Marshall Memo 192

A Weekly Round-up of Important Ideas and Research in K-12 Education
July 2, 2007

In This Issue:

Quotes of the Week

"I expect to hit the ground listening."

Carol Johnson, incoming Boston superintendent (*Boston Globe*, June 20, 2007, p. B5)

"Here's an Independence Day thought for you: America's true competitive edge doesn't come from producing more engineers than India. It arises from the creativity, rebelliousness, and drive that result from a broad liberal education and the values and convictions that accompany such teaching and learning."

Chester Finn, Jr. in *The Education Gadfly*, June 28, 2007

"The development of genuine expertise requires struggle, sacrifice, and honest, often painful self-assessment. There are no shortcuts."

Anders Ericsson, Michael Prietula, and Edward Cokely (see item #3)

"If you cannot measure it, you cannot improve it."

British scientist Lord Kelvin (*ibid.*)

"The general theory among these schools is that if students are weak in a particular area, the teachers need to learn more about it."

Karin Chenoweth (see item #2)

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1. Can Schools Teach Critical Thinking?

In this article in *American Educator*, University of Virginia cognitive psychologist Daniel Willingham deconstructs "critical thinking skills" – which everyone seems to agree that students should learn better in school – and gives some helpful advice on how we should go about teaching those skills.

First, a definition. Critical thinking, says Willingham, is when a person reasons, makes judgments and decisions, and solves problems using these three faculties:

- They avoid common pitfalls such as seeing only one side of an issue, discounting new evidence that doesn't back up their ideas, reasoning from passion rather than logic, failing to support statements with evidence, and others.
- Their reasoning, decision-making, or problem-solving is original; simply applying a solution from memory is not critical thinking.
- They are doing their own thinking; in other words, students aren't thinking critically if they need prompting from a teacher every step of the way.

Willingham explores the research on critical thinking and presents five conclusions for schools to consider:

• *Critical thinking is not just for advanced students.* Some teachers and administrators believe that "higher-order thinking" is good enrichment for the "best" students and other students need to stick to the basics. Rubbish, says Willingham. "This argument sells short the less-advanced students and conflicts with what cognitive scientists know about thinking. Virtually everyone is capable of critical thinking and uses it all the time – and… has been capable of doing so since they were very young. The difficulty lies not in thinking critically, but in recognizing when to do so, and in knowing enough to do so successfully."

• *To teach critical thinking, make strategies explicit and have students practice them.* An issue that comes up frequently as students learn problem-solving is that they understand how to solve a problem with one set of facts but can't apply what they've learned to similar problems with different facts. Here's an example:

> *A marching band is trying to get into a four-sided formation that doesn't leave any of its members marching alone. The band can't do it with rows of 12, nor with rows of eight, nor with rows of three – but it works with rows of five. The band has between 45 and 200 members. How many are there?*

To solve this problem, students have to understand how to find the least common multiple, but once they've solved this problem, many students have trouble applying what they've learned to a similar problem about rows of vegetables in a garden. Why? Because they get caught up in *the surface structure* of the problem – the marching band and the vegetables – and lose track of

the *deep structure* – least common multiples. Willingham says there are two keys to teaching students how to transfer what they learn about solving one problem to other similar problems:

- Explicitly teach each problem's deep structure and make students very familiar with it. This can come from repeated experience with one problem over time, or from exposure to problems with the same deep structure and different superficial details. It takes a good deal of practice and repetition for students to be able to immediately recognize the deep structure of a new problem.
- Teach students to *look for* the deep structure of problems. At first students need prompting – "The vegetable problem is similar to the band problem." Eventually they prompt themselves with an internal dialogue like this: "I'm seeing this problem in a math class, so there must be a math formula that will solve this problem. What is it?" The jargon is teaching metacognitive strategies, in this case, "Look for the deep structure." The problem, says Willingham, is that teaching metacognitive strategies will only take us so far. Students need detailed knowledge of the subject matter to make optimal use of them – which is why this and other critical-thinking skills should be taught in the content areas – his next point…

• *Critical thinking is best taught in the context of specific subject matter.* Willingham says that studies prove that critical thinking is not a skill, but a set of strategies that are quite specific to math, science, history, geography, etc. – and that knowing about the subject matter is vital to developing critical thinking skills within each discipline. "Knowing that a letter was written by a Confederate private to his wife in New Orleans just after the Battle of Vicksburg won't help the student interpret the letter," says Willingham, "unless he knows something about Civil War history."

"The good news," he continues, "is that within a content area like science, students have more context cues to help them figure out which metacognitive strategy to use, and teachers have a clearer idea of what content knowledge they must teach to enable students to do what the strategy calls for."

But even when students know a lot about a subject, critical thinking is not a slam dunk. This is because of the on-going difficulty of transferring skills to new situations and the tendency people have to stick to established patterns and ignore anomalous data. An example: in science, there's an important concept about cause and effect called conditional probabilities. If two things go together, it's possible that one causes the other. For example, if you start taking a new medicine and get more frequent headaches, you might infer that the medicine is causing the headaches. But it's also possible that the effect only takes place only when a third factor is present – for example, having a cup of coffee. Thus the link between the medicine and a headache is conditional on the presence of coffee. The principle of conditional probabilities can be taught, and children as young as three can get the basic concept – and yet doctors and highly trained scientists can fail to apply the principle because it is embedded in an unfamiliar context or flies in the face of their assumptions about a patient or a situation.

So critical thinking depends on three things: first, being very familiar with *content*

knowledge in the subject in question (e.g., math, science, history); second, learning *new ways of thinking* (e.g., looking for the deep structure in math problems or being aware of a conditional variable in a science problem); and third, learning and practicing *when* to deploy the right kind of thinking with a skillful teacher.

• *Students' own experiences can offer entrée to complex concepts.* As students are acquiring content knowledge, their everyday knowledge can help build mental bridges to more sophisticated thinking. For example, an elementary teacher might ask her students to think about a letter sent to the editor of a newspaper criticizing the school's decision to abolish recess. How would students view it differently if it were written by the principal – or by a third grader? Another example deals with the concept that *correlation does not imply causation*. On days when more ice cream is consumed, the number of crimes committed also rises. With a little prodding, students will realize that it's not ice cream that causes crime, or crime that causes people to eat more ice cream, but high temperatures that make people crave ice cream and also commit more crimes.

• *Special programs to teach critical thinking aren't worth it*. Willingham says that the 1983 *A Nation at Risk* report, which raised concern about the lack of critical thinking in U.S. schools, led to the development of a number of programs designed to impart those skills. Almost all these programs are based on the idea that there is a set of generic critical-thinking skills that can be applied and practiced across different subject areas. Here are some examples:

- Instrumental Enrichment, developed by Reuven Feuerstein – Uses abstract problems such as finding patterns in meaningless figures;
- Productive Thinking, developed by Martin Covington – Uses mystery stories;
- Cognitive Research Trust or CoRT, developed by Edward de Bono – Uses group discussion of interesting problems that students might encounter in everyday life.

Unfortunately, reports Willingham, there's very little evidence that these programs work. He says that studies of the programs are methodologically weak and "the evidence shows that such programs primarily improve students' thinking with the sort of problems they practiced in the program – not with other types of problems." In addition, since it's very difficult to anticipate students' responses and script the curriculum in critical-thinking programs, success depends on very knowledgeable and skillful teachers thinking well on their feet.

"You learn to think critically in the ways in which you practice thinking critically," concludes Willingham. "If you practice logic puzzles with an effective teacher, you are likely to get better at solving logic puzzles." But that is unlikely to carry over to other areas.

The problem with the programs, Willingham believes, is that they operate in a vacuum: being able to think critically depends on students having detailed content knowledge about the subject. "[Y]ou can't think critically about topics you know little about or solve problems that you don't know well enough to recognize and execute the types of solutions they call for," he concludes.

"Critical Thinking: Why Is It So Hard to Teach?" by Daniel Willingham in *American Educator*, Summer 2007 (Vol. 31, #2, p. 8-19),
http://www.aft.org/pubs-reports/american_educator/issues/summer07/Crit_Thinking.pdf

2. How Fifteen Schools Beat the Odds

In this *American Educator* article, education writer Karin Chenoweth summarizes the key factors that she found in the fifteen highly effective urban schools profiled in her new book, *"It's Being Done"* (Harvard Education Press, 2007) [See the summary of another article by Chenoweth in Marshall Memo 183]:

• *These schools have very high expectations for their students*. "It's not about feeling sorry for the kids," said Barbara Adderley, principal of Stanton Elementary School in Philadelphia. "It's about making sure that they understand what it is they're expected to do."

• *They use all the data they can get their hands on and embrace accountability*. They realize that teachers' perceptions of their students' learning, while important, are fragmentary and don't reveal overall patterns. So they gather, display, and analyze all the interim test data and other information they can get their hands on and follow up relentlessly with students. If another school outperforms them, they beat a path to that school to figure out what it did and adopt those ideas.

• *They steer clear of test prep*. These schools make sure that students aren't blindsided by any material on the state tests and familiarize students with the format, but teachers spend very little time having their students practice taking sample test items and "bubbling in." They insist on teaching a full, rich curriculum in all subject areas, including those that don't have high-stakes tests.

• *They use school time wisely*. This means treating instructional time as sacred, carving out blocks of uninterrupted time when announcements and pullouts don't happen, and cutting down on wasted time during the school day (e.g., getting out and putting away books and materials, bathroom trips, and moving from class to class). Students are engaged in productive activities almost all the time.

• *They add time for students, particularly those who are struggling*. Some schools use before- and after-school time, some use vacations and the summer. They all figure out how to get their students more learning time – and include enrichment activities as well.

• *They don't spend much time punishing students*. They don't need to, since they constantly teach good behavior and use incentives and positive activities to prevent discipline problems. Good teaching, high-quality curriculum materials, differentiated instruction, and student engagement keep students happily and successfully engaged most of the time. Mentors and social service agencies are also part of prevention and intervention.

• *They give teachers time to meet, observe each other, and do serious professional development*. Administrators create a master schedule that gives students a coherent instructional day and build in time for teacher teams to work and learn together. This is usually accomplished by having each grade level go to special subjects at the same time so all the teachers are free at the same time. "The general theory among these schools," says Chenoweth, "is that if students are weak in a particular area, the teachers need to learn more about it."

• *Although the principals are important leaders, they are not the only leaders.* Committees composed of teachers and sometimes parents and community members make important decisions on hiring, curriculum, school policies and procedures, budget, and more.

"These principals are consciously trying to build enduring structures that will outlast them," writes Chenoweth.

The article concludes by likening the work of these schools to the Wright brothers' tenacious struggle to get their plane off the ground at Kitty Hawk. "In much the same way," says Chenoweth, "the schools profiled in my book demonstrate that the job of educating all kids to high levels is possible. When you overcome drag and gravity with enough thrust and lift, you get flight; when you overcome poverty and discrimination with effective leadership, thoughtful instruction, careful organization, and what can only be recognized as the kind of pig-headed optimism displayed by the Wright brothers, you get learning – even in schools where many people wouldn't expect it."

"Uncovering Academic Success" by Karin Chenoweth in *American Educator*, Summer 2007 (Vol. 31, #2, p. 30-36),
http://www.aft.org/pubs-reports/american_educator/issues/summer07/chenoweth.htm
In a companion article, "Inside a Philadelphia Success Story", Chenoweth describes the dramatic turnaround at Stanton Elementary School:
http://www.aft.org/pubs-reports/american_educator/issues/summer07/stanton.htm
This article is accompanied by a powerful graph of the school's reading and math achievement before and after the turnaround:
http://www.aft.org/pubs-reports/american_educator/issues/summer07/Results.pdf

3. What Does It Take to Achieve at Very High Levels?

In this *Harvard Business Review* article, researchers Anders Ericsson, Michael Prietula, and Edward Cokely confront the common and deeply ingrained belief that it takes innate genius to become highly accomplished in any field. Not so, say the authors. What produces success – whether it's in chess, sports, medicine, or writing – is good teaching, support, and years of "deliberate practice."

This surprising conclusion was originally put forward in 1985 by Benjamin Bloom based on his study of 120 elite performers, and was recently confirmed by more than 100 scholars in *The Cambridge Handbook of Expertise and Expert Performance* (Cambridge University Press, 2006). "Consistently and overwhelmingly," say Ericsson, Prietula, and Cokely, "the evidence showed that *experts are always made, not born.*" Even Winston Churchill, regarded as one of the most charismatic orators of the modern era, practiced his speeches in front of a mirror. He worked hard to achieve the spellbinding effect he had on his audiences.

This is a hopeful conclusion for educators; it means that high achievement isn't the product of a genetic lottery and that success is within the grasp of virtually all of our students. But achievement is not achieved without a struggle. "The journey to truly superior performance," say the authors, "is neither for the faint of heart nor for the impatient. The development of genuine expertise requires struggle, sacrifice, and honest, often painful self-assessment. There are no shortcuts."

Drawing on the research, the authors have four key messages on the development of expertise:

• *Practice deliberately*. "Not all practice makes you perfect," says the authors, any more than living in a cave makes you a geologist. "Deliberate practice involves two kinds of learning: improving the skills you already have and extending the reach and range of your skills [by] … considerable, specific, and sustained efforts to do something you *can't* do well – or even at all. Research across domains shows that it is only by working at what you can't do that you turn into the expert you want to become." This is a crucial point, since many people tend to develop a skill to a certain level and then continue practicing at that level. "It's only human nature to want to practice what you can already do well," said golf pro Sam Snead, "since it's a hell of a lot less work and a hell of a lot more fun."

"Moving outside your traditional comfort zone of achievement requires substantial motivation and sacrifice," say Ericsson, Prietula, and Cokely. And it's exhausting. They report that highly accomplished experts usually can't practice for more than a few hours a day. But the *quality* of practice is what matters, not the *quantity*. Famed violinist Nathan Milstein became concerned when he saw other violinists practicing all day, but was reassured by his mentor, who said, "If you practice with your fingers, no amount is enough. If you practice with your head, two hours is plenty."

• *Use feedback*. "Genuine experts not only practice deliberately but also *think* deliberately," write the authors, citing research on world-class chess players. "We've observed that when a course of action doesn't work out as expected, the expert players will go back to their prior analysis to assess where they went wrong and how to avoid future errors. They continually work to eliminate their weaknesses." And using data is key. In the words of British scientist Lord Kelvin, "If you cannot measure it, you cannot improve it."

• *Be patient*. "Popular lore is full of stories of unknown athletes, writers, and artists who become famous overnight, seemingly because of innate talent," write the authors. But it always turns out that they spent years of hard, strategic practice before they achieved success. Research suggests that it takes at least ten years to develop high levels of expertise in most fields.

• *Find coaches and mentors*. Just as important as deliberate practice is good teaching and coaching. Research has shown that future experts needed different kinds of support at different points in their development. "In the beginning, most are coached by local teachers, people who can give generously of their time and praise," say the authors. "Later on, however, it is essential that performers seek out more-advanced teachers to keep improving their skills." At every stage, teachers need to have certain key characteristics. "The development of expertise requires coaches who are capable of giving constructive, even painful, feedback," say the authors, "…unsentimental coaches who would challenge them and drive them to higher levels of performance. The best coaches also identify aspects of your performance that will need to be improved at your *next* level of skill. If a coach pushes you too fast, too hard, you will only be frustrated and may even be tempted to give up trying to improve at all… Like good parents who encourage their children to leave the nest, good coaches help their students learn how to rely on an 'inner coach.'"

"The Making of an Expert" by Anders Ericsson, Michael Prietula, and Edward Cokely in *Harvard Business Review*, July/August 2007 (Vol. 85, #7/8, p. 114-121), no e-link available

4. How Can a Verbal Learner Teach Students Who Are Visual Learners?

In this thoughtful article in *Essential Teacher*, veteran ESL teacher Dorothy Zemach shares a domestic story that helped her understand the ways different people process information. When she and her husband moved into their first house, the kitchen had a stove whose four burner knobs were labeled *Left front, Left back, Right front,* and *Right back*. Zemach had no problem turning on the burner she wanted, but her husband (a native English speaker) was constantly turning on the wrong burner, sometimes burning a pot or not cooking something he wanted to cook.

Eventually they bought a new stove, this one with a different knob-labeling approach – a diagram showing graphically which knob controlled which burner. "My husband never burned another pot," says Zemach, " but I did… Visual learners, like my artist husband, process information most easily when they can see it as a picture, diagram, or live-action scene in a movie or play. Verbal learners, like me, learn better from lectures or reading."

Studies show that most people are visual learners – but teachers and textbook writers tend to be verbal learners, which produces lots of poor communication in classrooms. Zemach says that most of her ESL students are visual learners. "They make word maps to brainstorm for their essays, whereas I'd write a list. They spend time looking at the photos and diagrams in their textbooks, but I'd skip straight to the exercises. They were relieved when Apple Computer began using more icons and fewer words to label folders and applications, which continues to be an irritation to me."

So how can a teacher who is a verbal learner be effective with students who are visual learners? Zemach has the following suggestions:

• *Get the most out of textbook illustrations*. "Use the art to activate background schema, review vocabulary, and introduce new vocabulary," she says. "Ask students about the pictures (*What do you see in this picture? What is he doing? How is she feeling? What do you think he's going to do next?*). Have students ask and answer questions about the pictures. Have students close their eyes and tell a partner what they remember about a picture."

• *Illustrate new vocabulary words with sketches*. Zemach's husband taught her to draw stick diagrams and she uses them frequently in place of verbal explanations. When she feels she can't draw something, Zemach asks for a student volunteer.

• *Use gestures and facial expressions to explain new vocabulary and demonstrate situations*. Students can also help with this.

• *Use photos, drawings, charts, and graphs*. These take time to gather, but a teacher's stockpile can get better each year.

• *Encourage students to use graphs and charts*. These improve the impact of students' writing, and making and interpreting graphs and charts (by hand and using Excel and other software) is an important skill for college and life.

• *Have students illustrate new vocabulary*. Zemach has her students make a card for each new word; on one side, students write the word, the context sentence, the definition, and an original sentence using the word; on the back, students draw a picture representing the word. Her students can always find a way to illustrate words and idioms, and the cards are great for practice: students pair up and quiz each other by holding up each card's illustration and having the other student spell the word and give the definition and use it in a sentence.

• *Have students illustrate reading journals*. Students benefit when they make quick sketches of an important event in a book or for a new vocabulary word.

• *Teach students explicitly about different learning styles*. "It's important for learners not only to understand how they learn best," concludes Zemach, "but how to adapt their learning styles to material that is presented in another way."

"From A to Z: Picture This" by Dorothy Zemach in *Essential Teacher*, June 2007 (Vol. 4, #2, p. 12-13), no e-link available; the author can be reached at zemach@comcast.net.

5. Realistic Rules for Cell Phones

In this *American School Board Journal* article, consultant Dennis Adams has helpful suggestions for dealing with the cell phones, iPods, and the other digital devices that are so much part of youth culture today. "Any gadget that takes away from teaching and learning has to be controlled," he writes. "Home and school must come together on this one – both parents and teachers have to help children and young adults figure out what's appropriate."

The best policy is simple and straightforward, says Adams, but he doesn't think it's realistic to have an absolute ban on mobile devices in school. He says schools should have strict guidelines on three functions that have caused the most problems – cameras, text messages, and Internet access – but be open to the possibility of using students' devices for learning purposes when teachers want to use them as part of lessons. He suggests the following as possible schoolwide rules:

• Cell phones and other mobile devices should not be seen, heard, or viewed during school hours.

• If a mobile device in any way disrupts or distracts a class, it will be taken away and held for a parent to pick up.

"The Digital Device" by Dennis Adams in *American School Board Journal*, July 2007 (Vol. 194, #7, p. 22-23), no e-link available

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 37 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 evening (with occasional breaks; there are about 50 issues a year).

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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
Chronicle of Higher Education
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
Tools for Schools