, hypothesize, prove, and explain their ideas. States are at different points in the CCSS transitions, but all will be assessing their K–12 students against these higher standards in the 2014–15 school year.

Based on the changing demands of today's workforce, advances in other nations, and original analysis, this report provides a set of criteria for high-quality student assessments. These criteria can be used by assessment developers, policymakers, and educators as they work to create and adopt assessments that promote deeper learning of 21st-century skills that students need to succeed in today's knowledge-based economy.

The five criteria include:

1. **Assessment of Higher-Order Cognitive Skills** that allow students to transfer their learning to new situations and problems.

2. **High-Fidelity Assessment of Critical Abilities** as they will be used in the real world, rather than through artificial proxies. This calls for performances that directly evaluate such skills as oral, written, and multimedia communication; collaboration; research; experimentation; and the use of new technologies.

3. **Assessments that Are Internationally Benchmarked**: Assessments should be evaluated against those of the leading education countries, in terms of the kinds of tasks they present as well as the level of performance they expect.

4. **Use of Items that Are Instructionally Sensitive and Educationally Valuable**: Tests should be designed so that the underlying concepts can be taught and learned, rather than depending mostly on test-taking skills or reflecting students' out-of-school experiences. To support instruction, they should also offer good models for teaching and learning and insights into how students think as well as what they know.

5. **Assessments that Are Valid, Reliable, and Fair** should accurately evaluate students' abilities, appropriately assess the knowledge and skills they intend to measure, be free from bias, and be designed to reduce unnecessary obstacles to performance that could undermine validity. They should also have positive consequences for the quality of instruction and the opportunities available for student learning.

Criteria for High-Quality Assessment

I am calling on our nation's Governors and state education chiefs to develop standards and assessments that don't simply measure whether students can fill in a bubble on a test, but whether they possess 21st-century skills like problem-solving and critical thinking, entrepreneurship and creativity.

— President Barack Obama, March 2009

Responding to President Obama's call, policymakers in nearly every state have adopted new standards intended to ensure that all students graduate from high school ready for college and careers. Achieving that goal will require a transformation in teaching, learning, and assessment so that all students develop the deeper learning competencies that are necessary for postsecondary success.[1]

The changing nature of work and society means that the premium in today's world is not merely on students' acquiring information, but on their ability to analyze, synthesize, and apply what they've learned to address new problems, design solutions, collaborate effectively, and communicate persuasively.[2]

This transformation will require an overhaul in curriculum and assessment systems to support deeper learning competencies. Ministries of education around the world have been redesigning curriculum and assessment systems to emphasize these skills. For example, as Singapore prepared to revamp its assessment system, then Education Minister, Tharman Shanmugaratnam, noted:

> [We need] less dependence on rote learning, repetitive tests and a 'one size fits all' type of instruction, and more on engaged learning, discovery through experiences, differentiated teaching, the learning of life-long skills, and the building of character, so that students can…develop the attributes, mindsets, character and values for future success.[3]

Reforms in Singapore, like those in New Zealand, Hong Kong, a number of Australian states and Canadian provinces, and other high-achieving jurisdictions, have introduced increasingly ambitious performance assessments that require students to find, evaluate, and use information rather than just recalling facts. In addition, these assessments—which call on students to design and conduct investigations, analyze data, draw valid conclusions, and report findings—frequently call on students to demonstrate what they know in investigations that produce sophisticated written, oral, mathematical, physical, and multimedia products.[4] (See Appendix A for examples.) These assessments, along with other investments (in thoughtful curriculum, high-quality teaching, and equitably funded schools, for example) appear to contribute to their high student achievement.[5]

The United States is poised to take a major step in the direction of curriculum and assessments for this kind of deeper learning with the adoption of new Common Core State Standards (CCSS) in more than 40 states. These standards are intended to be "fewer, higher, and deeper" than previous iterations of standards, which have been criticized for being a "mile wide and an inch deep."[6] They aim to ensure that students are prepared for college and careers with deeper knowledge and more transferable skills in these disciplines, including the capacity to read and listen critically for understanding; to write and speak clearly and persuasively, with reference to evidence; and to calculate and communicate mathematically, reason quantitatively, and design solutions to complex problems.

The Common Core Standards will require a more integrated approach to delivering content instruction across all subject areas.[7] The Common Core Standards in English language arts are written to include the development of critical reading, writing, speaking, and listening skills in history, science, mathematics, and the arts, as well as in English class. The Common Core Standards in mathematics are written to include the use of mathematical skills and concepts in fields like science, technology, and engineering. These standards emphasize the ways in which students should use literacy and numeracy skills across the curriculum and in life. As states seek to implement these standards, they must also examine how their assessments support and evaluate these skills and create incentives for them to be well taught.

Two consortia of states—the Partnership for Assessment of Readiness for College and Careers (PARCC) and the Smarter Balanced Assessment Consortium (SBAC)—have been formed to develop next-generation assessments of these standards. As states are increasingly able to work collaboratively on problems of policy and practice, other initiatives, such as the Innovation Lab Network (ILN) of states and districts, coordinated by the Council for Chief State School Officers, are also developing strategies to create more intellectually ambitious assessments that are more internationally comparable.

Undoubtedly, there will be many initiatives to rethink assessments that accompany these reforms. Thus, it is timely to consider what the features of high-quality assessment systems that meet these new goals should include.

The recently released report of the Gordon Commission, written by the nation's leading experts in curriculum, teaching, and assessment, described the most critical objectives this way:

> To be helpful in achieving the learning goals laid out in the Common Core, assessments must fully represent the competencies that the increasingly complex and changing world demands. The best assessments can accelerate the acquisition of these competencies if they guide the actions of teachers and enable students to gauge their progress. To do so, the tasks and activities in the assessments must be models worthy of the

attention and energy of teachers and students. The Commission calls on policy makers at all levels to actively promote this badly needed transformation in current assessment practice...[T]he assessment systems [must] be robust enough to drive the instructional changes required to meet the standards...and provide evidence of student learning useful to teachers.

New assessments must advance competencies that are matched to the era in which we live. Contemporary students must be able to evaluate the validity and relevance of disparate pieces of information and draw conclusions from them. They need to use what they know to make conjectures and seek evidence to test them, come up with new ideas, and contribute productively to their networks, whether on the job or in their communities. As the world grows increasingly complex and interconnected, people need to be able to recognize patterns, make comparisons, resolve contradictions, and understand causes and effects. They need to learn to be comfortable with ambiguity and recognize that perspective shapes information and the meanings we draw from it. At the most general level, the emphasis in our educational systems needs to be on helping individuals make sense out of the world and how to operate effectively within it. Finally, it is also important that assessments do more than document what students are capable of and what they know. To be as useful as possible, assessments should provide clues as to why students think the way they do and how they are learning as well as the reasons for misunderstandings.[8]

What Should High-Quality Assessment Systems Include?

No single assessment can evaluate all of the kinds of learning we value for students, nor can a single instrument meet all of the goals held by parents, practitioners, and policymakers. It is important to envision a coordinated system of assessment, in which different tools are used for different purposes—for example, formative and summative, diagnostic vs. large-scale reporting. Within such systems, however, all assessments should faithfully represent the standards, and all should model good teaching and learning practice.

Five major features define the elements of assessment systems than can fully measure the Common Core State Standards and support the evaluation of deeper learning:

1. Assessment of Higher-Order Cognitive Skills: Most of the tasks students encounter should tap the kinds of cognitive skills that have been characterized as "higher-level"—skills that support transferable learning, rather than emphasizing only skills that tap rote learning and the use of basic procedures. While there is a necessary place for basic skills and procedural knowledge, it must be balanced with attention to critical thinking and applications of knowledge to new contexts.

2. High-Fidelity Assessment of Critical Abilities: In addition to key subject matter concepts, assessments should include the critical abilities articulated in the standards, such as communication (speaking, reading, writing, and listening in multi-media forms), collaboration, modeling, complex problem solving, planning, reflection, and research. Tasks should measure these abilities directly as they will be used in the real world, rather than through a remote proxy.

3. Standards that Are Internationally Benchmarked: The assessments should be as rigorous as those of the leading education countries, in terms of the kind of content and tasks they present, as well as the level of performance they expect.

4. Use of Items that Are Instructionally Sensitive and Educationally Valuable: The tasks should be designed so that the underlying concepts can be taught and learned, rather than reflecting students' differential access to outside-of-school experiences (frequently associated with their socioeconomic status or cultural context) or depending on tricky interpretations that mostly reflect test-taking skills. Preparing for and participating in the assessments should engage students in instructionally valuable activities, and results from the tests should provide instructionally useful information.

5. Assessments that Are Valid, Reliable, and Fair: In order to be truly valid for a wide range of learners, assessments should *measure well* what they purport to measure, *accurately evaluate* students' abilities, and do so *reliably* across testing contexts and scorers. They should also be *unbiased* and *accessible* and used in ways that support positive outcomes for students and instructional quality.

Standard 1: Assessment of Higher-Order Cognitive Skills

As suggested above, the Common Core State Standards, along with the Next Generation Science Standards, call for the development of many more complex skills than those that have been typically assessed in U.S. tests over the past decade. If these are to be developed in classrooms, the assessments should represent the critical skills and abilities that are outlined in the standards, rather than measuring only what is easiest to assess.

In particular, assessments should strike a much more productive balance between evaluating basic skills and those capacities that students can use to *transfer* their learning to novel contexts. As the National Research Council noted in its recent study, *Education for Life and Work*:

> We define "deeper learning" as the process through which an individual becomes capable of taking what was learned in one situation and applying it to new situations (i.e., transfer)...The goals included in the new [Common Core] Standards and the NRC Framework reflect each discipline's desire to promote deeper learning and develop transferable knowledge and skills within that discipline. For example, both the mathematics standards and the science framework include a "practices" dimension, calling for students to actively use and apply—i.e., to transfer—knowledge, and the English language arts standards call on students to synthesize and apply evidence to create and effectively communicate an argument.[9]

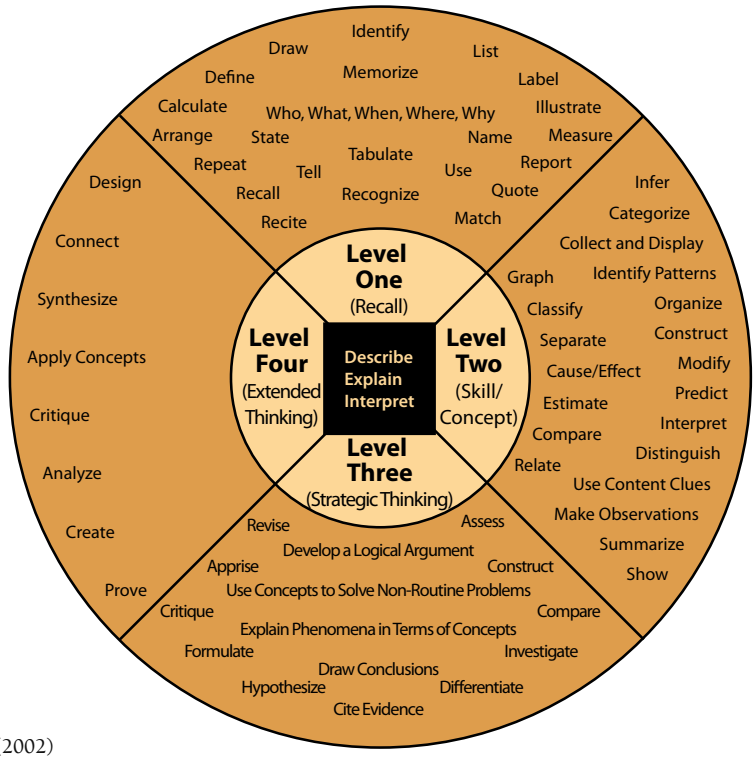
There are many ways to conceptualize the knowledge and skills represented in curriculum, teaching, and assessment. One widely used approach—though by no means the only useful one—is Webb's *Depth of Knowledge* (DOK) taxonomy (see figure 1, page 6).[10] Using the DOK framework as a guide, if assessments are to reflect and encourage transferable abilities, a substantial majority of the items and tasks (at least two-thirds) should tap conceptual knowledge and abilities (level 2, 3, or 4 in the DOK taxonomy). At least one-third of the total in mathematics—and at least half of the total in English language arts—should tap the kinds of cognitive skills that have been characterized as "higher-level," such as the abilities to assess, compare, evaluate, hypothesize, and investigate (level 3), as well as the abilities to analyze, synthesize, design, and create (level 4 in the DOK taxonomy below).

A number of studies have found that current state tests tend not to measure the more intellectually ambitious expectations set out in state standards, settling for recall, recognition, and implementation of procedures more often than analysis, evaluation, and production of ideas.[11]

According to a recent study of tests in 17 states, selected because they were reputed to have higher standards and more ambitious assessments than many others, fewer than 2% of mathematics items and only 21% of English language arts items reached the higher levels (DOK levels 3 and 4). These higher-level skills expect students to hypothesize, critique, analyze, synthesize, compare, connect, prove, or explain their ideas.[12] This study found that the level of cognitive demand was severely constrained by the extent of multiple-choice questions, which were rarely able to assess these higher-order skills.

Another recent study of 19 state tests, using a different method for classifying items, had very similar findings. The researchers found that only 7% of mathematics items and one-third of English language arts (reading) items required students to use higher-order skills of analysis, synthesis, or problem solving. Fully 80% of mathematics items and 52% of reading items tapped only lower-level skills such as memorization, recognition of information, and use of routine procedures.[13]

Figure 1: Depth of Knowledge Levels



Source: N. Webb (2002)

The plans for the new Consortia assessments could increase cognitive expectations by many orders of magnitude. An analysis of the Content Specifications for the Smarter Balanced Assessment Consortium found, for example, that 68% of the targets in English language arts and 70% of those in mathematics intend to tap these higher-level skills.[14] A more qualitative analysis of the item specifications for PARCC found comparable levels of intended intellectual rigor.[15]

This represents very significant initial progress that should be at least matched by any other assessments states select or develop to serve as their next-generation assessments. A reasonable standard would be that at least half of the assessment items and tasks would address higher-order skills. This would also suggest that at least half of the assessment items would call for students to respond in formats that require an elaborated response.

Percentage of Items at Different Levels of Cognitive Demand on 19 State Tests					
	Memorize/ Recognize/ Identify	Implement Procedures	Demonstrate Understanding	Conjecture; Prove/Analyze	Solve Novel Problems / Draw Connections
Mathematics	16%	63%	13%	6%	1%
English Language Arts (Reading)	31%	21%	15%	29%	4%

Standard 2: High-Fidelity Assessment of Critical Abilities

The Common Core State Standards identify a number of areas of knowledge and skills that are clearly so critical for college and career readiness that they should be targeted for inclusion in new assessment systems. As described in the standards, these include:

- **Research:** Conduct sustained research projects to answer a question (including a self-generated question) or solve a problem, narrow or broaden the inquiry when appropriate, and demonstrate understanding of the subject under investigation. Gather relevant information from multiple authoritative print and digital sources, use advanced searches effectively, and assess the strengths and limitations of each source in terms of the specific task, purpose, and audience.

- **Analysis and Synthesis of Information:** Integrate and synthesize multiple sources of information (e.g., texts, experiments, simulations) presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to address a question; make informed decisions; understand a process, phenomenon, or concept; and solve problems while evaluating the credibility and accuracy of each source and noting any discrepancies among the data.

- **Experimentation and Evaluation:** Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. Evaluate hypotheses, data, analysis, and conclusions, verifying the data when possible and corroborating or challenging conclusions with other sources of information.

- **Communication in Oral, Written, Graphic, and Multi-Media Forms:** Use oral and written communication skills to learn, evaluate, and express ideas for a range of tasks, purposes, and audiences. Develop and strengthen writing as needed by planning, revising, editing, and rewriting while considering the audience. Present information, findings, and supporting evidence, making strategic use of digital media and visual displays to enhance understanding. Use technology, including the Internet, to research, produce, publish, and update individual or shared products in response to ongoing feedback, including new arguments or information.

- **Collaboration and Interpersonal Interaction:** Develop a range of interpersonal skills, including the ability to work with others and to participate effectively in a range of conversations and collaborations.

- **Modeling, Design, and Complex Problem Solving:** Use quantitative reasoning to solve problems arising in everyday life, society, and the workplace—e.g., to plan a school event or analyze a problem in the community, to solve a design problem, or to examine relationships among quantities of interest. Plan solution pathways, monitoring and evaluating progress and changing course if necessary, and find relevant external resources, such as experimental and modeling tools, to solve problems. Interpret and evaluate results in the context of the situation and improve the model or design as needed.

If the skills discussed above are to be well measured, it will be important that the tasks students are asked to tackle directly measure these complex skills, rather than evaluating a remote proxy for the skills. For example, where the standards ask that students conduct research; find, evaluate, and synthesize information; weigh and balance evidence; and communicate a logical argument that is well defended with evidence, assessments should call for the demonstration of these skills in authentic tasks.

While it is possible to argue that the ability to locate evidence for an argument could be demonstrated by a student examining an already-provided text and pointing out where evidence for a particular claim could be found, this will not be sufficient to demonstrate that the student knows how to conduct research by finding, evaluating, and using appropriate evidence to build an argument or evaluate a situation. Thus, one of the sample performance tasks in the planned SBAC assessment requires that students take up a social scientific topic about which there are different views, engage in a Google search to find and weigh scientific and historical evidence, evaluate the credibility of the evidence, and develop a cogent essay that takes a position on that topic. Students are also expected to revise their work before it is final.

Similarly, while it is possible to ask students to answer multiple-choice questions that identify possible corrections to errors that have been identified in a text, this does not demonstrate whether the student could independently write or revise a text. New assessments should require students to revise their own written texts, as well as to revise a selection that is provided for them.

And while it is possible to ask students to select an answer to a mathematical problem that is given in a familiar format, this will not demonstrate whether the student could take a real-world problem and identify the kind of mathematics needed to solve it, develop and apply their own solution strategy, select and use appropriate tools, and explain their conclusions. This requires tasks that present the problem in its real-world form and allow students to figure out how to approach it and show their thinking.

As Webb (2005) suggests in illustrating how skills can be displayed and assessed at each Depth of Knowledge level, the activities needed to develop and evaluate these skills become more complex at deeper levels. (See figure 2, page 9.)

Figure 2: Web Alignment Tool

Level One Activities	Level Two Activities	Level Three Activities	Level Four Activities
Recall elements and details of story structure, such as sequence of events, character, plot and setting. Conduct basic mathematical calculations. Label locations on a map. Represent in words or diagrams a scientific concept or relationship. Perform routine procedures like measuring length or using punctuation marks correctly. Describe the features of a place or people.	Identify and summarize the major events in a narrative. Use context cues to identify the meaning of unfamiliar words. Solve routine multiple-step problems. Describe the cause/effect of a particular event. Identify patterns in events or behavior. Formulate a routine problem given data and conditions. Organize, represent, and interpret data.	Support ideas with details and examples. Use voice appropriate to the purpose and audience. Identify research questions and design investigations for a scientific problem. Develop a scientific model for a complex situation. Determine the author's purpose and describe how it affects the interpretation of a reading selection. Apply a concept in other contexts.	Conduct a project that requires specifying a problem, designing and conducting an experiment, analyzing its data, and reporting results/solutions. Apply mathematical model to illuminate a problem or situation. Analyze and synthesize information from multiple sources. Describe and illustrate how common themes are found across texts from different cultures. Design a mathematical model to inform and solve a practical or abstract situation.

Webb, Norman L. and others. "Web Alignment Tool" 24 July 2005. Wisconsin Center of Educational Research. University of Wisconsin-Madison. 2 Feb. 2006. (*www.wcer.wisc.edu/WAT/index.espx*)

The Consortium assessments include items and tasks that will measure some of these key attributes—including skills like listening and writing with revision, as well as mathematical modeling and applied problem solving—that have been neglected in most state tests over the last decade. However, the initial versions of the Consortia tests will not include long-term research and investigation tasks or assessments of multi-modal communications, such as spoken, visual, and technology-supported presentations. Some of these aspects of the standards will likely be tackled in later versions of one or both of the Consortia's tests.

States and districts should include these capacities in other aspects of their assessment systems, as many did during the 1990s, when states like Connecticut and Vermont had students design and conduct scientific experiments, often collaboratively, and analyze and present their results; Kentucky and Vermont engaged in writing portfolios that required students to plan, write, and revise extended pieces of work; and Wyoming and Wisconsin created profiles of students' learning through sets of performance tasks.

There are also a number of networks of high schools that engage students in demonstrating these abilities through structured performance assessments for graduation. These include public school networks like the Performance Standards Consortium in New York City, the International High Schools Network, New Tech High Schools, and Envision Schools, all of which require graduation portfolios that demonstrate research, presentation, and technology skills developed to a high standard.

New statewide efforts to create assessments that will evaluate these more complex abilities are underway in the U.S. through the Council for Chief State School Officers' Innovation Lab Network. This group of 10 states is planning to augment the Consortium assessments with more extended performance tasks that replicate, to the extent possible, the ways in which these kinds of abilities will be used in college and career contexts. That such initiatives are not only desirable but feasible has been demonstrated both in U.S. states and many countries abroad, which include such tasks routinely, at scale, as part of their examination systems.[16]

Standard 3: Standards that Are Internationally Benchmarked

The assessments should be as rigorous as those of the leading education countries, in terms of the kinds of tasks they present, as well as the level of performance they expect.

On the Program in International Student Assessments (PISA) tests, assessments typically require constructed responses to questions that require analysis and applications of knowledge to novel problems or contexts. From Finland to Singapore and Australia to New Zealand, students write even more extended responses to questions that require them to evaluate and analyze texts, data, and problems, rather than bubbling in responses to multiple-choice questions.

In addition to open-ended, "sit-down" tests, project components are now used in the examination systems of Hong Kong; Queensland and Victoria, Australia; New Zealand; and Singapore, as well as the International Baccalaureate program, which is used in more than 100 countries around the world as an arbiter of international educational standards.[17] These projects require students to investigate problems and design solutions, conduct research, analyze data, write extended papers, and deliver oral presentations describing their results. Some of the tasks also include collaboration among students in both the investigations and the presentations.[18] These assessments are scored by teachers, who are supported with moderation and auditing systems to ensure consistency, and are included in overall examination results. (See Appendix A for examples.)

Jurisdictions that use such assessments understand that problem-solving abilities are growing increasingly important in the modern economy, as indicated by shifts in the most valued skills identified by Fortune 500 companies. (See figure 3, page 11.) In 1970, companies were calling for reading, writing, and arithmetic.

However, by the turn of the century, the top five attributes these companies sought were, in order of importance: 1) teamwork, 2) problem solving, 3) interpersonal skills, 4) oral communications, and 5) listening skills. Thus, it will ultimately be important for high-quality assessment systems to include these abilities, setting performance standards that are comparable to those in high-achieving nations around the world.

Figure 3: Fortune 500 Most Valued Skills [19]

	1970	1999
1	Writing	***Teamwork***
2	Computational Skills	***Problem Solving***
3	Reading Skills	***Interpersonal Skills***
4	Oral Communications	Oral Communications
5	Listening Skills	Listening Skills
6	Personal Career Development	Personal Career Development
7	Creative Thinking	Creative Thinking
8	Leadership	Leadership
9	Goal Setting/Motivation	Goal Setting/Motivation
10	***Teamwork***	Writing

Sources: Cassel & Kolstad (1999); Creativity in Action *(1990).*

To underscore the worldwide responses to these new realities, in 2015, PISA will add assessment of collaborative problem solving to its assessments of reading, mathematics, and scientific literacy. Assessment of computer literacy is on the horizon as well.

If the United States wants to be internationally competitive with respect to preparing students for 21st-century occupations, its assessment strategies will also need to focus more explicitly on developing students' capacities to think, problem solve, collaborate, and communicate in many forms and using a wide range of technologies.

Standard 4: Use of Items that Are Instructionally Sensitive and Educationally Valuable

Assessment tasks should also be *instructionally sensitive* and *educationally useful.* That is, they should 1) represent the curriculum content in ways that respond to instruction, and 2) have value for guiding and informing teaching.

Instructionally sensitive items are designed so that the underlying concepts can be taught and learned, rather than reflecting students' differential access to outside-of-school experiences (frequently associated with their socioeconomic status or cultural context) or depending mostly on test-taking skills.[20] Although test-taking skills can be taught,

it is not a good use of valuable instructional time to spend hours teaching students to "psych out" the tests rather than to develop the critically important skills they will need to use in the real world.

Unfortunately, researchers have found that some of the current generation of state basic skills tests are instructionally insensitive.[21] As James Popham observed, these tests may fail to reveal how well a group of students has been taught, because they measure what students bring to school, but not what they learn from school.[22] This is particularly problematic when judgments about the success of individuals and groups of teachers and administrators are based on students' test performance. Only through the use of instructionally sensitive items—that is, items capable of distinguishing between students who have been taught relatively more or less well—can valid inferences about educators' contributions be drawn.

Studies have also found that, even when instruction sometime registers on tests like these, students have had to learn the standards in ways that replicate the format of the items on the tests, failing to generalize to the content domain, and thus under-representing the intent of the standards.[23]

However, there are ways to both test and improve instructional sensitivity.[24] Among these, assessments should be constructed so that an appropriate response requires the student to employ key, enabling knowledge and skills. The knowledge and/or skills represented by the test are clearly described so that teachers will have an understanding of the cognitive demands required for students' successful performance.

In addition, some researchers have found that "performance-based testing maximize[s] sensitivity by better integrating instruction and assessment."[25] Because performance-based testing is more congruent with the ways in which skills are taught and used, it can more easily measure the effects of instruction. Furthermore, such assessments can both guide and inform teaching in educationally valuable ways.[26]

In many countries, assessments *of, as*, and *for* learning are a goal.[27] Assessments are intended not only to measure learning, but also to improve learning by offering good models for teaching and learning and insights into how students think and what they know. Evidence shows that assessments that provide these insights, used to guide instruction and revision of work, can be powerful influences on learning and achievement.[28] As described below, this is an aspect of consequential validity.

Standard 5: Assessments that Are Valid, Reliable, and Fair

All large-scale assessments are expected to meet standards of validity, reliability, and fairness. Associated with these standards are expectations for accuracy and access.[29] Assessments can only be validated in relation to the specific purposes they are designed to serve. This requires the assembly of evidence about several kinds of validity claims.

To be valid for any purpose, an assessment should be a good representation of the knowledge and skills it intends to measure. This premise is generally captured by the overarching idea of *construct validity. Construct validity evidence* can be of several kinds. We have argued above that this kind of validity requires authentic representations of the knowledge and skills an assessment purports to measure using high-fidelity tasks. Other evidence may examine *content relationships* (whether there is a demonstrable relationship between the content specifications intended to be evaluated and the set of items and tasks on the test) and *concurrent relationships* (whether scores are reasonably related to those on other previously validated measures).

Predictive evidence is a form of construct validation that examines whether performance on an assessment is strongly related to real-world success in the domain that the assessment is meant to reflect. For example, to what extent does performance on a college admissions test predict a student's actual success in college? Does a cut score on a particular test used to allow students to take credit-bearing courses in college accurately predict students' abilities to succeed in such courses? And so on. This is particularly important for the assessment of new standards that are intended to lead to and reflect college- and career-readiness.

Consequential evidence refers to the kinds of consequences an assessment and its uses have for learners and for instruction. As Herman and Choi note: "Results should be useful and used for intended purposes and not carry serious unintended or negative consequences."[30] Assessments can positively influence instruction through their diagnostic value, as well as by communicating important learning goals and modeling appropriate pedagogy. They can guide helpful interventions and teaching decisions. However, assessments can also have negative consequences if they are designed or used in ways that distort teaching, deny students access to learning opportunities from which they could benefit, or create incentives for schools to underserve or exclude students with particular needs. Thus, both the assessments themselves, and the decisions related to their interpretation and use, must be subjected to scrutiny.

In order to have assessments that are truly valid for a wide range of learners, they should also be demonstrably *accurate* in evaluating students' abilities and do so *reliably* across testing contexts and scorers. They should also be *fair* and *accessible*: They should be free from bias and designed to reduce construct-irrelevant obstacles to performance

that otherwise would undermine validity for some subgroups (for example, language complexities not related to the construct being measured that impede the performance of English learners). Use of the principles of universal design, together with the design of accommodations and modifications, should create maximum access to the assessment for a wide range of learners. And they should sufficiently cover the continuum of achievement that they enable a wide range of students to show what they know and how they've progressed. Finally, they should be transparent enough to support opportunities to learn relative to the expected content and cognitive demands.

Conclusion

If schools are to enable the kind of transferable learning described in the Common Core State Standards and required of young people in contemporary society, assessments will need to support curriculum and teaching focused on such learning, along with traditional basic skills. New assessment systems, grounded in new standards, should include the features we have described here.

We recognize that our criteria for assessment systems should be rigorous and ambitious, while taking account in the near term of what should be achievable financially, logistically, technologically, and scientifically. The path to reaching more ambitious goals is likely to traverse distinct phases rather than occur in one giant leap. Given where we are today and what should be feasible in the near term, we suggest a set of indicators that can be used to evaluate the criteria. (See page 15.)

States should evaluate the set of assessments they select and develop against these standards, and should use them in ways for which they have been appropriately validated and in contexts that ensure positive consequences for students and for instruction.

INDICATORS OF QUALITY IN A SYSTEM OF NEXT GENERATION ASSESSMENTS

1) Assessment of Higher-Order Cognitive Skills

√ A large majority of items and tasks (at least two-thirds) evaluate the conceptual knowledge and applied abilities that support transfer (e.g., Depth of Knowledge levels 2, 3, or 4 in Webb's Taxonomy or the equivalent).

√ At least one-third of the assessment content in mathematics, and at least one-half in English language arts, evaluate higher-order skills that allow students to become independent thinkers and learners (DOK levels 3 or 4).

2) High-Fidelity Assessment of Critical Abilities

Critical abilities outlined in the standards are evaluated using high-fidelity tasks that use the skills in authentic applications:

√ Research, including analysis and synthesis of information

√ Experimentation and evaluation

√ Oral communications—speaking and listening

√ Written communications—reading and writing

√ Use of technology for accessing, analyzing, and communicating information

√ Collaboration

√ Modeling, design, and problem solving using quantitative tools

3) Standards that Are Internationally Benchmarked

√ Calibration to PISA, International Baccalaureate, or other internationally comparable assessment (based on evaluation of content comparability, performance standards, and analysis of student performance on embedded items)

4) Items that Are Instructionally Sensitive and Educationally Valuable

√ Research that confirms instructional sensitivity

√ Rich feedback on student learning and performance

√ Tasks that reflect and can guide valuable instructional activities

5) Assessments that Are Valid, Reliable, and Fair

√ Evidence that the intended knowledge and skills are well measured

√ Evidence that scores are related to the abilities they are meant to predict

√ Evidence that the assessments are well-designed and valid for each intended use—and that uses are appropriate to the test purposes and validity evidence

√ Evidence that the assessments are unbiased and fairly measure the knowledge and skills of students from different language, cultural, and income backgrounds, as well as students with learning differences

√ Evidence that the assessments measure students' learning accurately along a continuum of achievement, consistent with the purposes the assessments are intended to serve

Appendix A: Assessments Around the World

PROJECT WORK IN SINGAPORE

In Singapore, **Project Work** (PW) is an assessment that is compulsory for all pre-university students. There is dedicated curriculum time for students to carry out their collaborative interdisciplinary project tasks over an extended period. The assessment tasks, which are set by the Singapore Examinations and Assessment Board (SEAB), are designed to be sufficiently broad to allow students to carry out a project that they are interested in while meeting the task requirements.

In groups formed by the teacher, students agree on the project that the group will undertake, brainstorm and evaluate each other's ideas, and decide on how the work should be allocated. Project Work tasks result in:

- a **Written Report** that shows evidence of the group's ability to generate, analyze, and evaluate ideas for the project;
- an **Oral Presentation** in which each individual group member is assessed on his/her fluency and clarity of speech, awareness of audience, as well as response to questions. The group as a whole is also assessed in terms of the effectiveness of the overall presentation;
- a **Group Project File** in which each individual group member submits three documents related to "snapshots" of the processes involved in carrying out the project. These documents show the individual student's ability to generate, analyze, and evaluate (I) preliminary ideas for a project, (II) a piece of research material gathered for the chosen project, and (III) insights and reflections on the project.

The SEAB specifies task-setting, conditions, assessment criteria, achievement standards, and marking processes. Classroom teachers carry out the assessment of all three components of PW using the assessment criteria provided by the Board. All schools are given exemplar material that illustrates the expected marking standards. The Board provides training for assessors and internal moderators. Like all other assessments, the grading is both internally and externally moderated to ensure consistency in scoring.

In carrying out the PW assessment task, students are intended to acquire self-directed inquiry skills as they propose their own topic, plan their timelines, allocate individual areas of work, interact with teammates of different abilities and personalities, and gather and evaluate primary and secondary research material. These PW processes reflect life skills and competencies such as knowledge application, collaboration, communication, and independent learning, which prepare students for the future workplace.

EXTENDED EXPERIMENTAL INVESTIGATIONS IN QUEENSLAND

In Queensland (Australia) science courses, like those in Singapore, Hong Kong, and other Australian states, students must complete an extended experimental investigation that they design, conduct, and evaluate. In Queensland, the task is defined as follows:

> Within this category, instruments are developed to investigate a hypothesis or to answer a practical research question. The focus is on planning the extended experimental investigation, problem solving, and analysis of primary data generated through experimentation by the student. Experiments may be laboratory- or field-based. An extended experimental investigation may last from four weeks to the entirety of the unit of work. The outcome of an extended experimental investigation is a written scientific report. For monitoring, the discussion/conclusions/evaluation/recommendations of the report should be between 1500 and 2000 words.

To complete such an investigation the student must:

- develop a planned course of action;
- clearly articulate the hypothesis or research question, providing a statement of purpose for the investigation;
- provide descriptions of the experiment;
- show evidence of modification or student design;
- provide evidence of primary and secondary data collection and selection;
- execute the experiment(s);
- analyze data;
- discuss the outcomes of the experiment;
- evaluate and justify conclusion(s); and
- present relevant information in a scientific report.

GRADUATE CERTIFICATE IN SECONDARY EDUCATION (GCSE) TASK IN INTERACTIVE COMPUTER TECHNOLOGY, ENGLAND

In England, students choose a number of domains in which to be examined as part of the high school assessment system. Most of these examinations, which are linked to high school courses, include a project-based component that typically counts for 60% of the total examination score. The project below has been used as part of the Interactive Computer Technology examination.

> Litchfield Promotions works with over 40 bands and artists to promote their music and put on performances in England. The number of bands they have on their books is gradually expanding. Litchfield Promotions needs to be sure that each performance will make enough money to cover all the staffing costs and overhead, as well as make a profit. Many people need to be paid: the bands, sound engineers, and lighting technicians. There is also the cost of hiring the venue. Litchfield Promotions needs to create an ICT solution to ensure that it is all necessary information and that it is kept up to date. Its solution will show income, outgoings, and profit.
>
> Candidates need to: 1) Work with others to plan and carry out research to investigate how similar companies have produced a solution. The company does not necessarily have to work with bands and artists or be a promotions company. 2) Clearly record and display your findings. 3) Recommend a solution that will address the requirements of the task. 4) Produce a design brief, incorporating timescales, purpose, and target audience.

Produce a solution, ensuring that the following are addressed:

1. It can be modified for use in a variety of situations.
2. It has a user-friendly interface.
3. It is suitable for the target audience.
4. It has been fully tested.

You will need to:

1. Incorporate a range of: software features, macros, modeling, and validation checks—used appropriately.
2. Obtain user feedback.
3. Identify areas that require improvement, recommending improvement with justification.
4. Present information as an integrated document.
5. Evaluate your own and others' work.

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James Popham, *Professor emeritus at the Graduate School of Education and Information Studies, UCLA*. W. James Popham has taught courses for nearly 30 years, mainly on instructional methods for prospective teachers and on evaluation and measurement. In January 2000, he was recognized by *UCLA Today* as one of UCLA's top 20 professors of the 20th century. In 1978, Dr. Popham was elected to the presidency of the American Educational Research Association (AERA). He was also the founding editor of *Educational Evaluation and Policy Analysis*. In 2002, the National Council on Measurement in Education presented him with its Award for Career Contributions to Educational Measurement. In 2009, he was appointed to be a board member of the National Assessment Governing Board.

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