



Why classroom formative assessment needs to be a priority for every teacher, every school and every district

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Outline

- Why we need to raise achievement
- How we can use research to improve teaching
- Five perspectives on formative assessment
- Strategies and techniques

Raising achievement matters

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- For individuals:
 - Increased lifetime salary (Hanushek, 2005)
 - Improved health (OECD, 2010)
 - Increased life satisfaction (Duckworth & Cara, 2012)
 - Longer life (Lleras-Muney, 2005)
 - Higher achieving children (Macmillan & Tominey, 2022)
- For society:
 - Lower criminal justice costs (Levin et al., 2007)
 - Lower healthcare costs (Levin et al., 2007)
 - More tolerance of diversity (Post, 2016)
 - Higher GDP (Hanushek & Woessman, 2015)

What is the purpose of education?

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

The world of work is changing

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Which kinds of skill are disappearing fastest from the workplace?

	Skill category
A	Complex communication
B	Expert thinking/problem solving
C	Non-routine manual
D	Routine cognitive
E	Routine manual

Employment change by job type: 2002-2014

Coming to a restaurant near you...



e-LaCarte from Presto



Ziosk

Computers in medical diagnosis

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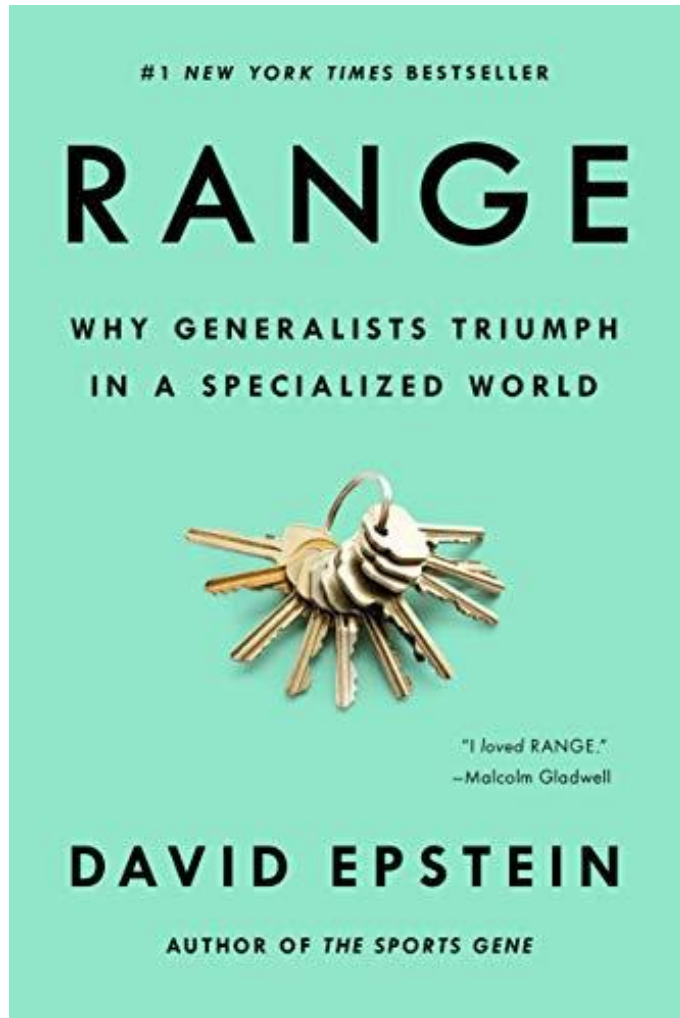
- Study of the use of neural nets to predict biopsy results
- Sample: 1,787 men with a serum prostate-specific antigen (PSA) concentration > 4.0 ng/ml
- Data:
 - Age
 - Maximum/average/change in PSA concentration over all visits
 - Maximum digital rectal examination over all visits
 - Maximum transrectal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

The changing nature of work

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In 1980, US banks employed 550,000 bank tellers. Between 1980 and 2010, US banks installed 375,000 ATMs. What was the impact on the number of bank tellers employed?

- A. Decreased by 50%
- B. Decreased by 30%
- C. Decreased by 10%
- D. Stayed the same
- E. Increased by 10%



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)

The challenge

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- Higher and higher levels of educational achievement are needed
- We cannot afford to narrow the curriculum to achieve this
- And we also need our students to leave us with a desire to carry on learning

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



Using research to improve teaching

The role of research

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- “Evidence-based” is a continuum, not a category
- Research can
 - Indicate areas where improvement efforts are unlikely to improve education
 - Provide information about relevant moderators of effect
 - Provide information about how much improvement is possible or likely
 - Provide information about the costs of the innovation

Effects of teacher knowledge

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Associated with a 1 sd increase in teacher knowledge (average to 84th percentile)

Measure	Source	Students	Annual impact
General cognitive skill	Hanushek, Piopiunik, and Wiederhold (2018)	9 th grade	2 weeks
College major/minor (math)	Lee (2018)	7 th – 12 th grade	2 weeks
Pedagogical content knowledge (math)	Hill, Rowan and Ball (2005)	Elementary	3 weeks

Does teacher learning last?

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- Teacher Knowledge Assessment System (TKAS) used to assess content knowledge for teaching mathematics (CKT-M) of 3,652 teachers
- Impact of 161 math content professional development programs estimated with pre-, post-, and delayed post-tests
- Average length of program: 53 hours (sd: 34)
- Analysis restricted to “good faith effort” sample
- Average
 - change in achievement: 0.11sd
 - decay in achievement per day: 0.003sd
 - time for achievement gain to decay entirely: **37 days**

What we can do instead

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- Five questions to ask of research
 - Does this solve a problem we have?
 - If we do this, how much faster will our students learn?
 - What will be the cost:
 - In money?
 - In teacher time?
 - Can we implement it here?
 - Do we know what to do?
- Educators need to be critical consumers of educational research
- Currently two ‘best bets’
 - Curriculum development
 - Formative assessment

Five arguments for formative assessment

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- The intuitive argument
- The functional argument
- The strategic argument
- The equity argument
- The empirical argument

Formative assessment: The intuitive argument

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- A principle and an uncomfortable fact about the world
 - The principle:
 - “If I had to reduce all of educational psychology to just one principle, I would say this: The most important single factor influencing learning is what the learner already knows. Ascertain this and teach him [or her] accordingly” (Ausubel, 1968 p. vi).
 - The uncomfortable fact:
 - Students do not learn what we teach.
 - What is learning?
 - Learning is a change in long-term memory (Kirschner, Sweller, & Clark, 2006).
 - The fact that someone can do something now does not mean they will be able to do it in six weeks, but ...
 - If they cannot do something now, it is highly unlikely they will be able to do it in six weeks.

Building plan “B” into plan “A”

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Three key shifts

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- A shift in how we think about educational goals
 - From a focus on *performance*
 - To a focus on *learning*
- A shift in how we think about aptitude
 - From the proportion and complexity of taught material retained
 - To the time taken to learn that material
- A shift in how we think about teaching
 - From a linear process
 - To a *contingent* process
 - “In fact, we may even insist that our educational efforts have been unsuccessful to the extent to which our distribution of achievement approximates the normal distribution.” (Bloom, 1968 p. 3)



The functional argument

Formative assessment, defined inclusively

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	Long-cycle	Medium-cycle	Short-cycle
Span	Across terms, teaching units	Within and between teaching units	Within and between lessons
Length	Four weeks to one year	One to four weeks	Minute-by-minute and day-by-day
Impact	Monitoring, curriculum alignment	Student-involved assessment	

Engagement and responsiveness

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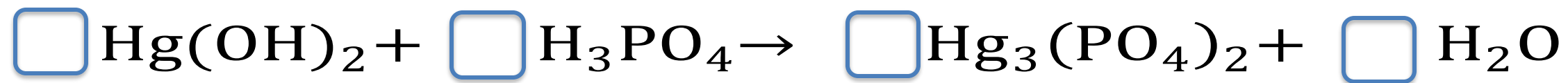
Formative assessment, defined inclusively

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Balancing chemical equations

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The strategic argument

Unpacking formative assessment

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	Where the learner is going	Where the learner is now	How to get the learner there
Teacher	Clarifying, sharing, and understanding learning intentions and success criteria	Eliciting evidence	Providing feedback that moves learners forward
Peer		Activating students as learning resources for one another	
Student		Activating students as owners of their own learning	

Unpacking formative assessment

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	Where the learner is going	Where the learner is now	How to get the learner there
Teacher	Before you can begin	Adaptive teaching/ responsive teaching	
Peer	The learner's role		
Student			

The equity argument

Formative assessment and equity

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- Focus on ways of closing “the achievement gap”
 - Proficiency for all
 - Excellence for many
 - Sub-groups proportionately represented in the excellent
- Educational interventions evaluated in terms of:
 - Impact on student achievement
 - Cost
 - Quality of evidence

Education Endowment Foundation Toolkit

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Intervention	Cost	Quality of evidence	Extra months of learning
Metacognition and self-regulation	\$		+7
Feedback	\$		+6
Oral language interventions	\$		+6
Reading comprehension strategies	\$		+6
Collaborative learning	\$		+5
Homework	\$		+5
Peer tutoring	\$		+5
Phonics	\$		+5
Individualised instruction	\$		+4
Parental engagement	\$		+4
Social-emotional learning	\$		+4

Education Endowment Foundation Toolkit

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Intervention	Cost	Quality of evidence	Extra months of learning
Arts participation	\$		+3
Mastery learning	\$		+5
Behavior interventions	\$\$		+4
Small group tuition	\$\$		+4
Within-class attainment grouping	\$		+2
One-to-one tuition	\$\$\$		+5
Teaching assistant interventions	\$\$\$		+4
Extending school time	\$\$\$		+3
Physical activity	\$		+1
Summer schools	\$\$\$		+3
Mentoring	\$\$\$		+2

Education Endowment Foundation Toolkit

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Intervention	Cost	Quality of evidence	Extra months of learning
Performance pay	\$\$		+1
Reducing class size	\$\$\$\$\$		+2
Aspiration interventions	\$		
Learning styles	\$		
Outdoor adventure learning	\$\$\$		
School uniform	\$		
Setting and streaming	\$		0
Repeating a year	\$\$\$\$\$	 	-3

Most cost-effective with strong evidence

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Feedback	\$		+6
Oral language interventions	\$		+6
Reading comprehension strategies	\$		+6
Peer tutoring	\$		+5
Phonics	\$		+5
Parental engagement	\$		+4

Most cost-effective general interventions with strong evidence

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Intervention	Cost	Quality of evidence	Extra months of learning
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Feedback	\$		+6
Peer tutoring	\$		+5

Unpacking formative assessment

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Teacher	Clarifying, sharing, and understanding learning intentions	Eliciting evidence	Providing feedback that moves learners forward
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The empirical argument

Reviews of research

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- Fuchs & Fuchs (1986)
- Natriello (1987)
- Crooks (1988)
- Bangert-Drowns et al. (1991)
- Dempster (1991, 1992)
- Elshout-Mohr (1994)
- Kluger & DeNisi (1996)
- Black & Wiliam (1998)
- Nyquist (2003)
- Allal & Lopez (2005)
- Köller (2005)
- Brookhart (2007)
- Wiliam (2007)
- Hattie & Timperley (2007)
- Shute (2008)
- Kingston & Nash (2011, 2015)

Direct experiments

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- Kingston and Nash (2011, 2015)
 - 50% to 70% increase in student learning
- Speckesser, Runge, Foliano, Bursnall, Hudson-Sharpe, Rolfe, and Anders (2018)
 - 25% increase in student learning

Summary

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- Raising achievement matters, for individuals and societies
- We cannot afford to do this by
 - narrowing the curriculum
 - alienating learners
 - increasing workload on teachers
- Considering relevance, impact, cost, feasibility and practicality, classroom formative assessment must be the priority for
 - student achievement
 - student agency
 - equity