

How Learning Works: Some fundamentals that can improve all communication, learning, research and teaching practices.

Francis Jones – always available to “consult”; EOS-South, rm361.¹

Virtually any communication involves someone learning something from someone else; maybe even everyone learning something! What fundamentals about how people learn are well established? And - how can we leverage those concepts to improve research, teaching and professional communication? We will discuss some fundamental concepts, including:

- Distinguishing novices vs. experts;
- Influence of prior knowledge (or lack of it) on learning;
- Motivation: can learning happen without it?
- Practice and Feedback; a crucial, iterative cycle, but how best to do it?

WORKSHEET

1. In what professional or academic settings does “learning” of ANY kind happen?
2. Suggest examples of “universal” (as you see it) fundamental notions about learning?
3. What behaviors distinguishing experts & novices?
4. Examples in your field illustrating effortless expertise compared to struggling novices.
Can you recognize issues related to...
‘Unconscious competence’ of an expert? ‘Unconscious incompetence’ of a novice? Expert assumptions?

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“How Learning Works” - A few Recommended Resources

If I had to give only one formal and one informal reference:

- **How Learning Works: Seven Research-Based Principles for Smart Teaching.** 1st ed. Ambrose, Susan A., Michael W. Bridges, Michele DiPietro, Marsha C. Lovett, and Marie K. Norman. 2010. Jossey-Bass. Well written, effectively organized, thoroughly referenced, fundamental & hence “timeless”.
- <http://cwsei.ubc.ca/> - references, student/instructor guidelines etc from two major science ed. initiatives at UBC & CU.

Short guidelines (most are 1-3 pages)

1. Targeting instructors: http://www.cwsei.ubc.ca/resources/instructor_guidance.htm
2. Targeting students: http://www.cwsei.ubc.ca/resources/student_guidance.htm
3. From EOAS: <https://www.eoas.ubc.ca/research/cwsei/eossei-times.html>
4. Most “teaching and learning support groups” in Departments, Faculties, Institutions.

Websites

5. <http://cwsei.ubc.ca/resources/index.html>: at the *Carl Wieman Science Education Initiative*. This site basically has it all - hundreds of pointers to all types of resources from articles, books and general publications to video interviews, public domain guidelines and on and on and on. Includes sections on Instructor Guidance; Student Guidance; Clickers; Video; Learning Goals; Tools; Course Transformation Resources; Papers; Other Resources (books, TA training, Talks, etc.) .
6. **UBC Teaching and Learning Resources Portal**: http://wiki.ubc.ca/Teaching_and_Learning_Resources_Portal. A huge, roughly 170 alphabetical list of pages and bibliographies.
7. **SERC - the Science Education Resource Center at Carleton College**, developed with NSF funding at <http://serc.carleton.edu/index.html>. Many workshop outcomes, teaching and/or learning materials, guidelines and resources, many tested and/or peer reviewed. FOUR AREAS: Higher Ed Portal; **Geoscience Educators**; K12 Portal; Resources Shortcuts.

Papers (just a few)

8. List of 49 recommended papers at CWSEI: <http://www.cwsei.ubc.ca/resources/papers.htm>
9. Chickering, Arthur W., and Zelda F. Gamson. "Seven principles for good practice in undergraduate education." AAHE bulletin 3 (1987): 7. Free at http://ctlit.ubc.ca/files/2010/09/SevenPrinciples_pdf.pdf
10. **The Wisdom of Practice: Lessons Learned from the Study of Highly Effective Tutors.** Mark Lepper and Maria Woolverton Improving academic achievement: Impact of Psychological Factors on Education, Ch. 7, edited by J. Aronson, Academic Press, pp. 135-158, (2002).
11. **How to Succeed in College: Learn How to Learn.** Robert Bjork, American Psychological Society, 14 (3), March 2001. See also <https://bjorklab.psych.ucla.edu/research/>
12. **The Expert Mind**, Philip E. Ross, Scientific American, V. 295, Issue 2, pp. 64-71 (August 2006).
13. **The Role of Deliberate Practice in the Acquisition of Expert Performance**, K. Anders Ericsson, Ralf Krampe, and Clemens Tesch-Romer. Psychological Review, Vol. 100. No. 3, 363-406 (1993).

Books or reports

14. ****Best of the bunch! How Learning Works: Seven Research-Based Principles for Smart Teaching.** 1st ed. Ambrose, Susan A., Michael W. Bridges, Michele DiPietro, Marsha C. Lovett, and Marie K. Norman. 2010. Jossey-Bass.
15. **How People Learn: Brain, Mind, Experience, and School: Expanded Edition.** Bransford, John D., Anne L. Brown, Rodney R. Cocking, and Committee on Developments in the Science of Learning, National Research Council, eds. 2000. Washington, D.C.: The National Academies Press. Free PDF download at <https://www.nap.edu/catalog/9853/how-people-learn-brain-mind-experience-and-school-expanded-edition>
16. **Earth and Mind: How Geologists Think and Learn About the Earth.** Manduca, Cathryn A., and David W. Mogk. 2007. Geological Society of Amer.
17. **Earth and mind II: A synthesis of research on thinking and learning in the geosciences.** Kastens, Kim A., and Cathryn A. Manduca. 2012. 486;486. Boulder, Colo: Geological Society of America.
18. **Thinking, fast and slow.** Kahneman, Daniel. Macmillan, 2011.
19. **The ABCs of How We Learn: 26 Scientifically Proven Approaches, How They Work, and When to Use Them.** 2016. Daniel L. Schwartz, Jessica M. Tsang, Kristen P. Blair, W.W. Norton & Co., Inc. ISBN: 978-0-393-70926-1
20. **Reaching Students: What Research Says About Effective Instruction in Undergraduate Science and Engineering.** 2015. Kober, Nancy, National Academies Press Free eBooks, National Research Council (U.S.), Board on Science Education, National Research Council (U.S.), and Division of Behavioral and Social Sciences and Education. Washington, DC: National Academies Press. Free PDF download at <https://www.nap.edu/catalog/18687/reaching-students-what-research-says-about-effective-instruction-in-undergraduate>.
21. **Research Corporation for Science Advancement**; Twelve books, most free, at <http://rescorp.org/about-rdsa/books>