Small Teaching

Written by: James M. Lang

Overview by: Matthew McHargue

Table of Contents

Part I: Knowledge 4
Chapter 1: Retrieving 4
Summary 4
Highlights 4
Principles 5
Quick Tips 5
Chapter 2: Predicting 5
Summary 5
Highlights 5
Principles 6
Quick Tips 6
Chapter 3: Interleaving 6
Summary 6
Highlights 7
Principles 7
Quick Tips 7
Part II: Understanding 8
Chapter 4: Connecting 8
Summary 8
Highlights 8
Principles 9
Quick Tips 9
Chapter 5: Practicing 9
Summary 9
Highlights 10
Principles 11
Quick Tips 11
Chapter 6: Self-Explaining 11
Summary 11
Highlights 11
Principles 12

Quick Tips 12
Part III: Inspiring 13
Chapter 7: Motivating 13
Summary 13
Highlights 13
Principles 14
Quick Tips 14
Chapter 8: Growing 15
Summary 15
Highlights 15
Principles 15
Quick Tips 16
Chapter 9: Expanding 16
Summary 16
Principles 16
Quick Tips 17
Resources 17
Informative 17
Books 17
Web Resources 17
Twitter Handles 18

Part I: Knowledge

To build and develop the critical thinking and problem solving skills most desired in higher education, students must have a strong base of facts and foundational knowledge on which to build. Often times they come to us with poor foundations and lack the essential study skills and meta-cognitive skills to learn material in such a way that it can be transferred into unique and varying circumstances. It is our responsibility then, to help students develop and utilize these skills so they can cultivate and efficiently utilize the framework necessary to build complex knowledge structures.

Chapter 1: Retrieving

Summary

Retrieving information from our long-term memory strengthens neural connections and helps schema construction. The more often retrieval is prompted, and the more variation involved in the prompts for retrieval, the more connections are formed among schemas. As learners begin to create more complex schemas and connect them with one another it becomes easier for them to retrieve information. More interconnected schema structures mean that a prompt will be more likely to activate a piece of one schema which has a connected pathway to the information needed to properly respond to the prompt.

Highlights

- The ability to effectively retrieve information requires practice. If I want students to be able to recall a fact or a process, I must provide them with opportunities to retrieve that information given various prompts.
- Reading and re-reading notes/flashcards has been empirically proven to be an ineffective study habit.
- Retrieval activities are not difficult to implement.
- Develop a mechanism to quantitatively measure the effectiveness of your strategies.
- Prepare to be initially disappointed about the amount of information students are able to recall.
- Strategies that include writing are better than those that require only verbal participation because all students are forced to participate and can do so without fear of embarrassment.
- Educate your students about the science behind retrieval practice and provide them with a rationale for your retrieval practice activities (especially those that are not going to be calculated into their grade).

Principles

- Frequency Matters
  - The more students practice retrieval the better they will get at it. Do it a lot. Not everything has to be graded.
- Alignment
  - Cognitive processing and problem type should be consistent throughout low and high-stakes assessments
- Require Thinking
  - Be intentional with your questioning techniques and require students to do more than simply recall isolated facts and figures.

Quick Tips

- Frequent low-stakes quizzes
- Open class with an overview from a student(s). Allow appropriate wait time if asking the class as a whole to respond.
- Minute paper to close class (e.g. Have students jot done the most important part of the lesson and one thing about which they are still confused).
- Administer a short low-stakes assessment to close class (e.g. Exit Ticket). The information gained from this can often help determine how to approach the next class session.
- Use your syllabus to quickly redirect student's attention to previously covered material.

Chapter 2: Predicting

Summary

The theory supporting prediction activities is closely related to the theory supporting retrieval practice. Both strategies place significant emphasis on the cognitive processes at work when we attempt to retrieve information stored in our long-term memory. Making predictions activates various schema networks to seek out any relevant prior knowledge. Further, prediction activities capitalize on the inherent curiosity of the human condition. Be piquing a student's curiosity we increase the potential for genuine engagement as the student seeks for either validation of a prediction or new information on a topic about which they know very little.

Highlights

- Predictions, even when incorrect, serve to increase retention and comprehension
- The power of prediction is especially helpful to novice learners.
- Prediction begins the process of building new knowledge networks. Even if the question is unfamiliar and the solution completely unknown, making a prediction prompts the brain to seek out any relevant prior knowledge. Then, when the question is later re-visited, there are neural pathways in place that are connected to germane information.

- Pre-tests give students clues about what to expect moving forward and thus can help to improve study strategy selection.
- Prediction activities help to pinpoint knowledge gaps.
- Prediction – Exposure – Feedback
- Use clickers and/or polling software for prediction activities.
- Require students to reason with rather than regurgitate prior knowledge.

Principles

- Stay Conceptual
  - Prediction activities are effective in part because they force students to activate any prior knowledge currently stored in long-term memory. If question prompts are too specific, this decreases the possibility that learners (especially novice learners) will be able to activate any existing knowledge structures.
- Fast Feedback
  - Student's predictions will be incorrect very frequently. While this is not inherently detrimental to learning, the quicker you can provide corrective feedback the better.
- Induce Reflection
  - Prediction activities provide an excellent platform for implementing and explicitly discussing meta-cognitive skills. Question students about why they made the predictions they did, what actually occurred, and if their prediction was right or wrong.

Quick Tips

- Pre-tests can be administered at the beginning of a semester, unit, or lesson. Question types and overall format should be similar to the summative assessment for the same material.
- Prior to initial content exposure, ask students to jot down what they already know or speculate about what they think they might be learning. (KWL Charts)
- Pause during instruction to allow students to predict the outcome of the content being presented (story, case study, problem, example, etc).
- When teaching a new cognitive skill (e.g. a new style of writing) allow students to attempt it and receive feedback before they feel ready.
- Close class by prompting students to make predictions about the material to be covered next.

Chapter 3: Interleaving

Summary

Interleaving involves spacing out learning sessions and mixing up the topics and/or skills being practiced during these sessions. The counter-intuitive nature of moving on to a new topic before achieving proficiency in one is likely to frustrate students and instructors alike. However, the research on interleaving is quite convincing. When done correctly, interleaving

creates deeper connections between topics and enhances one's ability to transfer knowledge from the context in which it was learned to new and unique contexts.

Highlights

- Spaced sessions allow our brain time to organize, encode, and consolidate some information. Of course, some bits will be forgotten. Thus, when asked to retrieve this forgotten information we begin seeking out connections and creating new ones if needed.
- Spaced learning can be encouraged through course deign
- Spaced learning is frustrating to learners
- Interleaving facilitates transfer of knowledge from its original context to new novel situations.
- It may be best to begin with blocked activities and transition slowly into interleaving.
- Blocked learning is most suitable introducing new content.
- Blocked learning combined with interleaving results in long-term retention and ability to transfer knowledge.
- Blocked learning without interleaving is similar to "cramming" and leads only to short-term retention.
- Interleaving can be implemented by: focusing on a cumulative approach to your overall assessment plan for a course, a shift in the sequencing and/or presentation of course content, spacing out deadlines for different types of work in online settings.

Principles

- Block and Interleave
  - Interleaving should not replace blocked practice in your classroom, but rather complement it
- Keep it Small and Frequent
  - Key topics and concepts should be constantly sprinkled in to class activities and assessments throughout the course
- Explain and Support
  - Students will be initially frustrated with interleaving because it is different and uncomfortable. Communicate with the students about what you are doing and why.

Quick Tips

- Every exam should have a small number of questions that require students to draw upon previously covered material.
- Provide opportunities for students to retrieve prior knowledge, practice skills developed earlier in the course, and apply knowledge and skills in new contexts.
- Hold weekly review sessions that require students to apply their most recently learned skill in a new context.
- Use quiz and exam questions that require students to synthesize new and old knowledge.
- Stagger deadlines for online students to promote the practice of spaced learning.

Part II: Understanding

A strong foundation of knowledge is a necessary pre-requisite for deep learning to occur which can then be transferred to unique and/or novel contexts. However, the mere acquisition of information coupled with the ability to retrieve it when prompted is not enough to produce this type of learning. Learners must be provided with activities and opportunities to form connections between and among the simplistic schema structures that constitute foundational knowledge. As more complex knowledge structures are formed and re-organized, students move toward the ability to engage with the information comprising those knowledge structures at a higher cognitive level. Consequently, students become better equipped to apply their knowledge to problems and contexts separate from those presented during instruction and class assignments.

Chapter 4: Connecting

Summary

Establishing connections between isolated bits of knowledge provides students with the ability to become better critical thinkers and problem-solvers. As an expert in your chosen discipline it is difficult (if not impossible) to comprehend the various chasms that exist among the many chunks of information stored by novice learners. The density of your knowledge structure is rich and complex allowing you to easily organize new information around closely related concepts and dozens of other things you already know. Novice learners do not yet have these fully formed networks of knowledge. Thus, upon receiving new information, it is difficult for them to do anything other than file it alongside other information that is extremely similar. It is our responsibility to provide them with opportunities to form connections among their various isolated knowledge networks.

Highlights

- Novice learners have a knowledge base that is sparse and they lack the cognitive processing skills necessary to form connections between and among seemingly unrelated topics.
- We should not simply make connections for our students if we want them to learn. Rather, we should provide frameworks (e.g. guided notes, graphic organizers) of knowledge that facilitate the cognition necessary to make connections.
- Activating prior knowledge is especially helpful in forming connections. It is easier to organize new information meaningfully into our existing knowledge structures if we are already consciously considering that which we already know is related to a topic.

- KWL charts are a quick and easy way to activate prior knowledge, allow students to make predictions, and provide an opportunity to reflect on new information all in one activity.
- Concept maps are a great tool for students to be able to visualize what they know, recognize the existing connections they have established, and form new connections.
- Creating multiple concept maps with various organizing principles is a good way to demonstrate the many connections that exist between the same topics.
- We should be explicit at times about our intention to form connections and how the activity at hand will help accomplish this.
- The type of meaningful connections that lead to enhanced problem solving and critical thinking skills will not occur naturally. We must create and strategically implement prompts and activities to facilitate these connections.

Principles

- Provide the Framework
  - Dissect your own (complex and well-organized) knowledge structures and identify the broad overarching topics. Then, require your students to make connections between these broad topics and justify these connections verbally and in writing.
- Facilitate Connections
  - Create opportunities (and be patient) that allow students to engage in productive struggles that result in those "aha moments" where connections are formed. The connection will be a stronger one when self-generated by the student.
- Leverage Peer-Learning Power
  - Students often have similar novice-level knowledge schemas with similar gaps and disconnects. Use this to your advantage and provide opportunities for them to help each other fill in these gaps and make connections collaboratively.

Quick Tips

- Solicit prior knowledge with brief activities at the beginning or end of a class session or with a whole class knowledge dump to begin the semester.
- Create concept maps that solve a problem or answer a question.
- Provide "skeleton" guided notes for lectures and let students fill in the connections.
- Offer (create) real-world examples/cases and allow students the opportunity to provide such examples on their own.
- Implement *The Minute Thesis* or similar activities that provide some guidance for students to create new and unique connections.

Chapter 5: Practicing

Summary

"It is virtually impossible to become proficient at a mental task without extended practice." (Daniel Willingham, pg.118). Regardless of how well we design and present instructional

material, students will always need to spend time practicing the skills we teach them in order to achieve mastery. We must be mindful that we are providing ample class time for practice so that we can provide guidance and ensure that students are not internalizing incorrect notions or processes. Further, this practice should be aligned with the types of cognitive tasks required on summative assessments for the course. When done properly, practice can lead to the automation of processes and skills which in turn alleviates stress on our working memory and allows it more operating capacity.

Highlights

- Practice relieves stress on our working memory and allows it more capacity to operate.
- Experts develop automation for many lower and mid-level cognitive tasks which frees up working memory capacity.
- Students can demonstrate mastery of one type of cognitive process while having little skill with related ones.
- Higher order cognitive skills are more difficult for students who have not automatized any of the associated lower order cognitive skills necessary to complete the task.
- We must be mindful of the automated tasks we complete. At a certain point we can slip into overlearning and risk being able to make adjustments to the smaller components of a task if and when it becomes necessary.
- To avoid overlearning, we can engage in what Langer (2007) refers to as *mindful learning.*
- Mindful learning involves: the willingness to shift and/or develop the categories that will guide one through a cognitive task; the ability to recognize new information and determine if it is germane to the task at hand; an openness to the possibility that the conclusions drawn today may be different tomorrow.
- You are the best guide students have toward engaging in *mindful learning.*
- The way you present an activity is significant. Be mindful of this and carefully select the words you chose and the approach you instruct students to take when completing an activity.
- Students need low-stakes practice opportunities complete with feedback from you in which they utilize the same cognitive skills you will ask them to on summative assessments.
- Unpack your assessments and pinpoint the success criteria. What are you looking for specifically? What cognitive skills are required? Are you providing ample practice opportunities to master these cognitive tasks?
- Provide feedback as much as possible on practice exercises. Circulating throughout the room to provide verbal feedback is a quick and easy approach that will also provide you with information about the common misconceptions held by your students.

Principles

- Make Time for In-Class Practice
  - Practice outside of class leaves various possibilities for ineffective practice strategies and solidifying incorrect perceptions.
- Space It Out
  - Spending 5-10 minutes at the beginning or end of class to engage in mindful practice will be well worth the time in the long run if done consistently. Research shows that this approach is superior to a single longer practice session.
- Practice Mindfully
  - Repetition will only get you so far. For deep learning, we must occasionally stop and reflect on what we are doing, why we are doing it, and question if there may be a better approach.

Quick Tips

- Brainstorm a list of skills your students need to develop in your course.
- Prioritize the list. What must they learn first?
- Look for areas in your existing course schedule where you can plan some in-class practice time.
- Align practice sessions with major assessments in content, design, and cognitive level.

Chapter 6: Self-Explaining

Summary

Explaining a process or a cognitive task to oneself, another person, or a room full of empty desks is a good way to determine just how well (or poorly) you understand something. If you know it well, you should be able to explain it simply and clearly. If you do not, you will come to this realization quickly as you struggle to string together something resembling a coherent thought. Explaining things verbally makes us acutely aware of a couple things. First, it makes us aware of what we know, how that information is organized in our heads, and the connections that exist between various topics. Perhaps more importantly, it makes us aware of what we don't know, highlights the flaws in our logic, and causes us to consider alternative ways to organize information.

Highlights

- We learn in deep and unique ways when we explain things *out loud* to ourselves or others.
- The best self-explanation techniques require learners to explain what they are doing and why so that they connect their knowing with their doing.
- Students perform well when learning from worked examples if asked to solve problems that are isomorphic to the worked examples. The problem is with transfer.

- Self-explanation activities should require learners to explain what they are doing, self-assess their comprehension, and paraphrase their overall approach.
- Creating *inference rules* helps students understand when and how to apply more general concepts and principles in novel circumstances.
- Self-explaining is a natural part of the assimilation and accommodation process necessary to resolve cognitive dissonance.
- Allowing learners to select the principle being used at certain points throughout a process is a good way to introduce novice learners to self-explanation.
- Pause students occasionally during the problem-solving process to ask, "Why are you doing that?"
- For more ideas about self-explanation strategies, research meta-cognitive strategies as these are essentially the same concepts.

Principles

- Scaffold Self-Explanation
  - Asking novice learners to self-explain their problem-solving approach to a newly introduced topic may be overwhelming. Instead, allow them to select the appropriate principles that should be used along the way.
- Point to Principles
  - Self-explanation has the amazing potential to help learners connect theory with practice. For this to happen, we must create opportunities for students to select or generate appropriate principles as they are making choices, searching for solutions, and revising their work.
- Utilize Peer Power
  - Students do not always need your ears to be the ones hearing their explanations. When allowing self-explanation with oneself or a peer, have a pre-determined strategy to provide whole-class feedback in a meaningful way.

Quick Tips

- Create opportunities for online students to self-explain. The Moodle quiz tool has a drop-down question type option you can use to prompt students to select which principle is or should be used in solving a problem.
- Develop a routine for students to self-explain as a fundamental part of doing work in your class.
- Use peer instruction and personal response systems to aid in the self-explanation process. Students provide an answer, pause to share their rationale with a neighbor, and then revise based on peer or whole-class feedback.
- Allow class time for *mindful practice* and circulate throughout the room prompting self-explanations.
- With all self-explanation strategies, push students to make connections between what they are actively doing and the principles, concepts, theories, and formulas they are using.

Part III: Inspiring

The first two parts of this book examine how we receive and process information, the cognitive science underlying the ways in which we then transform this information into knowledge structures, and myriad strategies and techniques we can implement to best facilitate the learning outcomes we desire. This is the meat and potatoes of teaching and learning. However, we must also consider the reality that our students are not simply cognition machines. Our students are real people with real lives, goals, ambitions, insecurities, etc. To be successful in facilitating knowledge construction, it is necessary that we accept this fact and its implications in the classroom. The beliefs our students hold regarding intelligence, learning, and ability determine their attitude and willingness to persist in the face of adversity. We must embrace the notion that cultivating student's mindsets around learning and providing them with inspiration is part of our job description.

Chapter 7: Motivating

Summary

Everyone who pursues post-secondary education does so for a reason. Whether they realize it or not, they are intrinsically or extrinsically motivated in some way. Some attend to obtain a degree or credentials for the workforce. Others attend to appease their parents and delay their entrance into the real-world. Non-traditional students often enroll to develop a new skill set to advance their career. Whatever the case, everyone is motivated by something. Part of our job as educators is to capitalize on our students' inherent motivations and to create further motivation for them to engage in meaningful ways and persist through the finish line.

Highlights

- Intrinsic motivation results in the best and deepest learning. This intrinsic motivation is largely determined by a combination of the value a learner places on course content and the degree to which they expect to be successful.
- Students brains do more in our classrooms than think, they feel. Those feelings can play a valuable role in our efforts to motivate our students.
- Motivation is driven by emotions. Leveraging the power of positive emotions makes it possible to drive both intrinsic and extrinsic motivation.
- We can leverage student's emotions help us capture their attention.
- Infusing learning with a sense of purpose drives our students' attention toward certain things and away from others. Aligning this sense of purpose with course content helps to heighten student attention to the important details.
- Humans feed off of one another's emotions. The enthusiasm of the instructor sets the emotional tone for the class community.

- A few engaged and highly motivated students can infect an entire classroom. However, the converse of this is true as well.
- Informal interaction with your students helps to create a sense of community and breeds a healthy socio-emotional relationship among the members within that community.
- Providing frequent feedback is an indication to your students that you care about their work and consequently motivates them to work a little harder on future assignments.
- Lack of feedback leads to apathetic students and uninspired work.
- Leverage the power of storytelling whenever possible in your teaching as the human brain is uniquely equipped to understand and remember stories.

Principles

- Acknowledge Emotions
    - Human beings are emotional creatures. Your students are no different. Find ways to leverage these emotions in a positive way to increase motivation and curiosity. Share stories or show short video clips to invoke emotional responses and incite interest in the topic for the day.
- Make it Social
    - Human beings are social creatures. Your students are no different. Give them the opportunity to learn together as part of a learning community through discussion, small and large group assignments, and as active participants in your lectures.
- Show Enthusiasm
    - Care about your content, and show it through your body language, verbal communication, and excitement throughout class. Also, show compassion and empathy for your students when they perform poorly. They are human and make mistakes. Keep this in mind when addressing them regarding failures and set-backs.

Quick Tips

- Get to class a few minutes early each day and get to know your students on a personal level.
- Open each class by eliciting an emotional response. Tell a story, show an image, ask a question, hook them in some way in the beginning and spend the rest of class reeling them in.
- Frequently remind them of the importance of your course content. How might this content help them in their personal or professional lives moving forward?
- Display daily goals/objectives somewhere in the room. This gives the students a constant reminder of what they are working to accomplish.
- Show your enthusiasm for your discipline. Let them know when you are presenting your favorite content of the course and communicate your hope for them to become equally as enthused.

Chapter 8: Growing

Summary

Albert Einstein is regarded by many as one of the most influential minds in all of human history. His contributions to knowledge are rivaled by few. One of his most famous quotes is, "It's not that I'm so smart, it's just that I stay with problems longer." This is an excellent example of the growth mindset and the power of valuing effort over ability. Research from Carol Dweck and many others over the last couple decades has resulted in a dichotomy of mindsets: fixed and growth. Those with a fixed mindset believe that their intelligence and ability is determined at birth and no amount of work will change that. Conversely, those with a growth mindset see intelligence and ability as malleable and strive to increase them through hard work and effort. The good news? We can help to shift our student's mindsets from fixed to growth. The bad news? We can shift their mindset the other direction also.

Highlights

- Research on mindset shows that students praised for effort rather than ability are more likely to persist through failure and ultimately perform better and attain higher levels of achievement.
- Those with a fixed mindset tend to use it as a defense mechanism. For example, if a student believes their intelligence is fixed, then failure is an indication that they are not intelligent. Thus, if they do not put forth effort they can attribute their failure to lack of effort and not lack of intelligence.
- Research in the field of cognitive psychology tells us that intelligence and ability can be improved through hard work and effort.
- We can alter our students' mindsets through formal and informal communication and through the feedback we provide on assignments.
- In addition to cultivating growth mindsets for individual students, we should also strive to create growth mindsets for our classrooms.

Principles

- Design for Growth
    - Structure your course such that there are numerous low-stakes opportunities to receive feedback and/or revise or resubmit work.
    - Gradually increase the weight of high-stakes assignments throughout the semester.
- Communicate for Growth
    - In both formal and informal communication with students, always be careful to use growth oriented language. Review your syllabus and assignments. Do they promote a growth mindset? When sending e-mails, posting announcements, etc. be intentional with your use of language.

- Feedback for Growth
    - In addition to informing students about what is correct and incorrect about their work, use feedback as an opportunity to encourage the characteristics that create a growth mindset. Acknowledge ability. Praise effort.

Quick Tips

- Provide opportunities for success early in the course.
- Consider offering rewards for effort or improvement.
- Share personal stories of failure, persistence, and triumph.
- Use growth language in feedback. Emphasize your belief that a student can improve and offer concrete steps to make these improvements.
- Solicit previous students that performed well in your course to write letters to current students offering advice and encouragement.
- Include a "Tips for Success in This Course" section in your syllabus or as a stand-alone document.

Chapter 9: Expanding

Summary

In the final chapter of the book, Lang briefly departs from the underlying theme of the book to explore a few ways to expand on the models and theories presented throughout the first eight chapters. For those of us with a tendency to fall down the rabbit hole after becoming initially engaged with a certain concept, this chapter offers three "big teaching" strategies along with a wealth of pedagogical resources to help you get started with small and big strategies alike.

Principles

- Activity-Based Learning
    - Ask your students to do whatever people do outside of your class in your discipline or with the specific content and skills you are teaching them.
    - Look outside the course for inspiration on things you can bring inside the course.
- Service Learning
    - Seek out colleagues who have conducted service learning projects and pick their brain.
    - Identify the individuals within your organization with connections to community organizations and get as much information from them as possible.
- Games and Simulations
    - Do not attempt to re-invent the wheel. There are an abundance of resources available for all disciplines. Find the one(s) that work for you and tweak them as you go.

Quick Tips

- Commit to reading one book on teaching and learning each year.
- Subscribe to an e-mail list like *Chronicle of Higher Ed* or *Faculty Focus.*
- Create a personal learning network on Twitter. Start by searching hashtags such as: #highered, #edutech, #edchat, #teaching, #learning. This will lead you to follow peers in your field with similar interests.
- Attend a conference on teaching and learning. If your discipline does not have a conference you are interested in attending, consider The Teaching Professor Conference or The Lily Conference.
- Attend professional development events on your campus. Here you will find expert help and like-minded colleagues.

Resources

Informative

Retrieval Practice

Learning Scientists

Quizlet

Retrieval Infographic

Interleaving Infographic

What is Cognitive Load?

Strategies for Reducing Cognitive Load

Books

What The Best College Teachers Do

Make It Stick: The Science of Successful Learning

How Learning Works: 7 Research-Based Principles for Smart Teaching

Mindset: The New Psychology of Success

Why Don't Students Like School?

Web Resources

ABLConnect

Pedagogy Unbound

Faculty Focus

Chronicle of Higher Education

Podcast: Teaching in Higher Ed

Twitter Handles

@DerekBruff

@SaRoseCav

@teachprof

@ClaireHMajor

@SChewPsych

@LangOnCourse

@mchargue87