

How People Learn vs. How We Believe People Learn

Most of us conclude that if we are learning easily, we are learning well. Recent research ([some](#)ⁱ done here at Princeton), however, clearly demonstrates that effortful learning usually signals not only deeper learning, but more durable long-lasting knowledge. It's analogous to working out. Lifting heavier weights which require more effort will build muscle in much the same way investing effort in grappling with new information builds stronger knowledge structures.

*Making learning difficult in strategic and **desirable** ways will enhance retention, retrieval, and transfer of knowledge. [Desirable difficulties](#)ⁱⁱ are those which evoke or induce mental processes which strengthen encoding and facilitate retrieval by virtue of making the taking in and processing of information more effortful. For instance, we recognize that teaching someone else that which we are ourselves are striving to learn is a highly effective way for deepening our understanding and making our knowledge more retrievable in the future. But WHY is it effective? The theory is that doing so requires that we instantiate or "reboot" our knowledge structures into working memory when explaining, we must elaborate on what we've taken in using our own long-term knowledge, we often make new linkages or connections among nodes of knowledge (e.g. topics), and we think under new circumstances in new ways when interacting with others in the role of "teacher". That's not to say that teaching others in, for instance, a study group, is the only way to incorporate desirable difficulties into your self-directed learning; there are many ways to do so.*

Here are some general learning principles to help you allocate your time and effort efficiently and incorporate desirable difficulties into your process of learning (processing), studying (solidifying), and exam preparation (practice). You can also use these principles, drawn largely from the work of [Robert Bjork's research lab](#)ⁱⁱⁱ, to examine your current approach to learning to assess its efficiency. Many of these are counter-intuitive, so meet with a learning consultant to brainstorm new methods.

- 1) Allocate your **attention** efficiently.
 - a) Focus on one task only, don't divide your attention.
 - b) Align your purposes to the design of the course by knowing professor's goals and determining purposes of instruction.
 - c) Turn on and off your attention mindfully and strategically
 - d) Devote attention to various learning tasks, in part, based upon time of day.
- 2) **Organize** information that you are trying to learn using powerful frameworks/conceptual categories like those used by experts in the field.
 - a) Explicate models, organizational patterns used by your professor and use them yourself to organize the information you are learning.
 - i) Ask: "How does my professor think about this topic, field, problem, etc.?"
- 3) Actively **elaborate** on and connect what you are learning to what you know.
- 4) To maximize a flexible application, make your studying **variable** (locations, examples, modalities).
- 5) **Space** your studying of a body of knowledge over several episodes; **interleave** your studying of different bodies of knowledge, don't study similar materials for long uninterrupted periods.
- 6) Visualize a representation (image) of the information you are learning. Consciously reinstate the image during studying and testing.
- 7) Introduce desirable difficulties which require productive effort now to

Anticipate subsequent study and practice (e.g. exam prep) and put information into an efficiently studyable form.

ⁱ https://web.princeton.edu/sites/opplab/papers/Diemand-Yauman_Oppenheimer_2010.pdf

ⁱⁱ <https://www.youtube.com/watch?v=XPllm-gtrMM>

ⁱⁱⁱ <https://bjorklab.psych.ucla.edu/research/>