



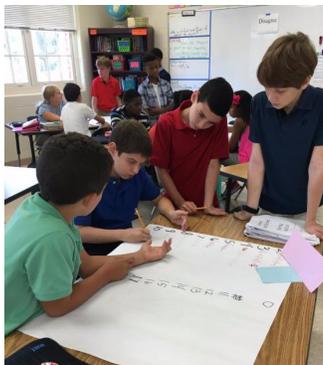
THE CENTER *for* TRANSFORMATIVE
TEACHING & LEARNING
AT ST. ANDREW'S EPISCOPAL SCHOOL

The Bridge

v.1.4

Welcome back to *The Bridge*, the monthly newsletter of the Center for Transformative Teaching and Learning. Each month *The Bridge* analyzes a specific aspect of teaching and learning through a Mind, Brain and Education Science research-informed lens.

It ain't what you know it's...
oh, no, sorry, it is what you know
The Foundation of Learning is Knowledge



Written by Ian Kelleher,
edited by Julia Dean and Molly Magner

I sense that the tide is beginning to turn on the debate over whether to prioritize knowledge or skills, '21st Century' or otherwise. There is an increasingly confident voice shouting a phrase that educators have shouted for thousands of years: knowledge is essential. Even in this Google-able world, students need a sturdy foundation of knowledge to become critical thinkers.

With this edition of "The Bridge," we as evidence-informed professionals boldly provide an epistemic nudge: an argument for the importance of knowledge that includes research-informed ideas for teachers on how to build knowledge and make it stick.

I recently heard Robert Pondisco, senior fellow at the Thomas B. Fordham Institute, speak at ResearchED DC on the importance of a re-commitment to teaching knowledge. During his talk, Pondisco eloquently painted the picture of President Obama during his first Inaugural Address, gazing down the length of the Mall to the Lincoln Memorial where Martin Luther King Jr. declared his dream to the nation just over fifty years ago. In this clip, Obama describes the sacrifices and struggles of past Americans that led to Obama's inauguration: a monumental moment in American history.

After showing this clip, Pondisco posed the following questions: what knowledge do children need to have to understand the significance of Obama's words at this moment in time? Do they have this knowledge? How would they have received this knowledge? Who might have it and who might not? How does this fit into the existing inequality gap? Pondisco's thought experiment provokes us to think of knowledge as a critical base for the analytical thinking skills that we strive to teach our students. That being said, what can we do to help our students have a solid basis of knowledge?

1) Acknowledge the limits of active working memory

Active working memory can hold fewer things for less time than most people realize. Though it is hard to measure, 7 things for 30 seconds for adults is a well-agreed-upon estimate. For children the numbers are lower. There is a trade off too; we can hold more things but for progressively less time. Having knowledge stored in long-term memory frees up the active working memory to more effectively help with higher order thinking tasks. In other words, having stored knowledge helps us think.

2) Teach for stickiness

Whether we are teaching with a focus on direct instruction or with a focus on projects, we need to get content knowledge to stick in long-term memory. Fortunately, there is robust research to guide us that suggests both things we should and should not do.

Things to encourage students NOT to do

(1) Reread notes

A trip down the aisles in Staples confirms what we already know - students love highlighters and markers. But research suggests that the staple of studying, rereading notes or the textbook, is a terrible, ineffective way to study. It tends to lead to what Brown, Reedier and McDaniel call "the illusion of fluency," in which students become so familiar with the text that they believe they know it before they actually do.



(2) Misuse flashcards

Similarly, students tend to misuse flashcards, turning them over too quickly to see the answer. The key advantage of using flashcards is the process of deep pondering to try and figure the problem out, even if that proves to be a difficult task.

Things to encourage students to do

(1) Retrieval practice

Retrieval practice is the idea of trying to recall knowledge from memory. Even if a

student is unable to recollect information, research suggests that the act of trying helps memory storage and recall. Retrieval practice can take many forms: self-testing, proper use of flashcards or online tools such as Quizlet, or taking a sheet of paper and writing out everything you know on a subject. The key is having students try deeply to recall, then check their work against their notes or model answers.

(2) Spaced studying

There is great research around the spacing effect, which entails studying, leaving a gap of time, then studying again. As educators, we can encourage students to space their studying rather than rely on massed studying, which does not lead to durable learning. Allowing your memory to become a bit rusty between study sessions makes the next study session more challenging, but in doing so, it helps create knowledge that is both more durable and more flexible. This is a concept that Clark and Bjork call "desirable difficulty." But what is the optimal spacing gap for your students, your subject, and the content you are teaching? Embark on your own learning adventure to discover the ways in which spacing can work best for your classes.

Things for us to do as educators

(1) Formative assessments

Replace pop quizzes with no- or low-stakes formative assessments. As you give them, say something along the lines of, "This is for you to figure out where you are, for me to figure out where you are, and for us both to adjust what we do accordingly." More of the brain restructuring associated with learning occurs when we struggle and when we get things wrong; therefore, we need to craft no- or low stress opportunities for students to make mistakes from which they can learn.

(2) Interleaving

Interleaving is a way to deliberately build the spacing effect into how you design your courses. Instead of starting the year with unit one, followed, perhaps, by unit two then unit three, there is an alternative way to organize your courses that will promote learning. After moving on to a new unit, plan on revisiting the core knowledge at least a few more times at spaced intervals later on in the year.

(3) Pre-testing

"Research suggests that starting a unit of study with a pre-test helps create more enduring learning. It appears to give students something on which to hang subsequent information. This test should, of course, not be graded, or if it is, it should be graded for effort rather than correctness. The other point of this pre-test is to give the teacher an idea of where the level of the class generally is, and what knowledge each individual student brings with them already, so that the teacher can tailor subsequent classes to best match the needs of the class. It is important to avoid seeding boredom, and to avoid the potential skipping of foundational knowledge that could prevent future learning. These are two common toxic effects on learning."

(4) Acknowledge Deficiencies in Project based learning (PBL)

PBL appears to have "silver bullet" status as a transformative teaching technique, but the actual evidence on its effectiveness is shaky. An excellent review of the literature can be found in the Education Endowment Foundation's recently released report on the results of a large randomized control trial on PBL. Two key areas where support is crucial are knowledge building and executive functioning building:

"Balancing didactic instruction with independent inquiry will ensure that pupils develop a certain level of knowledge and skills allowing them to comfortably engage in independent work."

"Student support: pupils need to be effectively guided and supported; emphasis should be given on effective time management and student self-management"

Without this support, PBL may actually contribute to the achievement gap as students from disadvantaged backgrounds often enter with deficiencies in knowledge and skills that are necessary to succeed on projects.

This echoes the work of Paul Kirscher (twitter: @P_A_Kirschner -one of the great voices in research on education that you perhaps have not heard of)., Although unguided or minimally guided instructional approaches are very popular and intuitively appealing, the point is made that these approaches ignore both the structures that constitute human cognitive architecture and evidence from empirical studies over the past half-century that consistently indicate that minimally guided instruction is less effective and less efficient than instructional approaches that place a strong emphasis on guidance of the student learning process. The advantage of guidance begins to recede only when learners have sufficiently high prior knowledge to provide "internal" guidance.

We may still decide to use project based learning to teach a range of different skills or to increase engagement - though this may only work if we expertly craft the project by incorporating factors such as student choice, relevancy to their lives, or empathy. However, research suggests that when we choose to do project based learning rather than direct instruction, an amount of direct instruction teaching that focuses on knowledge building is still important for students to gain sufficient knowledge so that they can grapple meaningfully with the project. In other words, even when we do projects, we need to begin them by explicitly teaching key knowledge in ways in which it will stick. Part of pedagogical content knowledge, that highly interlinked combination of subject knowledge and how to teach it, is to know exactly what knowledge-scaffolding students need to successfully launch into a project. If we want to create great projects, we also need to be great at teaching knowledge - and great at discerning what knowledge that needs to be.

A thought on how this links to assessment

Since I was a little kid, I have always enjoyed words. Some are more fun to play with than others, of course, but one of the best is 'facile.' We often use it to refer to someone who appears to be so good at something they do it with an effortless ease. But it's more nuanced meaning is to refer to a demonstration of thinking that at first glance seems neat, concise and elegant, but which on closer inspection is only neat, concise and elegant because it is over simplistic, itself lacking in nuanced details.

The writing of this article has inspired a future one that needs to be written: how do we avoid facile demonstrations of knowledge by our students? How do we craft assessments that steer students away from this? Or, as Rob Coe and David Didau put it in their musings on a very simple theory of learning, where will students think hard in this lesson? But in the time before this article is written, I encourage you to explore this idea yourself. If you have ideas as to what should go in such an article, please let us know.

Interested in participating in our professional development adventure this summer? [Click here for information regarding the Science of Teaching and School Leadership Academy](#), a five-day workshop co-designed by the CCTL and individual faculty from Harvard's Graduate School of Education and the Johns Hopkins University Science of Learning Institute.

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