TEACHING, LEARNING AND CULTURE: IMPLICATIONS FOR DIVERSE LEARNERS IN MATHEMATICS

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April 20, 2010

Teachers are being prepared to teach in classrooms that no longer exist.

A Look at Classrooms in the United States

Current demographics in the U.S., if an elementary and secondary classroom of 30 would look like the following:

- **12 of the 30 students would live in poverty**
- **10 of the students would be non-White**
- **10 of the students' primary language would not be English, but would be one of over 150 languages spoken in the U.S.**
- **An increasing number of the students would not be reared by their biological parents (Reared by grandparents or foster parents)**
- **1 of the students would be homeless**
- **6 will have moved at least four times before grade 3**
- **7 of the students will have been physically, sexually, verbally or emotionally abused at some point in her/his life**

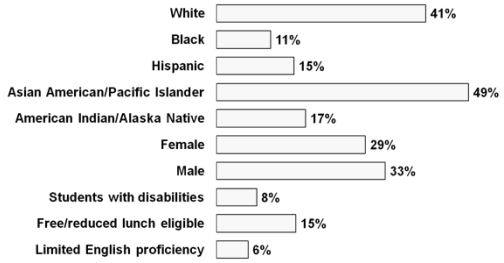
– U.S. Department of Education, 2008; U.S. Census Bureau, 2007; Department of Children & Family Services, 2006

Opportunity to Learn

Opportunity to learn is widely considered the single most important predictor of student achievement. Defined by the National Research Council as "circumstances that allow students to engage in and spend time on academic tasks …" (p. 333).

National Research Council. (2001). *Adding it up: Helping children learn mathematics.* J. Kilpatrick, J. Swafford, & B. Findell (Eds.). Mathematics Learning Study Committee, Center for Education, Division of Behavioral and Social Sciences and Education. Washington, D.C.: National Academy Press.

Percentages of Grade 8 Students Scoring At or Above the "Proficient" Range on the NAEP Math Test, 2007

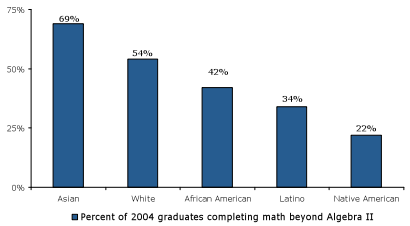


SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2007

Math Doesn't Add Up Equally for All Students

- **Fewer than half of African American, Latino and Native American students take math beyond Algebra II in high school.**
- **Disadvantaged students are only *half as likely* as their affluent peers to take math beyond Algebra II in high school.**
- **The pre-calculus/calculus gap between students from the most and the least disadvantaged families *doubled* between 1982 and 2004.**
- **Under these circumstances, higher-level math courses function not as the intellectual and practical boost they should be, but as a filter that screens students out of the pathway to success**

Advanced Math: Big Inequities by Race and Ethnicity



Source: National Center for Education Statistics. (2007, June). *High School Coursetaking: Findings from The Condition of Education 2007*. Washington, DC: U.S. Department of Education. (p. 24, Table SA-8).

Students Can Do Basics, …

347 + 453

90%

864 – 38

73%

… But Students Cannot Solve Problems

33%

Ms. Yost's class has read 174 books, and Mr. Smith's class has read 90 books.

How many more books do they need to read to reach the goal of reading 575 books?

Source: NAEP 2006

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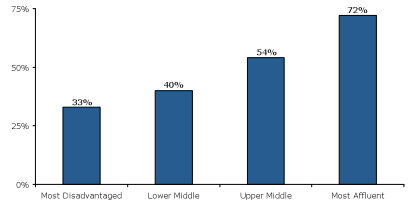
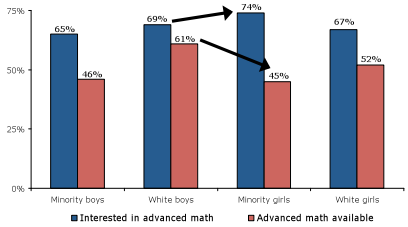
Advanced Math: Even Bigger Inequities by Family Wealth

Percent of 2006 Graduates Completing Math Beyond Algebra II



Source: National Center for Education Statistics. (2007, August). *Advanced Mathematics and Science Coursetaking in the Spring High School Senior Classes of 1982, 1992, and 2004*. Washington, DC: U.S. Department of Education. (p. 22, Figure 6)
NOTE: Data represent quartiles of high school graduates based on parents' socioeconomic status.

For Minority Students, Interest in Advanced Math Greatly Exceeds Availability



Source: National Action Council for Minorities in Engineering, *Progress Toward Power: A Follow-Up Survey of Children's and Parents' Attitudes about Math and Science,* Research Letter, October 2001. Survey conducted by Harris Interactive, 1999.

Reasons Behind Persistent Underachievement

Deficit Theory

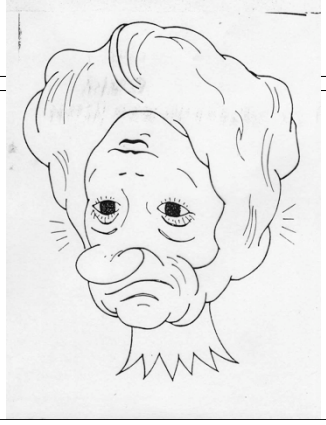
Culture
Language
Home Environment
Genetics

Answer: Change the Child

Difference Theory

-Cultural Discontinuity
-Language
-Teacher Expectations
-School is Irrelevant

Answer: Change the School



Our Words Matter!

Perceived Deficits	Strengths
Short attention span	Multi-tasker/curious
Irresponsible	Flexible
Distractible	Curious
Hyperactive	Energetic
Impulsive	Spontaneous
Stubborn	Persistent
Poor planner	Flexible
Disorganized	Thrives on chaos
Bossy	Leader
Argumentative	Critical thinker
Tests limits	Risk-taker
Manipulative	Clever/planner
Withdrawn	Reflective
Impatient	Eager/enthusiastic
Explosive	Passionate
Disobedient	Activist/Strong sense of self
Rebellious	Activist
Defiant	Bold
Victim	Survivor

What do effective teachers do and know?

KNOW **CARE** ACT

- **Well grounded in content**
- **Reject deficit thinking**
- **Professional learners**
- **Pedagogically sound**

Statement of Principles

The Equity Principle

Excellence in mathematics education requires equity– high expectations and strong support for all students.

The Curriculum Principle

A curriculum is more than a collection of activities: it must be coherent, focused on important mathematics, and well articulated across the grades.

The Teaching Principle

Effective mathematics teaching requires understanding what students know and need to learn and then challenging and supporting them to learn it well.

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Statement of Principles

The Learning Principle

Students must learn mathematics with understanding, actively building new knowledge from experience and prior knowledge.

The Assessment Principle

Assessment should support the learning of important mathematics and furnish useful information to both teachers and students.

The Technology Principle

Technology is essential in teaching and learning mathematics; it influences the mathematics that is taught and enhances students' learning.

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The New 3-Rs – Reteaching, Relearning, Reassessing

In effective schools one of the most consistent practices of successful teachers is the provision of multiple opportunities to learn … The consequences for a student who fails to meet a standard is not a low grade but rather the opportunity, indeed the requirement to resubmit his or her work.

Reeves, D., "Standards are Not Enough: Essential Transformations for School Success." NASSP Bulletin, Dec. 2000, 11.

Busy Bus Company Problem

Yvonne is trying to decide whether she should buy a weekly bus pass. On Monday, Wednesday, and Friday, she rides the bus to and from work. On Tuesday and Thursday she rides the bus to work, but gets a ride home with her friends. Should Yvonee buy a weekly bus pass?

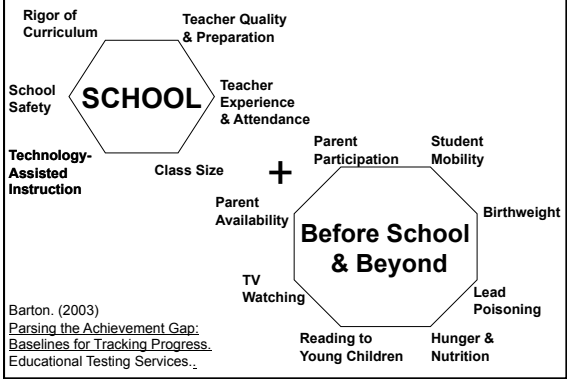
Bus Fares

One way:	$1.00
Weekly Pass:	$9.00

Johnson Family Home

The Johnson family lives in a two bedroom apartment. There are three beds in the house, How many total members are there in the Johnson family?

Correlates of Achievement & Gaps



Barton. (2003)
Parsing the Achievement Gap: Baselines for Tracking Progress.
Educational Testing Services.

Cowardice asks the question, "Is it safe?"
Expediency asks the question, Is it politic?
Vanity asks the question, "Is it popular?"
Conscience, asks the question, "Is it right?"
And there comes a time when one must take a position that is neither safe, nor politic, nor popular, but one must take it because one's conscience tells one that it is right

-Dr. Martin Luther King

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Leave No Parent Behind

These are real notes written by parents in a Tennessee school district (spellings have been left intact)

- My son is under a doctor's care and should not take PE today. Please execute him.
- Please exkuce Lisa for being absent she was sick and I had her shot.
- Please excuse Gloria from jim today. She is administrating.
- Please excuse Roland from P.E. for a few days. Yesterday he fell out of a tree and misplaced his hip.
- Carlos was absent yesterday because he was playing football. He was hurt in the growing part.
- Please excuse Ray Friday from school. He has very loose vowels.
- Gloria was absent yesterday as she was having a gangover.
- Please excuse Mary for being absent yesterday. She was in bed with gramps.
- Irving was absent yesterday because he missed his bust.
- Please excuse Jennifer for missing school yesterday. We forgot to get the Sunday paper off the porch, and when we found it Monday We thought it was Sunday.
- Please excuse Pedro from being absent yesterday. He had (diahre, dyrea, direathe), the shits.
- Marina was absent December 11-16 because she had a fever, sore throat, headache and upset stomach. Her sister was also sick, fever and sore throat, her brohter had a low grade grade feverl and ached all over. I wasn't the best either, sore throat and fever. There must be something going around, her father even got hot last night.

School Mathematics Is Not Working Well Enough for Enough Students

Internationally (TIMSS, 1994-1995), our students are not mathematically competitive

- 4th grade – average
- 8th grade – below average
- 12th grade – among lowest of 21
  - at 25th percentile, like FIMS & SIMS
  - particularly poor in Geometry
  - better in creative constructed responses questions

Source: US TIMSS Research Center, 1996–1998

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