Beyond Microlearning:
Using Research Evidence to Create Effective Learning

It is indisputable that we are now moving into a new era of life science training. We are replacing, or at least supplementing, large, structured training events with the hallmarks of the modern learning movement: microlearning, gamification, adaptive questioning and innovative assessments. Learning on phones and tablets has become more commonplace than learning on computers.

But to use modern learning effectively we need to answer a few questions:

What do we know about the effectiveness of microlearning?

Is there evidence that it actually works?

Is microlearning alone sufficient?

If it is not sufficient by itself what are the keys to making it effective?
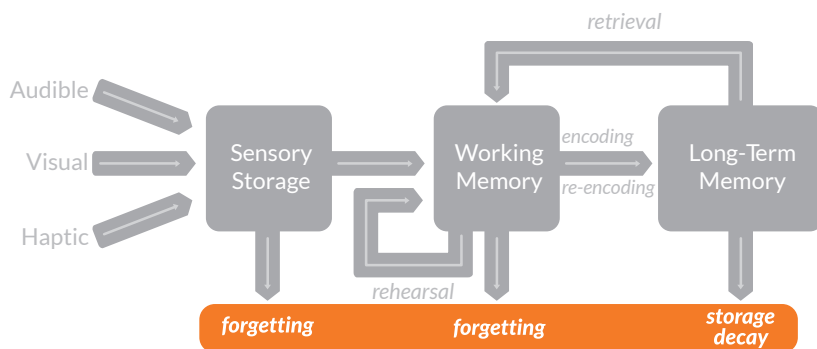
Why Now?

The modern learning movement is the result of two simultaneous phenomena:

1 Advances in cognitive- and neuro-science. We simply understand much better than we did 20 or 30 years ago how people learn and retain what they have learned. We know, for example, that there are three major parts to human memory:
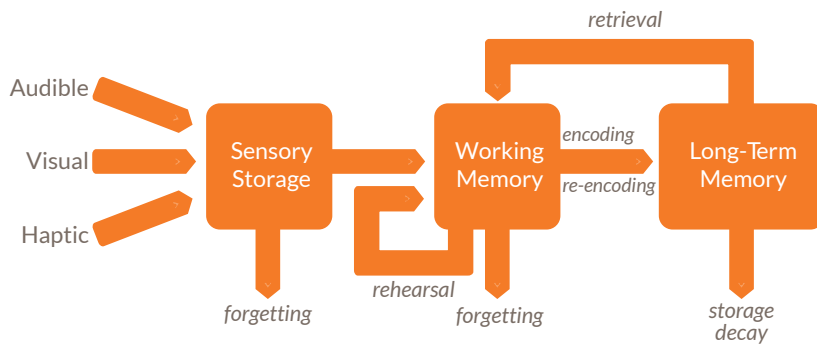
and that we forget at all stages of the learning process:

2 The advent of modern mobile technology that lets us learn when and where we want.
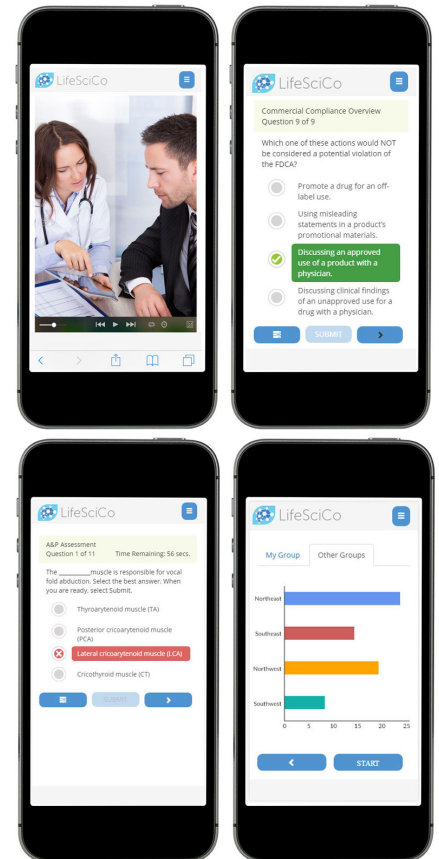
What Are The Benefits of Microlearning?

First, despite what you may have read, millennials do not have the attention spans of goldfish. This is what is known as a neuromyth. But, it is true that there is evidence that learners do disengage from on-line courses after a relatively short period of time. Philip Guo from the University of Rochester analyzed the average length of time learners viewed courses on edX, a popular MOOC. What he found was that learners' attention began to drop off after approximately 10 minutes:
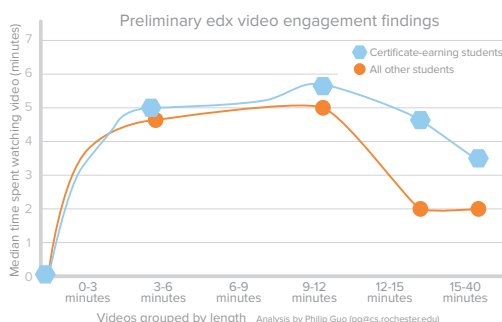
Secondly, microlearning addresses a significant limitation of human working memory. It is very easily overloaded (this is known as cognitive load). Recent research suggests that we can only process three to four discrete pieces of information at a time.

And finally, given job demands, we just have less time to learn. A number floating around learning blogs is just five minutes a day, and even if that is not exactly true we all know from personal experience that our job responsibilities eat up more and more of our discretionary time.

So, microlearning provides three clear benefits:

▶ It addresses the attention span problem

▶ It reduces cognitive load

▶ It allows us to learn as we have time

Why Microlearning Alone is Not Sufficient

We know from the *Ebbinghaus's Forgetting Curve* and decades of subsequent research that 80% or more of what is learned in a course is forgotten within 30 days. But what about a five or ten minute microlearning nugget? Will that be remembered in 30 days? The answer is no. **Microlearning does not inoculate the learner from forgetting any better than a traditional learning event.**

Something more is needed. Making microlearning truly effective requires two additional learning strategies:

▶ Spaced repetition
▶ Retrieval practice

Spaced Repetition and Subscription Learning

The spacing effect refers to the well-established finding that when learning is spaced over time students remember more material than when the learning is presented in a massed fashion. So, this:

Course			

can be replaced by this:

Subscription Nuggets		Subscription Nuggets		Subscription Nuggets
Subscription Nuggets		Subscription Nuggets		Subscription Nuggets
Subscription Nuggets		Subscription Nuggets		Subscription Nuggets
Subscription Nuggets		Subscription Nuggets		Subscription Nuggets

But, there is something important missing here. If you actually read the research, improved recall requires not just spacing but spaced repetition. Accomplishing this requires a Subscription Learning model where the material is presented and then re-presented over time.

Something like this:

Microlearning Nugget	Microlearning Nugget	Microlearning Nugget	Microlearning Nugget	Microlearning Nugget
Microlearning Nugget	Microlearning Nugget	Microlearning Nugget	Microlearning Nugget	Microlearning Nugget
Microlearning Nugget	Microlearning Nugget	Microlearning Nugget	Microlearning Nugget	Microlearning Nugget
Microlearning Nugget	Microlearning Nugget	Microlearning Nugget	Microlearning Nugget	Microlearning Nugget

When we learn, we take a subset of what is in working memory and store it in long term memory. But human long term memory is not like a computer. Knowledge is not stored forever. It is subject to storage decay. How do we prevent storage decay? By retrieving knowledge from long term memory, processing it in working memory and re-storing it in long-term memory. This process, known as re-encoding, strengthens the connections among the neurons in long term memory.

So, our challenge is to create exercises that require our learners to retrieve and re-encode. This process, known as retrieval practice, sometimes called the testing effect, can be accomplished in a variety of ways. Perhaps the best method is to quiz your learners some time after the learning event takes place. Research does not tell us exactly what the optimal time delay for re-encoding needs to be but there are indications that it is most effective if you employ it just as forgetting is setting in, perhaps several days after the learning event. This can then be repeated again several days or weeks later, ensuring that the connections are reinforced repeatedly.

Adaptive questioning, in which a learner is repeatedly required to answer a set of questions over a period of days or weeks, until a success threshold is achieved, is an excellent way to do this. An adaptive questioning algorithm might conceptually look as follows:

Most Frequent		Least Frequent	Success!
1	**2**	**3**	**4**
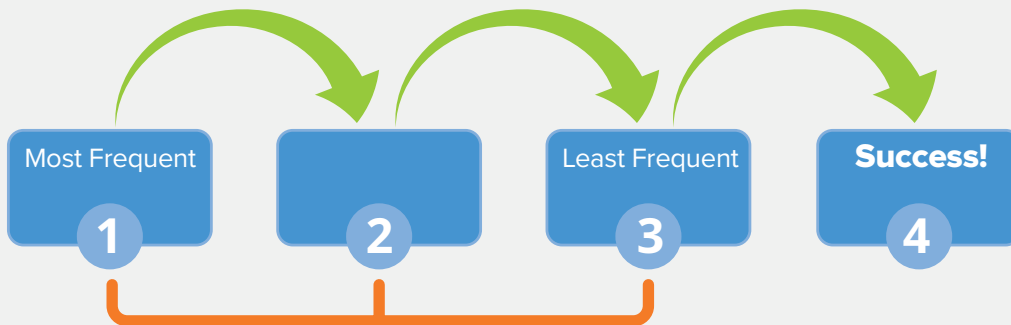
Questions answered incorrectly (Box 1) are asked more frequently than questions answered sometimes correctly (Box 2) and much more frequently than questions answered correctly (Box 3). Finally, questions are "retired" when they are answered correctly a pre-determined number of times consecutively (usually two or three). The underlying algorithm schedules delivery of a subset of the questions spaced over a period of days or weeks.

Beyond Microlearning

So, microlearning addresses some important learning needs, but it is important to think through the *why* and *how* before jumping on the bandwagon. By itself, it is not sufficient for effective long-term learning retention. To be an effective learning strategy it must be combined with spaced repetition and retrieval practice.

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