Ensuring the CCSSM Matters Ten Years from Now

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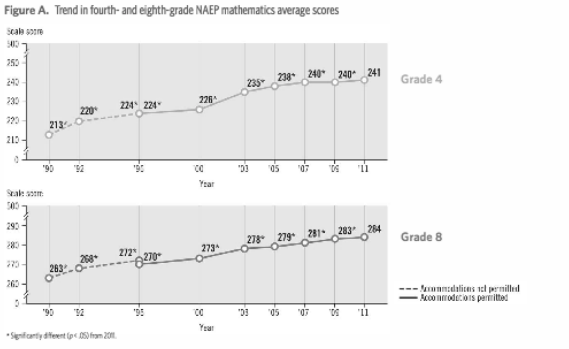
What Effect Have Standards Had on Student Achievement?



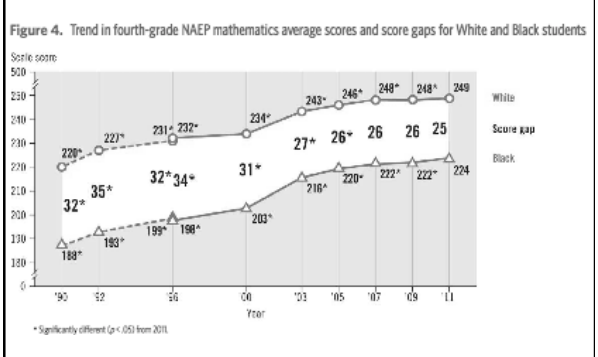
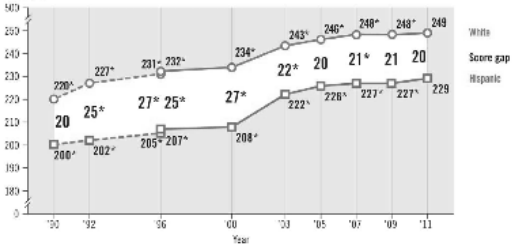


Figure 5. Trend in fourth-grade NAEP mathematics average scores and score gaps for White and Hispanic students



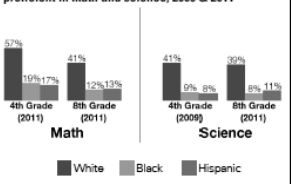
In California the Story is the Same

8th Grade NAEP scale scores, 2003 & 2011

	NAEP Scale Score		Change Since 2003	
	2003	2011	CA	Most Improved State
All	267	273	+6	+17 (DC)
Low Income	251	260	+9	+19 (MA)
White	283	290	+7	+17 (HI)
Black	246	254	+8	+19 (NJ)
Hispanic	250	260	+10	+24 (AR)

Totals may not sum due to rounding errors.

Percentage of California students scoring at or above proficient in math and science, 2009 & 2011



CHANGE THE EQUATION IN PARTNERSHIP WITH the American Institutes for Research.

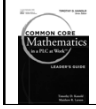
CCSSM Content Standards Alone Likely Will Not Address Achievement Differentials

"The Common Core may reduce variation in achievement between states, but as a source of achievement disparities, that is not where the action is. Within-state variation is four to five times greater" (p. 12).

Loveless, T. (2012). *The 2012 Brown Center Report on American Education: How Well are American Students Learning?* Brown Center on Education Policy at Brookings.

Five Necessary Paradigm Shifts for the CCSSM to Improve Achievement and Close Learning Differentials

- **Mathematics Curriculum**
- **Mathematics Instruction**
- **Mathematics Assessment**
- **Mathematics Intervention**
- **Mathematics Professional Development**

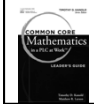


Kanold, T., & Larson, M. R. (2012). *Common Core Mathematics in a PLC at Work™: Leader's Guide*. Bloomington, IN: Solution Tree Press; Reston, VA: NCTM.

Paradigm Shift: Mathematics Curriculum

The CCSSM requires a paradigm shift to a "less is more" orientation with respect to content.

Specifically it requires that fewer standards be taught at a higher level of cognitive demand at every grade level than currently characterizes most state standards documents.



Kanold, T., & Larson, M. R. (2012). *Common Core Mathematics in a PLC at Work™: Leader's Guide*. Bloomington, IN: Solution Tree Press; Reston, VA: NCTM.

Common Core and Cognitive Demand

The Common Core State Standards for Mathematics represent a shift toward higher levels of cognitive demand than are currently represented in state standards … the CCSS emphasize the cognitive demand category "demonstrate understanding" more than state standards do … and twice the emphasis on "solve nonroutine problems" than state standards do.

Porter, A., McMaken, J., Hwang, J., & Yang, R. (2011). Common core standards: The new U.S. intended curriculum. *Educational Researcher*, 40(3), 103-116.

Current State Assessments Lack Rigor

Based on analysis from 17 leading states, the current cognitive rigor of state assessment items indicates that all items are at or below DOK2, with the majority at DOK1.

Herman, J., & Linn, R. (2013). On the Road to assessing deeper learning: the status of smarter balanced and PARCC assessment consortia [CRESST Report 823]. Los Angeles, CA: University of California, National Center for Research on Evaluation, Standards, and Student Testing [CRESST].

SBAC and will Dramatically Increase Rigor

Based on content specifications, as many as 49% of SBAC's assessment targets may be assessed at DOK3 and as many as 21% at DOK4. These expectations reflect a dramatic increase in the intellectual rigor relative to current state assessments.

Herman, J., & Linn, R. (2013). *On the Road to assessing deeper learning: the status of smarter balanced and PARCC assessment consortia* [CRESST Report 823]. Los Angeles, CA: University of California, National Center for Research on Evaluation, Standards, and Student Testing [CRESST].

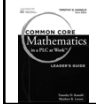
Prepare for More Realistic Results!

Current state proficiency rates under NCLB in many states inflate students' true level of mathematical understanding when measured against an international performance standard that defines mathematical proficiency in terms of connected mathematical understandings and processes in addition to procedural skills. We need to confront this fact and move forward from a new, but more realistic baseline of student achievement.

Larson, M. R., & Leinwand, S. (2013). Prepare for more realistic results. *Teaching Children Mathematics*, 19(9), 533-536.

Paradigm Shift: Instruction

The CCSSM requires a paradigm shift to lesson designs that embed the Standards for Mathematical Practice into teachers' daily lesson plans so that students develop not only procedural fluency, but also a deep understanding of the content.



Kanold, T., & Larson, M. R. (2012). *Common Core Mathematics in a PLC at Work™: Leader's Guide*. Bloomington, IN: Solution Tree Press; Reston, VA: NCTM.

We Must Focus on Instruction to Improve to Student Learning

We need to confront the fact that the single greatest determinant of learning is not socioeconomic factors or funding levels. It is instruction. A bone-deep, institutional acknowledgment of this fact continues to elude us.

Schmoker, M. (2006). *Results now: How we can achieve unprecedented improvements in teaching and learning.* Alexandria, VA: Association for Supervision and Curriculum Development.

Typically We Focus on Content

"In today's educational climate there is a strong focus on standards and curriculum, particularly as districts attempt to align to the recent Common Core State Standards. However, there is little attention paid to teachers and their practices" (p. 40).

Gujarati, J. (2011). From curriculum guides to classroom enactment: Examining early career elementary teachers' orientations toward standards-based mathematics curriculum implementation. *Journal of Mathematics Education at Teachers College*, 2, 40-52.

The Instructional Barrier

The U.S. cultural perception of what constitutes effective mathematics teaching and learning inhibits effective teaching and learning.

Barnes, D., Barry, R.Q., Brahier, D., Dillon, F. Huinker, D, Larson, M., Leinwand, S., Leiva, M., Martin, W.G., & Smith, M. (in press). *Principles and actions: An urgent agenda for school mathematics*. Reston, VA: NCTM.

Instructional Change is the Real Challenge

The challenge of the Common Core is to not only interpret and implement the content standards, but to change the instructional environment in which the students learn the content standards. The mathematical practice standards provide the guidelines for that important instructional change to take place.

Christinson, J., Wiggs, M. D., Lassiter, C. J., & Cook, L. (2012). *Navigating the mathematics common core state standards*. Englewood, CO: Lead +Learn Press.

Instruction Matters

Teaching has 6 to 10 times as much impact on achievement as all other factors combined … two teachers working with the same socioeconomic population can achieve starkly different results on the same test .. Just three years of effective teaching accounts on average for an improvement of 35 to 50 percentile points.

Schmoker, M. (2006). Results now: How we can achieve unprecedented improvements in teaching and learning. Alexandria, VA: Association for Supervision and Curriculum Development.

Effective Instruction

There is broad agreement from research … that a conceptually oriented version of mathematics instruction involves mathematical tasks that are … cognitively demanding, as well as pedagogical practices that are suitable to support collaboration and discourse among students, and thoughtful engagement with mathematical reasoning, problem solving, and explanation.

Silver, E. (2010). Examining what teachers do when they display their best practice: Teaching mathematics for understanding. Journal of Mathematics Education at Teachers College, 1(1), 1-6.

Features of Effective Instruction that Support Mathematical Practices 1 - 3

Tasks

- **Conceptual Engagement & Perseverance**

Talk

- **Mathematical Discourse – "Math Talk"**

What is a Mathematical Task?

A mathematical task is defined as a set of problems or a single complex problem that focuses students' attention on a particular mathematical idea …

Boston, M. D., & Smith, M. S. (2009). Transforming secondary mathematics teaching: Increasing the cognitive demands of instructional tasks used in teachers' classrooms. Journal for Research in Mathematics Education, 40(2), 119-156.

Choice of Mathematical Tasks is Critical

"Different types of tasks provide different opportunities for students' learning and place different expectations on students' thinking. If the tasks students encounter require memorizing facts or practicing procedural computations (i.e., tasks with low-level cognitive demands), students are likely to become facile with facts and computational skills. If tasks require students to think, reason, and make sense of mathematical ideas (i.e., tasks with high-level cognitive demands, or cognitively challenging tasks), students are likely to be constructing a rich understanding of mathematics" (p. 82).

Boston, M. (2012). Assessing instructional quality in mathematics. *The Elementary School Journal*, 113, 76-104.

Cognitively-Demanding Tasks are Atypical

Typical classroom mathematics teaching in the United States tends not to use challenging tasks, nor to promote students' thinking about and engagement with mathematical ideas, and thus fails to help students develop understanding of the mathematics they are learning.

Silver, E. (2010). Examining what teachers do when they display their best practice: Teaching mathematics for understanding. Journal of Mathematics Education at Teachers College, 1(1), 1-6.

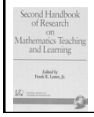
The Use of Mathematical Tasks in the United States is Unique

… [A] key difference between instruction in the United States and other countries is the way teachers and students work on problems as a lesson unfolds. Tasks in the United States are rarely enacted at a high level of cognitive demand.

Stigler, J. W., & Hiebert, J. (2004). Improving mathematics teaching. Educational Leadership, 61(5), 12-16.

We Don't Emphasize Perseverance: Mathematical Practice 1

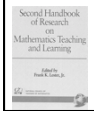
… [S]tudents often urge the teacher to make mathematical tasks more explicit by breaking them down into smaller steps, specifying exact procedures to be followed, or actually doing parts of tasks. Should the teacher succumb to such requests, the … sense-making aspects of the task are reduced or eliminated, thereby robbing students of the opportunity to develop meaningful mathematical understandings.



Stein, M.K., Remillard, J., & Smith, M.S. (2007). How curriculum influences student learning. In F. Lester (Ed.), Second Handbook of Research on Mathematics Teaching and Learning (pp. 319-370). Charlotte, NC: Information Age Publishing.

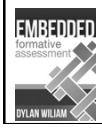
Perseverance

Struggle does not mean needless frustration or extreme levels of challenge created by nonsensical or overly difficult problems. It means that students expend effort to make sense of mathematics, to figure something out that is not immediately apparent … It means the opposite of simply being presented information to be memorized or being asked only to practice what has been demonstrated.



Hiebert, J., & Grouws, D. A. (2007). The effects of classroom mathematics teaching on students' learning. In F. K. Lester (Ed.), Second handbook of research on mathematics teaching and learning . Charlotte, NC: Information Age Publishing

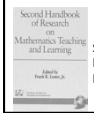
If your students are going home at the end of the day less tired than you are, the division of labor in your classroom requires some attention.



Wiliam, D. (2011). *Embedded formative assessment.* Bloomington, IN: Solution Tree Press.

Supporting Perseverance by Emphasizing Mathematical Practices 2 and 3

Teachers' questions play a central role to the outcome of a lesson. Asking questions that scaffold or support students' continued engagement with a task and that press students to explain and justify their thinking are key to sustaining the cognitive demands of mathematical tasks …



Stein, M.K., Remillard, J., & Smith, M.S. (2007). How curriculum influences student learning. In F. K. Lester (Ed.), Second handbook of research on mathematics teaching and learning . Charlotte, NC: Information Age Publishing.

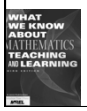
Why Should We Ask Questions?

In the United States, the purpose of a question is to get an answer. In Japan, teachers pose questions to stimulate thought. A Japanese teacher considers a question to be a poor one if it elicits an immediate answer, for this indicates that students were not challenged to think.

Stevenson, H., & Stigler, J. (1992). *The learning gap: Why our schools are failing and what we can learn from Japanese and Chinese education.* New York: Touchstone.

Effective Questioning is Critical to Mathematical Practice 3

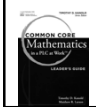
"Effective mathematics teachers … pose more questions with higher cognitive demand and ask more follow-up questions, and their students ask more questions as well. Effective teachers orchestrate productive discussions through purposefully prepared questions" (p. 22).



McRel. (2010). *What we know about mathematics teaching and learning*, third edition. Bloomington, IN: Solution Tree Press.

Paradigm Shift: Mathematics Assessment

The CCSSM requires a paradigm shift toward formative assessment as a multifaceted and continuous process indigenous to instruction leveraged to guide instruction and support students.



Kanold, T., & Larson, M. R. (2012). *Common Core Mathematics in a PLC at Work™: Leader's Guide*. Bloomington, IN: Solution Tree Press; Reston, VA: NCTM.

Typical Reaction with Struggling Students:

Slow It Down (don't cover it all) or Race Through It (don't cover it well)

Research indicates that when students who struggle are allowed enough time to master content, they become almost like top students. The problem is that it can take up to five times as long for students who struggle to master content as faster students.

Usiskin, Z. (2007). The case of the University of Chicago school mathematics project – secondary component. In C. R. Hirsch (Ed.), Perspectives on the design and development of school mathematics curricula (173-182). Reston, VA: NCTM.

Educide by the Low-Slow Group

Too often, schools serving large populations of minority students emphasize "slowing down" or providing less mathematics content, rather than providing more challenging content.

Walker, E. N. (2007). Why aren't more minorities taking advanced math? Educational Leadership, 65(3), 48-53.

Different Opportunities for Different Students

The learning opportunities provided for low-ability, average-ability, and high ability-grouped classrooms are hierarchically different. Students in these different groups are offered very different tasks, curriculum, and instruction.

Boaler, J., Wiliam, D., & Brown, M. (2000). Students' experiences of ability grouping – disaffection, polarisation and the construction of failure. British Educational Research Journal, 26(5), 631-648.

Educide by the Low-Slow Group

Low expectations often result in self-fulfilling prophecies. Once placed in the low tracks, it is very difficult for students to move to a higher track.

Flores, A. (2008). The opportunity gap. TODOS Research Monograph: Promoting High Participation and Success in Mathematics by Hispanic Students: Examining Opportunities and Probing Promising Practices, 1(1), 1-18.

Already Some Movement toward CCSSM High School Pathways

Some school districts that have adopted a policy that all ninth-graders take algebra typically have eliminated general mathematics, consumer mathematics, and pre-algebra courses. Research suggests that this is a positive step toward raising standards for all students …

RAND Mathematics Study Panel. (2003). Mathematics proficiency for all students: Toward a strategic research and development program in mathematics education. Santa Monica, CA: RAND.

New Forms of Tracking

Even with universal algebra policies, there is the real possibility that 'tracking' will create different 'algebras' for different populations of students.

Stein, M. K., Kaufman, J. H., Sherman, M., & Hillen, A. F. (2011). Algebra: A challenge at the crossroads of policy and practice. *Review of Educational Research*, 81, 453-492.

But is it Really Algebra?

Nearly all of the class of 2005 graduated having taken "Algebra 1." However, based on the course materials, fewer than one in four studied the kind of challenging topics needed to prepare for college-level mathematics.

Nord, C., Roey, S., Perkins, R., Lyons, M., Lemanski, N., Brown, J., and Schuknect, J. (2011). *The Nation's Report Card: America's High School Graduates* (NCES 2011-462). U.S. Department of Education, National Center for Education Statistics. Washington, DC: U.S. Government Printing Office.

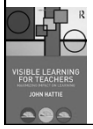
How Do We Cover it All and Cover it Well with All Students?

Based on its review of research, the Panel recommends regular use of formative assessment, particularly for students in elementary grades … for struggling students, frequent (e.g., weekly or biweekly) use of these assessments appears to be optimal, so that instruction can be adapted based on student progress …

National Mathematics Advisory Panel. (2008). Foundations for Success: The Final Report of the National Mathematics Advisory Panel. U.S. Department of Education: Washington, DC.

Who gets the most valuable feedback from assessments?

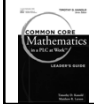
The major reason for administering tests in classrooms is for teachers to find out what they taught well or not, who they taught well or not, and where they should focus next. If a test does not lead to a teacher evaluating these claims, it was probably a waste of everybody's time and effort.



Hattie, J. (2012). *Visible learning for teachers: Maximizing impact on learning.* New York: Routledge, Taylor & Francis Group.

Paradigm Shift: Mathematics Intervention

The CCSSM requires a paradigm shift toward grade level or subject-based teams of teachers implementing required and targeted instructional responses for all students.



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Instructional Interventions that Make a Difference

Frequent monitoring (at least weekly) of student progress.

Results of frequent assessment are used to form small groups of students for instruction, practice, and reinforcement in the skills and concepts with which they are struggling. <u>Small group support takes place in addition to whole class instruction</u>.

Baker, S., & Gersten, R., & Lee, D. (2002). A synthesis of empirical research on teaching mathematics to low-achieving students. *The Elementary School Journal*, 103(1), 51-73.

"Level Up" and Accelerate

A longitudinal study of over 1,000 low-achieving and at-risk 6-8 grade students found that students placed in heterogeneous "universal acceleration" courses with "workshop" support had greater gains in achievement and continued to enroll in upper level math courses at greater rates than those placed in traditional remedial courses that slowed down instruction.

Burris, C.C., Heubert, J.P., & Levin, H.M. (2006). Accelerating mathematics achievement using heterogeneous grouping. American Educational Research Journal, 43(1), 105-136 .

Time Must Become the Variable, Not Learning

Time and support must become variables. Some students will require more time to learn, and so the school must develop strategies to provide students with that time during the school day.

DuFour, R., DuFour, R., Eaker, R., & Karhanek, G.. (2004). Whatever it takes: How professional learning communities respond when kids don't learn. Bloomington, IN: National Education Service. p. 35.

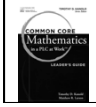
Early Intervention

There is ample evidence that achievement trajectories are quite stable as children begin middle school … by the end of third grade school achievement over the long term is highly predictable.

Pianta, R. C., Belsky, J., Vandergrift, N., Houts, R., & Morrison, F. J. (2008). Classroom effects on children's achievement trajectories in elementary school. American Educational Research Journal, 45(2), 365-397.

Paradigm Shift: Mathematics Professional Development

The CCSSM requires a paradigm shift in the grain size of change beyond the individual isolated teacher or leader. It is the grade-level or course-based collaborative learning team that will develop the expanded teacher knowledge capacity necessary to bring coherence to the implementation of the CCSSM



Kanold, T., & Larson, M. R. (2012). *Common Core Mathematics in a PLC at Work™: Leader's Guide*. Bloomington, IN: Solution Tree Press; Reston, VA: NCTM.

Change is Hard

The most likely reason for the stability of teaching practices over time is that teaching is a cultural activity and cultural activities, by their very nature, are highly resistant to change.

Stigler, J. W., & Thompson, B. J. (2009). Thoughts on creating, accumulating, and utilizing shareable knowledge to improve teaching. The Elementary School Journal, 109(5), 442-457.

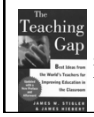
We Must Move Beyond Pockets of Excellence

Teachers working alone in their classrooms develop inconsistencies in instructional practices and rigor and create inequity in student learning experiences.

Ferrini-Mundy, J., Graham, K., Johnson, L., & Mills, G. (1998). *Making change in mathematics education: Learning from the field.* Reston, VA: National Council of Teachers of Mathematics.

The Importance of Professional Learning Communities (PLCs) as a Vehicle to Improve Consistency in Instructional Quality

Teachers have a professional responsibility to participate in group decision making to improve the art and practice of teaching. One of the most powerful forums for teacher improvement is involvement in a professional learning community.



Stigler, J. W., & Hiebert, J. (1999). The teaching gap: Best ideas from the world's teachers for improving education in the classroom. New York: The Free Press.

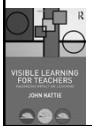
Professional Learning Focused On Embedding the Mathematical Practices into Daily Instruction

The essential factor in growth and improvement in teaching is lesson preparation and the analysis of lesson outcomes both during and after each lesson.

NCTM. (2007). Mathematics teaching today: Improving practice, improving student learning. Reston, VA: NCTM.

Why Lesson Planning?

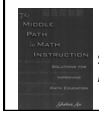
Planning can be done in many ways, but the most powerful is when teachers work together to develop plans … collaborate on understanding their beliefs of challenge and progress, and work together to evaluate the impact of their planning on student outcomes … the co-planning of lessons is the task that has one of the highest likelihoods of making a marked positive difference on student learning.



Hattie, J. (2012). *Visible learning for teachers: Maximizing impact on learning.* New York: Routledge, Taylor & Francis Group.

The Importance of Structured Lesson Planning

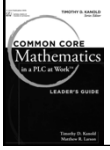
Chinese teachers' lesson plans are detailed teaching notes, which include the objectives, content, key points, difficult points, and procedures. The teaching procedure is the main body of the lesson plan, which includes review and introduction, the new lesson, the types of questions to be asked, examples given, problems for practice, and a summary. Usually it takes at least two to five pages to write a plan for one lesson.



Shuhua, A. (2004). *The middle path in math instruction: Solutions for improving math education.* Lanham, MD: ScarescowEducation.

But Not for Every Lesson

Intensive lesson planning is not only a high-leverage strategy to effect change in teachers' practice, it is also an effective strategy to prevent the degradation of collaborative teacher learning team discussions into mere story-swapping and the sharing of materials … the lack of time to devote this careful planning and reflection to all lessons cannot be used as an excuse to never collaboratively learn, plan, and reflect on the effectiveness of key lessons.



Kanold, T., & Larson, M. R. (2012). *Common Core Mathematics in a PLC at Work™: Leader's Guide*. Bloomington, IN: Solution Tree Press; Reston, VA: NCTM.

Perhaps We Don't Have an "Achievement" Gap

When African American and White students complete the same mathematics courses, the differences in average achievement gains are statistically insignificant. Additionally, there are no statistically significant differences in achievement between high- and low-SES students who complete the same courses.

Hoffer, T. B., Rasinski, K. A., & Moore, W. (1995). Social background differences in high school mathematics and science coursetaking and achievement. Washington, DC: U.S. Department of Education.

The Importance of Persisting in the Curriculum

Of all pre-college curricula, the highest level of mathematics in secondary school has the strongest continuing influence on bachelor's degree completion. Finishing a course beyond Algebra 2 more than doubles the odds that a student who enters post-secondary education will complete a bachelor's degree.

Adelman, C. (2006). Answers in the toolbox: academic intensity, attendance patterns, and bachelor's degree attainment. (Office of Educational Research and Improvement Publication.) http://www.ed.gov/pubs/Toolbox/Title.html

It's Not What You Say, It's What People Hear

~~Achievement Gap~~

Instructional Gap

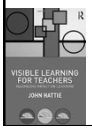
The CCSSM Gives Us a New Opportunity

The unprecedented adoption of the same set of mathematics standards by nearly all states … provides the opportunity for educators nationwide to press the "reset" button on mathematics education (p. 48).

Larson, M. R. (2011). *Administrator's guide: Interpreting the Common Core State Standards to improve mathematics education.* Reston, VA: NCTM.

YOU are Key to Making it Happen!

[Effective] Teachers and leaders believe that success and failure in student learning is about what they, as teachers or leaders, did or did not do … by implementing research-based practices … We are change agents!



Hattie, J. (2012). *Visible learning for teachers: Maximizing impact on learning.* New York: Routledge, Taylor & Francis Group.