An Evidence-Based Approach to Unit-Level Teaching and Learning

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Abstract

Every day, someone in the operational Army conducts a professional development workshop, delivers a mandatory training class, or gives a lecture on some new aspect of doctrine. Unfortunately, these classes do not always equate to soldiers learning because many of their instructors lack the knowledge of what it means to have their students learn. The Army can do better, and this article offers a set of evidence-based principles in theoretical and practical form that will make an immediate difference to the quality of its operational instructional design.

Teaching is part of military life, and all who serve are teachers. From the formal lessons covering individual skills, collective tasks, and professional development to the informal day-to-day coaching and mentoring, the Army acts to help its teams grow. In fact, the Army defines itself as a learning organization (Senge, 1990; U.S. Department of the Army [DA], 2017).

Despite this claim, the military treats teaching and learning as the domain of a select few. Those who teach in the Army's school system enjoy instructor training and faculty development programs that qualify them for their jobs, but most teachers, the ones who work with soldiers in the operational domain, know little of the science of teaching and learning and must fend for themselves. In the main, their instincts are good, but most often they mimic what they have seen, no matter its efficacy.

In many ways the military educational system does better than its civilian counterparts. Many college and university professors enter the field with little to no training in the scholarship of teaching and learning (Fertig, 2012). They, like the teachers in the operational domain, face the unspoken expectation that anyone with content knowledge can teach.

However, the notion that anyone with content knowledge can teach should be disabused. Key lessons learned after several decades of command assignments and teaching positions both in the Army and at civilian institutions have led to this argument. Army leaders outside the school system should be offered a set of con-

cepts and concrete examples of what kind of teaching method works and why it works so they can improve learning in their units.

The Key to Everything

My civilian employer developed a First Year Seminar Program for all incoming freshmen in 2015. The design team spent hundreds of hours developing the curriculum with the right pedagogical approach and a faculty development plan to help with the rollout. Unfortunately, this extensive work delivered by a pool of talented and highly qualified instructors was not enough. The first year of the program ended with poor results on internal end-of-course surveys asking students about the learning outcomes.

What we discovered after several after action reviews was that some of our best instructors *were* the problem. The key to successful learning is realizing that effective teachers must do more than present engaging lessons. Teachers must also know whether their students are learning what they are expected to learn. It seems like a self-evident concept, but many of the Army's professional teachers confused content delivery (instruction) with learning. They are not the same.

This unsuccessful method forced us to look more closely at what it means "to learn" and how to orient our teachers to a learning-centric model of instruction. Looking at the definition of learning may seem pedantic, but our team discovered that even seasoned classroom veterans use the term rather casually, and they often see it differently. For instance, they would talk about student learning as various *outputs*—lessons delivered, papers written, and tests passed—rather than how much material their students actually remembered and used. Students are adept at keeping things in working memory long enough to finish most standard assessments, but exceptional papers and aced tests are not always indicative that a student has learned for the long term (Soderstrom & Bjork, 2015; Willingham, 2009).

The Army's concept of learning is "the acquisition of new knowledge or skill by experience, instruction, or study, or a combination of all three" (DA, 2017, p. 9). It is a process that "involves internalizing and synthesizing information and knowledge and manifesting behaviors as competencies" (DA, 2017, p. 9). This is a good definition, but there is more to it. For instance, in his book *Make it Stick*, Brown (2014) said that learning is "acquiring knowledge and skills and having them readily avail-

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able from memory so you can make sense of future problems and opportunities" (p. 2). Also, Chris Hakala, director of the Center for Excellence in Teaching, Learning, and Scholarship at Springfield College in Massachusetts, emphasized that we must be able to apply our knowledge *in changing contexts* before we can say that we have learned the material (Hakala, personal communication, June 13, 2019).

Hakala's words about changing contexts are important. Daniel Willingham (2009) tells us people fixate on how we frame our problems. These are called surface structures. The steps to solving problems are called deep structures. If students learn how to calculate the amount of varnish needed for a tabletop restoration, they might not see that they also know how to calculate the amount of grass needed to reseed a lawn (p. 97).

What my civilian colleagues and I concluded in our after action reviews was that despite having highly rated teachers conduct engaging and active seminars, students were not always learning beyond surface structures. Given years of excellent teacher evaluations, it was a troubling realization, and it demanded action. The search for answers pointed us to the psychological sciences and a set of principles that, when properly applied, generated almost immediate results on our various qualitative and quantitative assessment instruments.

Reading this research also exposed some common educational beliefs as myths, most notably the myth of retained information resulting from tailoring classroom instruction to accommodate different learning styles (Pashler et al., 2019). For some, this exposure is hard to accept as the concept of tailoring instruction to accommodate different learning styles is widely held to be considered a successful learning approach, but there is no scientific evidence to support this belief. In other words, if an instructor designs a lesson that offers a combination of visuals, lecture or discussion, and hands-on work and thinks it means his or her students will learn the material better, then he or she is mistaken. There is no question students *prefer* different instructional styles based on what they perceive has worked best (Willingham, 2019). Using a balanced instructional approach is an effective way to *present* material, but *learning* demands more.

Evidence-Based, High-Impact Practices

Goal orientation and mindset are important aspects of learning, but learning starts with approaches that we found to have the most direct and immediate impact on a program of instruction, course, seminar, or workshop. These include

- connecting a student's prior knowledge to the new material,
- getting students to practice,
- having students retrieve knowledge, and
- providing feedback.

As I considered the question of how to explain these concepts within an article, it occurred to me that I had the answer in the same way the Army trains its soldiers

on individual tasks. The military does an exceptional job of teaching technical skills. An instructor sees right away if a trainee can disassemble, assemble, and function check an M4 rifle. After a time, a trainee can repeat the task in changing and varied contexts like when he or she is tired, distracted, or abused by inclement weather. It becomes a habit of mind, and in our success, we can see the same roots of what contributes most to successful learning.

Connecting

We enhance learning when we can connect what we are doing to something we already know (Brown, 2014). Not ironically, I am connecting these principles to what soldiers learn in basic training. Connections help a person move information from working memory to long-term memory. Furthermore, the information will be easier to retrieve later if he or she can connect what he or she is learning to multiple points of existing knowledge (multiple analogies).

The better rifle instructors will find ways to connect students' actions to things they know. Sports analogies are popular in the military because many recruits played a sport as children or young adults. Assembling and disassembling a rifle, for example, is a lot like playing football, the instructor might say. If the parts (the players) are not put together in the right sequence, the play falls apart.

Keep in mind that students often arrive with prior knowledge of a topic that is misguided or simply wrong. Instructors may find themselves having to correct students before they teach anything new, a prospect made trickier because students are not always aware that what they know is wrong (Lucariello et al., 2016).

Practice

After providing the basics, instructors ask trainees to practice because that is how learning happens (Lucariello et al., 2016). Soldiers follow the steps hundreds of times if necessary. Instructors prompt trainees to recall their knowledge by asking them to tell instructors what they are doing and why. The trainees must be able to repeat for the instructors, on demand, the function checks or the immediate actions to take upon the event of a rifle malfunction.

Instructors do not limit trainees' experience to a clean, classroom environment. Instructors insist the trainees experience assembly and disassembly of their weapons in changing conditions like after firing on the range or during a tactical field problem. Instructors do this to ensure that the trainees can apply their process knowledge in multiple contexts. Instructors vary conditions so when trainees are confronted with new challenges, they can apply their knowledge effectively.

Retrieval

Retrieval is as simple as it sounds. It is recalling information to strengthen memory and make learners less likely to forget it (Agarwal et al., 2013). Most commonly, this is done through testing. A test that is used to assess students and hold them accountable for remembering the information makes them more interested in acing the test than it does in learning the material. Many students will admit to keeping information in working memory only long enough to pass the test. They will admit that days later, never mind a year later, they do not remember much of what was taught. A low-stakes test is much better for learning assessment. Using low-stakes tests to help students see their areas of weakness is a learning strategy. If students come to understand what they do not know, then they can review the material appropriately.

Feedback

Feedback is more than grading, scoring, or assigning a "go" or "no-go." It is the act of coaching. When instructors watch someone perform a task and they correct a mistake, then they are providing feedback. Feedback is most effective when it is immediate, clear, and explanatory (Lucariello et al., 2016). This does not mean instructors need to jump in and correct every mistake. If the learning outcome involves letting trainees struggle with a problem in order to let them work out the solution themselves, then offering feedback too soon can be a mistake.

There is a difference between desirable difficulty and frustration (Bjork & Bjork, 2015). A trainee with even a little experience (having been taught the basics and having practiced a bit) can often solve problems on their own. Instructors might need to frequently interrupt beginners because letting them struggle does not help the learning. The question of what is appropriate depends on an instructor's goal and a student's ability.

Mindset

Not to be overlooked in learning is how students see the source of their success. Many believe that their accomplishments come from having natural talent while others see effort as the primary driver, and according to Dweck (2016), this distinction is a difference maker. In *Mindset: The New Psychology of Success*, Dweck (2016) calls the emphasis on talent a "fixed mindset" and the reliance on effort a "growth mindset."

According to Dweck, students who see talent as the primary driver work hard to protect that reputation. It often manifests in their behavior. Students with fixed mindsets are less inclined to ask questions because they have convinced themselves that smart people should always know the answer and questions might

expose their ignorance. Fixed mindset students might also shy away from difficult tasks because they fear that trying and failing would cause people to doubt their innate talent. There are also clues in students' language. An instructor might hear someone with a fixed mindset say, "I'll never be able to do that!" or "She's a technical person … I'm not." As we often express the same sentiments about our own abilities ("I am not a math person."), we do not always recognize these warning signs when they are present.

Some scholars think the concept of mindset is a bit of a stretch (Sisk et al., 2017). They see it as overplayed and caution educators not to see it as a panacea. In my experience, however, Dweck's findings are valid and to the student who "made it this far" on "how smart they are," the fear is quite real. What is worse, we teachers are, despite good intentions, guilty of contributing to the problem. Whenever we see good work and praise students' talent or tell them how smart they are, we are contributing to the mythology.

Learning is too complex to think that any one variable (like mindset) will "solve" our problem, but Dweck is right when she says that talent without effort is a recipe for stagnation and eventual failure. To make learning more effective, teachers need to encourage Dweck's growth mindset. We need to convince students that their abilities today are not *who* they are and that with hard work, their abilities can improve.

It is not hard to make this happen. Some teachers share personal stories to make a point. When discussing new and difficult material, they discuss their own failures and how through effort and hard work they eventually prevailed. We all have plenty of examples, from math class to disassembling our weapons for the first time, where effort mattered more than being "a math person" or "mechanically inclined."

We can also change our language. When students do well, I am now careful to ask about how much time they spent studying or practicing, or how many times they made mistakes along the way. I praise their effort, which is often hidden from their peers who only see the final result. Think back to our basic rifle marksmanship effort; there is no such thing as natural, only range time.

Performance Goals

Mindset also matters when soldiers are defining their goals. Students focus on one of two types of goal: mastery or performance. To achieve mastery is to develop competence, whereas to perform is to demonstrate ability (Lucariello et al., 2016). At first blush, these may seem quite similar, but to master something is to actually learn it. A student with a performance goal is more apt to focus on a test score or a grade, the metrics that provide public recognition. Deresiewicz (2014) calls attention to the "game of school," namely seeking high marks without really learning the

material. To seek mastery means accepting failure as a path to learning and taking on more difficult challenges for the sake of learning.

Anyone who has been around soldiers or students for even an hour recognizes that there are those who are playing the "game" and those who are looking for mastery. The former will avoid giving answers or offering ideas because they are afraid of giving the wrong answer and appearing foolish. In my experience, soldiers playing the "game" are much more numerous than soldiers looking for mastery.

As people are ultra-social creatures and desire more than anything to fit in with a group, they are prone to look askance on those who stand out (Haidt, 2006). The consequences of this ultra-sociality is that students often delight in environments that cater to the fixed mindset, environments that do not ask them to retrieve knowledge, practice in front of their peers, or welcome feedback.

Adjusting a Typical Lesson Plan

This is an article on learning, not instruction. Granted, providing content is fundamental to teaching and learning, though how an instructor delivers material is less important than one might think. There are many content delivery methods, from lectures to problem-based learning. It is beneficial to use any of them. What matters more is how instructors get students to retrieve information and use what they are taught.

For the sake of this article, let us assume that a "lesson plan" is a prototypical set of slides from a PowerPoint presentation. Put them aside for now. Instead, start by thinking about the learning outcomes. Instructors may have these already, or they may have to develop some themselves. Outcomes need not be fancy or full of educational jargon. They simply need to define clearly what that student will say when she gets home and says, "Today was good—I learned how to … ." In doing this, instructors shift the focus away from what *they* can deliver to thinking about what *their students* are going to walk away having learned.

A helpful tool for this effort is Bloom's Taxonomy (Armstrong, n.d.). Bloom's Taxonomy is a set of three hierarchical models used to categorize learning objectives into levels of complexity and specificity. It provides a framework that positions different words in progressively harder categories, or levels, of learning. At the lower end are the words "knowledge," "comprehension," and "application" (in that order), and at the higher end are "analysis," "synthesis," and "evaluation" (Anderson, n.d.). Each level contains a set of useful words that indicate what a student should be capable of doing at the particular level. Gaining knowledge, for example, calls for defining, duplicating, or stating, while evaluation demands designing, constructing, or investigating. As with any framework, Bloom's model is not a substitute for judgment, though at the lower end of the scale, students might find

that defining a specific term is as difficult a challenge as designing or constructing something tangible (Didau, 2011).

Clear learning outcomes allow instructors to adjust their instructional plan and to align content with stated outcomes. When using a slide deck, for example, it could mean winnowing the number of slides down significantly. There is no formula for how many to keep or what to keep, but less is often more. Instructors will need to use their judgment on what slides to keep, and it is not easy. Consider the typical Army learning outcome—familiarization. It does not necessarily mean "cover everything at half an inch deep." It can mean covering two key concepts at a yard deep. If this is what instructors decide, that they want their students to learn, then they may keep the slides that focus on these two key concepts and abandon the others.

Next, consider how students, by the time instructors are done, retrieve from memory and apply key concepts to solve problems in various and changing contexts. That is, consider how they will learn. Just like rifle instruction, successful recall will require making connections to what students already know, having them practice, testing them to help them retrieve what they know, and providing feedback.

The good news is that a simple conversation, when done well, facilitates all of these components. It allows students to work out their ideas on the material in real time, and it often forces them to engage with differing opinions as others offer different views and interpretations. Just be careful: a discussion is not questions and answers *with the instructor*. It needs to be an honest engagement *among students*. The trick is to get it going. If, for example, a slide in our fictional deck noted the reintroduction of C2 into the lexicon, I would remove the generic bullets and substitute questions, such as "Did the Army bring back command and control (C2) in their latest doctrine, or did they just acknowledge that we never stopped using it?" (If this is too esoteric, any rank- or experience-appropriate question will do.)

Instructors should be clear about their intent, namely that they are seeking conversation. (Here is a tip: When an instructor asks a question designed to facilitate discussion, he or she should sit down. Doing so signals to the group that he or she is no longer the center of attention, and when he or she stands back up, it is an instant signal that once again, he or she is.) Try to avoid using questions that lead to a "gotcha" game of twenty questions, for example, "What did the Army add back into the doctrine?" Specifically, avoid questions that seek direct and narrow answers. The idea is to open lines of inquiry and invite conversation, not to encourage students to parrot back to the instructor what they think he or she wants to hear.

A caution is in order at this point. First, be careful to keep the discussion focused on the learning outcomes. People remember (they commit to long-term memory from working memory) what they think about (Willingham, 2009). If a class discussion digresses too far afield, it may be lively and interesting, but students may walk away thinking about (learning) something other than what the instructor intended.

When an instructor thinks that students have discussed the topic enough, he or she can bring the focus back to the doctrine and what the Army is now saying about command and control. It does not require a new slide. Talk about it. The brain can only handle so much at once, and if an instructor presents a student with a slide to read and then reads its content to the student (or has someone else read to the student), the student may not be able to process both reading the slide and having it read. It is called cognitive overload, and it will cause students' eyes to glaze over. Along the same lines, it is good practice to use few words, or even better, to use a simple picture on the slides. I prefer the picture because of something called "dual-coding," the idea that adding nonverbal prompts enhances cognition (Smith, 2016).

Keep in mind that by reducing slides and adding pictures, instructors will need to know the material well. They need not be an expert on the subject, but the slides will no longer serve as a crutch. Be ready to jump in with feedback that corrects erroneous statements or wild assertions.

Another technique that works to get conversations started is to ask students to share or write down what they already know about a particular subject. Perhaps there is a slide on operational art, which is a term that has been around for a while. Ask students to describe their experience with it or with design methodology. There is usually quite a mixed reaction among senior noncommissioned officers and officers.

If students stay silent, do not despair, but remember why they are reticent. They are likely trying not to look foolish in front of their leaders, peers, or subordinates. They are revealing something of their mindset and goal choice, and this mindset inhibits learning. Have them write down their ideas first, as writing these ideas out gives them time to think. Students need not read these statements to their instructors or to each other; the mere act of writing matters most. It primes the pump, so to speak, and is a good practice (a good conversation starter) to have them pair up and share with each other first.

Lastly, and throughout instructor delivery, run checks on learning. A good retrieval practice is to ask students to write down the most significant things they learned in the previous hour, or if an instructor is starting a second hour (or day), the most significant item learned in the last hour (or day).

Considerations for Future Discussion

This is an article for those who are not instructors in the Army's school system, though its lessons may benefit existing faculty as well. This is for the leaders who work outside of the institutional domain and do not have the advantage of a formal faculty development program or instructor certification. The unspoken expectation that anyone with content knowledge can teach effectively is harming the ability to

develop tomorrow's leaders because, despite extensive educational efforts, it is likely those leaders are learning less than imagined.

What should be considered for future discussion is an Army-wide Center for Teaching and Learning that provides not only resources for instructors on important evidence-based practices but that also sends experts to the field to help non-instructors who teach professional development workshops, mandatory training, unit-run lessons in decision-making, etc., become better at their craft. *U.S. Army Learning Concept for Training and Education, 2020–2040* alludes to this, but it does not offer any concrete steps (DA, 2017).

As an interim measure, I offer this story of personal trial with its key lessons in the hopes that it offers Army leaders a set of concepts and concrete examples of what works in student learning and why it works so students can improve *learning* in their units. The simple techniques outlined in this article work. Start small and do not give up. Instructors too will get feedback as they go. They should keep a record (a form of retrieval) of what they did in class and what they might do the next time. They should work to improve their own knowledge and use this knowledge to solve future problems in multiple contexts. In a word: learn.

References

Agarwal, P. K., Roediger, H. L., McDaniel, M. A., & McDermott, K. B. (2018). *How to use retrieval practice to improve learning.* Retrieval Practice. https://www.retrievalpractice.org/library

Armstrong, P. (n.d.). *Bloom's taxonomy*. Vanderbilt Center for Teaching. Retrieved 10 February 2020 from https://cft.vanderbilt.edu/guides-sub-pages/blooms-taxonomy/

Bjork, E. L., & Bjork, R. (2015). Making things hard on yourself, but in a good way: Creating desirable difficulties to enhance learning. In M. A. Gernsbacher & J. R. Pomerantz (Eds.), *Psychology and the real world* (pp. 55–63). Worth Publishers.

Brown, P. C., Roediger, H. L., & McDaniel, M. A. (2014). *Make it stick: The science of successful learning.* Harvard University Press.

Deresiewicz, W. (2014). *Excellent sheep: The miseducation of the American elite and the way to a meaningful life*. Free Press.

Didau, D. (2011). *Challenging Bloom's taxonomy.* The Learning Spy. https://learningspy.co.uk/myths/challenging-blooms-taxonomy-2/

Dweck, C. S. (2016). *Mindset: The new psychology of success.* Random House.

Fertig, J. (2012). *How do professors learn to teach (or do they)?* The James G. Martin Center for Academic Renewal. https://www.jamesgmartin.center/2012/03/how-do-professors-learn-to-teach-or-do-they/

Haidt, J. (2006). *The happiness hypothesis: Finding modern truth in ancient wisdom*. Basic Books.

Lucariello, J. M., Nastasi, B. K., Anderman, E. M., Dwyer, C., Ormiston, H., & Skiba, R. (2016). Science supports education: The behavioral research base for psychology's top 20 principles for enhanc-

ing teaching and learning. *Mind, Brain, and Education*, *10*(1), 55–67. https://doi.org/10.1111/mbe.12099

Pashler, H., McDaniel, M., Rohrer, D., & Bjork, R. (2008). Learning styles: Concepts and evidence. *Psychological Science in the Public Interest*, *9*(3), 105–119. https://doi.org/10.1111/j.1539-6053.2009.01038.x

Senge, P. M. (1990). *The fifth discipline: The art and practice of the learning organization*. Doubleday/Currency.

Sisk, V. F., Burgoyne, A. P., Sun, J., Butler, J. L., & Macnamara, B. N. (2018). To what extent and under which circumstances are growth mind-sets important to academic achievement? Two meta-analyses. *Psychological Science*, 29(4), 549–571. https://doi.org/10.1177/0956797617739704

Smith, M. (2016). *Dual coding: Can there be too much of a good thing?* The Learning Scientists. https://www.learningscientists.org/blog/2016/11/17-1

Soderstrom, N. C., & Bjork, R. A. (2015). Learning versus performance: An integrative review. *Perspectives on Psychological Science*, *10*(2), 176–199. https://doi.org/10.1177/1745691615569000

U.S. Department of the Army. (2017). *The U.S. Army learning concept for training and education, 2020-2040* (Training and Doctrine Command Pamphlet 525-8-2). U.S. Government Publishing Office. https://adminpubs.tradoc.army.mil/pamphlets/TP525-8-2.pdf

Willingham, D. T. (2009). *Why don't students like school? A cognitive scientist answers questions about how the mind works and what it means for your classroom* (1st ed.). Jossey-Bass.

Willingham, D. T. (2019). *Learning styles FAQ*. Daniel Willingham—Science & Education. http://www.danielwillingham.com/learning-styles-faq.html