

Marshall Memo 80

A Weekly Round-up of Important Ideas and Research in K-12 Education
March 28, 2005

In This Issue:

1. Why don't high-school students get enough sleep?
2. Beefing up high-school math teaching
3. Comparing six approaches to teaching Algebra I
4. Positive effects of block scheduling on sixth-grade math scores
5. A different take on middle-school block scheduling
6. Ways that good research is misused and ignored
7. Are computers really helping student achievement?
8. Short items: (a) Teaching students how to do homework in their learning style;
(b) National Archives documents online

Quotes of the Week

"Many teenagers are behaviorally and physiologically not ready to fall asleep until 11:00 p.m. or later and are biologically programmed to be asleep when school begins. As a consequence, many students fall asleep in early morning classes, and they may also fall asleep behind the wheel driving to school."

Amy Wolfson and Mary Carskadon (see item #1)

"Math."

Response from high-school dropouts about why they quit school (see item #2)

"In high school, my algebra teacher would give us an assignment and tell us to do the homework. The next day, she would give answers on the overhead. I never understood how she did it, and she didn't show us."

Crystal Collett of Kansas City, KS, reflecting on a former teacher (see item #2)

"[W]hen evidence, however rigorous, is pitted against politics, politics always wins."

Deborah Stipek (see item #6)

"Research at the middle level indicates that most students are taught in a formal classroom setting through the use of traditional instructional methods such as lecture, assigned readings, drill, and independent practice. Learning-style researchers indicate that many students achieve well in a traditional educational environment, but the majority of student do not."

Jennifer Lauria Minotti (see item #8a)

1. Why Don't High-School Students Get Enough Sleep?

This article reports on the start times of 345 secondary schools across the country (most high schools open between 7:30 and 8:00 a.m.) and the reasons that school districts choose such early hours (athletic schedules, bus tiers, and a tradition of opening high schools first, then middle schools, then elementary schools). The authors then list the ramifications of early high-school hours:

- Teachers, parents, and adolescents consistently say that teens don't get enough sleep.
- Teens struggle with getting up in the morning; they are described as sleepy and dragged out and fall asleep in classes
- They also fall asleep while driving; sleep-deprivation is a major cause of car accidents among drivers 16-25, especially boys.
- The biological need for about nine hours of sleep does not change from ages 10-17.
- In fact, older adolescents sleep longer than young adolescents in lab settings (and on weekends and vacations).
- But high-school students stay up late for biological reasons (their sleep clock is pushed forward) and because of after-school activities, family schedules, and homework.
- Given the early hour that most high schools open, it's almost impossible for adolescents to get optimal (9.2 hours) or even adequate (8.5 hours) sleep. "Many teenagers are behaviorally and physiologically not ready to fall asleep until 11:00 p.m. or later and are biologically programmed to be asleep when school begins," write the authors.
- On school nights, secondary-school students get less sleep less than younger students:
 - o Fourth graders get about 10 hours of sleep a night.
 - o Middle-school students get about 8 hours.
 - o High-school students get about 7 hours.

- Cognitive function and psychomotor skills are closely linked to the amount of sleep a person gets; numerous studies have correlated sleep loss with significant decreases in adolescents' academic performance.
- Conversely, studies have shown that when adolescents get more sleep, they get better grades and have greater motivation to do their best in school.

The authors acknowledge that it is complicated for school districts to change high-school opening hours, and suggest that as a short-term stopgap, schools might offer a curriculum on the importance of sleep. But they believe it makes much more sense to adjust school hours, and they conclude the article with a direct appeal to educators "who have seen their slack-jawed, dejected, and exhausted students... who have seen the very tangible effects of insufficient sleep – to place youngsters' sleep closer to the top of issues taken into account in all aspects of academic scheduling."

"A Survey of Factors Influencing High School Start Times" by Amy Wolfson and Mary Carskadon in *NASSP Bulletin*, March 2005 (Vol. 89, #642, p. 47-66), no e-link available

2. Beefing Up High-School Math Teaching

When researchers asked recent West Virginia high-school dropouts, "What was it about school that caused you to quit?" a majority replied, "Math." As it is taught in all too many schools, math seems to have a "gatekeeper" effect, preventing many low-achieving students from successfully completing high school. And a good number of students who make it to college end up taking remedial math classes as freshmen and sophomores because of inadequate preparation.

Studies point to several reasons that explain why math is such a problem and why the achievement gap between white, Hispanic, and African-American students (as measured by NAEP tests in 1990, 1992, 1996, and 2000) has not narrowed:

- Many student enter high school with weak math preparation from their elementary and middle schools.
- Some dropouts report that they were bored in their math classes and were not really *taught*. "In high school, my algebra teacher would give us an assignment and tell us to do the homework," said Crystal Collett, a Kansas City community college student. "The next day, she would give answers on the overhead. I never understood how she did it, and she didn't show us."
- Some of the dropouts reported that they were "pushed along" without real mastery of the subject matter.

- Some students took watered-down courses that left them still needing remediation when they got to college. “[A]lgebra’ is not algebra in every location,” said Danny Martin, a Chicago math professor in. “For many students of color, they may have taken the math requested, and then tried to enter college and tried to enter the workforce and found out they were not prepared.”

“If the country’s serious about this on the mathematics side,” said Robert Moses, a former Civil Rights leader who founded the Massachusetts-based Algebra Project, “it will have to do something very different than it’s doing now.” Moses is worried about high-stakes math tests, which he fears will prevent students from delving into the deeper concepts that can engage them intellectually. To counteract this tendency and make up for prior deficits, his project gives students *real* algebra 90 minutes a day, five days a week – the equivalent of two math courses in a year. Teachers in the Algebra Project have no more than 70 students, collaborate with their math colleagues in common planning periods, and often follow the same group of students through high school.

“Math Emerges As Big Hurdle for Teenagers” by Debra Viadero in *Education Week*, March 23, 2005 (Vol. 24, #28, p. 1, 16)
<http://www.edweek.org/ew/articles/2005/03/23/28math.h24.html>

3. Comparing Six Approaches to Teaching Algebra I

This article paints a dreary picture of the kind of Algebra I lesson that is typical in many American secondary-school classrooms:

- The teacher reviews homework.
- The teacher explains a new problem type and gives examples.
- Students do seatwork to practice the new problem type.
- The teacher summarizes the work.
- The teacher answers students’ questions.
- The teacher assigns homework consisting of similar problems.

The article then reports the results of a meta-analysis of 35 experimental studies measuring the impact of different Algebra I teaching methods on student achievement. Here are the top six classroom approaches with a brief description of its salient characteristics, rank-ordered by the percentile gain that each one achieved:

- *Direct instruction* – Establishing a direction and rationale for learning by relating new concepts to previous learning, leading students through a specified sequence of instructions based on predetermined steps that introduce and reinforce a concept, and

providing students with practice and feedback relative to how well they are doing (21 percentile gain).

- *Problem-based learning* – Teaching through problem solving where students apply a general rule (deduction) or draw new conclusions or rules (induction) based on information presented in the problem (20 percentile gain).

- *Manipulatives, models, and multiple representations* – Teaching students techniques for generating or manipulating representations of algebraic content or processes, whether concrete, symbolic, or abstract (15 percentile gain).

- *Cooperative learning* – Students working together to reach a common goal (13 percentile gain).

- *Communication and study skills* – Teaching students to read and study mathematical information effectively and providing opportunities for students to communicate mathematical ideas verbally or in writing (thinking aloud) (3 percentile gain).

- *Technology-aided instruction* – Using computer software applications and/or hand-held calculators to enhance instruction (3 percentile gain).

The author of this study recommends that principals and teachers use these findings as a checklist to see what types of teaching methods are currently being used, and then think about ways that lessons might be enhanced by combining the most effective aspects of all six. He believes that teachers should prioritize the top three approaches (direct instruction, problem-based learning, and manipulatives/models/multiple representations), with a special emphasis on direct instruction's clear focus on the desired learning outcome and frequent assessment of student learning with formative tests that shape teaching decisions. He does not recommend that teachers discount the last three approaches, which can be incorporated as tools within an effective lesson.

Here is a scenario of how an ideal combination of five of the six teaching methods might unfold:

- The teacher identifies a new skill or concept and provides a rationale for learning it (direct instruction).
- The teacher teaches the concept using problem-solving activities derived from real-life situations that are interesting to students (problem-based).
- Students use calculators to develop problem-solving strategies or represent linear relationships in equations with graphs (technology-aided and manipulatives/models).

- Throughout the lesson, the teacher has students use math vocabulary, share their thinking by conjecturing, arguing, and justifying ideas orally and in writing, and ask questions when difficulties or misunderstandings arise (communication and study skills).
- The teacher concludes by giving students feedback and reviewing concepts, emphasizing comparisons to previously-covered concepts (direct instruction).
- Students do practice work at home that reviews previously-covered material as well as the day's target objective (direct instruction).

"Teaching Methods for Secondary Algebra: A Meta-Analysis of Findings" by Matthew Haas in *NASSP Bulletin*, March 2005 (Vol. 89, #642, p. 24-46), no e-link available

4. Positive Effects of Block Scheduling on Sixth-Grade Math Scores

This article describes a study on the impact of block scheduling on the mathematics achievement of 8,737 sixth graders in five middle schools in a diverse North Carolina school district. In the first three years of the six-year study, students had a traditional middle-school schedule (6-7 classes a day). For the next three years, the schools switched to a block schedule (either the 4 x 4 alternate day-model with 90-minute periods or a fan block with a combination of extended and shortened blocks of time). Researchers tracked students' scores on North Carolina's end-of-the-year math curriculum test, and also interviewed teachers about the ways in which block scheduling affected their classrooms.

The study showed a marked improvement in the math achievement of students in all five schools after the transition to block scheduling. The researchers believe that students in such widely-differing schools did better because:

- Students were able to take a greater variety of classes, including more electives and additional, higher-level math courses.
- Longer class periods allowed time for more interactive instruction involving cooperative learning, inquiry method, group discussion, concept development, simulations, and seminars.
- Teachers were better able to meet students' individual learning needs and give one-on-one and small-group help.
- Ten minutes of class transition time were saved every day under block scheduling.
- There were fewer discipline referrals, fewer disruptions, and more focus on

academic work in the longer classes.

- Teachers needed to spend less time taking attendance, doing report cards and taking care of other administrative matters and had more time to plan and prepare for classes.

“The Effect of Block Scheduling on Middle School Students’ Mathematics Achievement” by Kim Mattox, Dawson Hancock, and Allen Queen in *NASSP Bulletin*, March 2005 (Vol. 89, #642, p. 3-13), no e-link available

5. A Different Take on Middle-School Block Scheduling

In this study, researchers interviewed principals and teachers in 62 middle schools in Louisiana, Illinois, and Colorado, some using traditional schedules and some using block schedules. The data showed that teachers spent their time in very similar ways regardless of the type of schedule they used:

- A third of the class on whole-class instruction;
- A third on small-group work;
- A third on individual student work.

Block scheduling didn’t change the pattern of traditional teaching; regardless of which type of schedule they used, all teachers were trying to teach math in pretty much the same way.

The researchers found this strange, since block scheduling is supposed to give teachers the additional time they need to get students involved in more hands-on work, more extended investigations, more real-world problems, and more discourse about mathematical ideas to prepare students to meet the new, more demanding math standards. What could explain teachers sticking with the traditional three-part math lesson associated with 45-minute periods?

Researchers concluded that it was the other side of the standards movement – high-stakes testing – that was responsible for teachers not using longer blocks of classroom time in more innovative ways. The pressure of tests seemed to be preventing block-scheduled teachers from taking the risk of adapting their instructional style to include more interactive practices. “Simply changing the structure of the school schedule cannot act as the sole catalyst for instructional change,” say the researchers.

For this to happen, the researchers say, teachers need ongoing professional development to help them more fully understand the demands of new math standards and take full advantage of longer blocks of classroom time.

“Block Scheduling and Mathematics: Enhancing Standards-Based Instruction?” by Leslie Flynn, Frances Lawrenz, and Matthew Schultz in *NASSP Bulletin*, March 2005 (Vol. 89, #642, p. 14-23), no e-link available

6. Ways That Good Research Is Misused and Ignored

Educational research will continue to have “a feather’s weight” of impact on schools, says Deborah Stipek, dean of the Stanford school of Education, until a number of things change. She cites three examples of how solid, “evidence-based” research gets distorted in the real world:

- *Class size* – The Tennessee STAR study demonstrating the benefits of smaller class size was applied to a very different situation in California where, unlike Tennessee, there wasn’t a good supply of trained teachers to fill the newly-created positions. Stipek thinks that California’s very costly initiative “may have done more harm than good, at least for children in the low-income communities that could not compete for the limited supply of trained and experienced teachers.”

- *Pre-school* – The High/Scope research from Ypsilanti, Michigan on the long-range benefits of preschool spawned a number of watered-down programs that looked nothing like the original and didn’t confer anything approaching the intended benefits on children.

- *Grade-level retention* – Research over the years has failed to support the benefits of keeping students back when they don’t meet minimum standards. But, Stipek writes, “when evidence, however rigorous, is pitted against politics, politics always wins.” In this case, the evidence has not stopped the “no social promotion” juggernaut.

Stipek hopes that the new emphasis on scientifically-based research will help produce more rigorous analysis of programs and commercial products sold to schools. But, based on the examples cited above, she believes we need to learn how to read the research more carefully and follow its implications more consistently.

“‘Scientifically Based Practice’ – It’s About More Than Improving the Quality of Research” by Deborah Stipek in *Education Week*, March 23, 2005 (Vol. 24, #28, p. 44, 33) <http://www.edweek.org/ew/articles/2005/03/23/28stipek.h24.html>

7. Are Computers Really Helping Student Achievement?

A study published by England’s Royal Economic Society (RES) found that computer use in schools has had zero impact on student achievement – and computer

use at home has had a *negative* impact. This was startling news to the British government, which has already spent £2.5 billion on school computers and is about spend another £1.5 billion.

RES researchers analyzed the school achievement and home backgrounds of 100,000 fifteen-year-olds in 31 countries that took part in the 2000 PISA study (Programme for International Student Assessment) by the Organisation for Economic Co-operation and Development. At first blush, the findings seemed favorable to computer use in schools and at home: the more students used computers, the better they did, and teens who had more than one computer at home were a year ahead of those who had no home access.

But the RES team showed that these conclusions were “highly misleading.” Access to computers at home and school went hand in hand with other factors that were the real cause of higher achievement. Once the other advantages were factored in, the link between school computers and student literacy and math achievement was reduced to zero (because computer instruction replaced more effective forms of teaching), and home computers turned out to have a negative impact (because they diverted attention from homework). The researchers said the initial impressions from the PISA data show how “careless interpretations can lead to patently false conclusions.”

“Pupils Make More Progress in 3Rs ‘Without Aid of Computers’” by John Clare in *News.telegraph*, March 28, 2005
<http://www.telegraph.co.uk/news/main.jhtml?xml=/news/2005/03/21/n teach21.xml&sSheet=/portal/2005/03/21/ixportal.html> (Many thanks to Marshall Memo subscriber Meg Campbell for pointing out this study.)

8. Short Items:

a. Teaching students how to do homework in their learning style - This intriguing study in a racially and economically diverse New York City parochial school compared one group of middle school students who did traditional homework assignments with a second group of students who were taught their individual learning styles and given individualized homework assignments based on their style. At the end of two weeks, the learning-style group did markedly better than the control group on classroom tests in reading, math, science, and social studies – as well as having more positive attitudes towards homework.

The author believes that the ideal situation is to use students’ learning style to tailor instruction for the entire school day, but she recognizes that this is not possible

in most classrooms. Given the realities in many traditional classrooms (see quote above), she argues that students can still excel if they know their individual learning style and have learned strategies to do their homework in a way that fits with their style. "Parents and educators unwittingly have hidden the truth from children concerning individuals' differential abilities, learning styles, and strengths in diverse areas," she writes. "Children are eminently proficient at discerning their own special strengths and recognizing their own difficulties. Individuals need to acknowledge and understand their own learning style as well as learn to appreciate the differing styles of others."

"Effects of Learning-Style-Based Homework Prescriptions on the Achievement and Attitudes of Middle School Students" by Jennifer Lauria Minotti in *NASSP Bulletin*, March 2005 (Vol. 89, #642, p. 67-89), no e-link available

b. National Archives documents on line – The website of the National Archives in Washington, D.C. now features an archive of hundreds of original source documents, including Thomas Edison's patent sketches of his electric lamp, the canceled U.S. Treasury check for \$7.2 million paid to Russia for the purchase of Alaska in 1868, and letters to the Federal Communications Commission complaining about *The War of the Worlds* radio broadcast by H.G. Wells in 1938. The site is at <http://www.archives.gov>. You can click on The Digital Classroom and explore documents by historical period.

"Document Retrieval" by Kathleen Kennedy Manzo in *Education Week*, March 23, 2005 (Vol. 24, #28, p. 22)
<http://www.edweek.org/ew/articles/2005/03/23/28fedfil.h24.html>

© Copyright 2005 Kim Marshall

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 best practices in K-12 education. Kim Marshall, drawing on 35 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 39 carefully-chosen publications (see list to the right), sifts through scores of 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, provide e-links to full articles when available, and e-mails the memo to subscribers every Monday (with occasional breaks; there were 50 issues in 2003-04).

Subscriptions:

Individual subscriptions are \$50 for the school year (\$25 for a half-year, beginning late January). 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.

Website:

If you go to <http://www.marshallmemo.com> you will find detailed information on:

- How to subscribe or renew
- Why the Marshall Memo?
- Focus topics
- Headlines for issues 1-68
- What readers say
- About Kim Marshall
- A free sample issue

Subscribers have access to the Members' Area of the website, which has:

- The current issue (in PDF or Word format)
- All back issues (also in PDF or Word)
- A database of all articles to date, searchable by topic, article headline, source, article title, author, and level
- How to change access e-mail or password

Publications covered:

(those read this week are underlined)

American Educational Research Journal
American Educator
American School Board Journal
ASCD SmartBrief
Atlantic Monthly
Bay State Banner
Boston Globe
CommonWealth Magazine
District Administration
Ed. Magazine (Harvard School of Education)
Education Digest
Education Gadfly
Education Next
Education Update (ASCD)
Education Week
Educational Leadership
Educational Researcher
Elementary School Journal
Harper's
Harvard Business Review
Harvard Education Letter
Harvard Educational Review
Journal of Staff Development
Middle School Journal
NASSP Bulletin
New York Times
New Yorker
Newsweek
PEN Weekly NewsBlast
Phi Delta Kappan
Principal Magazine
Principal Leadership
Psychology Today
Reading Research Quarterly
Reading Today
Rethinking Schools
Review of Educational Research
Teachers College Record
Teacher Magazine

E-links will be provided whenever possible.