Marshall Memo 341

A Weekly Round-up of Important Ideas and Research in K-12 Education
June 21, 2010

In This Issue:

Quotes of the Week

"Mrs. Brown was barely five feet tall, a wisp of a woman, but when she spoke, she conveyed a message of 'I am the teacher. I care about you, and I'm in charge here.' Her students hung on every word."

Cindi Rigsbee in "The Relationship Balance" in *Educational Leadership*, Summer 2010 (Vol. 67, #10, online only)
http://www.ascd.org/publications/educational-leadership/summer10/vol67/num09/The-Relationship-Balance.aspx

"[Merit pay] alone is not going to get you those results. If you do that, you're saying that teachers already had the capacity to get results and were holding out for more money."

David Lussier, Austin, Texas Schools (quoted in "New Emphasis on New Teacher Support" by Tracy Crow in *The Learning System*, Summer 2010 (Vol. 5, #6, p. 1)

"School districts do a great job of collecting data. Where many of us fall down is in using it."

Andrew Bott, Boston principal (see item #5)

"One of the most stubborn, persistent phenomena of the mind is that when you do two things at once, you don't do either one as well as when you do them one at a time."

Daniel Willingham (see item #2)

"The job of teaching is not to 'execute' the paper curriculum irrespective of results, any more than it is the coach's job to execute the playbook irrespective of the score."

Allison Zmuda and Jay McTighe (see item #3)

"The goal of education is not to produce higher scores, but to educate children to become responsible people with well-developed minds and good character."

Diane Ravitch in "In Need of A Renaissance" in *American Educator*, Summer 2010 (Vol. 34, #2, p. 10-22) http://www.aft.org/pdfs/americaneducator/summer2010/Ravitch.pdf

1. Effective Teaching Strategies That Don't Take More Time

In this thoughtful article in *Educational Researcher*, psychology professors Doug Rohrer (University of South Florida) and Harold Pashler (University of California/San Diego) point to three conclusions from research on human learning and memory that are often ignored in K-12 schools:

• *Taking a test (or testing oneself) improves learning and retention*. Years of research have found that "a test that requires a learner to retrieve some piece of information can directly strengthen the memory representation of this information," say Rohrer and Pashler. Retrieving a remembered item also slows down the rate at which it is forgotten. Studies have shown that when students test themselves after studying, it's a much more effective strategy than reading the material again. This effect has been documented at different age levels and in various subjects, including science, history, geography, and foreign language.

Interestingly, the "testing effect" doesn't work with all types of test. Multiple-choice questions, where students are asked to choose the correct answer from a list of alternatives, are not nearly as effective as short-answer questions, where students must produce the answer from memory. This means that the memory boost doesn't come from rehearsing the correct answer but from the act of retrieval itself.

There's another reason that self-testing works better than re-reading: self-assessment gives the learner much more accurate feedback on what's been forgotten and needs additional study time (followed by additional memory checking).

The implication of this research is that students should spend much more time retrieving information than slogging through conventional studying. Even simple self-testing, such as writing down everything one can remember after reading a text or listening to a lecture, is highly effective.

• *Spacing practice improves learning and retention*. Most teachers think it's logical and efficient to present material in a compressed block of time. But over the years, researchers have consistently found that spreading out the same amount of instruction into several sessions spaced over time results in better learning. This is true from primary-grade phonics to college-level science. A number of studies suggest that instruction should be spread out over several sessions, leading to a relatively distant test, with the gap between sessions gradually widening as the test approaches. If we want life-long retention, it's best to revisit the material about once a year.

• *Interleaving different types of material increases learning and retention*. When we teach multiple skills (for example, addition, subtraction, multiplication, and division), there are two different approaches: blocked (aaabbbcccddd) or interleaved (abcdabcdabcd). An earlier generation of research found that interleaving was superior for motor skills – for example, baseball batters learning how to hit three different pitches (curve, slider, and fastball) learn better when the pitches come in an unpredictable sequence, as they do in a real game. More recent research has found that interleaving works with cognitive learning as well. For example, in paired art history courses, students learned about numerous paintings by 12 different artists. One class had the paintings presented in groups by the same artist; another class saw the paintings in a mixed-up sequence. On a test, the second class did much better at identifying previously unseen paintings by each of the 12 artists. "In essence," say Rohrer and Pashler, "interleaving improved their ability to discriminate between different kinds of styles."

Interleaving is particularly effective with mathematics and statistics, where students have to be able to apply different skills and understandings to problems that are superficially similar. In one study involving geometry at the college level, interleaving boosted subsequent test scores (compared to blocked instruction) by a factor of three.

But despite these findings on the advantages of interleaving, almost all math textbooks use the blocked approach. This gives students a crutch they won't have on cumulative final exams and real-world applications. "It is not surprising if they often struggle when asked to demonstrate a skill they have not previously practiced," say Rohrer and Pashler.

Why are the three inferior strategies – studying by re-reading, compressing instruction, and blocking practice – used so commonly in schools and colleges when the research evidence is overwhelmingly against them? The authors believe it's because most teachers believe that testing, spacing, and interleaving are less effective. Why is this? Because these strategies produce more errors and frustration in the short term. "In brief," say Rohrer and Pashler, "if people tend to judge the efficacy of a learning strategy on the basis of their performance during training, they will choose strategies that sometimes yield suboptimal long-term learning." One group of researchers dubbed these short-term frustrations as "desirable difficulties" on the road to improved long-term learning.

In the case of the studying-by-re-reading strategy, there's another reason it's the default approach in schools and colleges. Studies have shown that learners using this strategy have an inflated sense of how much they will remember. It's only when they take the final test that they find out how ineffective it's been – and then they tend to blame other factors.

"Recent Research on Human Learning Challenges Conventional Instruction Strategies" by Doug Rohrer and Harold Pashler in *Educational Researcher*, June/July 2010 (Vol. 39, #5, p. 406-412), no e-link available; the authors can be reached at drohrer@usf.edu and hpashler@ucsd.edu.

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2. How Can We Make the Best Use of Technology in Classrooms?

In this helpful *American Educator* article, University of Virginia professor Daniel Willingham answers two questions about the impact of technology in schools:

• *Has technology changed the way students think?* On average, young people spend 7.5 hours a day using a phone, computer, TV, or other electronic device, and all this gives them new ways of accessing and integrating information. There are two areas of controversy:

Engagement – Technology can fascinate young people, but not always. Willingham gives the example of teenagers engrossed in a *Twilight* series book that uses a Gutenberg-era platform. "In order for technology (or any instructional tool) to increase student engagement in academic content," he says, "it has to aid in presenting problems as both challenging and solvable. And many technologies can do just that."

There's definitely a "wow" factor with technology that can hook students into learning, but for that to be sustained and successful, the gizmo has to be used wisely. This is best illustrated by students' reactions to interactive whiteboards. When kids are asked what they think of whiteboards, they are quite enthusiastic, but when math learning is compared in classrooms with and without whiteboards, there is very little difference. "That doesn't mean that the interactive whiteboard couldn't be used to make math more interesting," says Willingham. "It means that the presence of an interactive whiteboard alone doesn't buy the teacher that much. The teacher must know what to do with it."

Multitasking – Many young people multitask with technology, due to the fact that they have slightly larger working memories than adults and can hold more information in the mental "space" in which thinking takes place. But Willingham is firm that "all of us perform tasks best when we do only one at a time." College students who think they are terrific at multitasking do worse than focused learners when tested on what they have been working on. "One of the most stubborn, persistent phenomena of the mind is that when you do two things at once, you don't do either one as well as when you do them one at a time," says Willingham. "Multitasking is never a good idea if you really need to get something done." That's because people multitask by switching rapidly back and forth between tasks – and that's difficult to do well, especially with demanding tasks like texting with a friend and doing homework. The only exception with some people is listening to background music, preferably instrumental, and even there, some students are unable to concentrate well on academic work attention while music is playing.

• *How might technology influence classroom practice?* Interactive whiteboards are an interesting example of pros and cons. It would seem like a no-brainer that this technological innovation would help improve teaching and learning. But research so far has found minimal benefits. "Teachers need time and professional development to create lessons that exploit the potential advantages of the technology," says Willingham, "and it must be recognized that crafting such lessons is not necessarily straightforward." The same is true of multimedia instruction – lessons that combine printed and/or spoken words with images (illustrations, photos, animation, and/or video): multimedia lessons can be helpful, or they can overload and confuse some students, depending on the size of their working memory and their background knowledge about the subject. Willingham's advice: "teachers should carefully monitor students

to see if a new technology-based component in a lesson is enhancing comprehension or becoming overwhelming."

So what does all this mean for teaching? Willingham draws the following lessons from the research:

• *Encourage students to avoid multitasking when doing an important task*. Students may not heed this advice when they're on their own because they think they're better at multitasking than they really are, which means it's important for teachers to provide quiet time in class when multitasking is not allowed and students can see just how efficient they can be when they focus on one thing.

• *If you get a new piece of technology, learn how to use it well*. The best ideas, says Willingham, come from teachers as they experiment with whiteboards, clickers, social networking software, and other doo-dads. "Happily, the teachers who are enthusiastic early adopters of technology are also the ones who are likely to share their ideas with their colleagues via the Internet," he says, and suggests two sites: http://www.tammyworcester.com and http://www.freetech4teachers.com.

• *Think about what each technology can do best*. Better than asking, *What can I do with this whiteboard* is asking, *I want to teach X. Is there a tool that will help me?* and finding the best one – not necessarily high-tech. For example, videos are better than photographs for showing processes that evolve over time, but photos are better for studying the details of a scene. Clickers allow simultaneous, whole-class responses to teacher-made questions but sometimes a low-tech response system like raising hands works better. An overhead projector allows a teacher to prepare material ahead of time, present a lot of information simultaneously, and show photocopied diagrams and figures. But a blackboard allows a teacher to show a long sequence of steps – something Japanese teachers make excellent use of, especially in math classes.

• *There's nothing wrong with engagement*. If technology helps students pay more attention to content and have fun, go for it! But tailor instruction in a way that takes advantage of every possible modality – including some that are downright old-fashioned.

"Ask the Cognitive Scientist: Have Technology and Multitasking Rewired How Students Learn?" by Daniel Willingham "Writing to Improve Reading" in *American Educator*, Summer 2010 (Vol. 34, #2, p. 3)

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3. Creating Online Troubleshooting Guides

(Originally titled "How to Be an Education Troubleshooter")

In this *Educational Leadership* article, consultants Allison Zmuda and Jay McTighe suggest that educators should build online databases of troubleshooting tips for specific teaching and learning problems – for example, How do you teach sixth graders who still can't divide fractions even though they supposedly learned how in fourth and fifth grades? Why do many students struggle to write a cogent paragraph? Why aren't students using academic

vocabulary in everyday speech? How do we work with students who give up the first time they encounter frustration?

"Every subject in the curriculum includes certain topics and skills that challenge many students because the material is complex, difficult, or counterintuitive," say Zmuda and McTighe, adding that curriculum documents, textbooks, and teachers' guides aren't always helpful. "The job of teaching is not to 'execute' the paper curriculum irrespective of results," they continue, "any more than it is the coach's job to execute the playbook irrespective of the score. The teacher's job is to flesh out the lessons in the curriculum and adjust instruction whenever needed to ensure optimal learning and performance." To be able to do that well, teachers need to be able to access the best thinking of educators around the country who have encountered similar problems.

Zmuda and McTighe suggest that being able to contribute ideas to the online database adds purpose and motivation to professional learning communities within each school. Making this part of the work of PLCs also helps to mitigate the all-too-common assumption that good teachers should be able to figure out this stuff by themselves. As teams meet to plan units and look at diagnostic and formative assessment data and student work, they might ask themselves probing questions and develop solutions in two areas:

• *Curriculum-based problems* – What are the common and predictable misconceptions, skill deficits, and performance weaknesses in each area of the curriculum? What specific approaches, strategies, and resources have proven successful in addressing these "instructional red flags"? It's very helpful for teachers to have access to this information before they begin each curriculum unit – and as they examine student learning as the unit unfolds.

• *Student learning problems* – What attitudes and behavior problems seem to interfere with student learning – and what approaches, strategies, and resources have worked in the past? Here's a website developed by core subject teachers and specialists in gifted education, special education, English language acquisition, instructional technology, and staff development in the Grand Island Public Schools in Nebraska:
http://www.gips.org/public/staff/differentiation/differentiation-strategy-bank

"How to Be an Education Troubleshooter" by Allison Zmuda and Jay McTighe in *Educational Leadership*, Summer 2010 (Vol. 67, online only)
http://www.ascd.org/publications/educational-leadership/current-issue.aspx. The authors can be reached at Zmuda@competentclassroom.com and jmctigh@aol.com.

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4. Spatial Thinking – the Key to Success in STEM

In this *American Educator* article, Temple University professor Nora Newcombe says that people with well-developed spatial thinking skills tend to do well in STEM areas – science, technology, engineering, and mathematics. What is spatial thinking? It's the ability to notice and remember the location and shape of objects and mentally manipulate them and track their paths as they move. There are widely used tests to measure spatial proficiency, including questions on folding a two-dimensional shape into a three-dimensional one, recognizing a

shape when it's rotated, imagining mechanical motion, and seeing spatial patterns and progressions (see the article link below for sample questions).

"To really understand what spatial thinking is, we must be clear about what it is not," says Newcombe. First, it's not a substitute for verbal or mathematical thinking – people who are successful in STEM careers are good at all three kinds of thinking. Second, it's not a learning style. "The truth is that there is virtually no support for learning styles in the research literature," she says. "While students may have preferences, all of us (with very rare exceptions) learn by seeing, hearing, and doing. Likewise, all of us (with very rare exceptions) think verbally, mathematically, and spatially. So teachers should be trying to provide students with the content knowledge, experiences, and skills that support development of three ways of thinking."

The big question for schools is whether spatial skills are innate or can be improved. Newcombe says they can definitely be developed. Elementary school students' spatial skills improve more during the school year than over the summer, which is evidence that schools are doing something to improve it. And a series of studies have demonstrated specific ways in which spatial skills can be nurtured. Although boys, on average, have stronger spatial skills, it's not clear whether this is in their DNA or comes from their environment. But researchers say that girls' spatial skills, if they aren't already strong, can be developed to the threshold levels necessary to be successful in STEM careers.

So what does this mean for teachers and parents? Newcombe lists the following insights:

• Adults need to understand what spatial thinking is and the kinds of activities and materials that support its development. Since it's not a subject in school and students don't get grades in it, teachers need to be especially aware of what they can do to help develop it.

• Teachers at all levels need to avoid making students anxious about their performance in this arena. When students worry about performing well on a spatial task, additional space in working memory is gobbled up and they perform less well. Teachers need to be mindful of reducing the pressure and stereotyping that is sometimes common with spatial tasks. "Instead," says Newcombe, "teachers should emphasize that the tasks can be enjoyable and useful, and that they can be mastered with some effort and time."

• In the preschool years, teachers and parents need to encourage, support, and model engagement in age-appropriate spatial activities of a playful nature – for example, spatially challenging books like Zoom, using playful examples when teaching the names of the circle, square, and triangle, teaching spatial words like *out, in, outside, inside, middle, between, here, there, front, back, side, top, bottom, up, down, under, over, around, tall, high, short, low, line up, row, next to,* and *corner*, encouraging young children to gesture, asking children where things go in simple "experiments", doing jigsaw puzzles, using maps and models, and developing analogies to help children learn scientific ideas.

• In the elementary years, teachers should supplement these preschool activities with more focused instruction in spatial thinking, highlighting the spatial elements in math lessons, using mapping skills, using well-crafted analogies to make comparisons (for example,

comparing diagrams of animal and plant cells), having children make sketches to elaborate their understanding of states of matter and force and motion, and getting students involved in photography, origami, and video games like Tetris.

"Picture This: Increasing Math and Science Learning by Improving Spatial Thinking" by Nora Newcombe in *American Educator*, Summer 2010 (Vol. 34, #2, p. 29-33, 43)
http://www.aft.org/pdfs/americaneducator/summer2010/Newcombe.pdf

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5. Getting a Critical Mass of Highly Skilled Teachers in Turnaround Schools

In this *Education Week* article, Stephen Sawchuk reports on the efforts of some school districts and programs to get the best teachers into schools with the greatest needs. One cautionary note being heard is that even great teachers will fail if they are working solo in dysfunctional environments. "All this focus on individuals, on getting the best and brightest and placing them into schools, is a limited strategy," says Susan Moore Johnson of the Harvard Graduate School of Education. "It is driving so much of what's going on right now, that we risk neglecting the context of these people's work… You really need a mechanism for the whole school to improve with the influx of new teachers."

Kirabo Jackson of Cornell University has come to a similar conclusion in his work on matching teachers with schools: "Teachers aren't as effective in environments they don't want to be in," he says, "and they don't stay in environments they don't want to be in." Studies show that strong principals and the opportunity to work with like-minded colleagues are key factors in effectiveness and retention.

Teach Plus, a Boston-based nonprofit, is working to get a number of effective teachers into three turnaround schools in Boston. The idea, says director Celine Coggins, is for "turnaround teacher teams" to make up a quarter to a third of the staff of a school, along with a new principal, and for the new teachers to stay for at least three years. "Many teachers come into the profession on a social-justice mission," she says, "and part of what they're looking for are colleagues who have the same idea as they do about getting the job done."

About 150 teachers applied for the turnaround teams, including some already in the schools, and part of the final selection process asked candidates to work with other teachers to analyze information from a hypothetical school and come up with an action plan. Andrew Bott, one of the newly appointed turnaround principals, likes the focus on data-driven instruction. "Recruiting a cohort of people who have that skill and are excited about it will make a difference," he says. "School districts do a great job of collecting data. Where many of us fall down is in using it."

"New Tacks Target Balancing Teacher Talent" by Stephen Sawchuk in *Education Week*, June 16, 2010 (Vol. 29, #35, p. 1, 16, 17),
http://www.edweek.org/ew/articles/2010/06/10/35distribute.h29.html

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6. The Dark Side of the GED

In this *Education Week* item, Mary Ann Zehr reports on a new study, "The GED", that raises questions on the efficacy of the General Educational Development exam. According to the study (written by James Heckman, John Eric Humphries, and Nicholas Mader and published by the National Bureau of Economic Research), the GED made up 12 percent of all high-school credentials issued in 2008. The concerns:

- Passing the GED doesn't help much in finding better economic opportunities or completing post-secondary education.
- GED passing statistics distort the overall U.S. achievement picture, giving the impression that U.S. students are making more progress than they really are.
- Noncognitive deficits hold back many GED recipients from success: lack of persistence, low self-esteem, low self-efficacy, and a greater propensity to engage in risky behaviors.
- The GED's widespread availability and low cost may actually induce some students to drop out.

"Equivalency Exam" by Mary Ann Zehr in *Education Week*, June 16, 2010 (Vol. 29, #35, p. 5)
report available for purchase at http://hq.ssrn.com/login/pubSignInJoin.cfm?nber_id=w16064

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7. Using Digital Games in the Classroom

In this *Digital Directions* article, Katie Ash reports on ways that teachers can get the maximum classroom mileage from digital games. "Games, by their very nature, assess, measure, and evaluate," says Brock Dubbels of the University of Minnesota/Twin Cities. "When used in the correct way, they can actually increase subject-matter knowledge as well as help students build higher-order thinking skills." But this potential will remain untapped if teachers don't provide the right kind of guidance. Here are Ash's tips:

• *Dive in*. It's important to actually play the game to get a feel for how it works and how it might be integrated with subject matter. Commercial games often have a cheat sheet or walk-through guide.

• *Organize sharing time with colleagues*. Having a dedicated time and place to discuss the best uses of game-based instruction helps move the process forward.

• *Make explicit connections*. Students need teachers to connect the dots between games and subject matter.

• *Use students as a resource*. Students often know more about games than their teachers, and kids feel empowered and engaged when they're asked for help.

• *Don't be afraid to make mistakes*. "If teachers avoid new approaches," concludes Ash, "they will not embrace innovative teaching methods."

"Getting Into the Games: Educators Connect Games and Learning" by Katie Ash, *Digital Directions*, Spring/Summer 2010 (p. 14,15)
http://www.edweek.org/dd/articles/2010/06/16/03games.h03.html

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8. Writing Improves Reading

This *American Educator* item summarizes a report from the Carnegie Corporation of New York, *Writing to Read: Evidence for How Writing Can Improve Reading*. The bottom line: having students respond to what they read in writing (analyzing, interpreting, reflecting, or summarizing) improves their reading proficiency and comprehension. Why? Because writing gets students to reflect on the ideas presented in the text and put them into their own words. The authors of the study, Steve Graham and Michael Hebert, stress that writing should not replace reading instruction. Students need both.

"Writing to Improve Reading" in *American Educator*, Summer 2010 (Vol. 34, #2, p. 3) http://www.aft.org/pdfs/americaneducator/summer2010/Notebook.pdf; the full report is available at http://www.all4ed.org/files/WritingToRead.pdf.

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9. Short Items:

a. PD website – Schoolwide Network is a search-engine site featuring numerous video and document files for professional development (e.g., launching writers workshop or a student-run bookstore). Educators can create an account and contribute files. Material is quality-controlled and ranked in order of popularity: http://www.schoolwidenetwork.com

Spotted in "Top Picks" compiled by Tim Ebner in *Digital Directions*, Spring/Summer 2010 (p. 12)

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b. Online museums – The Museum of Online Museums website can in some cases rival an actual visit to a museum, and teachers can search for particular works of art or artifacts. Check it out at http://www.coudal.com/moom.

Spotted in "Top Picks" compiled by Tim Ebner in *Digital Directions*, Spring/Summer 2010 (p. 12)

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c. High-school study aids website – This oddly-titled website (Shmoop) has learning guides, summary reviews, quizzes, and vocabulary identifications to help students study literature, history, biology, and other subjects. The guides can be downloaded to iPhones, Kindles, and Nooks. The site also has a teacher resource center: http://www.shmoop.com.

Spotted in "Top Picks" compiled by Tim Ebner in *Digital Directions*, Spring/Summer 2010 (p. 12)

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d. Career search website – The CTI Career Search gives students quick and honest insights into all kinds of careers, with roughly 2,000 career stories based on interviews of

people working in more than 200 careers. The site also lists educational requirements, salaries, and more: http://www.citytowninfo.com/employment

"Notebook" in *American Educator*, Summer 2010 (Vol. 34, #2, p. 3)

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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).

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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- How to change access e-mail or password

Publications covered

Those read this week are underlined.

American Educator
American Journal of Education
American School Board Journal
ASCD, CEC SmartBriefs, Daily EdNews
Catalyst Chicago
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
New York Times
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
The Atlantic Monthly
The Chronicle of Higher Education
The Language Educator
The Learning Principal
The New Yorker
The Reading Teacher
Theory Into Practice
Tools for Schools