Marshall Memo 189

A Weekly Round-up of Important Ideas and Research in K-12 Education
June 11, 2007

In This Issue:

Quotes of the Week

"I was so closed in my own little world. You start out feeling like only your needs matter… but now I realize my issues are really so small."

Sakinah Smith, a Brooklyn, NY high-school valedictorian involved in Model U.N. (*Education Week*, June 6, 2007, p. 10-11)

"Without the right people standing in front of the classroom, school reform is a futile exercise."

Tom Kane, education professor, in *ED Magazine*, Spring 2007, p. 31

"Teaming is popular everywhere. Unfortunately, people are teams in name only in schools. Teams decide where to go on the next field trip, as opposed to being a team that emphasizes discussions of learning. Today's teams almost never have as their goal the improvement of teaching practice."

Katherine Boles, education lecturer, in *ED Magazine*, Spring 2007, p. 7

"In education today, people tend to think of tests as dipstick devices. You stick it in to measure what people know. But every time you test someone, you change what they know."

Jeffrey Karpicke (see item #1)

"Immediate recall in the form of a test is an effective method of aiding the retention of learning and should, therefore, be employed more frequently in the elementary school."

Herbert Spitzer (*ibid.*)

"The way we typically do things in education seems almost reverse-engineered to produce the least possible learning."

Andrew Butler (*ibid.*)

"Enjoy your differences, but realize that our common humanity matters much, much more."

Bill Clinton, speaking at Harvard Class Day, June 6, 2007
http://www.news.harvard.edu/gazette/2007/06.07/99-clinton.html

1. How Frequent Quizzes Can Improve Long-Term Memory

In this fascinating article in *The Chronicle of Higher Education*, David Glenn begins by describing a study done in Iowa in the 1930s. Researcher Herbert Spitzer had thousands of sixth graders read a non-fiction article about bamboo. He then gave different groups of students a detailed multiple-choice quiz at different points over a three-week period:

- Some students took the quiz right after reading the article and again the next day.
- Some were only quizzed three weeks later.
- Some students were quizzed at other intervals.

Students were not allowed to keep the article and weren't told when they would be tested, so there was no way they could study for the quizzes.

Three to nine weeks later, all students were tested on how well they remembered the bamboo article, and the results were striking. Those who were quizzed within 24 hours of their initial reading of the article remembered much more than students who were quizzed days or weeks later. Spitzer published his findings in 1939, concluding, "Immediate recall in the form of a test is an effective method of aiding the retention of learning and should, therefore, be employed more frequently in the elementary school."

But Spitzer's study (and others like it) did not change the conventional wisdom, which has continued to see tests as tools for auditing – not levers for improving – student learning.

Recently, researchers at Washington University in St. Louis have done further research on this topic and confirmed the "testing effect" that Spitzer discovered almost 70 years ago. The St. Louis team has found that quizzing students immediately after teaching has a uniquely powerful way of implanting facts in a student's memory. This happens not because the rapid tests motivate students to pay attention or work harder; something else is going on. Improvements in long-term retention seem to be triggered by "effortful retrieval" – students being forced to pull out and reconstruct what they've just heard.

Jeffrey Karpicke, a member of the St. Louis group, says, "People usually imagine memory as a storage space, as a space where we put things, as if they were books in a library. But the act of retrieval is not neutral. It affects the system." Henry Roediger III, another St. Louis researcher, puts it this way: "In education today, people tend to think of tests as dipstick devices. You stick it in to measure what people know. But every time you test someone, you change what they know."

What the St. Louis studies are finding is that immediate testing is more helpful than conventional studying – for example, re-reading something two or three times. This was

demonstrated by an ingenious experiment by Andrew Butler at Washington University. Students who had no background in art history were shown videotaped lectures on three impressionist artists – Renoir, Degas, and Morisot – on three successive days. Immediately after each lecture, each student sat at a computer and was asked to go through a different study method for each videotape:

- Reading over the main facts of the lecture;
- Taking a multiple-choice quiz;
- Taking a short-answer quiz.

A month later, all the students were given a 90-question short-answer test covering all three artists. The test included some information that was in the initial lectures but was not reviewed in the study sessions. Here were the results:

- Students got 20% correct on the items they had not reviewed.
- Students got 36% correct on the artist they reviewed by re-reading the main facts.
- Students got 36% correct on the artist they reviewed with a multiple-choice quiz.
- Students got 47% correct on the artist they reviewed with a short-answer quiz.

Butler believes his study demonstrates that daily, short-answer quizzes are the best way to embed new information in long-term memory. Regular quizzes, he says, force students to repeatedly retrieve facts from memory and build deeper fluency with the material.

The opposite extreme is waiting till the end-of-trimester test and cramming the night before. While those who use this very common approach may do reasonably well on the test, this kind of "learning" doesn't stick in students' long-term memory. "The way we typically do things in education," says Butler, "seems almost reverse-engineered to produce the least possible learning."

The St. Louis team is continuing its research in an Illinois middle school and a university in New Mexico. So far, they have shown that students who take daily multiple-choice quizzes using handheld "clickers" do much better on long-term retention than students who don't. What the researchers haven't figured out yet is how important it is for students to get immediate feedback on their "clicker" quizzes and whether it makes a difference to give a diagnostic test at the beginning of curriculum units to show students what they don't know. They are working on answering these questions.

The St. Louis researchers have encountered two push-backs to frequent classroom quizzes:

• *Don't these quizzes encourage students to concentrate on narrow, isolated facts, as opposed to the broader concepts and themes at the heart of the course?* Not so, says Kathleen McDermott, one of the team members, citing recent studies by graduate student Jason Chan. "In the process of retrieving Fact A, if it takes you a minute to get there, you think, Hmm – what did I learn about this general topic? So in a sense, you're also retrieving Fact B and Fact C, even though that's not what you were directly asked to do."

• *Don't the quizzes take time away from actual teaching?* Henry Roediger, the team leader, believes the time is well spent. "[T]his is the best thing that you could be doing if you want them to learn," he says. "Give them a quiz, and give them feedback on the quiz."

"You Will Be Tested On This" by David Glenn in *The Chronicle of Higher Education*, June 8, 2007 (Vol. 53, #40, p. A14); this article can be purchased at http://chronicle.com/weekly/v53/i40/40a01401.htm

2. Teaching Algebra with a Social Conscience

In this article in *Rethinking Schools*, Washington state teacher Jana Dean describes how she teaches algebra – the gateway to higher mathematics – to her economically diverse, tracked eighth graders. "Sadly, by middle school, students *expect* math class to be disconnected from their lives," writes Dean. So how could she make algebra relevant?

She began by having students partner up and discuss four statements and then write their conclusions in their notebooks:

- Those who work should be paid.
- No one who works full time should live in poverty.
- Wages should be high enough to support a family on one income.
- The legal minimum wage should be high enough to get by.

Students were highly engaged and voiced strong opinions. Stephanie said, "People work hard for their money… It's expensive to pay bills, buy food, pay rent and all the extras." Daryl added, "The legal minimum wage should be high enough to get by because if people aren't making enough working full time, they need to be paid more."

The teacher ended the period with some numbers: the federal minimum wage was $5.15 an hour; and the Washington state minimum wage was $7.93.

The next day, students' task was to graph four linear relationships on the same coordinate grid and write equations for each. The data came from a day's and then a month's full-time wages for four service industry occupations: a retail clerk at Wal-Mart, a security guard, a retail clerk at Costco, and a home nursing aide. Each student got a card describing the job in detail (these are available at the link below – Dean worded them carefully, knowing that many of her students' family members held jobs like these). Students worked in groups of four with each occupation represented; they listened to each job card read aloud and then tried to estimate the hourly wages for each.

Dean then passed out estimates for the wages in each job ($7.00 for Wal-Mart, $8.00 for home nursing aide, $10.00 for Costco, and $11.00 for security guard) and had students plot their graphs. The graphs dramatized the $40-a-day gap between a Costco worker and someone working at the federal minimum wage. When they were finished, Dean gave students the following prompt:

> *How does the rate of pay affect the shape and steepness of the lines on your coordinate grid? Describe the shape of a graph for the wage of a job at $20 per hour. Describe the shape of a graph for the wage of a job at the federal minimum of $5.15 per hour.*

Responding to these questions helped students see that the steeper the line, the higher the wage, and that each of the jobs produced a straight line. These helped her introduce the concepts of "slope" – the rate of increase – and "linear" – a relationship that graphs a straight line.

Dean spent several days getting students to practice recognizing linear patterns in tables and graphs and writing equations from them. She then showed a PBS documentary, *Waging a Living*, which shows the economic struggles of a San Francisco security guard who has to pay for his uniform. This hit home with some students, who had family members in similar circumstances. Students were beginning to realize that working meant more than making enough money to pay back Mom for their iPod. Angie exclaimed, "Dang! I've been working all day, and I still haven't broken even!"

Now students were ready to deal with rent. Dean broke them into groups of four and had them look through classified ads to find affordable housing that was located close enough to their job so they could get there on time in the morning. She doled out cards that introduced various wrinkles (e.g., finding $25 in coins in an old couch they got from their grandmother), and then had students use the minimum wage to write an equation that would tell them how many hours they would have to work to make the rent. The Costco workers calculated that, given the requirement to pay a month's rent in advance, they'd have to work 300 hours to pay the rent.

Dean then framed a discussion around two questions: What happens in families when there isn't enough money; and What can happen in an economically successful family that can throw it off the rails? Students chimed in with a welter of family stories: absent parents, death, disability, etc. Dean introduced new variables: $230 for new tires, a $1,500 dentist's bill for a cracked tooth, $30 for new shoes for a growing adolescent, and $405 each month to feed a family of three. She also introduced the hard fact that some employers would not give workers more than 30 hours of work a week (most students had family stories that verified this).

Dean then had students enter the Washington state minimum wage of $7.93 an hour in their graphing calculators ($y = 7.93x$) and look at graphs and tables generated from the equation to answer questions like: How many hours do you have to work at the minimum wage to pay for the dentist? For new tires? For new shoes? For food? Students discovered that it would take three people working full time at the minimum wage to support a family of two adults and one child. Several students remarked that they never saw their parents because they were working all the time.

This led to a discussion on whether the state's minimum wage, highest in the nation, was high enough. No! said most students. Mark wrote, "You have to pay the rent, then buy food, and what if you have to go to the doctor? How are you going to have enough money to kill some bills? On the minimum wage, you're going to run out of money two weeks before your paycheck and then the rent will be due." Another student thought credit cards would help bridge the gap she saw on his graph, but also concluded, "Just don't have kids until you have a job good enough to pay for it."

Several months after teaching this unit, Dean asked students what they had learned. Some reported that they were working on improving their grades, staying in school, and planning their futures. Others had a new awareness of social class differences. "My mom works for just above the minimum and we never have money for extra things," wrote Evan.

Lizzie wrote that learning algebra this way "unshields us from the safety of our home to be ready for the outside world."

Concludes Dean, "My students have learned that algebra matters – and so do they."

"Living Algebra, Living Wage: 8th Graders Learn Some Real-World Math Lessons" by Jana Dean in *Rethinking Schools*, Summer 2007 (Vol. 21, #4, p. 31-35); the article is available at http://www.rethinkingschools.org/archive/21_04/wage214.shtml; the author can be reached at jdean@reachone.com.

3. The Professional Development Potential of Classroom Videotapes

In this article in *Tools for Schools*, Joan Richardson extols the power of videotaping instruction as a professional learning tool – and provides some useful caveats.

• Videotaping can help a teacher spot errors and improve. In the words of teacher Becky Hinson, "Videotaping myself teaching was one of the most worthwhile experiences I had. You see yourself doing things that you don't know that you do." For example, reviewing a video of one of her classes, Hinson saw a student waving his hand, vying for her attention. If she hadn't seen him on tape, she would never have believed that she hadn't noticed this child.

• Videotapes have the potential for revealing other classroom foibles. "If every teacher in the U.S. were to film themselves for an hour and calculate the number of minutes they were talking and the number of minutes that kids were talking," says Sandi Everlove of TeachFirst, "we might start an educational revolution in this country."

• Watching videos helps teachers develop a common language about instruction.

• Videos allows them to see strategies they haven't seen before – in classrooms down the hall or in other schools.

• Videotapes allow observers to focus intently on students and talk about what they're doing and saying in a way that isn't possible in an actual classroom. A teacher might say, "I don't think that student understood the question that the teacher asked. Look at his face. Listen to his answer. I wonder why he did that. Maybe it's the way the teacher phrased the question. Maybe the teacher didn't provide enough time."

• A group of teachers watching a videotape can rewind the tape and look at something again.

• Classroom videos, used well, can bring authenticity to PD sessions. "So much of professional development has relied on workshops and books," says Curtis Linton of the School Improvement Network/Video Journal. "The limitation of both of them is that they're devoid of students."

• Watching videotapes avoids having to free up teachers from classroom or other duties to observe "live" lessons.

• Videos provide a more lasting "memory" of a lesson than notes or imperfect memories.

Videos are most effective when they are watched by groups of colleagues, says Jim Stigler, a psychology professor at UCLA. He has used videotapes extensively over the years and cautions teachers against watching their own classroom videotapes alone. "Looking at

yourself is very threatening," he says. "You want to develop your analytic skills in situations that aren't so threatening." In addition, teachers watching solo can miss blind spots in their teaching; having at least one additional set of eyes is important to a thoughtful analysis of instruction.

Stigler thinks videotaped lessons don't have to be perfect for colleagues to unpack, analyze, and learn from them – but he does think taped lessons need to be good. "You don't learn a lot from pointing out the errors of bad teachers," he says. "The point is to develop your analytical skills, to analyze teaching and identify strategies."

Watching videotaped lessons from within one's own building can be problematic. First, teachers may hold back and avoid criticizing a lesson when they are with colleagues with whom they have to work every day. If they watch videos of teachers from another building, critical analysis may go deeper. Second, videos may capture *common practice* within a building – which, to put it delicately, may not be *best practice*. Again, videos from other schools – or video libraries – may help raise expectations about what good teaching should look like.

Richardson has two final words of advice: don't stage classroom interactions (teachers can spot this a mile away) and edit classroom videos down to 20 minutes of continuous classroom action. More than that can get tedious and cut into the time needed to analyze and discuss.

"Learning Through a Lens: Classroom Videos of Teachers and Students Prove to Be a Powerful Professional Learning Tool" by Joan Richardson in *Tools for Schools*, May/June 2007 (Vol. 10, #4, p. 1-7), no e-link available

4. Rating Whole-School Improvement Models

This thorough study of the effectiveness of various comprehensive whole-school improvement models by researchers at the American Institutes for Research (AIR) has been previously publicized, but their rankings are worth repeating:

Elementary School Models

Moderately strong evidence of positive impact on overall academic achievement:

- Direct Instruction (full immersion model)
- Success for All

Moderate evidence of impact:

- Accelerated Schools-PLUS
- America's Choice School Design
- Core Knowledge
- Literacy Collaborative
- National Writing Project
- School Development Program
- School Renaissance

Limited evidence of impact:

- ATLAS Communities
- Different Ways of Knowing
- Integrated Thematic Instruction
- Modern Red Schoolhouse
- Pearson Achievement Solutions (formerly Co-nect)
- Ventures Initiative
- Focus System

Zero evidence of impact:

- Breakthrough to Literacy
- Coalition of Essential Schools
- Community for Learning
- Comprehensive Early Literacy Learning
- Expeditionary Learning
- First Steps
- Onward to Excellence II

Secondary School models

Moderate evidence of impact:

- America's Choice School Design
- First Things First
- School Development Program
- Success for All – Middle School
- Talent Development High Schools

Limited evidence of impact:

- Expeditionary Learning
- KIPP
- Middle Start
- More Effective Schools
- Project GRAD

Zero evidence of impact:

- Accelerated Schools-PLUS
- ATLAS Communities
- Coalition of Effective Schools
- High Schools That Work
- Making Middle Grades Work
- Modern Red Schoolhouse
- Onward to Excellence II
- Turning Points

"A Systematic Review of Whole-School Improvement Models" by Yael Kidron and Marlene Darwin in the *Journal of Education for Students Placed At Risk* (JESPAR), Spring 2007 (Vol. 12, #1, p. 9-35), no e-link available

5. Bill Gates on Conquering Complexity with a Five-Step Process

At Harvard Commencement last week, Harvard-dropout-made-good Bill Gates finally got his diploma (an honorary degree) and issued a call to action on the top moral issues of our time – disease, inequality, and inadequate education. Gates identified what he believes is preventing more effective solutions: "The barrier to change is not too little caring, it is too much complexity. To turn caring into action, we need to see a problem, see a solution, and see the impact. But complexity blocks all three steps."

Gates insisted that today's daunting problems are manageable if we cut through complexity by using a five-step process – steps that could be used by schools for strategic planning:

• *Determine a goal* (in the case of the AIDS epidemic, ending the disease)

• *Find the highest-leverage approach* (with AIDS, that's prevention)

• *Discover the ideal technology for that approach* (i.e., a vaccine that gives immunity).

• *Meantime, make the smartest application of the technology we already have* (while vaccine research proceeds, get people to avoid risky sexual behavior).

• *Measure the impact of your work* (gather data and share your successes and failures so others can learn from your efforts).

Speech by Bill Gates at Harvard Commencement, June 7, 2007; the full prepared text is available at http://www.news.harvard.edu/gazette/2007/06.14/99-gates.html.

6. Is *Sounder* a Good Novel for Classrooms?

In this article in *Rethinking Schools*, Jennifer Lindstrom, an elementary teacher at the American School in London, describes her experience teaching *Sounder*, a widely-used novel by William Armstrong about an African-American sharecropping family during the Depression. As she began reading the book to her diverse group of students, they responded with a combination of quiet unease and vocal discontent, and Lindstrom decided to switch to a different book, *Francie*, a novel about a black family in the South by Karen English. Some students insisted on finishing *Sounder*, and when both books had been read, Lindstrom had students compare and contrast them on several criteria. Here's what students came up with:

• *Characters* – In *Sounder*, none of the characters, except the dog, had names. In *Francie*, characters had names and vivid personalities.

• *Community life* – The family in *Sounder* didn't seem to have friends – it was just their family. In *Francie*, there was a vibrant community life – hobbies and interests, pleasures and passions, virtues and faults.

• *Resistance* – Students couldn't recall the family in *Sounder* pushing back against the injustices that were visited upon them. Turning to *Francie*, Lindsrom says that "students nearly jumped out of their seats with examples of resistance… *Sounder* reads like a religious allegory

in which the characters accept their fate in an almost saint-like fashion and just hope that things will turn out all right in the end. *Francie* is neither sentimental nor romantic. It simply tells a story of racism and resistance through imperfect and very real characters."

• *Other* – Almost everything in *Sounder* was sad, and there was very little dialogue, in marked contrast to *Francie*.

Pulling their thoughts together, students concluded that in *Sounder*, there was no hope and the characters didn't seem real. In *Francie*, even though bad things happened, the characters were three-dimensional and there was resistance and achievement.

Lindstrom recalls a mentor who urged her to "Follow the flame, not the ashes" and concludes, "If we follow the 'flame' of intellectual achievement and resistance to oppression, as in *Francie*, we honor the many dimensions of a group's experience." Despite her newfound misgivings about *Sounder*, Lindstrom is glad students had the chance to compare the two books and thanks them for being her "most provocative teachers."

"Following the Flame: Choosing Literature That Empowers" by Jennifer Lindstrom in *Rethinking Schools*, Summer 2007 (Vol. 21, #4, p. 31-35), no e-link available; the author can be reached at jen_lindstrom@yahoo.com.

7. Short Item:

High-school biology websites – This helpful compilation of websites in *Phi Delta Kappan* gives free access to online resources in biology:

• http://science.exeter.edu/jekstrom/default.html - This site, created by former Phillips Exeter Academy teacher Jim Ekstrom, has software, lab exercises, projects, scanning electron microscope images, and links to other science sites for students and teachers.

• http://www.lewport.wnyric.org/jwanamaker/index.htm - Also created by a high-school biology teacher, this website features animations illustrating complex processes of living systems.

• http://gslc.genetics.utah.edu - This website was created by the Genetic Science Learning Center at the University of Utah and has a variety of interactive activities, including the Biotechniques Virtual Laboratory and The Basics and Beyond, with an animated tour through the basic concepts of genetics. Another section deals with the brain and addiction.

• http://www.troy.k12.ny.us/thsbiology/index_2.html - This website from Troy High School in New York has detailed instructions for labs on a variety of topics, a series of in-depth reviews on major biology topics, and a link to send questions to a Troy High School teacher.

• http://www.iit.edu/~smile/index1.html - This website from the Science and Mathematics Initiative for Learning Enhancement (SMILE) at the Illinois Institute of Technology has a number of lesson plans that can be adapted to different levels.

• http://science.nhmccd.edu/BioL/index.html - This website was created by the North Harris College Biology Department and has a wealth of useful links, including animations, movies, and interactive tutorial links.

• http://serendip.brynmawr.edu/sci_edu/biosites.html - This website from Bryn Mawr has links under 14 headings, including Comprehensive Biology Tutorials, Cell Biology, and Genetics. Each link is rated on its level, playfulness, interactivity, and quality of explanation.

• http://regentsprep.org/Regents/biology/biology.cfm - This website by the Oswego City Schools is designed to help students prepare for the New York State Living Environment Regents Exam, but its resources can be useful to all high-school biology students.

• http://tolweb.org/tree/phylogeny.html - The Tree of Life Project's website has contributions from biologists around the world. Eventually, this site will have a page with pictures, text, and other information for every species and for each group of organisms, living or extinct. Students and teachers can contribute material to the site.

• http://froggy.lbl.gov - This website from the Lawrence Berkeley National Laboratory at the University of California has a virtual frog dissection.

"Web Watch: High-School Biology Websites" by Judith Palleschi and Donna Frymire in *Phi Delta Kappan*, June 2007 (Vol. 88, #10, p. 801)

Do you have feedback? Is anything missing?

If you have comments or suggestions, if you saw an article or web item in the last week that you think should have been summarized, or if you would like to suggest additional publications that should be covered by the Marshall Memo, please e-mail: kim.marshall8@verizon.net

About the Marshall Memo

Mission and focus:

This weekly memo is designed to keep principals, teachers, superintendents, and others very well-informed on current research and effective practices in K-12 education. Kim Marshall, drawing on 36 years' experience as a teacher, principal, central office administrator, and writer, lightens the load of busy educators by serving as their "designated reader."

To produce the Marshall Memo, Kim subscribes to 44 carefully-chosen publications (see list to the right), sifts through more than a hundred articles each week, and selects 5-10 that have the greatest potential to improve teaching, leadership, and learning. He then writes a brief summary of each article, pulls out several striking quotes, provides e-links to full articles when available, and e-mails the memo to subscribers every Monday (with occasional breaks; there are about 50 issues a year).

Subscriptions:

Individual subscriptions are $50 for the school year. Rates decline steeply for multiple readers within the same organization. See the website for these rates and information on paying by check or credit card.

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Publications covered

Those read this week are underlined.

American Educator
American School Board Journal
ASCD, CEC SmartBriefs
Atlantic Monthly
Catalyst Chicago
CommonWealth Magazine
Daily EdNews
Ed. Magazine
EDge
Education Digest
Education Gadfly
Education Next
Education Week
Educational Leadership
Educational Researcher
Edutopia
Elementary School Journal
Essential Teacher (TESOL)
Harvard Business Review
Harvard Education Letter
Harvard Educational Review
JESPAR
Journal of Staff Development
Language Learner (NABE)
Middle Ground
Middle School Journal
NASSP Bulletin
New York Times
New Yorker
Newsweek
PEN Weekly NewsBlast
Phi Delta Kappan
Principal
Principal Leadership
Principal's Research Review
Reading Research Quarterly
Reading Today
Rethinking Schools
Review of Educational Research
Teachers College Record
TESOL Quarterly
Theory Into Practice
Times Educational Supplement, Magazine
Tools for Schools