A SAMPLING OF WHAT WE KNOW ABOUT LEARNING FROM SCHOLARSHIP OF TEACHING AND LEARNING AND EDUCATIONAL RESEARCH

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Below is a summary of some evidence-informed knowledge about what works in teaching and learning. These ideas and resources should be helpful for your teaching (and learning!) as well as for **a theoretical basis for scholarship of teaching and learning research and/or for understanding and interpreting assessment or scholarship of teaching and learning results.**

How Learning Works. List of the seven research-based principles for improving learning from Susan Ambrose, et. al 2010. *How Learning Works: 7 Research-Based Principles for Smart Teaching.* Jossey-Bass (pages 4-6). Book contains practical suggestions for teaching.

1. **"Students' prior knowledge can help or hinder learning."**
2. **"How students organize knowledge influences how they learn/apply what they know."**
3. **"Students' motivation determines, directs, and sustains what they do learn."**
4. **"To develop mastery, students must acquire component skills, practice integrating them, and know when to apply what they have learned."**
5. **"Goal-directed practice coupled with targeted feedback enhances the quality of students' learning."**
6. **"Students' current level of development interacts with the social, emotional, and intellectual climate of the course to impact learning."**
7. **"To become self-directed learners, students must learn to monitor and adjust their approaches to learning."**

Academically Adrift. Summary of key findings from Richard Arum and Josipa Roksa. *Academically Adrift.* 2011. University of Chicago. Conclusions based on a longitudinal study of 2,322 students at 24 four-year institutions in U.S. Learning measured using the Collegiate Learning Assessment (CLA), an open-ended, performance task which assesses critical thinking, complex reasoning, and written communication. Growth in CLA scores (from fall of freshman year to spring of sophomore year) was associated with the following college experience factors after statistically controlling for many background, student, and institutional characteristics.

1. **Hours spent studying alone (positive association with CLA growth score)**
2. **Perceptions of high faculty expectations (positive association with CLA growth score)**
3. **High reading & writing requirements (positive association with CLA growth score)**
4. **Percentage of college costs covered by grants and scholarships (positive association with CLA growth score)**
5. **Hours spent studying with peers (negative association with CLA growth score)**
6. **Time spent in fraternities and sororities (negative association with CLA growth score)**
7. **Field of Study (complex relationships given other factors)**

What the Best College Teachers Do. Summary of conclusions from Ken Bain. *What the Best College Teachers Do.* 2004. Harvard University Press. (pages 15-19). Conclusions based on intensive interviews and observations of some of the best (based on their ability to produce significant learning) teachers in the nation in higher education.

1. Outstanding Teachers Know their Subjects Well -They are active in their discipline, follow important developments within their fields, do research/scholarship, read extensively, work with colleagues…They are also able to simplify complex topics of the discipline. They had an intuitive understanding of learning and saw learning in terms of major, long-term influences on students' feelings, knowledge, and actions.

2. Outstanding Teachers are Scholarly Teachers -They treat their teaching as intellectual challenges as important as their disciplinary scholarship. They use inquiry into learning and begin with questions about student learning objectives.
3. The Best Teachers Expect "More" - They challenge students but have learning objectives that focus on learning to think and act as will be needed in life.
4. The Best Teachers Create a "Natural, Critical Learning Environment" - In this environment, students learn through the use of authentic tasks and by grappling with stimulating and important questions or problems. This environment is challenging yet supportive, and learners have a sense of control, work collaboratively, receive useful feedback for improvement, and feel they will be evaluated fairly.
5. Highly Effective Teachers have a Strong Trust in Students - They believe students want to and are able to learn. They are open and honest with students and engage in appropriate self-disclosure. They treat students with respect and caring. They do not blame students.
6. Outstanding Teachers have a Strategy to Assess their Efforts and Make Changes
The faculty members use various ways to obtain feedback on their teaching and students' learning and adjust based on this feedback. Efforts to assess students develop from learning objectives.

What the Best College Students Do. Direct Quote of advertising excerpt from publishers web page (I have not yet read this book). Based on Ken Bain. *What the Best College Students Do.* 2012. Harvard University Press.
"Combining academic research on learning and motivation with insights drawn from interviews with people who have won Nobel Prizes, Emmys, fame, or the admiration of people in their field, Ken Bain identifies the key attitudes that distinguished the best college students from their peers. These individuals **started out with the belief that intelligence and ability are expandable**, not fixed. This led them to **make connections across disciplines**, to **develop a "meta-cognitive" understanding of their own ways of thinking**, and to **find ways to negotiate ill-structured problems** rather than simply looking for right answers. **Intrinsically motivated** by their own sense of purpose, they were **not demoralized by failure nor overly impressed with conventional notions of success**. These movers and shakers didn't achieve success by making success their goal. For them, it was a byproduct of **following their intellectual curiosity, solving useful problems, and taking risks in order to learn and grow**."

Seven Principles for Good Practice in Undergraduate Education. Direct Quote Excerpt from Arthur W. Chickering and Zelda F. Gamson. *The American Association for Higher Education Bulletin*, March 1987. (http://honolulu.hawaii.edu/intranet/committees/FacDevCom/guidebk/teachtip/7princip.htm)
"These seven principles are not ten commandments shrunk to a 20th century attention span. They are intended as guidelines… to improve teaching and learning. These principles seem like good common sense, and they are -- because many teachers and students have experienced them and because research supports them. They rest on 50 years of research on the way teachers teach and students learn, how students work and play with one another, and how students and faculty talk to each other."
"1. Encourages Contact Between Students and Faculty. Frequent student-faculty contact in and out of classes is the most important factor in student motivation and involvement. Faculty concern helps students get through rough times and keep on working. Knowing a few faculty members well enhances students' intellectual commitment and encourages them to think about their own values and future plans.
2. Develops Reciprocity and Cooperation Among Students. Learning is enhanced when it is more like a team effort that a solo race. Good learning, like good work, is collaborative and social, not competitive and isolated. Working with others often increases involvement in learning. Sharing one's own ideas and responding to others' reactions sharpens thinking and deepens understanding.
3. Encourages Active Learning. Learning is not a spectator sport. Students do not learn much just by sitting in classes listening to teachers, memorizing pre-packaged assignments, and spitting out answers. They must talk about what they are learning, write about it, relate it to past experiences and apply it to their daily lives. They must make what they learn part of themselves.

4. Gives Prompt Feedback. Knowing what you know and don't know focuses learning. Students need appropriate feedback on performance to benefit from courses. When getting started, students need help in assessing existing knowledge and competence. In classes, students need frequent opportunities to perform and receive suggestions for improvement. At various points during college, and at the end, students need chances to reflect on what they have learned, what they still need to know, and how to assess themselves.
5. Emphasizes Time on Task. Time plus energy equals learning. There is no substitute for time on task. Learning to use one's time well is critical for students and professionals alike. Students need help in learning effective time management. Allocating realistic amounts of time means effective learning for students and effective teaching for faculty. How an institution defines time expectations for students, faculty, administrators, and other professional staff can establish the basis of high performance for all.
6. Communicates High Expectations. Expect more and you will get more. High expectations are important for everyone -- for the poorly prepared, for those unwilling to exert themselves, and for the bright and well motivated. Expecting students to perform well becomes a self-fulfilling prophecy when teachers and institutions hold high expectations for themselves and make extra efforts.
7. Respects Diverse Talents and Ways of Learning. There are many roads to learning. People bring different talents and styles of learning to college. Brilliant students in the seminar room may be all thumbs in the lab or art studio. Students rich in hands-on experience may not do so well with theory. Students need the opportunity to show their talents and learn in ways that work for them. Then they can be pushed to learn in new ways that do not come so easily."

Taking Stock of Research on Teaching and Learning. Summary and/or quotes of key findings from chapters synthesizing empirical research on teaching and learning in higher education from Hughes, J. Christensen and Mighty, J. (eds.) (2010). *Taking Stock: Research on Teaching and Learning in Higher Education.* Montreal and Kingston: Queens' Policy Study Series, McGill-Queen's University Press.
Four key findings/observations gleaned from the chapters in the book (pages 262-263; 275):

1. Students vary in their approaches to learning (e.g., deep vs. surface).
2. These variations are, in part, a result of features of the learning context and, in particular, the situation and opportunities faculty members provide (e.g., active learning, collaboration promote deep approaches).
3. The above are important because variations in student approaches to learning are related to actual learning outcomes (e.g., deep approaches are related to more meaningful, long lasting, transferable learning).

"Most importantly, when faculty adopt active-learning pedagogies, students are more likely to engage in deep-learning approaches, leading to improved mastery and retention of knowledge and skills, and more sophisticated learning approaches."

Improving Students' Learning. Summary of findings from a review by Dunlosky, J., Rawson, K. A., Marsh, E. J., Nathan, M. J. and Willingham D. T. (2013). "Improving Students' Learning with Effective Techniques: Promising Directions from Cognitive and Educational Psychology." *Psychological Science in the Public Interest.* 14(1): 4-58. The authors review research on the effectiveness of ten (not meant to be an exhaustive list; selected for various reasons) teaching-learning strategies for k-12 and undergrads in terms of promoting student learning across student characteristics, context, materials, and tasks. The 10 strategies are then categorized as: high, moderate, or low utility.
High Utility Strategies:

1. Practice testing - "Self-testing or taking practice tests over to-be-learned material."
2. Distributed practice- "Implementing a schedule of practice that spreads out study activities over time."

Moderate Utility Strategies:

1. Elaborative interrogation- "Generating an explanation for why an explicitly stated fact or concept is true."

2. Self-explanation- "Explaining how new information is related to known information, or explaining steps taken during problem solving."
3. Interleaved practice- "Implementing a schedule of practice that mixes different kinds of problems…or different kinds of material, within a single study session."

Low Utility Strategies:

1. Summarization- "Writing summaries (of various lengths) of to-be-learned texts."
2. Highlighting/underlining- "Marking potentially important portions of to-be-learned materials while reading."
3. Keyword mnemonic- "Using keywords and mental imagery to associate verbal materials."
4. Imagery for text- "Attempting to form mental images of text materials while reading or listening."
5. Rereading- "Restudying text material again after initial reading."

High Impact Educational Practices. List of potential (when done well) high impact (for learning and persistence) educational practices based on research at numerous institutions and with multiple sources of data from Kuh, George D. (2008). *High-Impact Educational Practices: What They Are, Who Has Access to Them, and Why They Matter.* Washington, DC: AAC&U.

- **First-year Seminars and Experiences**
- **Common Intellectual Experiences**
- **Learning Communities**
- **Writing-Intensive Courses**
- **Collaborative Assignments and Projects**
- **Undergraduate Research**
- **Diversity/Global Learning**
- **Service Learning, Community-Based Learning**
- **Internships**
- **Capstone Courses and Projects**

Teaching and Learning: Contributions from Social Psychology. Summary of findings based on research and theory/synthesis from Debra Mashek and Elizabeth Yost Hammer (eds.) (2011). *Empirical Research in Teaching and Learning: Contributions from Social Psychology.* Malden, MA: Wiley-Blackwell.

Chapter 5 by Johnmarshall Reeve- Teaching in Ways that Support Students' Autonomy:

- **Nurture students' inner motivational resources (fit course and assignments with their intrinsic motivation, values and goals, etc.).**
- **Provide explanatory rationales for decisions, assignments, etc.**
- **Use non-controlling, informational language.**
- **Display patience to allow time for self-paced learning.**
- **Acknowledge and accept student expressions of resistance and negative affect.**

Chapter 7 by Diane Halpern and Clayton Stephenson- Applying the Science of Learning to the Art of Teaching (principles of learning that promote critical thinking and transfer):

- **Clarify objectives.**
- **Have students generate responses.**
- **Distribute learning over time.**
- **Vary learning activities.**
- **Use dual-coding (e.g., visual and verbal).**
- **Provide feedback that informs.**
- **Challenge learners' epistemology.**

Chapter 8 by John Hattie- Which Strategies Best Enhance Teaching and Learning in Higher Education (a synthesis of 800 meta-analyses on promoting student achievement). The best teachers…

1. **"Communicate clear learning intentions and criteria for success."**
2. **"Use multiple teaching strategies that emphasize student perspectives in learning."**
3. **"Seek feedback regarding the effectiveness of their teaching and provide feedback to students regarding the effectiveness of their learning."**

How People Learn. Summary of practical implications from National Research Council. (1999). *How People Learn: Bridging Research and Practice.* Washington, DC: National Academy Press. (pages 10-17).

1. "Draw out and work with the preexisting understandings" that students bring with them. These ideas and conceptions about the world and how things function must be "engage" or students will likely have difficulty understanding new information and concepts beyond surface short-term learning.

2. "Teach some subject matter in depth, providing many examples in which the same concept is at work…" Research demonstrates that for students to develop competence in "an area of inquiry", they must have three things: 1. "a deep foundation of factual knowledge," 2. an understanding of "facts and ideas in the context of a conceptual framework," and 3. the ability to "organize knowledge in ways that facilitate retrieval and application."

3. Integrate the teaching of metacognitive skills into the course and curriculum in multiple areas. Using metacognitive strategies will assist students in becoming more autonomous learners through clarifying and reflecting on learning goals and their achievement.

Helping to Motivate Students to Enhance Learning. Summary of practical implications from Marilla Svinicki. 2004. *Learning and Motivation in the Post-Secondary Classroom.* Anker. (pages 222-235). These principles are based on the ideas and research from several major theories of human learning.

1. Emphasize a Few Key Ideas as Cognitive Theory suggests that key ideas must be made explicit and stressed in the overall course and each session.

2. Be Aware of Prior Knowledge because theories indicate that what students learn is influenced by what they bring to the class. There are various sources of data for this including pretests or prior knowledge surveys given by the instructor.

3. Tap into Motivational Sources and think about what motivations students may bring to your course and what you can do to enhance that. Provide reasonable choice and control to students. Help students make connections between what they are learning and their lives. Provide early opportunities for success in the course.

4. Build Structural Knowledge to Achieve Understanding by using various strategies to help students see and build interconnections among ideas and/or skills and/or applications in the course. They need an overall, meaningful structure.

5. Structure Learning to Support Encoding of Content; that is, use encoding strategies (e.g., organizational encoding, elaboration encoding) to promote "deep: learning.

6. Use Modeling to Teach Skills by demonstrating for students the thinking or skills you wish them to learn and practice. Use peers as models as well.

7. Give Lots of Active, Coached Practice, providing opportunities for active, hands-on practice with assistance and feedback from faculty and peers.

8. Teach in Ways that Promote Transfer so as to provide opportunities, modeling, and practice for students to apply knowledge and skills to novel situations or problems.

9. Help Students become Aware of their Own Learning Strategies through self-analyis and self-reflection to become more aware of how they learn and how they can use that knowledge to improve their learning.

10. Respect Individual Differences in Learning and allow flexibility and choice to make diversity in learning an asset.

Five Key Changes to Practice. Direct quotes from the author from Weimer, Maryellen. (2013). *Learner-Centered Teaching: Five Key Changes to Practice*, 2nd Edition. Wiley.

1. Learner-centered teaching engages students in the hard, messy work of learning. I believe teachers are doing too many learning tasks for students. We ask the questions, we call on students, we add detail to their answers. We offer the examples. We organize the content. We do the preview and the review. I'm not suggesting we never do these tasks, but I don't think students develop sophisticated learning skills without the chance to practice.

2. Learner-centered teaching includes explicit skill instruction. Learner-centered teachers teach students how to think, solve problems, evaluate evidence, analyze arguments, generate hypotheses—all those learning skills essential to mastering material in the discipline. They do not assume that students pick up these skills on their own, automatically. Research consistently confirms that learning skills develop faster if they are taught explicitly along with the content.

3. Learner-centered teaching encourages students to reflect on what they are learning and how they are learning it. Learner-centered teachers talk about learning. Learner-centered teachers include assignment components in which students reflect, analyze and critique what they are learning and how they are learning it. The goal is to make students aware of themselves as learners and to make learning skills something students want to develop.

4. Learner-centered teaching motivates students by giving them some control over learning processes. I believe that teachers make too many of the decisions about learning for students. …when teachers make all the decisions, the motivation to learn decreases and learners become dependent. Learner-centered teachers search out ethically responsible ways to share power with students. They might give students some choice about which assignments they complete…classroom policies…assignment deadlines…assessment criteria.

5. Learner-centered teaching encourages collaboration. It sees classrooms (online or face-to-face) as communities of learners. Learner-centered teachers recognize, and research consistently confirms, that students can learn from and with each other. Certainly the teacher has the expertise and an obligation to share it, but teachers can learn from students as well. Learner-centered teachers work to develop structures that promote shared commitments to learning. They see learning individually and collectively as the most important goal of any educational experience.

Learning and the Brain. Summary of some implications from J. E. Zull, J. E. 2002. *The Art of Changing the Brain: Enriching the practice of teaching by exploring the biology of learning*. Sterling, VA: Stylus Publishing.

1. **The importance of connecting learning to students' prior knowledge.**
2. **Using emotions appropriately to enhance learning.**
3. **Varying pedagogy to trigger activity in different parts of the brain.**
4. **The importance of the the visual sense.**
5. **Showing students, role-modeling, can be important.**
6. **The need for active learning- students should "do."**
7. **Students should have some control.**
8. **Students should reflect.**