

Why Classroom Formative Assessment Should Be a Priority for Every School

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Overview: Science and Design

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- We need to improve student achievement
- This requires improving teacher quality
- Improving the quality of entrants takes too long
- So we have to make the teachers we have better **Science**
- We can change teachers in a range of ways
- Some will benefit students, and some will not
- Those that do involve changes in teacher practice

- Changing practice requires new kinds of teacher learning **Design**
- And new models of professional development

Raising achievement matters

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- For individuals:
 - Increased lifetime salary
 - Improved health
 - Longer life
- For society:
 - Lower criminal justice costs
 - Lower healthcare costs
 - Increased economic growth:
 - Net present value to the U.S. of a 25-point increase on PISA: \$40 trillion (three times the National Debt)
 - Net present value to the U.S. of getting all students to 400 on PISA: \$70 trillion



What is the purpose of education?

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- Four main philosophies of education
 - ▣ Personal empowerment
 - ▣ Cultural transmission
 - ▣ Preparation for citizenship
 - ▣ Preparation for work
- All are important
- Any curriculum is a (sometimes uneasy) compromise between these four forces



Recession (2008-2010) and recovery (2010-2012)

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- Those with a high school diploma or less
 - ▣ lost 5.6 million jobs in the recession, and
 - ▣ lost a further 230,000 jobs in the recovery
- Those with an Associate's degree
 - ▣ lost 1.75 million jobs in the recession, but
 - ▣ gained 1.6 million jobs in the recovery
- Those with at least a Bachelor's degree
 - ▣ gained 187,000 jobs in the recession, and
 - ▣ gained a further 2 million jobs in the recovery

Carnevale, Jayasundera, and Cheah (2012)



...with profound impacts on some workers

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Education level	Change in salary 1978 to 2005
Postgraduate qualification	+28%
BA/BSc	+19%
Some college	0%
High school diploma	0%
High school dropout	-16%

Economic Policy Institute (2010)



The coming war for jobs (Clifton, 2011)

- Right now
 - ▣ 7 billion people on earth
 - ▣ 5 billion adults
 - ▣ 3 billion people who want to work
 - ▣ 90% of these want to work full time
- As a consequence
 - ▣ 2.7 billion full-time formal jobs are wanted
 - ▣ with only 1.2 billion full-time formal jobs available
- A shortfall of 1.5 billion jobs
- So, for every US worker, there are 10 people who would like their job...



A daunting target

- Programme for International Student Assessment (PISA)
 - ▣ United States 496
 - ▣ Canada 527
 - ▣ Finland 544
 - ▣ Shanghai 579



The world of work is changing...

Skill category	Percentage change 1969-1999
Complex communication	+14%
Expert thinking/problem solving	+8%
Routine manual	-3%
Non-routine manual	-5%
Routine cognitive	-8%

Autor, Levy & Murnane (2003)



Off-shoring and automation

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	Off-shoreable	Not off-shoreable
Skilled	Radiographer Security analyst Tax accountant	Surgeon (?) Bricklayer Hairdresser
Unskilled	Food packager Data entry clerk Call centre operator	Grocery store clerk Receptionist Retail salesperson



Terminal G, MSP airport



Meet Maddie Parlier...

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Davidson (2012)



Computers in medical diagnosis

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- Pilot study of the use of neural nets to predict biopsy results
- Sample: 1,787 men with a serum prostate-specific antigen (PSA) concentration > 4.0 ng/ml
- Data:
 - ▣ Age
 - ▣ Maximum, average and change of PSA concentration over all visits
 - ▣ Maximum digital rectal examination over all visits
 - ▣ Maximum transrectal ultrasonography results over all visits
- Positive predictive value (% of those predicted with positive biopsies)
 - ▣ Specialist urologists: 34%
 - ▣ Artificial neural nets: 77%

Snow, Smith and Catalona (1994)



How flat is the world?

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Percentage crossing national boundaries

Physical mail:	
Telephone minutes:	1. 2%
Internet traffic:	2. 5%
First generation immigrants:	3. 10%
University students:	4. 20%
People, ever in their lives:	5. 50%
Goods and services:	

Ghemawat (2011)



Mostly round; some flat bits

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Percentage crossing national boundaries

Physical mail:	
Telephone minutes:	
Internet traffic:	
First generation immigrants:	
University students:	
People, ever in their lives:	
Goods and services:	

Ghemawat (2011)



There is only one 21st century skill

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So the model that says learn while you're at school, while you're young, the skills that you will apply during your lifetime is no longer tenable. The skills that you can learn when you're at school will not be applicable. They will be obsolete by the time you get into the workplace and need them, except for one skill. The one really competitive skill is the skill of being able to learn. It is the skill of being able not to give the right answer to questions about what you were taught in school, but to make the right response to situations that are outside the scope of what you were taught in school. We need to produce people who know how to act when they're faced with situations for which they were not specifically prepared. (Papert, 1998)



Successful education?

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The test of successful education is not the amount of knowledge that a pupil takes away from school, but his appetite to know and his capacity to learn. If the school sends out children with the desire for knowledge and some idea how to acquire and use it, it will have done its work. Too many leave school with the appetite killed and the mind loaded with undigested lumps of information. The good schoolmaster is known by the number of valuable subjects that he declines to teach.

The Future in Education (Livingstone, 1941 p. 28)



Where's the solution?

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- Structure:
 - Smaller/larger high schools
 - K-8 schools/"All-through" schools
- Alignment:
 - Curriculum reform
 - Textbook replacement
- Governance:
 - Charter schools
 - Vouchers
- Technology:
 - Computers
 - Interactive whiteboards
- Workforce reforms



Are private schools the answer?

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- In PISA, U.S. students in private schools out-perform public school students by 25 points
- But, after controlling for social class, public school students in the U.S. out-perform private school students by 10 points.



Pause for reflection

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- What's the most interesting, surprising, or challenging thing you have heard so far?
- See if you can get consensus with your neighbors



School effectiveness

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Three generations of school effectiveness research:

- Raw results approaches:
 - Different schools get different results.
 - Conclusion: Schools make a difference.
- Demographic-based approaches:
 - Demographic factors account for most of the variation.
 - Conclusion: Schools don't make a difference.
- Value-added approaches:
 - School-level differences in value-added are relatively small.
 - Classroom-level differences in value-added are large.
 - Conclusion: An effective school is a school full of effective classrooms.

We need to focus on classrooms, not schools

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- In the USA, variability at the classroom level is at least four times that at school level.
 - ▣ As long as you go to school, it doesn't matter very much which school you go to.
 - ▣ But it matters very much which classrooms you are in.
- It's not class size.
- It's not the between-class grouping strategy.
- It's not the within-class grouping strategy.



And most of all, on teachers

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- Take a group of 50 teachers:
 - ▣ Students taught by the most effective teacher in that group of 50 teachers learn in six months what those taught by the average teacher learn in a year.
 - ▣ Students taught by the least effective teacher in that group of 50 teachers will take two years to achieve the same learning
(Hanushek & Rivkin, 2006)
- And furthermore:
 - ▣ In the classrooms of the most effective teachers, students from disadvantaged backgrounds learn at the same rate as those from advantaged backgrounds
(Hamre & Pianta, 2005).

Improving teacher quality takes time

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- A classic labor force issue with two (non-exclusive) solutions:
 - ▣ Replace existing teachers with better ones.
 - ▣ Help existing teachers become even more effective.



Replace existing teachers with better ones?

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- Raising the bar for entry into the profession?
- De-select (i.e., fire) ineffective teachers?
- So we have to help the teachers we have improve
 - ▣ The “love the one you’re with” strategy



How do we speed up teacher improvement?

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- Merit pay for effective teachers?
 - ▣ Can't be done fairly, and doesn't work
- Improve the effectiveness of existing teachers:
 - ▣ It can be done:
 - Provided we focus rigorously on the things that matter
 - Even when they're hard to do
- Create a culture of continuous improvement
 - ▣ But what should we help teachers improve?



The evidence base for formative assessment

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- | | |
|---------------------------------|-----------------------------|
| □ Fuchs & Fuchs (1986) | □ Nyquist (2003) |
| □ Natriello (1987) | □ Brookhart (2004) |
| □ Crooks (1988) | □ Allal & Lopez (2005) |
| □ Bangert-Drowns, et al. (1991) | □ Köller (2005) |
| □ Dempster (1991, 1992) | □ Brookhart (2007) |
| □ Elshout-Mohr (1994) | □ Wiliam (2007) |
| □ Kluger & DeNisi (1996) | □ Hattie & Timperley (2007) |
| □ Black & Wiliam (1998) | □ Shute (2008) |

Which of these are formative?

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- A. A district science supervisor uses test results to plan professional development workshops for teachers
- B. Teachers doing item-by-item analysis of 5th grade math tests to review their 5th grade curriculum
- C. A school tests students every 10 weeks to predict which students are “on course” to pass the state test in March
- D. “Three-fourths of the way through a unit” test
- E. Students who fail a test on Friday have to come back on Saturday
- F. Exit pass question: “What is the difference between mass and weight?”
- G. “Sketch the graph of y equals one over one plus x squared on your mini-white boards.”



The formative assessment hijack

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- Long-cycle:
 - Span: across units, terms
 - Length: four weeks to one year
 - Impact: Student monitoring; curriculum alignment
- Medium-cycle:
 - Span: within and between teaching units
 - Length: one to four weeks
 - Impact: Improved, student-involved assessment; teacher cognition about learning
- Short-cycle:
 - Span: within and between lessons
 - Length:
 - day-by-day: 24 to 48 hours
 - minute-by-minute: five seconds to two hours
 - Impact: classroom practice; student engagement



Main approaches to formative assessment

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- Professional Learning Communities
“...an inclusive group of people, motivated by a shared learning vision, who support and work with each other, finding ways, inside and outside their immediate community, to enquire on their practice and together learn new and better approaches that will enhance all pupils’ learning.” (Stoll et al., 2006)
- Two main approaches
 - Focus on outcomes for students
 - Focus on increased teacher capacity



Complementary processes

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Data-driven PLCs

- Quality control
- Common assessments
- Improvement through better team work and systems
- Focus on individual outcomes for students
- Regular meetings focused on data
- 16 points on PISA (in two to three years)

Classroom FA TLCs

- Quality assurance
- Highly structured meetings
- Improvement through increased teacher capacity
- Focus on teachers' individual accountability for change
- Regular meetings focused on teacher change
- 30 points on PISA (in two to three years)

Unpacking formative assessment

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	Where the learner is going	Where the learner is	How to get there
Teacher	Clarifying, sharing and understanding learning intentions	Engineering effective discussions, tasks, and activities that elicit evidence of learning	Providing feedback that moves learners forward
Peer		Activating students as learning resources for one another	
Learner		Activating students as owners of their own learning	

Formative assessment and other priorities

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- Formative assessment is an integral part of many current policy priorities:
 - ▣ Framework for teaching (Danielson)
 - ▣ Common formative assessments (DuFour)
 - ▣ Differentiated instruction (Tomlinson)
 - ▣ Response to (instruction and) intervention



Framework for teaching (Danielson 1996)

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- Four domains of professional practice
 1. Planning and preparation
 2. Classroom environment
 3. Instruction
 4. Professional responsibilities
- Links with student achievement (Sartain, et al. 2011)
 - Domains 1 and 4: no impact on student achievement
 - Domains 2 and 3: some impact on student achievement



The framework in detail

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- Domain 2: The classroom environment
 - 2a: Creating an environment of respect and rapport
 - 2b: Establishing a culture for learning
 - 2c: Managing classroom procedures
 - 2d: Managing student behavior
 - 2e: Organizing physical space
- Domain 3: Instruction
 - 3a: Communicating with students
 - 3b: Using questioning and discussion techniques
 - 3c: Engaging students in learning
 - 3d: Using assessment in instruction
 - 3e: Demonstrating flexibility and responsiveness



Formative assessment and domain 3

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Framework for teaching

- Communicating with students
- Using questioning and discussion techniques
- Engaging students in learning
- Using assessment in instruction
- Demonstrating flexibility and responsiveness



Classroom formative assessment

- Sharing learning intentions with students
- Eliciting evidence
- Feedback
- Students as learning resources
- Students as owners of their learning

Differentiated instruction: not a new idea

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- Differentiation in action (Stradling & Saunders, 1993)
- Differences in
 - ▣ educational goals
 - ▣ curriculum structure
 - ▣ course content
 - ▣ learning tasks
 - ▣ teaching approach
 - ▣ pace of learning
 - ▣ assessment
 - ▣ review



Most definitions of DI are vague

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“While the concept of ‘differentiated instruction’ can be defined in many ways, as good a definition as any is ensuring that what a student learns, how he/she learns it, and how the student demonstrates what he/she has learned is a match for that student’s readiness level, interests, and preferred mode of learning.” (Tomlinson, 2004 p. 188)

“To differentiate instruction is to recognize students’ varying background knowledge, readiness, language, preferences in learning and interests; and to react responsively. Differentiated instruction is a process to teaching and learning for students of differing abilities in the same class.” (Hall, Strangman, & Meyer, 2011)



Differentiated instruction and formative assessment

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Aspects of differentiated instruction (Hall, Strangman & Meyer, 2008)		FA?
Content	Several elements and materials are used	
	Align tasks and objectives to learning goals	☑
	Instruction is concept-focused and principle-driven	
Process	Flexible grouping is consistently used	
	Classroom management benefits students and teachers	
	Initial and on-going assessment of student readiness and growth	☑
Products	Students are active and responsible explorers	☑
	Vary expectations and requirements for student responses	☑
	Clarify key concepts and generalizations	
Miscellaneous	Use assessment as a teaching tool	☑
	Emphasize critical and creative thinking as a goal in lesson design	
	Engaging all learners is essential	☑
	Balance between teacher-assigned and student-selected tasks	

Response to (instruction and) intervention

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“Response to intervention integrates assessment and intervention within a multi-level prevention system to maximize student achievement and reduce behavior problems. With RTI, schools identify students at risk for poor learning outcomes, monitor student progress, provide evidence-based interventions and adjust the intensity and nature of those interventions depending on a student’s responsiveness, and identify students with learning disabilities.”
(National Center on Response to Intervention, 2010)

- Two “creation myths” for RT(I)I
 - ▣ A protocol for preventing academic failure (progress monitoring, early—research-based—intervention)
 - ▣ An alternative to IQ testing in the identification of learning disabilities



Response to (instruction and) intervention

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- Key points
 - ▣ Tier 1 must be high-quality, evidence-based instruction
 - ▣ Student progress must be monitored
 - ▣ Failure to progress triggers additional support
- Formative assessment
 - ▣ Makes tier 1 instruction as effective as it can be
 - ▣ Allows assessment of progress (for tier 2 assessment)



And one big idea

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	Where the learner is going	Where the learner is	How to get there
Teacher	<div style="background-color: #4a69bd; color: white; padding: 20px; border-radius: 15px; text-align: center;"> Using evidence of achievement to adapt what happens in classrooms to meet learner needs </div>		
Peer			
Learner			

An educational positioning system

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- A good teacher:
 - ▣ Establishes where the students are in their learning
 - ▣ Identifies the learning destination
 - ▣ Carefully plans a route
 - ▣ Begins the learning journey
 - ▣ Makes regular checks on progress on the way
 - ▣ Makes adjustments to the course as conditions dictate



So much for the easy bit

A model for teacher learning

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- Content, then process
- Content (what we want teachers to change):
 - ▣ Evidence
 - ▣ Ideas (strategies and techniques)
- Process (how to go about change):
 - ▣ Choice
 - ▣ Flexibility
 - ▣ Small steps
 - ▣ Accountability
 - ▣ Support



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Teacher learning communities


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- We need to create time and space for teachers to reflect on their practice in a structured way, and to learn from mistakes.

(Bransford, Brown & Cocking, 1999)
- “Always make new mistakes.”

—Esther Dyson
- “Ever tried. Ever failed. No matter. Try again. Fail again. Fail better.”


(Beckett, 1984)



Teacher learning communities

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- Plan that the TLC will run for two years.
- Identify 10 to 12 interested colleagues:
 - ▣ Composition:
 - Similar assignments (e.g., early years, math/science)
 - Mixed subject/mixed phase
 - Hybrid
- Secure institutional support for:
 - ▣ Monthly meetings (75–120 minutes each, inside or outside school time)
 - ▣ Time between meetings (two hours per month in school time):
 - Collaborative planning
 - Peer observation
 - ▣ Any necessary waivers from school policies



A “signature pedagogy” for teacher learning

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- Every monthly TLC meeting should follow the same structure and sequence of activities:
 - ▣ Activity 1: Introduction (5 minutes)
 - ▣ Activity 2: Starter (5 minutes)
 - ▣ Activity 3: How’s it going? (25–50 minutes)
 - ▣ Activity 4: New learning about formative assessment (20–40 minutes)
 - ▣ Activity 5: Personal action planning (15 minutes)
 - ▣ Activity 6: Review of learning (5 minutes)



Every TLC needs a leader

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- The job of the TLC leader(s):
 - ▣ To ensure that all necessary resources (including refreshments!) are available at meetings
 - ▣ To ensure that the agenda is followed
 - ▣ To maintain a collegial and supportive environment
- But most important of all:
 - ▣ It is not to be the formative assessment “expert.”



Peer observation

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- Run to the agenda of the observed, not the observer:
 - ▣ Observed teacher specifies focus of observation:
 - E.g., teacher wants to increase wait time.
 - ▣ Observed teacher specifies what counts as evidence:
 - Provides observer with a stopwatch to log wait times.
 - ▣ Observed teacher owns any notes made during the observation.



Summary

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- Raising achievement is important.
- Raising achievement requires improving teacher quality.
- Improving teacher quality requires teacher professional development.
- To be effective, teacher professional development must address:
 - What teachers do in the classroom
 - How teachers change what they do in the classroom
- Formative assessment + teacher learning communities:
 - A point of (uniquely?) high leverage



Thank you

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