Marshall Memo 165

A Weekly Round-up of Important Ideas and Research in K-12 Education
December 18, 2006

In This Issue:

Quotes of the Week

"Knowing that a student got a *B* on an assignment is not instructionally meaningful. Knowing that the student understands what protons, electrons, and neutrons are but is confused about the distinction between atomic number and atomic mass *is* meaningful. This information tells the teacher where to begin instruction."

Dylan Wiliam and Jacqueline Clymer (see item #1)

"That's a good question. I don't know the answer, but I can tell you how we can find out."

A model response to a student question to which the teacher doesn't know the answer; Harold Wenglinsky and Samuel Silverstein (see article #3)

"You need at least a familiarity and comfort with science to tackle many of the activities and issues of modern life. Even though you don't need to know the details of every scientific conundrum, you need an awareness of what is and isn't science."

Alan Leshner, head of the American Association for the Advancement of Science (see item #7a)

"I have a childlike belief that people only relate to things that are meaningful to them in a personal way and that people are initially excited only by things that they understand. The key to understanding information is being able to realize that 'it has something to do with me.'"

Alan Leshner (*ibid.*)

"What are you, iodine-deficient or something?"

One Kazakh boy's way of insulting the intelligence of another, picking up on a health information campaign on the link between iodine and cognitive development, "In Raising the World's I.Q., the Secret's In the Salt" by Donald McNeil, Jr. *New York Times*, December 16, 2006, p. 1

1. Formative Assessments and Final Grades – Are They Compatible?

In this *Educational Leadership* article, British assessment guru Dylan Wiliam (co-author of the groundbreaking 1998 article "Inside the Black Box") and Pennsylvania 8th-grade science teacher Jacqueline Clymer team up to explore the link between assessment and grading. They begin by decrying the way summative assessments *of* learning (final grades) overshadow formative assessments *for* learning in many classrooms and schools. In fact, they say, studies show that many commonly-used grading practices actually damage student achievement. This happens when feedback from assessments focuses on the student (final, judgmental grades) versus giving interim feedback on specifically what needs to be improved – and giving students a chance to "get smarter."

Wiliam and Clymer draw a parallel between the thermostat, which is a perfect feedback system, and they way formative assessment might ideally work. A thermostat gives us the following information (classroom parallels are in parentheses):

- The current temperature (what a student knows and can do right now);
- A way to set the temperature we want (a standard that students need to reach);
- A way to see if there is a gap between the two (comparing the first two to see if students have learned the standard);
- If there's a gap, turning on the furnace or air conditioner to close it (re-teaching, tutoring, etc.)

Few schools have a feedback/corrective loop that works this well, and grades rarely foster learning or improvement, which has led to calls for abolishing grades entirely (Alfie Kohn's books and articles, for example). But Wiliam and Clymer don't think this is a good idea because (a) if teachers didn't report their students' achievement in grades, administrators and parents would be likely to demand timed written examinations to find out how students were doing; and (b) it's not impossible for thoughtful educators to design grading systems that act like a good thermostat, giving teachers and students formative feedback to drive a process of continuous improvement – and at the same time providing data for final report card grades.

Wiliam and Clymer go on to describe the components of a good formative assessment system and how it can be linked to grades:

• *Assessments are designed to give feedback* – Teachers and students understand that formative feedback is not a final grade but is information that can *inform* teaching and drive student improvement.

• *The record-keeping system is based on learning standards* – "Knowing that a student got a *B* on an assignment is not instructionally meaningful," they write. "Knowing that the student understands what protons, electrons, and neutrons are but is confused about the distinction between atomic number and atomic mass *is* meaningful. This information tells the teacher where to begin instruction."

• *Grades can rise or fall depending on ongoing learning* – If grades are based on accumulated points, say Wiliam and Clymer, shallow learning is encouraged (it doesn't matter if you forget what you learned earlier in the semester as long as you passed the quiz). But if grades are based on your accumulated knowledge at the end of the marking period, the incentive is to learn the material in more depth so you remember it. Here's an example of a perverse grading system: Lesley and Chris are students in a school that has eight-week marking periods. Lesley gets the following weekly grades: A, A, A, A, C, C, C, C and earns a final grade of B. Chris gets these weekly grades: C, C, C, C, A, A, A, A and also winds up with a B. But if the weekly grades reflect cumulative understanding, Chris has much better grasp of the subject matter at the end of the marking period than Lesley and his grade should reflect that. Clearly this marking system is flawed.

• *Grades are based on achievement, not aptitude* – If teachers don't raise (or lower) grades based on new evidence of learning (or learning loss), they send the message that assessments are measuring aptitude rather than achievement. "Students who think they will do well will engage in the assessments to prove how smart they are," say Wiliam and Clymer, "whereas students who think that they are likely to fail will disengage. When assessment is dynamic, however, all students can improve. They come to see ability as incremental instead of fixed; they learn that smart is not something you are – it's something you become."

To test out these ideas, Wiliam and Clymer conducted a pilot study in an 8th-grade physical science class at Clymer's school in Quakertown, Pennsylvania. One marking-period unit covered ten standards:

- Use of lab equipment
- Metric unit conversion
- Density calculation
- Density application
- Density as a characteristic property
- Phases of matter
- Gas laws
- Communication (graphing)
- Communication (lab reports)
- Inquiry skills

The teacher used a combination of quizzes, experiments, labs, and projects to assess students' ongoing understanding as the curriculum unfolded. Some classroom activities produced

formative grades in more than one standard – for example, a lab report on the density of pennies provided data for student scores in graphing, inquiry-skill, and calculation of density.

The teacher then graphically displayed students' proficiency in an Excel spreadsheet with students' names going down the left-hand side and the ten standards across the top. She recorded each student's status on each of the standards in the intersecting cell, using traffic-light colors to shade the cells and 2-1-0 scores to keep track of students' accumulated points for final grades (which were tallied on the right side of the spreadsheet):

- Green – Mastery, consistently meeting or exceeding the standard – 2 points;
- Yellow – Developing, meeting the standard with limited errors – 1 point;
- Red – Beginning/below basic, not meeting the standard or just beginning to meet it.

Each student's final grade for the marking period was based on the aggregate level of proficiency on the ten content standards, with 20 being the highest possible score.

At any point in the marking period, the teacher could look horizontally and tell at a glance which students were having the most difficulty (e.g., Scott, who had two red cells and four yellows, and Grace, who had one red and five yellows) and look vertically and see which standards needed more attention (e.g., uses of lab equipment, metric unit conversion, density as a property, and phases of matter). The teacher frequently updated students on their status and coached them to help them improve their grades, giving them a chance to revise and improve their work and multiple opportunities to show mastery.

At the end of the marking period, students took a test to verify their skills, knowledge, and understanding. If students did better on the final test than they had on the formative assessments, their grade moved up. If they did worse, the teacher interviewed them to give them another chance to show what they knew. Report card grades were given out at the end of the marking period – but if a student revisited a standard and mastered it by the end of the year, his or her year-end grade improved. In other words, the final June grade was *not* an average of all five marking period; it was a statement of what the student knew at the end of the year.

In May of the pilot year, Wiliam and Clymer interviewed a sample of students about the new grading system. Here's what students said:

• All but one understood that what mattered was what they understood at the end of the marking period, not how they did when the topic was first introduced. They "got" that they weren't expected to arrive at school already knowing the content – that the name of the game was improving as a result of good teaching.

• Many students shifted from a "performance orientation" (striving to have the highest grade in the class) to a "mastery orientation" (working to understand the material).

• Most students liked the provisional nature of the formative grades; they appreciated knowing what they had mastered and where they needed to improve.

• Students got more involved in monitoring their own learning; they frequently asked the teacher or their classmates for clarification to make sure they understood.

• Students said they liked getting specific, detailed feedback. One student noted that the kind of comment he was accustomed to getting from teachers – "Good job!" – didn't give him enough information to improve his work.

• Most students saw their teacher as a coach rather than a judge.

• Many students said they studied for tests, which they admitted they hadn't done the year before.

• Students said they understood more, focused more on learning important concepts, and felt more relaxed in class because the teacher judged them on understanding, not just on test performance.

• Half the students said they thought they had learned more science than in previous years; half said they had learned about the same; none said they had learned less.

In terms of achievement, students in the pilot class did somewhat better than a comparison class the year before. An analysis of the final scores showed that the new grading system was better for all students, and was especially helpful for the highest- and the lowest-achieving students.

The authors end their article with a caveat about using this assessment system with special-needs students. There is a tendency, they say, for compassionate teachers to give students with IEPs credit for mastering content that they haven't really mastered. "We think this is a mistake," write Wiliam and Clymer. "The record-keeping system must provide accurate information about what the student can and can't do… when a cell includes a number, it should mean the same thing for all students." The only exception would be "dis-applying" certain standards that are inappropriate for students with special needs and leaving those cells blank.

One more thing: Wiliam and Clymer also think that effort and improvement should not be folded into students' overall grades. Each student's status on each standard should be clear, they say, and other less-objective data should be reported in separate grades, or explained clearly if policy requires that it be part of a single grade.

"Improving the Way We Grade Science" by Jacqueline Clymer and Dylan Wiliam in *Educational Leadership*, Dec. 2006/Jan. 2007 (Vol. 64, # 4, p. 36-42), no e-link available

2. Learning from Higher-Performing Countries' Science Teachers

In this helpful article in *Educational Leadership*, Kathleen Roth and Helen Garnier, two LessonLab researchers in Santa Monica, California, report on their analysis of videotapes of a random sampling of 500 eighth-grade science lessons in the U.S. and four countries that outperformed us in recent TIMSS assessments – the Czech Republic, Japan, Australia, and the Netherlands. Roth and Garnier found two striking differences between science lessons in the U.S. and those in the higher-performing countries:

• The other countries each had a core pattern of science teaching, whereas the U.S. teachers used a variety of approaches.

• Teachers in the other countries engaged students in the core science ideas of their lessons, whereas American teachers worked at engaging students in a variety of activities, with much less attention to the science content; some U.S. lessons had no content at all.

Based on their international perspective, Roth and Garnier suggest the following guidelines for improving science teaching in the U.S. (they use these as they work with inservice and pre-service teachers):

• *Develop a clear, coherent science content "storyline."* By this they mean that teachers should make the science ideas drive the lesson from beginning to end. Specifically:

- Identify one main learning objective.
- Articulate this in goal statements and focus questions for students.
- Choose content materials and activities matched to the learning goal.
- Follow a storyline sequence as the lesson unfolds.
- Link content ideas and activities.
- Make sure students know the important ideas and the links among them.
- Summarize and synthesize important ideas at the end of the lesson.

• *Link all activities to science ideas.* American teachers try hard to make science interesting for students by including hands-on activities, but activities don't always serve the purpose of the lesson, and following procedures is often more important than content. To counteract this, it's essential to identify one clear learning goal and then make sure that every hands-on activity and every curriculum material moves the content storyline along. "Teachers who use this approach comment on how much it helps them focus their science lessons," write Roth and Garnier. "They often recognize how much they have been shortchanging this part of the planning process in the past."

• *Strengthen teachers' content knowledge.* To teach well, science teachers need to grasp the "big ideas" of the unit they are teaching. The authors have little confidence that pre-service and inservice science courses are the best way to beef up content knowledge. Instead, they recommend having teachers analyze videos of science teaching – including their own – and look at student work. They cite studies of mathematics teacher training in which this has been effective. Roth and Garnier also recommend using better science instructional materials. "Current U.S. science textbooks are strong on presenting information and vocabulary and short on putting concepts and activities together to coherently develop big ideas," they write. The authors encourage teachers to seek out materials that link activities and content.

"What Science Teaching Looks Like: An International Perspective" by Kathleen Roth and Helen Garnier in *Educational Leadership*, Dec. 2006/Jan. 2007 (Vol. 64, # 4, p. 16-23)
http://www.ascd.org/portal/site/ascd/template.MAXIMIZE/menuitem.459dee008f99653fb85516f762108a0c/?javax.portlet.tpst=d5b9c0fa1a493266805516f762108a0c_ws_MX&javax.portlet.prp_d5b9c0fa1a493266805516f762108a0c_journaltypeheaderimage=%2FASCD%2Fimages%2Fmultifiles%2Fpublications%2Felmast.gif&javax.portlet.prp_d5b9c0fa1a493266805516f762108a0c_viewID=article_view&javax.portlet.prp_d5b9c0fa1a493266805516f762108a0c_journalmoid=af862e9be585f010VgnVCM1000003d01a8c0RCRD&javax.portlet.prp_d5b9c0fa1a493266805516f762108a0c_articlemoid=19c62e9be585f010VgnVCM1000003d01a8c0RCRD&javax.portlet.prp_d5b9c0fa1a493266805516f762108a0c_journalTypePersonalization=ASCD_EL&javax.portlet.begCacheTok=token&javax.portlet.endCacheTok=token

The full TIMSS Video Study science report, as well as a highlights report, are available at: http://nces.ed.gov/timss. The set of CDs with videos of five full lessons is available for purchase at http://www.lessonlab.com/bkstore - click on the Videos tab and type TIMSS in the Search Videos box.

3. What Science Teachers Need To Know

In this *Educational Leadership* article, two science educators point to skills and knowledge that are associated with higher student achievement in science:

• *Laboratory skills* – Good training means that teachers go beyond "cookbook" lab exercises and ensure that students make the connection between their hands-on experiences and the underlying science content.

• *Hands-on learning* – Students who were exposed to experiential science learning at least once a week did markedly better in assessments.

• *Instructional technology* – Creative use of the Internet can expose students to science content that can't be experienced first-hand – e.g., volcanic eruptions, microscopic organisms.

• *Frequent formative assessments* – Students whose teachers gave them weekly assessments (multiple-choice and short-answer) to check for understanding were nearly a full grade ahead of students who were assessed less frequently.

The authors also say that well-trained science teachers are less likely to label students' answers as "right" or "wrong," instead asking, "Why do you think that?" When a student asks a question to which they don't know the answer, they are more likely to respond, "That's a good question. I don't know the answer, but I can tell you how we can find out."

"The Science Training Teachers Need" by Harold Wenglinsky and Samuel Silverstein in *Educational Leadership*, Dec. 2006/Jan. 2007 (Vol. 64, # 4, p. 24-29), no e-link available

4. Preventing Failure Before Students Are Referred to Special Education

This sidebar in an *American School Board Journal* article on ways to reduce unnecessary special-education referrals quotes the "Recognition and Response" protocol for 3-5-year-old students developed at the University of North Carolina/Chapel Hill:

• *Early intervention* – Teachers and parents are trained to recognize critical early warning signs that a child may not be learning as expected, and adopt new strategies to help the child succeed.

• *Pinpointing root causes* – A highly trained intervention team determines which students are underachieving because of classroom factors such as inadequate instruction and which students are underachieving due to learning disabilities.

• *Looking at the big picture* – Teams assess and modify the overall quality of a child's early learning experiences before formally diagnosing and labeling a child with a disability.

• *Skillful, targeted intervention* – Schools adopt an intervention system that includes recognition of a child's problems through screening, assessing, and monitoring, and response to a child's problems through research-based curriculum and instruction.

• *Three tiers of intervention* – In succession, schools provide a child with a high-quality environment and intentional teaching, group interventions, and individualized interventions.

• *Data-driven decisions* – Teams use a collaborative problem-solving process that involves teachers, parents, and specialists who collect data, conduct assessments, and monitor a student's progress at every stage of intervention.

"A Vigilant Approach" by Susan Black in *American School Board Journal*, January 2007 (Vol. 193, #1, p. 33-35); the full report, "Recognition and Response: An Early Intervening System for Young Children At-Risk for Learning Disabilities: Research Synthesis and Recommendations" (May 2006), is available at:
http://www.recognitionandresponse.org/images/downloads/2006fpgsynthesis_recognitionandresponse.pdf

5. Keys to Effective Youth Mentoring

Mentoring adolescents – for example, a business professional meeting monthly with a high-school student – has been "hot" since a 1995 study of the Big Brothers/Big Sisters program. It's estimated that this year, there are about three million mentor-mentee relationships in the U.S.. But this article in *Education Week* reports that many mentoring relationships don't last long enough; furthermore, they lack other certain ingredients needed to be more than "feel-good" frills. There's also a tendency for schools to use mentors as adjunct tutors to boost academic skills, which detracts from the primary mission: psychosocial development from a close, consistent, enduring relationship.

David DuBois, a University of Illinois/Chicago researcher, has studied this issue and come up with "Seven C's" of Success for effective youth-mentoring relationships:

- *Compatibility* – Mentors and young people should be a good match in basic personality, but they don't need to be close in age or belong to the same racial or ethnic group.
- *Capability* – It helps if a mentor has had experience working with young people and is sensitive to the challenges his or her mentee faces at home and in the community.
- *Consistency* – Mentors should meet with their mentees on a regular basis.
- *Continuity* – Mentorships should last at least a year.
- *Closeness* – It's important that an emotional bond is formed between mentor and mentee.
- *Centeredness* – Communication should focus on the young person's developmental needs.
- *Connectedness* – Mentors are most successful when they connect with the mentee's parents and/or other key figures in their lives.

"Rise in Youth Mentoring Outpaces Knowledge Base" by Debra Viadero in *Education Week*, Dec. 13, 2006 (Vol. 26, #15, p. 8-9); here is a link to the research report, "Understanding and Facilitating the Youth Mentoring Movement" by David DuBois and Jean Rhodes:
http://www.srcd.org/documents/publications/spr/spr20-3.pdf

6. Diminishing Returns from Conventional Reading Instruction?

In this full-page ad in *Education Week*, Edison Schools stresses the importance of a solid science, social studies, and fine arts curriculum – "core knowledge" – as students master reading skills:

"We know from research and experience that to become successful readers, children need to learn how to read in a systematic and intensive way. A single-minded focus on this

over the past decade has produced significant increases in primary reading scores. And that's important. But, unfortunately, upper-elementary and secondary students have not made similar progress in reading comprehension. Could it be that drilling students in reading skills has resulted in less time devoted to the content areas – and thus less time to develop the contextual knowledge students need to make sense of what they're reading? Might students become better readers if we gave them more engaging and substantive content – and spent less time 'teaching reading'?"

Edison Schools advertisement in *Education Week*, Dec. 13, 2006 (Vol. 26, #15, p. 2)

7. Report on Successful Charter High Schools

This 72-page report from the U.S. Department of Education features eight high-performing charter schools (chosen from 400 candidates), describes their six common traits, and gives a brief description of each school based on a two-day site visit. The schools share these characteristics:

- Mission-driven – Relentless focus on goals, a supportive culture;
- College preparation focus – Rigorous curriculum, real-world experiences;
- Teaching for mastery – Remediation and acceleration, effective use of interim assessments;
- Wraparound student support – Easily accessible adult support, family commitment, demystifying the college-going experience;
- Professional learning – Principals as instructional leaders, teachers learning together, teacher induction and retention;
- Accountability – Sound fiscal management, dedicated board, continuous improvement.

The profiled schools are: Gateway High School, Media and Technology Charter High School (MATCH), Minnesota New Country School, North Star Academy, The Preuss School, SEED Public Charter School of Washington, D.C., Toledo School for the Arts, and YES College Preparatory School, Southeast Campus.

The report is available free by e-mailing edpubs@inet.ed.gov and is also available online at: http://www.ed.gov/admins/comm/choice/charterhs/report_pg6.html. It was written by a WestEd team, including Sarah Feldman, Nikki Filby, Joy Zimmerman, and Jim Johnson. Two other staff also helped with some of the site visits: BethAnn Berliner and Aditi Goel. (Spotted in *Education Gadfly*, Dec. 14, 2006)

8. Short Items:

a. Online help teaching evolution – This rich resource bank for teaching evolution – and defending the teaching of evolution – is on the website of the American Association for the Advancement of Science: http://www.aaas.org/news/press_room/evolution.

"Understanding the Scientific Enterprise: A Conversation with Alan Leshner" by Deborah Perkins-Gough in *Educational Leadership*, Dec. 2006/Jan. 2007 (Vol. 64, # 4, p. 8-15)
http://www.ascd.org/portal/site/ascd/template.MAXIMIZE/menuitem.459dee008f99653fb85516f762108a0c/?javax.portlet.tpst=d5b9c0fa1a493266805516f762108a0c_ws_MX&javax.portlet.prp_d5b9c0fa1a493266805516f762108a0c_journaltypeheaderimage=%2FASCD%2Fimages

%2Fmultifiles%2Fpublications%2Felmast.gif&javax.portlet.prp_d5b9c0fa1a493266805516f762108a0c_viewID=article_view&javax.portlet.prp_d5b9c0fa1a493266805516f762108a0c_journalmoid=af862e9be585f010VgnVCM1000003d01a8c0RCRD&javax.portlet.prp_d5b9c0fa1a493266805516f762108a0c_articlemoid=a8b62e9be585f010VgnVCM1000003d01a8c0RCRD&javax.portlet.prp_d5b9c0fa1a493266805516f762108a0c_journalTypePersonalization=ASCD_EL&javax.portlet.begCacheTok=token&javax.portlet.endCacheTok=token

b. Online science courses – These two programs provide science content online, allowing teachers to study small chunks of content:

• The National Teacher Enhancement Network at Montana State University: http://www.scienceteacher.org

• The JASON Foundation: http://www.jason.org

"Strategies for Science Education Reform" by Gerald Weaver in *Educational Leadership*, Dec. 2006/Jan. 2007 (Vol. 64, # 4, p. 30-34)

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).

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- All back issues (also in PDF or Word)
- A database of all articles to date, searchable by topic, title, author, source, level, etc.
- How to change access e-mail or password

Publications covered

Those read this week are underlined.

American Educator
American School Board Journal
ASCD SmartBrief
Atlantic Monthly
Catalyst Chicago
CommonWealth Magazine
Ed. Magazine
EDge
Education Digest
Education Gadfly
Education Next
Education Update
Education Week
Educational Leadership
Educational Researcher
Edutopia
Elementary School Journal
Essential Teacher (TESOL)
Harvard Business Review
Harvard Education Letter
Harvard Educational Review
JESPAR
Jimmy Kilpatrick
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
Teacher Magazine
Teachers College Record
Theory Into Practice
Times Educational Supplement