WHITE PAPER

The Future of Educational Assessment

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By Stephen Murphy, Ph.D. and
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Any look at the future of assessment has to recognize that our current assessment programs, however sophisticated, have limitations—the same limitations as our current assembly-line approach to schooling established 100 years ago to help the nation enter the industrial era.

With some exceptions, school districts across the United States still organize students in age-similar classrooms where all students study the same curriculum at the same pace from a teacher who doles out learning content. Yet learning science research indicates that all students learn differently and at different speeds, and that most students learn best in systems that are geared toward deeper learning and by studying what matters most to them led by a teacher who, rather than dispense knowledge, facilitates and guides self-directed learning at each students' own pace.

We need to shift our approach to provide the kind of learning required for the knowledge era, preparing students for a future of continuous learning by equipping them with the tools to master complex thinking, aligned to their identity as students, and to facilitate creativity. The student-centered learning of the future will be more authentic and based in the real world; and it will be interconnected with an environment and ecosystem of tools and resources that maximize students' context for learning.

This approach will harness the missing forces in learning today—student interest and motivation. Students will be able to view learning and instruction as relevant to them personally, engaging them in a personal and local, culturally relevant context and authentically connecting with their lives. This student-centered model will strengthen students' identity as learners and facilitate creative approaches to understand the learner in a strong learning community.

This future paradigm of student learning still includes curriculum (learning targets for academic achievement and progress), instruction (tools and methods for transmission of knowledge) and assessment (collecting evidence of learning attainment). But these key components of learning are approached from a completely different orientation that focuses on the student experience. The differentiator being that it attempts to explicitly connect students with learning and puts students—not the curriculum to be mastered nor the teacher as dispenser of knowledge—at the center.

Future Paradigm of Student Learning

The future paradigm of student learning (see exhibit 1.) is designed to represent elements closest to students and their individual learning. It is important to recognize that the student exists in a broader ecosystem (i.e., family, community, classroom, school, district, state) where the learning and social environments, school funding, access to technology, school improvement cycles, etc., all function and impact student learning, but do so indirectly. These "outer" layers in the broader ecosystem of education are acknowledged as important but outside the core intent of our argument. Setting this aside, when we change the paradigm of learning to focus on student-centered learning, the parts of the system are inherently more complex, and educators must possess multiple tools designed to ready students for future success.

In spite of the slow shift to a knowledge-era approach to learning, current assessments already can be a powerful tool to engage students in their learning and to help them assess their own progress and needs. When used as part of a comprehensive system to help students reach specific learning goals, assessment can bolster student learning, teacher practice and behavior, while also playing a significant role in guiding school improvement efforts.

Why Assessments Matter

After 15 years of No Child Left Behind's focus on testing for accountability, educators and policymakers have recognized the value of balancing student performance on end-of-year exams with using testing as a vehicle to strengthen teaching and learning. Today, schools, districts, and states are gaining greater assessment literacy and learning how assessment can strengthen performance. Driven by an urgency to provide valuable, actionable information to educators and students that statewide summative assessments cannot provide, our education system is increasingly focused on classroom assessment practices embedded in instructional activities.

The Future Paradigm of Student Learning

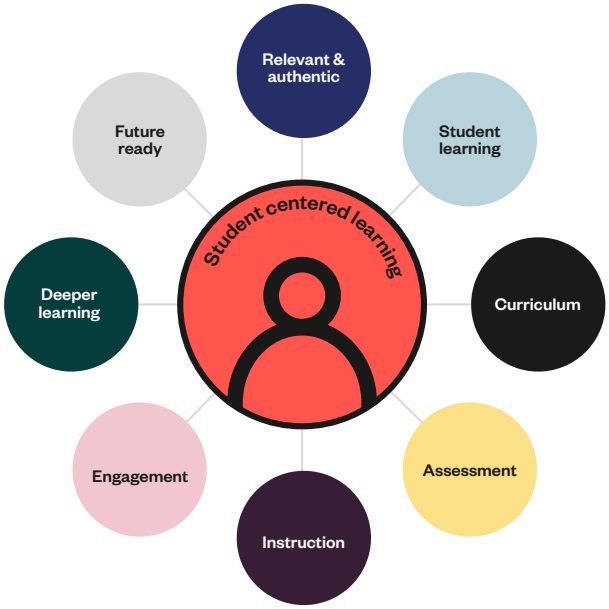


EXHIBIT 1:
FUTURE PARADIGM OF STUDENT LEARNING

Teacher understanding of what students know and can do often falls along a broad continuum; teachers must constantly navigate the competing demands of ensuring student learning and curriculum pacing. Some students may need remediation, while others need additional challenge to keep them engaged. Assessment well-fitted with instruction can help to address this challenge, but a potential barrier is the wide range of types and quality of assessment approaches. There can be in-class quizzes and tests, end-of-chapter or end-of-unit assessments, periodic tests over the school year, and end-of-year tests—all of which can be developed by the teacher, textbook publishers, the school or district, or assessment providers. These assessment activities can vary in quality and alignment to curricular standards, have different purposes and uses, provide different kinds of data and reporting, and provide a range of reliability, validity, fairness, and meaningfulness.

Increasingly, states are beginning to employ balanced assessment systems that integrate interim and classroom assessment. This comprehensive approach to assessment supports educators in improving learning by providing multiple measures that educators can use to determine what students know and can do—both during and following instruction—to engage students in their learning and monitor academic progress toward end-of-year goals. These measures enable opportunities to:

- Verify learning of a specific unit of instruction
- Determine whether students are struggling with a concept
- Gauge student readiness for end-of-year accountability testing
- Evaluate a year's worth of learning

Ultimately these measures help determine if students have mastered grade-level content and are prepared for the next year of learning.

The mindset shift to expand state-sponsored, statewide balanced assessment system is a sound approach departments of education are introducing to monitor and inform learning progress throughout the academic school year.

Typically, balanced assessment models include:

- **FORMATIVE ASSESSMENT**, in which educators and learners gather evidence of understanding while instruction occurs in real time through small, focused check-ins that support educators in making instructional adjustments that help individual students, groups of students, and/or the whole classroom.
- **BENCHMARK ASSESSMENTS**, which are used at the end of a series of instruction to verify learning and identify students requiring additional instruction or enrichment. These assessments also have a high impact on student learning and can support instructional decisions for each student and a class, school, or district.
- **INTERIM ASSESSMENTS**, typically offered in the fall, winter and spring, monitor student performance, progress, and growth through the year in reaching end-of-year academic goals and help identify students or curricular areas that need attention. They provide feedback to help improve instruction, evaluate program effectiveness, monitor academic progress, and inform resource allocation. They have a moderate impact on student learning but help understand overall classroom, school, and district performance in the classroom. Another form of interim assessment, through-year assessment, assesses only those content standards covered during instruction in the course of the learning period.
- **SUMMATIVE ASSESSMENTS** are the familiar end-of-year assessments that verify learning and fulfill accountability requirements, providing indicators of achievement status for a given year against on-grade expectations that also can highlight year-over-year growth. These assessments provide aggregate information for use in program evaluation, policy and policy decisions, budget allocations, and accountability status (including identification of schools in need of extra support), and provide data regarding effectiveness of curricular and instructional approach.

“Increasingly, states are beginning to employ balanced assessment systems that integrate interim and classroom assessment.”

Assessment for a New Era

In the future, assessment will be seen differently—not as a sorting mechanism which identifies the students who gain the most from the current system, but rather as a vehicle for measuring authentic learning where assessment is an integral part of the learning process.

The new era requires that assessment provides powerful tools to support teacher thinking and practices in the classroom that encourage active learning, student agency, and authentic ways of measuring what students do, making assessment more fully integrated into learning. In the intermediate and long term, these new types of learning will push assessment far beyond statewide accountability testing into more effective teaching and assessment practices. In the new era, assessment will be part of ongoing, just-in-time evaluation of student progress toward achieving standards. The idea is to create a student-centered view and teaching practice that identifies student learning and learning needs during instruction, embeds formative assessment activities within lesson plans and curriculum units, and authentically engages students in their own learning and progress.

New measures must prepare students to be future ready, learning focused, and supportive of their whole selves. They must promote student agency in an engaging and authentic manner. We must help students creatively engage and develop outcomes, leverage resources and tools provided to them in their learning, so that they can be agents of their own futures.

Authentic assessment requires students to apply what they have learned in an unfamiliar, novel, or complex and often real-word (immersive) environments or in situations that mimic the real world (e.g., a case study). They also typically require judgment and innovation, assess the student's ability to efficiently and effectively use a repertoire of knowledge and skill to negotiate complex tasks, and allow appropriate opportunities to rehearse, practice, consult resources, and get feedback on and refine performances and work products (Wiggins, 1998). Examples of authentic assessment include conducting research and writing a report, developing character analyses, participating in student debates, writing an essay about a book or chapter, conducting experiments, generating journals, engaging in peer discussions and self-reflection. The ways in which these types of learning activities are systematically tied together within and across years, as well as the learning environments in which they are implemented, are the keys that will help students grow in their engagement, agency, mastery, and future preparation.

Systems to Support Student Learning

These concepts can be measured through a variety of methods and more likely via a suite of measures such as self-reflection/perception surveys, observation tools, assessments based on multiple content areas, teacher logs, rubrics, and performance-based tasks.

For example, the **Center for Assessment,** in its work on 21st century skills (2020), asserts that self-directed learning holds promise as a concept and suggests the "best way to assess self-directed learning is through authentic, performance-based tasks that allow students to demonstrate their ability to apply self-directed learning skills [and] is not likely to come from a final student work product. Self-directed learning is a process, not an outcome."

The Impact of Engagement

In supporting students to become future-ready and increase agency in their learning, educators will also need to incorporate measures that focus on students' cognitive, behavioral, and emotional engagement during the learning process. It is possible, through surveys, to understand the level of student engagement, curiosity, interest, and passion that is so central to student agency.

Prior research has uncovered strong relationships between overall student engagement and academic achievement-related outcomes, but increased student engagement may hold greater promise for producing future-ready students who demonstrate increased agency in their learning.

While there are different approaches to conceptualize student engagement, there are three domains that hold promise as the structure of student engagement. These include:

- **COGNITIVE ENGAGEMENT:** A student's perceptions and beliefs associated with school and learning, including the cognitive processing a student brings to academic tasks and the number and type of strategies a student utilizes (Walker, Greene, & Mansell, 2006)
- **BEHAVIORAL ENGAGEMENT:** A student's observable actions or participation while at school, reflected in a student's positive conduct, effort, and participation, e.g., participation in extracurricular activities, attendance, and work habits (Fredricks, Blumenfeld, & Paris, 2004)
- **EMOTIONAL (AFFECTIVE) ENGAGEMENT:** A student's feelings toward [the student's] school, learning, teachers, and peers (Jimerson, Campos, & Grief, 2003)

These domains of engagement can be measured through a student self-report survey where students respond to content aligned to the domains that can provide information to schools and districts on where and potentially how to improve the learning environment to bolster engagement.

> "When used as part of a comprehensive system to help students reach specific learning goals, assessment can bolster student learning, and teacher practice and behavior while also playing a significant role in guiding school improvement efforts."

Technology Will Expand Assessment Capabilities in Powerful Ways

Technology Enabled and Enhanced Items

Current and imminent technology capabilities offer exciting opportunities for advancing educational assessment.

Some of the technological applications used in testing today, to be sure, are simply computerized versions of selected-response items that appear on state assessments. For example, some drag-and-drop items are not much different from multiple-choice or even fill-in-the-blank selected-response items that use many current technology capabilities.

These technology-**enabled** approaches offer no more information about student knowledge and thinking than do conventional selected-response items.

Technology-**enhanced** approaches, on the other hand, permit us to elicit knowledge and skills that cannot be obtained from selected-response items and are becoming widely available in online state summative assessments and interim assessments. New digital technologies are being used in assessment to animate item stimuli, bringing to life science phenomena (e.g., forces and motion) or dynamically manipulable stimuli, such as adjusting variables in a chemistry experiment or a physics phenomenon (e.g., motion and velocity). (See exhibit 6.)

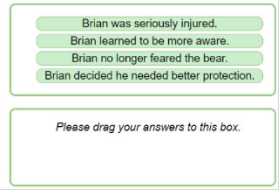
Assessment Technology and Student Engagement

A study of elementary and middle school students responding to multiple-choice, multiple-select items using two types of assessment technology, supports the popular claim that technologically enhanced approaches are more engaging than multiple-choice and multiple-select items (Wise, Soland, & Dupray, 2021). Engagement is measured by the frequency of rapid guessing on items, where low engagement is indicated by high incidents of rapid guessing. On the four item types, the rapid guessing rates were multiple-choice, 3.6%; multiple-select, 1.7%; and for the combined TEIs, 0.4%. In multiple-select items, students select two or more correct responses from multiple options. The two types of test items were:

- Gap-match items in which students drag words, phrases, symbols, graphical elements, or numbers to fill in blanks in a response space
- Selectable-text items (also known as hot spot items), in which students highlight a piece of text or section of a table of information (e.g., a word, a passage section, number, symbol, or equation) to respond to an item

Wise and colleagues (2021) suggest that two factors—how interesting they are to interact with and how much effort is required to complete them—may influence student engagement with the items.

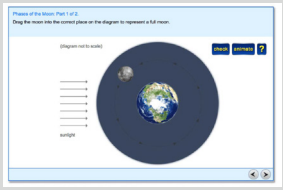
EXHIBIT 2: TECHNOLOGY-ENABLED GAP-MATCH ITEM



Students read a passage and drag true statements into the box

(Source https://assess.com/2019/12/26/what-are-technology-enhanced-items/)

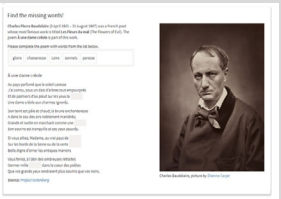
EXHIBIT 3: TECHNOLOGY-ENHANCED GAP-MATCH ITEM



Students drag the moon to the place on the diagram when it is full

(Source https://victoryprd.com/portfolios/suite-of-technology-enhanced-items/)

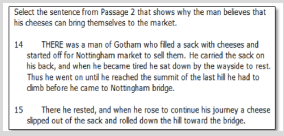
EXHIBIT 4: TECHNOLOGY-ENABLED GAP-FILL ITEM



Students drag response choices (at top) into the blanks in the sentences (below)

(Source https://www.taotesting.com/user-guide/creating-test-materials/adding-interactions/interactions/gap-match-interaction/)

EXHIBIT 5: TECHNOLOGY-ENHANCED SELECTABLE-TEXT ITEM



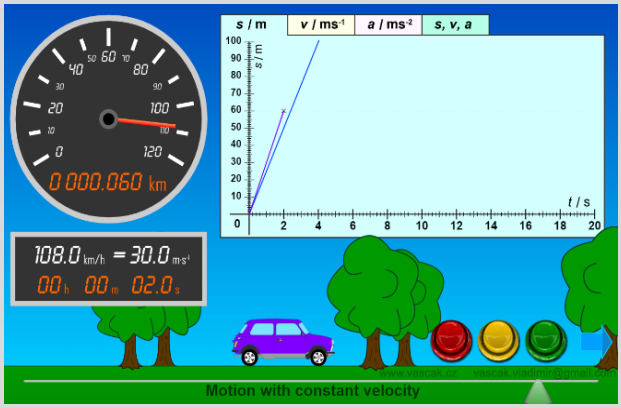
Source: Florida State Assessment Reading Technology-Enhanced Item, Miami-Dade County Public Schools. MDCPS, Office of Academics and Transformation, 2015-2016.

Students highlight text to respond to an inference question

(Click to view)

The following exhibit shows animated stimulus for a science item (see Exhibit 6) and a simulated, immersive environment for exploration, experimentation, and unobtrusive and direct formative assessment (see Exhibit 7).

EXHIBIT 6: ANIMATED STIMULUS FOR A SCIENCE ITEM



Click here to view the animation.

EXHIBIT 7: IMMERSIVE ENVIRONMENT FORMATIVE ASSESSMENT ITEM.

Click to view immersive item. (Source SimScientists WestEd 2009-2002.)

Long term, we can imagine—now, even see—immersive environments for students to explore. These environments can be developed as learning tools (e.g., science content, rigorous investigative practices) with embedded, unobtrusive formative assessments (DiCerbo & Behrens, 2014) and also as "stealth" assessment (Shute & Ventura, 2013) that can provide immediate formative feedback to help students enhance their learning. Immersive environments like these, with embedded formative assessment activities, can be created (and in some cases adopted) for integration into classroom instruction units.

It is possible right now to conduct project-based learning and assessment activities online. And there is wildly enthusiastic discussion everywhere about game-based assessments, something we can expect to see in the next few years. The advantages of building, storing, and evaluating student work samples for portfolio assessments enable educators to use portfolios in numerous ways to assess student projects, accomplishments, and growth.

Right now, some state assessment programs, such as the Florida Standards Alternative Assessment—Datafolio—are operating alternate assessment portfolios for students with the most significant cognitive disabilities. Today, teachers can scan and upload student work to a website portfolio folder system and even enter the evidence directly. This reduces the paperwork burden for classroom teachers, who, even 10 years ago, recorded student work products and other forms of evidence of learning and achievement growth in paper portfolios. This meant file folders stuffed with photocopies, worksheets, and so forth.

Technology-Enabled Classroom Formative Assessment

Technology capabilities for advancing formative assessment enable teachers to assess student understanding, skills, and competencies that are considerably challenging to assess in the classroom. A little creative thinking makes it easy to imagine how teachers can use the examples we describe for assessing higher-order thinking skills (e.g., reasoning, problem solving), a holy grail since at least the 1990s; 21st century skills and deeper learning competencies like future, systems, self-directed, and multi-literate thinking; content mastery; and perhaps even social and emotional learning skills like self-awareness and emotion regulation.

Assessment activities possible in technology-enhanced, formative assessment approaches enable teachers to assess these skills, in many cases to have them scored immediately and automatically using advances in automated scoring enabled by machine learning and other artificial intelligence (AI) approaches. Students can receive automated or teacher-generated, immediate, personalized, formative feedback on their strengths and learning needs. For example, curriculum providers could embed inference items using selectable text and assess student engagement, logical and scientific investigation techniques, and problem-solving in immersive learning as part of their formative assessment and feedback framework.

Challenges of Delivering Technology-Enhanced Assessments

The recent pandemic has brought to the forefront the idea that technology capabilities can support online learning and drawn further awareness that effectiveness and accessibility of online learning for all students is clearly a challenge. Likewise, the move toward online testing—that is, administering tests remotely to students who are not in schools or classrooms—is also coming to the forefront now.

Licensing and credentialing for professions (e.g., health care, plumbing and heating) and graduate admissions (i.e., the Graduate Record Examination) already rely on online testing. Because these tests are voluntary to examinees, testing programs can use high-tech security measures like AI-enabled iris recognition to confirm the identity of an examinee. These AI capabilities are personally intrusive and are not allowable for educational testing. However, online automated, personalized feedback of assessment for learning is already available for many college undergraduate courses. For these approaches to be effective, of course, we need to address challenges in implementing technology-enhanced formative assessments. These include:

- Developing and deploying assessments
- Integrating them into curriculum and instruction
- Ensuring all students have access to up-to-date digital devices and the internet
- Providing professional learning to support teachers integrating these formative assessment activities and tools into their daily classroom instructional activities, to interpret information on student learning and learning needs, and to support students' capabilities for self-assessment and guiding their own learning

Professional learning is particularly important and must be approached comprehensively.

Assessment providers must address all the challenges in collaboration with teachers, schools, and districts, and help promote the opportunities for teachers and students to engage in formative assessment practices that have been demonstrated to enhance student learning.

These are manageable challenges, and the payoffs promise to outweigh the required investment of teacher and student time.

> "The student-centered learning of the future will be more authentic and based in the real world; and it will be interconnected with an environment and ecosystem of tools and resources that maximize students' context for learning."

Expanding the Impact of Classroom Assessment Practices on Student Learning

As part of commercially available balanced assessment systems, interim assessments have become widely desired assessment and feedback tools in districts and states around the country. Educators use them primarily to track student learning and progress during fall, winter, and spring, and to predict likely student performance on end-of-year state assessments. To be clear, our field does not have systematic information on how school- and district-level staff use information from interim assessments, how much they value this information, and what affects interim assessment information has on curriculum, teaching decisions, and student achievement. The popularity of interim assessments around the country and our experience suggest positive responses regarding these three considerations.

Research on teacher assessment practices indicates that "regardless of their intended purpose, [classroom assessments] directly or indirectly influence students' future learning, achievement, and motivation to learn" (Moss, 2013, p. 8078–8084). The academic knowledge and skills that teachers assess in their classrooms and how they assess signal what is important for students to learn, spur students' learning, and motivate students to learn. Other researchers have documented this finding (e.g., Wiliam, 2017; McTighe & Ferrara, 2021).

The Assessment Training Institute has recognized the power in these findings and provides training in classroom assessment tools and practices to help teachers and students plug into that power. When more preservice teacher training programs catch on to the importance of this training, each cadre of newly trained and certified teachers will be able to integrate this powerful practice into their classroom instruction.

Even the psychometricians' professional organization, the National Council on Measurement in Education recognizes the power of classroom assessment as part of learning. For several years, NCME has held the annual Classroom Assessment Conference with the goal of promoting research and development in classroom assessment tools and practices.

The power of embedded classroom formative assessment practices and tools comes, in large part, from the feedback provided to teachers and students. Formative feedback about aspects of one's own experience or understanding from teachers, parents, and books identifies what students have mastered and partially mastered, and their subsequent learning needs. In his widely acclaimed series of books and follow-up studies, including "Visible Learning" (2009), Hattie observes that "feedback was among the most powerful influences on achievement" (p. 173). He summarizes results from meta-analyses of the positive effects of feedback on student learning. "Providing information about the [learning] task" (p. 175) is the key to helping students improve their mastery of learning goals. More specifically, Hattie reports that "providing formative evaluation" (Hattie, 2009, Appendix B) is the third-highest influence on student achievement among findings from the thousands of studies he included in his meta-analysis of over 800 other published meta-analyses (p. 3). He reports that the average effect size across thousands of studies, involving many millions of students, is .90, an improvement rate that is typically associated with advancing children's achievement by two to three [school] years, improving the learning rate by 50 percent on average, [and that] students receiving that treatment would exceed 84 percent of students not receiving that treatment (pp. 7–8).

Researchers note that some types of feedback have more benefit than others. Praise and criticism (feedback about students themselves) is the least effective type of feedback for supporting learning, while feedback about processing and self-regulation, both related to student thinking, are powerful influences on deep learning and mastery of content and skills. Meanwhile, feedback about student performance on the learning task—that is, their learning—helps students develop learning strategies and self-regulation (Hattie and Timperley, 2007). Other researchers have pointed out that effective feedback is non-evaluative (i.e., information to guide improvement, not a grade or criticism), supportive, timely, and specific (Shute 2008). Researchers agree that using formative feedback to promote student learning requires understanding its complexities. The success of formative feedback depends on multiple factors, including characteristics of individual learners, aspects of the learning task (e.g., its complexity for specific learners), and characteristics of the feedback (e.g., its complexity for a student, when it is provided).

Teachers can communicate oral and written feedback on student learning by using scoring rubrics (e.g., McTighe & Ferrara, 2021, chap. 4). Online AI-supported learning and assessment systems have some capability for providing effective, personalized feedback based on intelligent, automated scoring engines (e.g., in e-learning courses).

Next Steps

To increase the efficacy of student-directed learning, schools, districts, and states need to think about student learning as a whole and how they can bring multiple measures together to inform student progress against learning goals. We need to change the dialogue about assessment from event-and pressure-based testing to thoughtful systems of assessment and move to a new paradigm of learning where curriculum, instruction, and assessment are elements of a broader landscape of the student.

Our view of learning should no longer be curriculum-, instruction-, and assessment-driven but rather student-driven. Educators, online curriculum providers, and technology developers need to continue enhancing instructional content and technology capabilities to support immersive and project-based learning environments, and help students build portfolios of their learning. Not least, teachers need expanded professional learning opportunities to use assessments and data as integral components of teaching.

Teachers remain fundamental to student learning. We must provide teachers with expanded preservice and high-quality professional learning to equip them with the skills and training to use assessments and data as integral components of teaching.

The world continues to advance rapidly in this information age—assessment must, as well.

> “Students will be able to view learning and instruction as relevant to them personally, engaging them in a personal and local, culturally relevant context and authentically connecting with their lives. ”

References

Chu, S. K. W., Reynolds, R. B., Tavares, N. J., Notari, M., & Lee, C. W. Y. (2017). 21st century skills development through inquiry-based learning: From theory to practice. Singapore: Springer.

Hattie, J. (2009). *Visible Learning*. Kindle edition. Routledge.

Hattie, J., & Timperley, H. (2007). The power of feedback. Review of *Educational Research*, 77(1), 81–112.

Jimerson, S. R., Campos, E., & Greif, J. L. (2003). Toward an understanding of definitions and measures of school engagement and related terms. *The California School Psychologist*, 8, 7–27. https://doi.org/10.1007/BF03340893.

Florida State Assessment Reading Technology-Enhanced Item, Miami-Dade County Public Schools. MDCPS, Office of Academics and Transformation, 2015-2016. https://languageartsreading.dadeschools.net/pdf/LAFS/3%20FSA%20Item%20Types%202015-2016.pdf

Koening, J. A. (2011). *Assessing 21st century skills: Summary of a workshop*. Washington, D.C.: The National Academies Press.

Mehta, J., & Fine, S. (2019). *In search of deeper learning: The quest to remake the American high school*. Harvard University Press.

McTighe, J., & Ferrara, S. (2021). *Assessing student learning by design: Principles and practices for teachers and school leaders*. Teachers College Press. https://www.tcpress.com/assessing-student-learning-by-design-9780807765401?page_id=892.

Moss, C. M. (2013). *Research on classroom summative assessment*. In J. H. McMillan (Ed.), Research on classroom assessment (pp. 235–255). Kindle edition. Sage. Plate and Monroe 2014.

Shute, V. J., & Ventura, M. (2013). *Stealth assessment: Measuring and supporting learning in games*. MIT Press. https://doi.org/10.7551/mitpress/9589.001.0001.

SimScientists WestEd 2009-2002. http://www.simscientists.org/sci_topics/index.php

Walker, C. O., Greene, B. A., & Mansell, R. A. (2006). Identification with academics, intrinsic/extrinsic motivation, and self-efficacy as predictors of cognitive engagement. Learning and Individual Differences, 16(1), 1–12.

Wiggins, G. P. (1998) *Educative assessment: Designing assessments to inform and improve student performance*. Jossey-Bass.

Wise, S. L., Soland, J., & Dupray, L. M. (2021). The impact of technology-enhanced items on test-taker disengagement. *Journal of Applied Testing Technology*, 22(1), 28–36.

Wiliam, D. (2017). Embedded formative assessment. Solution Tree: Bloomington, IN.

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