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Literacy

Literature


Louise Rosenblatt transformed the field of English Education, including reading practices at the elementary level, with her transactional theory of the reading process. A contemporary of John Dewey, Rosenblatt promoted authentic experiences, deep conversations about the core ideas found in good books, and the democratic purposes of schooling. First published in 1938, her foundational text, *Literature as Exploration*, continues to be reprinted, and to serve as the cornerstone of the English curriculum. Rosenblatt argued that meaning does not reside in the printed text or in the head of the reader. Rather, her theory focused attention on the transaction between reader and text. Echoing her work with Dewey, Rosenblatt goes on to argue that reading literature is not a vicarious experience, but a lived-through experience; and that each experience shapes the reader’s future engagements with text, and with the world. Equally important, Rosenblatt argues that experience is transformative, and that education in the English Language Arts should “lay the foundation for and foster the development of a democratic society” (49). Rosenblatt’s work was initially taken up by college and secondary English faculty. Increasingly, however, elementary and middle school teachers have embraced this theoretical perspective. The authors of this particular article go on to provide rich examples of Rosenblatt’s theory-in-action in elementary classrooms.


Building on Rosenblatt’s theory, Probst explains that literature invites readers to:

• Speak about their experiences of text,
• Engage in critical dialogue with others about their differing experiences of the text as well as the key social issues addressed by the author,
• Engage in intellectual inquiry—to examine and assess ideas,
• Tell our own stories, ensuring that multiple perspectives are represented in the texts available, and
• Participate in a society and the culture, by building ideas with others through critical dialogue.

The Canon


Pike argues the importance of reading “major” literary works as well as the importance of helping students find relevance in these texts. He summarizes the debate between the traditional classics of literature on the one side and the expanded definition of text, on the other side, to include other media and contemporary authors. Pike acknowledges that while these classics in literature may not be appealing to students initially, through thoughtful instruction, students can learn to see contemporary issues from new perspectives.

Mosle provides an overview of the debate about the texts students should read in school, particularly in light of the demands by David Coleman and the Common Core Standards for more attention to nonfiction. Mosle argues for more attention to high quality narrative nonfiction, including examples from journalism and radio programs such as “This American Life”. Reading well-crafted and compelling text will broaden students’ background knowledge on a variety of topics and at the same time “get the sound and feel of good writing in their heads”.

Talk


School is intended to be a place where learners come together to talk about literature, about writing, and about the big ideas that spark a passion for learning. Oral discourse is the primary tool for learning and includes both informal, rough-draft thinking about new ideas (exploratory talk) as well as prepared presentations of thoughtful arguments (presentational talk). Generative classroom talk is more than the ping-pong exchanges between teacher and one student after another. Rather, partner, small group and whole class discussion provide opportunities for students to explore and share new understandings, and to examine the similarities and differences across various perspectives. Establishing classrooms where talk supports learning requires time – large blocks of time to allow full exploration of ideas, as well as engaging curriculum – something worth talking about.


The authors explain how “listening in” on student conversations and observing students helps teachers assess student learning: both process and content. These assessments help teachers plan next steps that are specifically matched to the individual learners.

Batchelor, K. (2012). The ‘Us’ in Discuss: Grouping in Literature Circles. Voices from the Middle, 20, 2, pp. 27-34.

The author begins with an overview of the importance of shared discussions about literature in heterogeneous groups, highlighting the use of talk in these small groups to build community, nurture interpersonal skills, and support students in understanding complex text. Later she provides examples of classroom assessment practices that nurture effective discussion.

New Literacies


Harste argues that 21st century technologies are changing our definitions of what it means to be literate, and what “literacy” entails. Through several examples, he explains how the study of language-in-use can open up possibilities for exploring the socio-political aspects of language, and that such studies are essential.
For the most part, studying language in terms of what work it does and how it does it has been left out, as has providing daily opportunities to inquire into problems of personal and social relevance to learners. No wonder, then, that students learn more about literacy on the streets than they do at the chalkface. This has to change. (11)


One of several policy briefs and position statements developed by NCTE, this document provides a brief overview of the ways digital technologies are changing the possibilities for learning, particularly for reading and writing. In addition to a useful glossary, the policy brief outlines research-based recommendations for approaching reading and writing in this digital age. Central to the recommendations are the opportunities to connect students with others across time and space, to provide authentic audiences for student work in a variety of digital platforms and to create new possibilities for making and sharing ideas.


Expanding reading and writing across the disciplines presents new challenges for schools. First, disciplines and school subjects are not identical (Social Studies, for example, does not exist as a department or course at the college level.) Second, the reading/writing demands vary from one discipline or subject to the next, although they share some common features such as problem solving, empirical inquiry, research from sources, and performance. Writers must develop nuanced understandings of the differences, for example, in structure, tone and criteria for evidence when writing an essay in Science vs. English vs. History.

*Reading*


Allington, past president of the International Reading Association, is a leading voice in the discussions about reading instruction and supporting struggling readers. His work, grounded in large-scale research studies of exemplary teachers, has helped the profession identify and respond to several key findings:

• Readers need to read books and other materials that they choose for themselves – every day.
• Readers need to spend significant time engaged in *successful* reading – every day.
• Readers need to read things that they understand – every day. Reading and rereading texts that make sense helps *all* readers develop skill and confidence.
• Readers need to be writers – every day, with permission to write about things they care about so that they will be more likely to work at revising and editing the work.
• Readers need time every day to talk to others about their reading and their writing. Conversation improves comprehension.
• Readers need models of fluent reading, particularly through listening to a fluent adult reading aloud, every day. Allington argues that this is not just for beginning readers, but for all readers.

Allington concludes this particular article with a call to schools to implement these low-cost, high impact strategies for supporting readers. At the same time, he calls for a ban on the use of test-prep materials – arguing that time spent reading, writing, and talking about both will yield better results.

Allington researched interventions for struggling readers and came to the conclusion that there are “Four Research-Based Design Principles for Helping Struggling Readers”. 1) Struggling readers need to spend more time reading every day, and should have an additional reading lesson every day. 2) Struggling readers must spend at least 80% of their time in texts that they can read – throughout their school day. This requires access to lots of books at many levels. 3) Struggling readers need explicit and personalized reading instruction, in very small groups, from a trained reading professional – not a paraprofessional. 4) Instruction for struggling readers must be coordinated between teachers and specialists to ensure coherence in the instruction and to support access to appropriate reading material in the classroom.

**Guided Reading**


Guided reading – small groups of students reading in “just right” materials with the support of a knowledgeable teacher, is the cornerstone of most elementary reading programs and, increasingly, middle school programs. Even as students progress to the high school level, they benefit from time spent learning and practicing the effective reading strategies appropriate to the discipline. (Learning to read science journals requires different skills and strategies than reading novels or technical manuals or the newspaper.) Fountas and Pinnell are nearly synonymous with guided reading: they are the leaders of the well-respected *Reading Recovery* program and champions of leveled books for young readers.

In this article, the authors provide an overview of the structure of a guided reading lesson, and the rationale for the structure. Next, they review the concept of leveled books and why this practice has gained such popularity in classrooms. Finally, they argue that it’s not enough for teachers to “do” guided reading – to implement the basic steps of a guided reading lesson. Rather, they argue that teachers should begin by establishing a rich reading/writing classroom structure, and then begin to infuse focused strategy instruction into that environment. “The lesson structure is only the beginning of providing effective small-group instruction for students of all ages. Powerful teaching within the lesson requires much more” (281).


In this overview of research about what matters in the teaching of reading, Allington presents a strong argument for the need to have expert teachers working with all students. He goes on to challenge school and district leaders to craft “policies that ensure that more effective teachers are created each year in their schools.”


This research summary outlines the key characteristics of outstanding fourth grade teachers. The list is similar to that found in the *Reading Rockets* article cited above.

Senechal argues that a heavy focus on the teaching of strategies may interfere with the close reading of texts. Further, such instruction may be centered on using the strategy correctly, but at the expense of attention to significant meanings in the text. Senechal goes on to question the practice of student self-selected reading materials at the expense of “deliberately selected, high-quality books that will enrich their lives”.

**Close Reading**


The Common Core Standards have sparked heated debate for a variety of reasons, including the emphasis David Coleman and Sue Pimentel place on *close reading*. Boyles uses the definition of close reading offered by PARCC (the counterpart to SMARTER BALANCE) which focuses on the study of complex text through deliberate rereading in order to understand central ideas, supporting details and key aspects of text structure that contribute to text meaning. Boyles, an advocate for such close reading, calls for these practices to be used at all grades, not just in secondary schools. She explains how the shift from “comprehension packets” to “good reader strategies” has cultivated metacognitive readers, but has become stalled in text-to-self connections. She argues that reading instruction at all levels should focus on teaching students to ask thought-provoking questions and to observe and analyze text by looking for examples and details from the text to illustrate a point.


Gallagher cautions that we are “killing” student enthusiasm for reading by focusing on the development of test takers instead of readers, by limiting authentic reading experiences (focused on real-world reading materials such as magazines, newspapers and websites devoted to current issues), by over-teaching the books we use in school – or under-teaching challenging texts. Gallagher also calls for close reading of text, including rereading.


In this two-part video conference (with transcript posted), Fisher explains that the CCSS do not specifically call for close reading of text, but that close reading will be required to “learn the text well”. He advocates posing text-based questions to prompt student rereading and discussion of the text, calling upon students to provide evidence for their ideas, to engage in argumentation about key concepts.
Independent Reading


The authors begin with a review of the research supporting independent reading and then go on to outline a model for independent reading that captures even reluctant readers. The research review includes the following findings:

- Wide reading is associated with academic achievement in all areas.
- Wide reading leads to expanded vocabulary knowledge, and to higher performance on standardized tests.
- In-school free reading promotes reading comprehension and supports struggling readers.
- Independent reading, in the absence of active teacher involvement, is not sufficient to build reading skills of beginning readers.

In an effort to find more time in the crowded school day, teachers/schools have relegated independent reading to home reading. The authors contend that this is not sufficient because it is premised on the assumption that students have access to a wide range of appropriate books at home, that they have a purpose for reading (beyond filling page quotas) and that students are independent readers.

The key characteristics of effective independent reading programs are:

- Access to a variety of appealing books.
- Conducive environment for reading (comfortable, quiet space) with teacher encouragement to read.
- Consistent and predictable time for independent reading.
- Teacher as a model of reading.
- Professional development for teachers focused on guidelines for independent reading and ways teachers can facilitate this reading.
- Non-accountability – no expectation that students complete tasks or demonstrate comprehension or growth.
- Follow-up activities that promote excitement about reading. (Pilgreen, 2000).

In addition, the authors argue that the teacher must assume an active role in supporting independent reading by monitoring student focus and stamina through conferring with readers.


The goal of reading instruction is to promote independent reading – the lifelong reading habit of literate individuals. Independent reading provides opportunities for teachers to work with individual readers or even small groups, providing “just now” instruction aimed at promoting students’ reading growth. The article includes summaries of research studies related to independent reading. These studies found that, “One statistically-significant factor uncovered was that students in the more effective and moderately effective schools spent more time independently reading than did students in the least effective schools” (223).

Vocabulary


A leading, albeit controversial, voice in the field of reading/language education, Beck and her colleagues outline a set of principles to be used in determining which words to teach as vocabulary words. This article, based on
their earlier work (1985, 2002) acknowledges that students need and learn far more words than could be effectively taught in school. They divide words into three tiers to help prioritize instruction:

- Tier 1: high frequency words found in oral and written language, which rarely require instruction (and, sit, dog, clock).
- Tier 2: words that are used extensively in the English language, but not so often that students are likely to learn them without some instruction (nimble, feeble, vigor). These are words worth teaching because students are likely to encounter them as readers, and to use them as writers.
- Tier 3: words that occur less frequently and are subject-specific (ex: cellular response). These are words students do not encounter in the broad pool of everyday language, but are necessary in the discipline – and good candidates for instruction. Other Tier 3 words may not be good targets of instruction because they occur infrequently and are not tied to disciplinary knowledge (ex: besmirch, begone).


Marzano urges the use of vocabulary notebooks for instruction in Tier 2 words, and discipline-specific Tier 3 terms. Content area classrooms are the most appropriate places for studying discipline-specific Tier 3 words, making the study of vocabulary important across the curriculum.


The author argues that students need support in developing the discipline-specific vocabulary required to effectively describe what they observe. Content area teachers can develop content knowledge while also using effective vocabulary learning strategies.


Hirsch articulates a causal relationship between expanded vocabulary and increasing upward mobility. His claim is based on reviewing several studies of the relationship between vocabulary and academic achievement, and the connection between academic achievement, college success and future level of income. Hirsch supports learning new vocabulary in the context of reading and argues against spending “large amounts of school time on individual word study”. “A large vocabulary results not from memorizing word lists but from acquiring knowledge about the social and natural worlds.”

**Grammar**


The author challenges the common practice of using samples of student writing (with their permission) for teaching grammatical concepts – editing or “correcting” the sample. Instead, building on the work of Weaver (1996) and Noden (1999), the author calls on teachers to only use positive examples – to focus instruction on the close study of effective use of grammar in published texts. For example, teachers would study how authors effectively use sentence fragments rather than teach students to avoid sentence fragments. The focus of instruction shifts from teaching grammar as an editing skill to teaching grammar as a tool for the composing process. The author advocates for (and provides examples of) using read-aloud to highlight grammatical
concepts which students later explore in informal quick-writes. Teachers and students together would engage in an inquiry focused on, for example, verb tenses, using works by published authors, style manuals, and old textbooks as resources for understanding the different ways authors use verb tense to convey their ideas.


Doniger argues that the study of grammar has a central place in the teaching of literature, particularly as a tool for helping students understand complex texts.

**Weaver, C. McNally, C. & Moerman, S. (2001) To Grammar or Not to Grammar: That is Not the Question! Voices from the Middle, 8, 3, pp. 17-33.**

In addition to the arguments made above, these authors explain that much of what occurs in the more traditional methods of teaching grammar is actually the teaching of specific vocabulary for talking about language (identifying parts of speech). They review the research studies that affirm such teaching has little transfer to the quality of writing. The focus, they argue, must shift from a study of “correctness” to a study, in the context of reading and writing, of the ways authors use grammar to convey their ideas.

**Spelling**


This issue of *School Talk* is devoted to responding to questions teachers are asking about spelling, and then summarizing the best practices for teaching spelling. These research-based practices include:

- Sharing discoveries about how written language works.
- Teaching focus lessons on how words word.
- Learning to solve a spelling problem using spelling strategies.
- Building on the reading/writing connection.
- Focusing instruction on learning spelling to facilitate writing rather than on learning a set of words.


Turbill completed a number of research projects and case studies focused on understanding why students engaged in literature-rich classrooms with multiple opportunities to write may still be struggling with spelling. She argues, based on the results of her research, that spelling may best be taught as a proofreading skill, and in the context of reading and writing instruction. Specifically, proofreading requires a certain sensitivity to spelling patterns and the skill of proofreading can be explicitly taught. Further, raising awareness of spelling patterns during reading and writing instruction contributes to this “spelling conscience”.

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Writing Conference


This issue of *School Talk* summarizes what we know about best practices related to conferences with writers. The authors describe these conferences as based on conversation between teacher and student writer and remind us that the conference is focused on the writer and not on the actual writing piece.

The point of a writing conference is to help students become better writers. By “better writers” I mean writers who can use the strategies, techniques, and ways of thinking about writing that we teach them in today’s conferences on their own later when they work on future pieces (Anderson, pg. 3).

The authors provide a list of “tips” for successful conferences including: find something to praise, learn to listen to students’ writing goals, and adopt a reflective stance that helps the writer see the writing process. The authors caution teachers to remain focused on the primary purpose of the conference:

I’ve watched other teachers who can’t resist the urge to fix everything that may be wrong with their students’ drafts. If we take control over a student’s writing and make sure that the draft has our perfect lead or our brilliant dialogue, all we’ve done is given a demonstration of our expertise as writers. We shouldn’t confuse this with helping students develop their own expertise. (Anderson, pg. 3)

Ongoing professional development in the qualities of good writing across genres, components of the writing process, and strategies for conferring with writers is essential for an effective conference program.

“Although conferences appear to be informal conversations, they are in fact highly principled teaching interactions designed to move writers along learning pathways. Used strategically, conferences can be powerful interventions that address individual writing needs.” Carl Anderson


Patthey-Chavez and Ferris conducted a research study into conferences with writers focused on these two questions: a) Could changes in student writing be tied to conferencing, and b) Could the status of the student (weaker or stronger student, native or non-native speaker) or the type of writing course (general freshman composition or specialized genre-specific course) be tied to any systematic differences in the conferencing process or its outcome? “This study looked at four teachers and their writing conferences. They collected copies of first drafts, tapes of their conferences, and copies of subsequent drafts from one stronger and one weaker student, for a total of 8 students and 32 texts. All students revised their papers in ways indicating that the conference had had an effect on their revision process. The findings indicate that what is ostensibly the "same" treatment does not generate the same response from all students. They also indicate that the divergent backgrounds students bring to instructional events have a structuring effect that cannot be dismissed solely as teacher bias and self-fulfilling prophecy” (pg. 51).

Writing


This research-based summary, produced by the James R. Squire Office of Policy Research at the National Council of Teachers of English, includes discussion of common myths about the teaching of writing and concludes with research-based recommendations. These recommendations include:

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• Require all students to engage in extensive writing.
• Foster collaborative writing processes.
• Make new media writing a regular part of students’ composing experiences, and build the technology infrastructure necessary to do this.
• Provide formative assessment feedback to students as they are developing drafts.
• Incorporate writing in every subject area and provide professional development for all teachers.


Lacina and Block provide an overview of the best practices for supporting adolescent writers and then summarize their research into what schools across the country are doing to support writing.

The following best practices were being used in a majority of the schools surveyed:
• Teaching writing strategies.
• Using prewriting.
• Incorporating writing across the curriculum.
• Using a process-approach to writing.
• Using sentence-combining activities.

In discussing the implications of their study, the authors argue that key components of the elementary writer’s workshop should be expanded to the secondary level.


Rief summarizes our current understandings about writing and the teaching of writing:
• Writing is thinking.
• There is no one process that defines the way all writers write.
• We learn to write by reading extensively and writing for real audiences.
• Writers need constructive response.
• Evaluation of writing should highlight the strengths of process, content, and conventions, and give the writer the tools and techniques to strengthen the weaknesses.
• Writing is reading. (When writers write, they engage in critical thinking driven by the reading and rereading of their draft.)


Ray provides an overview of what an effective writing workshop looks like and highlights how teachers can support students. Effective teachers of writing help students build stamina for writing and learn to use talk to shape writing ideas. In addition, students write what they read. Effective writing teachers help students understand the variety of options available to writers so that even the youngest writers know different types of writing they can create.


Yancey briefly outlines concerns regarding standardized achievement testing and then presents two examples, one elementary and one at the transition to college, of alternatives to standardized tests for measuring student
learning or establishing student readiness for college. Both represent the use of portfolios, selected samples of student writing that reflect the required topics.

**California Writing Project Why Writing Matters.**
National Writing Project & Nagin, C. *Because Writing Matters: Improving Student Writing in Our Schools* San Francisco: Jossey-Bass, 2006

See below.

**Mathematics**


This article is the result of conversations between mathematics and mathematics educators around forging areas of common agreement over several, sometimes contentious, issues in K-12 mathematics education. Three fundamental assertions (e.g., proficiency with computational procedures) are detailed and explained, followed by seven areas of agreement. These areas of agreement center around the automatic recall of basic facts, calculator use, algorithms, fractions, “real-world” contexts, instructional methods and teacher knowledge. Readers of this article may be interested in the areas of common ground sometimes overlooked in “math wars” discussions.


This paper offers a framework for examining the role of subject matter knowledge in the teaching of mathematics. Starting with a brief review of the history of efforts to investigate the role of subject matter knowledge, the paper continues with an in-depth look at what “subject matter knowledge of mathematics” might mean. An approach to examining and analyzing teachers’ knowledge of mathematics is illustrated, using the topic of place value as an example. Three cases of teaching multiplication in fourth grade are presented in the final section of the paper. The analysis explores how each teacher’s knowledge of mathematics interacts with her idea about the teaching and learning of mathematics and her ideas about pupils and context.


The author discusses the importance if using international benchmarks to make educational change. The author discusses four ways this can occur: (1) showing what is possible in education; (2) putting national targets into a broader perspective; (3) assessing the pace of change; and (4) supporting the political economy of reform. “While the development of international benchmarks is fraught with difficulties and their comparability remains open to challenges, cultural differences among individuals, institutions, and systems should not suffice as a justification to reject their use, given that the success of individuals and nations increasingly depends on their global competitiveness.”

Briars addresses systemic mathematics reforms with particular attention to the following eight issues: 1) High stakes assessments must be tied to appropriate instructional targets; 2) Standards-based instruction is more than using manipulatives and cooperative learning; 3) Teachers need Standards-based instructional materials; 4) Teachers need substantial, continuing professional development and in-class support; 5) Administrators must recognize and support Standards-based instruction; 6) District policies and practices will have to change; 7) Materials and services are available to support mathematics reform; 8) Reform has a payoff for all students. In addition, Briars includes a short piece on educating parents about mathematics education reform, stressing that parents play an important role in reform efforts.


The authors take the three principles from How People Learn: (1) teachers must engage students’ preconceptions; (2) understanding requires factual knowledge and conceptual frameworks; and (3) a metacognitive approach enables student self-monitoring and places it in the context of mathematics.


Adding it Up explores how students in pre-K through 8th grade learn mathematics and recommends how teaching, curricula, and teacher education should change to improve mathematics learning during these critical years. The committee identifies five interdependent components of mathematical proficiency and describes how students develop this proficiency. The committee discusses what is known from research about teaching for mathematics proficiency, focusing on the interactions between teachers and students around educational materials and how teachers develop proficiency in teaching mathematics.


This paper examines assessments in the early elementary grades, where a strong foundation is basic mathematics concepts and procedures ahs to be developed, and on which more-advanced mathematics topics can build. It compares Hong Kong’s Grade 3 assessment administered in June with that for Grade 3 in Massachusetts administered in May. The comparison of the content and characteristics of the Massachusetts assessment with those of the Hong Kong assessment suggests areas of difference that may guide Massachusetts and other states to reexamine their mathematics assessments. When examining the test items on the assessments that were more cognitively demanding (most from Hong Kong) the following features showed to increase mathematical rigor:

- developing multistep solutions that require students to carry out a series of math procedures rather than a single calculation
- solving problems in non-routine situations require students to adapt what they have learned
- satisfying multiple problem conditions simultaneously
- correctly differentiating among multiple representations of the same concept
- finding the most efficient solution strategy among alternative strategies

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• translating different representations to a common representation before completing the solution
• having to manipulate problem elements to obtain the solution
• selecting the appropriate information from a set that includes extraneous information


The main content of the paper is to describe problem solving in Finnish school mathematics, since this is the picture of mathematics teaching that is conveyed to teacher students and universities. The description begins with considering Finnish mathematics curricula with the focus on the flow of problem solving. Furthermore, different manifestations of problem solving in mathematics textbooks are discussed as well as how Finnish teachers implement problem solving in mathematics lessons. Additionally the way teachers use problem solving in assessment is discussed briefly.


This article presents an analogy which explains much of the differences between schooling and teaching in the highest achieving countries in the world and in the United States. The new analysis of data from the Third International Math and Science Study (TIMSS) provides evidence that American students and teachers are greatly disadvantaged by the country’s lack of common, coherent curriculum and the texts, materials, and training that match it. In this article, the authors briefly review what TIMSS is and the TIMSS findings to date, which have been published in a series of previous reports. Then they turn to more recent findings in Grades 1 through 8 mathematics curricula, in which the high performing countries teach a very similar, very coherent, core math curriculum to all of their students – and the U.S., decidedly and clearly, does not. Lastly they look at the importance of this finding by examining the cascade of benefits that flow from attaining a coherent, common curriculum.


During the 1990s, the teaching of mathematics became the subject of heated controversies known as the math wars. The immediate origins of the conflicts can be traced to the reform’ stimulated by the National Council of Teachers of Mathematics’ Curriculum and Evaluation Standards for School Mathematics. Traditionalists fear that reform-oriented, “standards-based” curricula are superficial and undermine classical mathematical values; reformers claim that such curricula reflect a deeper, richer view of mathematics than the traditional curriculum. An historical perspective reveals that the underlying issues being contested – I mathematics for the elite or for the masses: Are there tensions between “excellence” and “equity”? Should mathematics be seen as a democratizing force or as a vehicle for maintaining the status quo? – Are more than the century old. This article describes the context and history, provides details on the current state, and offers suggestions regarding ways to find a productive middle ground.

This study compares key features of the Singapore and US mathematics systems. The article addresses the topics of curriculum framework, textbooks, assessments, and teachers. Singapore’s national framework is a carefully sequenced and has fewer topic than the U.S. There is an emphasis on computation skills along with more conceptual and strategic thinking. Singapore follows a spiral organization in which topics are presented at one grade level and again in a later grade, but only at a more advanced level. Their textbooks are problem-based and the illustrations feature a concrete to pictorial to abstract approach. Singapore assessment stress the importance of constructed response questions allowing students to demonstrate a higher-level cognitive ability. Teachers in Singapore are highly trained and continue once in the classroom with 100 hours of required annual professional training. The U.S. is strong in its emphasis on applied mathematics and developing 21st Century skills such as representation, reasoning, making connections and communication.


Describes mathematics, skills and understanding as being completely intertwined. No one can acquire conceptual understanding, problem solving skills, or basic skills individually; rather, they go hand in hand. This false dichotomy of skills and understanding impeded efforts to improve mathematics education. Gives several examples to show that deep understanding of mathematics ultimately lies within the skills.

Science

Scientific Inquiry


Atlas of Scientific Literacy: Project 2061, American Association for the Advancement of Science and NSTA. Washington, DC, 2001


Inquiry is the process scientists use to learn about the natural world. Science is a systematic process of inquiry about natural phenomena. The National Science Education Standards recommend that science should be taught in the same way it is done, using inquiry. Inquiry-oriented instruction engages students in the investigative nature of science, involves activity and skills, and focuses on the active search for knowledge or understanding to satisfy a curiosity. It is through this systematic process of inquiry that the content of scientific knowledge is obtained. When science is taught as a process of inquiry, students learn how to be scientists. Research reflects the importance of programs in science that provide opportunities for students to develop skills necessary to
problem solve. This requires assumptions, use of critical and logical thinking, and consideration of alternative explanations.

Inquiry-based science instruction is structured and has a student-generated outcome. Students are allowed to arrive at conclusions and outcomes based on observation; the teacher does not inform the students of expected outcomes. Regardless of the source of the question (teacher or student derived), inquiry-based learning requires that students play a major role in answering the question. This can occur through designing and executing controlled experiments, making measurements and observations, or building and testing models. Students will discover the relationship between the variables, and can better propose explanations based on evidence derived from their own work. Although students in the classroom rarely discover something new, current research indicates that students engaged in inquiry discover knowledge new to themselves.

There is a broad spectrum of research to support inquiry-based science education. The reports from the last decade share the conclusion that experiences in a science classroom should provide students with the opportunity to develop problem-solving skills that allow them to compete in an increasingly scientific and technological world. From a pedagogical perspective, inquiry-oriented teaching is often contrasted with more traditional expository methods and reflects the constructivist model of learning, often referred to as active learning, so strongly held among science educators today. The work of Piaget and others indicates that the learning environment should be rich in physical experiences; direct involvement is one key to intellectual development. The National Center for Improving Science Education reported in 1989 that, “students are more likely to learn science if they explore natural phenomena directly, pose their own questions, design their own experiments, and discuss the results with others.”

Studies with large numbers of students in a variety of classrooms over a period of many years show that with the use of inquiry-based science programs, teachers can expect substantial improvement in science process and creativity. In addition, it has been shown that there is an increase in performance on tests of logic, science content, and attitudes toward science. Other research supports the belief that direct, manipulative experiences in science as part of a strong inquiry-oriented program will enhance the development of process skills and critical thinking.

Inquiry-based instruction has been widely embraced by the science education community. The development of an inquiry-based science program is the central tenet of the National Science Education Standards. This coincides with the familiar work of Project 2061’s Benchmarks for Science Literacy, which discusses scientific inquiry throughout. Inquiry into authentic questions generated from student experiences is the central strategy for teaching science.

Concepts, Processes, and Habits of Mind


While process (procedural knowledge) and concepts (declarative knowledge) are both worthwhile goals in science education, an even more important outcome may be the habits of mind that students develop as they learn and do science. These are the values, attitudes, and skills that relate directly to a person’s outlook on knowledge, learning, and ways of thinking and acting. Instructional strategies that have been effective in
prompting student interest and involvement are ones that connect science, technology, and societal issues. The students learn science in contexts that are relevant and, therefore, learn with greater depth and understanding.

Much debate has been generated in recent years over the relative emphasis on process skills vs. conceptual knowledge in science education. Science educators would agree that delivering science content to the students through lecture, reading, or worksheets alone rarely changes students’ misconceptions. Research indicates that having students practice process skills in isolation from a conceptual framework produces neither content knowledge nor process skills that are useful to the students outside the context of the specific activity. Instruction that involves students in using scientific processes to change their own naive theories in ways that are personally relevant and consistent with scientific explanations has been shown to be effective in both the improvement of the process skills and the achievement of deeper understanding of science concepts. To make these changes, students must do challenging, cognitive work that includes the use of science processes such as predicting, hypothesizing, and observing. The goal is not to make them better observers or predictors, but to serve them in the development of better explanations of natural phenomena.

**Science in the United States and the World**


International comparisons are important as they help educators recognize alternative ways of teaching science and rethink their ideas about effective science instruction. A number of studies have been published recently that provide data indicating that the United States is losing ground with respect to the international community in the fields of math, science and technology. Although U.S. students perform close to the international average in life sciences, they lag behind other countries’ students in chemistry, physics, and earth science. Despite US students performing near average in the life sciences, the American public lacks acceptance of biological evolution, one of the fundamental “big ideas” in the life sciences. A study conducted by Miller indicated that when comparing 32 European countries, Japan and the US adult population, the US was second only to Turkey in rejecting the statement that “Human Beings, as we know them, developed from earlier species of animals.” The percentage of US adults who accept the evidence for biological evolution is only 40% and has been declining since 1985 when survey data of this nature began to be collected.

On the PISA assessment, the US scored almost exactly at the average of all participating countries with less than 10% of U.S. students scoring in one of the top two of six performance levels. One of the most widely
quoted international comparison reports is the Trends in International Mathematics and Science Study (TIMSS), the first international study to provide a detailed picture of science teaching practices. (http://nces.ed.gov/timss)
The TIMSS study examined science teaching practices in four countries that outperformed the United States: Japan, Australia, the Czech Republic, and the Netherlands. Two major differences between these four countries and the United States emerged from the data. First, each of the higher-achieving countries had its own distinct core pattern of science teaching, whereas U.S. lessons were characterized by variety. Second, all of the higher-achieving countries focused lessons on core content. In U.S. lessons, content played a lesser role, sometimes no role at all, and lessons were usually built around engaging students in a wide variety of activities that were sometimes unrelated and unconnected.

This study recommends improving science teaching in the United States in three areas:
1. Develop a clear, coherent science content storyline,
2. Link all activities to science content ideas, and
3. Strengthen teachers’ content knowledge.

It has been 15 years since science standards were revised. Since that time, many advances have occurred in the fields of science and science education, as well as in the innovation-driven economy. Next Generation Science Standards (NGSS) are being developed in a two-step process. The first step was the development of the Framework for K–12 Science Education by the National Academies of Science that identified the broad ideas and practices in natural sciences and engineering that all students should be familiar with by the time they graduate from high school. The second step is the development of standards based on the Framework, which will engage science educators and experts from around the country who will serve as writers and will produce drafts of the standards. Achieve is managing this process on behalf of the 26 lead states. States are working together to develop and implement NGSS standards which offers opportunities for states to share best practices, leverage economies of scale in the education marketplace, and will ensure all students—in any state and any district that adopts them—gain the knowledge and skills they need for success in college and careers. Every NGSS standard has three prongs: content, scientific and engineering practices and cross-cutting concepts. The integration of rigorous content and application reflects how science is practiced in the real world. Implementing improved K–12 science standards will better prepare high school graduates for the rigors of college and careers. In turn, employers will be able to hire workers with strong science-based skills—including specific content areas but also skills such as critical thinking and inquiry-based problem solving.

**Science Sequence in the Secondary School**


The traditional high school sequence of biology, chemistry, and physics is an outdated approach, based on the nature of science teaching developed in the 1920's. At that time, biology emphasized classification and taxonomy, chemistry consisted of simplistic models of atomic structure and chemical bonding, and physics demanded a rigorous regimen of higher-level mathematics. As these sciences and approaches to teaching have evolved, many scientists and educators are encouraging a new sequence where physics is taught first, then chemistry, and finally biology. The rationale is that physics can be understood in a conceptual framework, offering experiments that are consistent and accurate. These experiments provide students excellent practice in developing science process skills. Chemistry becomes more understandable when students have a solid foundation in the physical laws governing the interactions of matter and energy that are central to the study of chemistry. Modern biology has become much more complex, based on molecular structure and chemical change. An understanding of basic chemistry is essential to understanding biology as it exists now in the twenty-first century. The physics-chemistry-biology sequence enables students to see the logical progression of scientific thought, from forces and motion, to molecular structures, and ultimately to the development of simple and complex life forms. The illogic of teaching high school science in the traditional biology-chemistry-physics sequence is clearly illustrated by an analysis of the concept prerequisites in standard science textbooks. Uri Haber-Schaim, one of the principal authors of the Physical Science Study committee physics course, investigated such prerequisites and the results are interesting. He considered a topic a prerequisite for a course if, for that course, the topic is used extensively without being developed in the textbook. In standard biology textbooks of the type typically used by freshmen and sophomores in high school, he found an average of 23 chemistry prerequisites. In popular high school chemistry textbooks, he found an average of 31 physics prerequisites and no biology prerequisites. In his examination of typical high school physics textbooks, however, he found no biology prerequisites and an average of only 2 chemistry prerequisites. It stands to reason that students cannot be expected to comprehend the subject matter of their high school courses in biology and chemistry when the concepts that underlie those subjects are not developed until after they have completed the course.

The high school curriculum has been based on the more rational Physics-Chemistry-Biology order for about eleven years. Teaching physics as the first course in the sequence was initiated in the 1991-92 school year. The complete turnaround that resulted in all students taking chemistry in the sophomore year and biology in the junior year was achieved beginning with the freshman class that entered Clayton High School in 1996. Since that time Clayton High School has been the site of many visits by individuals and teams interested in adopting the sequence we use. The Missouri Department of Education has begun promoting “Physics First” through their A Time For Physics First initiative. The American Association of Physics Teachers recently published (December, 2006) a document entitled, “Physics First: Building a stronger foundation in the knowledge and understanding of science.” This document promotes the notion of teaching physics as the first course in the high school sequence as an effective way to meet the goals of a state of the art science program. This sequence is gaining popularity nationwide, with an ever-increasing number of schools and school districts adopting the sequence. The topic is receiving enormous attention on electronic science education discussion forums, at national science education conventions, and in major science education journals. Nationwide, science educators are realizing the benefits of an enlightened mode of delivering science education that has been the norm in the Clayton School District since the early 1990’s.

In 2001, the United States Department of Education employed a panel of experts to examine a wide variety of science curriculum programs in use across the country. This panel named only two such programs as exemplary, its highest level of recognition. One of the two exemplary programs cited by the Department of Education is called Modeling Instruction in High School Physics. Reviewers were impressed with explicit goals of the program that reflect the current research on learning theory. They state “the goals of the program strongly mirror the vision promoted in the national science standards. Reviewers emphasized that the program is impressive in its awareness of and attention to the national content, teaching, and assessment standards. The program is exceptional in its modeling and emphasis on the skills, attitudes, and values of scientific inquiry. It
addresses important individual and societal needs by providing constructivist pedagogy for the fundamental mechanics that are crucial to the physical world.”

Modeling Instruction in High School Physics is the basis of each of the freshman physics courses taught at the high school as well as the higher-level courses taken by juniors and seniors. All of the teachers that teach physics at the high school have received intensive training in the Modeling methods. Two of the CHS physics teachers lead national, state and local workshops on the Modeling program.

**Engineering – Project Lead the Way (PLTW)**


*Project Lead The Way: Promoting Engineering in Schools* describes the basic premise of the Project Lead The Way (PLTW) program and how it is impacting schools and students. The author describes how companies are in need of engineers and scientists and are partnering with PLTW to help encourage and/or influence students to pursue STEM (science, technology, engineering and math) careers. Middle and high school students are becoming more interested in the Engineering and Science fields due to the hands-on, project-based learning that takes place within PLTW classrooms. They also found that while not all students are interested in a STEM career, they were still able to take valuable problem solving skills learned in these classes with them to college.

Tai, R. (2013) *An Examination of the Research Literature on Project Lead the Way*. PLTW.org  

An Examination of the Research Literature on Project Lead the Way examines 30 separate studies relating to Project Lead the Way. The studies are focused on three areas: student achievement, teacher training and principal and parent views of the program. Studies relating to students have shown improvement in math and science achievement for students who take PLTW courses. While not a lot of data has been collected concerning principals and parents, the principals and parents who were surveyed stated that PLTW has been a positive addition to their schools, creating excitement and motivating students. In regards to teacher training, teachers who have been trained have consistently rated the training as “valuable” to “very valuable.” In addition, 94 percent of PLTW teachers state they would recommend the program to others. Parents who have been surveyed have been positive about their child’s involvement with PLTW.

**Social Studies**

American Historical Association, annual conference, January 2013  
[www.youtube.com/watch?v=CUvtyYxABsg](http://www.youtube.com/watch?v=CUvtyYxABsg)

The link above is a speech provided by Bill Cronon, the president of the American Historical Association, as part of the association’s annual conference. As the Frederick Jackson Turner professor of history at the University of Wisconsin (PhD from Yale and Oxford), Dr. Cronon addressed the most distinguished group of historians in our country with a message about the need for us to be storytellers as we engage students in history. He mentioned the need for educators to “put themselves” into the narrative as an approach to teaching
and learning. While historians often default to the 3rd person in the act of writing or teaching history, the president’s address at the AHA called for a return to the stories that originally attracted us to the field of history.


This article provides an excellent summary of a wide variety of research that connects storytelling with improvements in oral language, reading comprehension and writing. Because of the interrelated nature in the processes of reading and writing in all subjects, storytelling is an effective pedagogical strategy that can be woven into instruction to increase student competencies in all areas. Students engagement and motivation increase due to various storytelling activities. Defined by the National Council of Teachers of English as “relating a tale to one or more listeners through voice and gesture”, storytelling capitalizes on students’ desires to talk and relate with one another. (1) Miller has synthesized several research studies to show improvement in student writing in the areas of the use of language and the knowledge of the intended audience. For reading, it is suggested that storytelling can be used as a means to increase literacy and promote comprehension skills.

http://www.ncte.org/about/over/positions/category/curr/107637

“This storytelling in Education? YES!” A Statement Concerning the Importance of Storytelling in Education, presented by The Youth, Educators, and Storytellers Alliance (YES!) August 1, 2006

This concise one page document summarizes the various reasons why the art of storytelling is central to student learning. From the National Storytelling Network, qualitative and quantitative research studies show that storytelling can improve academic performance. This position paper highlights the various communication skills that can be practiced via storytelling in the classroom. The ancient art of oral communication can help focus listening, organize information and enhance auditory processing. In addition to the added benefit of student engagement, this article suggests that storytelling can be a useful tool to build cultural literacy, enhance memory and develop critical thinking skills.

**Research: K-12 alignment**


As a former high school teacher and now editor of the Concord Review, Fitzhugh emphasizes the expectations at the college level for research and writing. He believes that long-term, sustained academic research is a unique and lasting means of acquiring significant content knowledge; likewise, he argues that the writing process (use of evidence, framing argument, developing thesis) provides irreplaceable critical thinking skills. Embedded within this article and the entire mantra at the Concord Review is the idea that student writing should be more academic. Fitzhugh believes that academic writing will rise or fall to the level of our expectations. If universities still require research and writing, why do so many high schools fail to prepare their students. According to a 2002 study commissioned by the Concord Review, 95% of U.S. secondary teachers consider it important for students to write research papers in history, however, the same study reported that 81% of them don’t assign such papers. Fitzhugh concludes that standardized tests and “superficial writing skills” have left educators with little time to teach research and writing and even less time to correct and grade them. While much of this article focuses on the end product, a college prep research paper, Fitzhugh comments significantly on how public schools can improve reading and writing in the elementary and middle school levels.  

Referencing E.D. Hirsch and psychologist Daniel Willingham, this article asserts that many of our elementary
classrooms have wasted time applying reading strategies to trivial fiction, rather than using reading and writing as a means to acquire foundational knowledge in our core subjects. Fitzhugh suggests an increase in nonfiction texts at early ages as a means to acquire background knowledge and skills that are necessary to produce students who can handle serious academic research at the secondary level.

http://education.fcps.org/researchprocess/

This is the website for a detailed research process articulated by the Frederick County Public School system in Maryland. The website could provide study model for a holistic approach to many aspects of research. By identifying common problems such as the misuse of Wikipedia and the appropriate role for online databases, this school district has significantly considered the role of technology in their guidelines for K-12 research. There is a chart that clearly identifies necessary skills per each grade level, a scope and sequence that organizes skills by objectives and outlines for teacher expectations throughout the process. Rubrics have been developed to help teachers access the research process, not the final product, so that they can be applied across the content areas. Mary Jo Richmond, Coordinator of Media Services for Frederick County Public Schools, is credited with the maintenance of the website, but it is obvious that a large number of educators contributed to the clear, logical organization of a process that is often challenging and confusing.


Schools often wait until students are in high school before they require them to do research reports, but all elementary students can benefit from learning small inquiry projects and reports. These assignments can motivate, engage students in sustained learning and provide skills that are necessary in later educational settings. According to this article, even 1st grade students can conduct appropriate research assignments and write reports in a fashion that allows them to share what they have learned. Such projects give young learners a head start in the digital age over so many other schools that wait for much more formal or traditional approaches to research at the secondary level.

Malone, Tera, The term paper is disappearing: Some schools see write of passage as quaint or unworkable amid growing class sizes. Chicago Tribune, Jan 27, 2012.

As the title implies, this recent article mentions the decreased attention given to traditional research papers because of the amount of time that it takes to teach and grade the assignment. Once considered a rite of passage with its footnotes, bibliography and extensive reading and research, the term paper has faded from the American classroom due to increased class sizes. Tim Gilfoyle, the chair of the history dept. at the University of Loyola Chicago, estimated that “fewer that 10 percent of his students wrote a research paper in high school using primary sources”. However, Gilfoyle notes that the paper is still the basic requirement at most universities. In his own classes, he assigns a 12-page assignment as the final exam for his freshmen courses. Several Chicago-area schools reported that they have reduced the length and level of analytical expectations. In the digital age, when the evaluation of multiple sources of information is more essential than ever, schools are lowering their requirements for students. The article noticed that schools in the Chicago suburbs like New Trier and Barrington that continue this laborious process assign these papers in English classes as literary analysis.

Geography

Carano, Kenneth and Berson, Michael, Breaking Stereotypes: Constructing Geographic
Professors from the University of South Florida provide numerous examples of technology projects that could be used in various grade levels to help students connect around the world. Beyond the politically correct and culturally naïve quality of many textbooks, these ideas (such as blogs between students about real world issues) can be cross-curricular and provide geographic insights. This article clearly highlights the geographic and cultural illiteracy of American students as compared with other industrialized countries. At a time when globalization is making the world more interconnected, it is important to consider the various ways that our students perceive young people from different backgrounds. The authors provide examples of stereotypes from classrooms that they have visited and seek to correct geographic and cultural misconceptions with practical suggestions. Through technology and instruction based in a deep knowledge of global issues, teachers can promote geographic literacy as a means of making our students more culturally aware of the world in which they live. In addition to practical suggestions, the article includes digital resources that can help educate teachers in this endeavor.


As the executive director of the Educational Foundation for the National Geographic Society, Dr. Edelson provides a brief overview of the three levels of geographic understanding (interactions, interconnections, implications) that are necessary to prepare students for critical thinking in the 21st century. He asserts that our society makes far-reaching decisions everyday and it is our job in education to help to get our students to realize the impact that our small, daily, individual decisions may make on the rest of the world. In addition, he outlines six categories of critical decisions that geo-literacy prepares people to make: community life, locations and transportation, interactions across cultures, environmental and societal impacts, global affairs and acts of caring. The challenge of geo-education, according to Dr. Edelson, is weaving the knowledge and skills required to make these decisions into a written curriculum. If we are to prepare for the future that our students will inherit, this is an area that we need to address. This is one essay from a set of National Geographic articles entitled “Essays on Geo-Literacy” that all address modern issues of geography and technology in the 21st century.


The Geography Education National Implementation Project (GENIP) - a consortium of the Association of American Geographers (AAG), the American Geographical Society (AGS), the National Council for Geographic Education (NCGE), the National Geographic Society (NGS) - wrote this update of the original 1994 publication. Divided into six themes with eighteen standards, this document provides a conceptual overview of what students should know about geography (K-12). Objectives are included for 4th, 8th and 12th grade as guides for a written curriculum and the levels of expectations. In addition to the use of maps and analysis of spatial organizations, standards include cultural perceptions of space, characteristics of biomes and ecosystems and economic interdependence. Taken as a whole, this document can provide an important guideline for the evaluation of a curriculum and consideration for ways to incorporate geographic concepts into other areas of social studies.
In addition to the easily quotable and much documented surveys or studies about “What our students don’t know about geography”, Dr. Hough suggests some reasons for the decreased emphasis on geography. As the editor of the journal for graduate work at Harvard in education, she cites the recent trends such as NCLB, increased testing in math and literacy and a lack of international relevancy in our classrooms. It is easy to lament that only 37 percent of 18 year olds could find Iraq on a map, however, it is much more difficult to do something about it. Dr. Hough believes the problem lies with state laws that have “almost forced curriculums to focus on math, reading and science, leaving little room for anything else”. This article also hints at some aspects of cultural geography. It is noted that 70% of students thought that English was the most widely spoken language around the world and only 10% of the students surveyed communicated regularly with someone from outside of the United States. Rather than just focus on the location of Iraq, the article cites Education Professor Fernando Reimers who asks the relevant question: “What do you need to know to be an effective and competent global citizen?” It is noted that our country is becoming ethnically more diverse, but our education may not be adjusting. The confluence of geography and globalization have provided an opportunity for educators to make informed decisions that our consistent with our democratic purpose.

Common Core

Smithsonian, National Museum of American History Engaging Students with Primary Sources

This extensive publication from our country’s national museum provides both an introduction to the use of primary sources in the classroom and also numerous practical suggestions and examples. Beginning with a simple “What?” and “Why?” approach, it is suggested that teachers who implement some of the materials from the manual will help to develop problem solving skills in our students. Smithsonian suggests that student engagement increases with documents because they are real, tangible and appeal to student curiosity. Various sources of primary materials are evaluated for strengths and weaknesses so that teachers can select certain types of documents to achieve specific learner outcomes. For example, the limitations of a newspaper account may include the contemporary bias of that historical time period and the strengths of historical advertisements lie in their visual appeal. This “how to” manual provides instructions for ways to locate primary source documents and also includes sample lessons.

College, Career and Civic Life (C3), Guidelines for enhancing rigor in civics, economics, geography and history in K-12 schools

Still in draft form, these standards for social studies have not yet been released to the public. As an accompaniment to the CCSS, historians and educators have collaborated to articulate national standards that focus on skills for social studies. This is not a written curriculum, but rather a framework or approach to developing critical thinking, reading and analysis skills within the four major strands of social studies classes. Hopefully, these will be released in the coming months so that all teachers will have an opportunity to use these documents as a resources in the design of lesson plans. Based on a personal acquaintance and the completion of a non-disclosure agreement, the coordinator for Social Studies has been able to gain access to this information to inform important decisions, however, the specific standards can’t be detailed at this time.
www.theatlantic.com/magazine/archive/2012/10/the-schoolmaster/309091/

This article focuses on one of the main authors of the Common Core State Standards, David Coleman. A Rhodes Scholar and McKinsey consultant, Coleman has had more to do with what our students will study in the future than perhaps anyone else in education. While the article focuses on the common core, it provides an insight into the thinking behind the National Governor’s Association and Chief Council of State School Officers. Coleman’s drive and the underline rationale for his movement may lie in his fear of a watered-down curriculum. While his critics voice concern over reading lists that are not culturally diverse and expectations that seem overly optimistic for many struggling school districts, Coleman is zealous about the power of liberal arts education and the mission to get all American students to college. The concern for Coleman and others behind the higher standards movement is not just what the students are reading, but how they are being taught to read. The common core will not influence a large degree of major curriculum changes, but rather, it may significantly impact instructional practices and assessment. For example, this article sites teaching materials from Texas and Vermont in which 60 to 80 percent of the student responses could be considered accurate without specific references to the text. In another example, students were asked to agree or disagree with the actions of Dr. King’s protest movement without actually reading any of King’s speeches or having detailed knowledge of the events in historic context. The common core is calling for less reflection and personal connection and more of a traditional approach to the significance of content material in our reading and writing.


Finland offers an example of how a nation built a comprehensive “teaching and learning system” that has raised achievement and closed achievement gaps. Once poorly ranked by international standards, Finland has become the poster child for school improvement since emerging from the shadow of the Soviet Union and rising to the top of PISA and other testing comparisons. As opposed to our national standards movement, Darling-Hammond suggests that Finland has improved their educational system with more local autonomy and less external assessments. As an endowed chair in the School of Education at Stanford, she makes logical and obvious comparisons to the United States. Included in these direct references are the amount of time and money spent in the U.S. on centralized controls that includes standardized testing. She frequently uses the phrase “teaching and learning system” to suggest the direct connection between teacher training, thoughtful curriculum design and appropriate materials for assessment. Leaders in Finland contribute their own success to the intensive investments in teacher education – three years of high quality graduate level preparation at the expense of the country.