

# DESIGN FOR HOW PEOPLE LEARN

SECOND EDITION

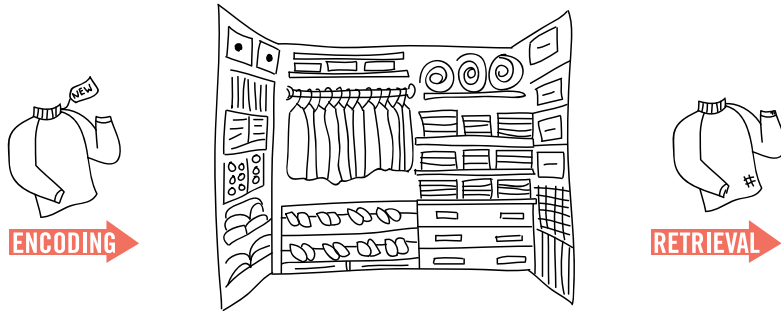
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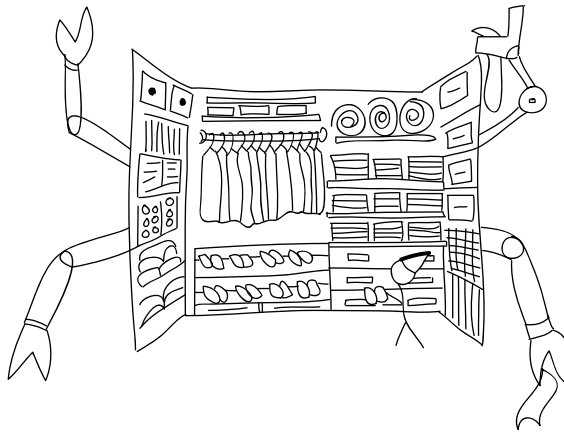
## MEMORY IN & OUT

Successful learning involves encoding and retrieval—memory in and memory out. Remembering is a necessary first step, but you need to be able to retrieve, manipulate, combine, and innovate with the information you remember.



Information in your brain doesn't just sit there like a wool sweater during summertime. When you put information in, it doesn't lie passively waiting to be taken out but instead interacts with other information. So your brain isn't *really* a closet.

In order for your brain to be like a closet, it would have to be a super-automated closet that reorganizes itself constantly, or one that's populated by some kind of closet elves who are continually moving and arranging things.



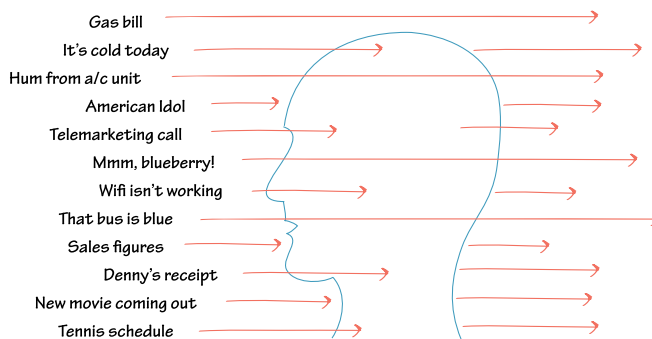
Also, anything you put in your closet automatically gets stored in multiple categories, so the blue socks your grandmother knitted for you would simultaneously (and magically) be put with things that are wool, things that are blue,

socks, outfits that go with those socks, stuff from Grandma, things that are starting to wear out, and so on.

What's more, the self-organizing closet has multiple, overlapping ways to keep track of things. So when you put away those blue socks in the "socks" drawer, the closet can retrieve them by looking on the "things that are wool" shelf or on the "things that are blue" hanger.

Your brain is a dynamic, multi-faceted, constantly changing entity. Anything you retain from this book will change the physical structure of your brain by creating new connections and strengthening (or weakening) existing connections.

So what winds up sticking? We are bombarded with millions and millions of data points all day long. We can't possibly attend to—much less remember—all of them.



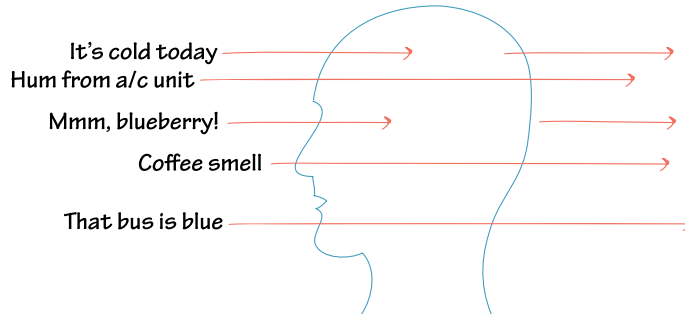
Fortunately, you have a series of filters and triggers that allows you to parse this information:

- **Sensory memory.** This type of memory is your first filter of everything you sense and perceive. If you choose to pay attention to something, it gets passed on to short-term memory.
- **Short-term memory.** This is the memory that allows you to hold on to ideas or thoughts long enough to take action. Most things get discarded out of short-term memory, but some things get encoded into long-term memory.
- **Long-term memory.** This is your closet, where you store information that you'll keep for a while.

Let's take a closer look at each of these.

## SENSORY MEMORY

The first level of memory is sensory memory. Basically pretty much anything you sense is held momentarily in your sensory memory.



Most sensations keep right on going, unless there's something unusual or noteworthy about what you are sensing.

For example, stop right now and pay attention to all the noises you can hear. If you are indoors, you are likely hearing the hum of an air conditioning or heating unit, or noise from appliances or computers. If you are outside, there will be environmental noises depending on your location.

Unless someone or something calls your attention to one of these, you probably weren't paying attention to those noises, and you were certainly not encoding those noises into your memory.

## HABITUATION

Sensory memory isn't a big concern for learning designers, except for the phenomenon of habituation. Habituation means getting used to a sensory stimulus to the point that we no longer notice or respond to it.

**HABITUATION:** This allows you to stop noticing the annoying refrigerator buzz after you've been listening to it for a while, or when you stop even noticing that "check engine" light on the dashboard when it's been on for weeks.

If things are unpredictable, they can be harder to habituate to. For example, the horrible torment of a flickering fluorescent light persists long after you've stopped hearing the hum from the computer monitor, because the

unpredictable pattern of the flicker keeps calling our attention to it over and over and over...

Similarly, being stuck in traffic stays infuriating because it's rarely uniform (start...stop...start...little faster...STOP...go...go go...Go...GOGOGOGO...*Stooooop!*).

People can also habituate to things that we don't necessarily want them to habituate to. For example, when was the last time you paid much attention to the advertisements in the banner at the top of webpages? You've probably learned how to tune those out. Web designers refer to that as "banner blindness," and eye-tracking studies (Nielsen 2007) verify that not only do people not pay much attention to banner ads, but they frequently don't look at them at all. (The same thing can happen with resource and reference material we provide for learners on websites and in elearning courses!)

## IMPLICATIONS FOR LEARNING DESIGN

**Consistency can be useful.** Consistency can be a useful tool to make things easier for your learner. For example, if you use the same basic format for each chapter of a technical manual, your learners get used to the format and don't have to expend mental energy repeatedly orienting themselves to the format; instead, they can focus on the *content* of the chapters.

**Too much consistency is bad.** Too much consistency can lead to habituation in your learners. You want to vary your teaching methods and the way you present information. For example, if you are creating an elearning program and you give the same type of feedback in the same location every single time, then learners are going to learn to ignore it, particularly if the feedback is the generic "Good Job!" kind. Another example of too much consistency is the "banner blindness" mentioned above.

**Annoying variability is bad too.** While some variation is useful for keeping the learner's attention, meaningless differences are just irritating. For example, if you take that elearning feedback box and have it randomly pop up in different areas of the screen, it will probably keep the learner from habituating to it as quickly, but it's also going to really annoy them. A better approach would be to have different feedback formats that are appropriate to the different types of content you are presenting, or to use a variety of different learning activities to keep things interesting. Variation can be a useful tool for maintaining attention, but it should be used in a deliberate and meaningful way.

The best way to know whether something is too consistent is through user testing. Watch your learners interact with print or electronic materials, or pilot test a class—if your learners are inattentive or seem to obviously ignore resource materials, that’s a clue that they’ve started to gloss past those elements.

SHORT-TERM OR WORKING MEMORY

Once something has attracted your attention, it moves into your short-term or working memory. If it succeeds in penetrating your short-term memory, it’s probably something that:

- Is significant to you for some reason
- You are actively looking for
- You need to take action on
- Surprises or confounds your expectations

Working memory has a relatively short duration and limited capacity, but you use it pretty much constantly throughout the day.

WHAT DO YOU RETAIN?

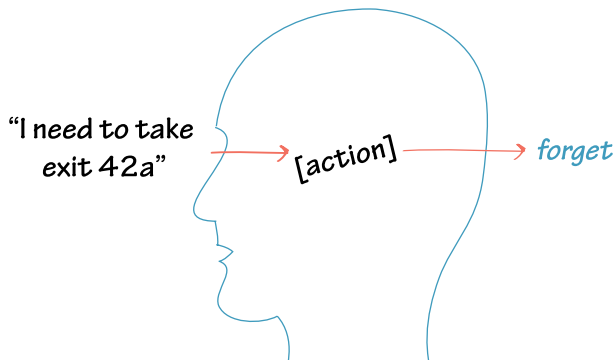
For example, let’s say you are deciding what to wear to work today. You glance at the weather (cool and rainy) and at your schedule (client meeting). You hold those two things in working memory while you check your closet. You also retrieve some information from long-term memory (the conference room is always hot; the black suit is at the cleaners because of that unfortunate guacamole stain).

New Information in Working Memory	Pulled from Long-Term Memory
Cool and rainy weather	Conference room is always hot
Client meeting	Black suit is at the cleaners

All this information gets processed together as you make the decision to wear layers.

Working memory will discard most pieces of information as soon as you’re done with them, like the Wi-Fi password at the coffee shop, the number of the freeway exit you need to take, or the phone number that you recite over and over until you can get it dialed.

All of those types of information are the kind of thing that you might keep in working memory for the few seconds that you will need it. If it takes you longer, you might also keep it there via repetition.



Repetition will refresh the information in working memory until you use it and stop repeating. If you repeat something long enough, you will eventually grind it into long-term memory, but that's not the most efficient method (we'll discuss better methods later). Some information will drop out more quickly if it doesn't have significance.

Let's take a look at the following three pieces of information you might hear in the morning news radio report.

Information: The temperature is 12 degrees Celsius.

#### Factors that influence retention:

- Is it unusual? If it's significantly different than the weather for the last few days, it's more likely to catch your attention.
- Is it important to you? You'll retain it better if the weather affects your plans for the day.
- Is it a familiar format? If you ordinarily use Fahrenheit, you're unlikely to remember the Celsius temperature, because you won't know whether it means you should wear your coat.

If you do remember it for the length of the day, it's still unlikely you'll continue to remember it days or weeks later, unless there was something significant about the date (e.g., it was your brother's wedding day).