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Canadian Management Centre

Technology and the Science of Learning:
Using digital technologies to support brain-friendly workforce training

Executive Summary

There is good news for business leaders and learning professionals who want to offer impactful, efficient employee development: digital technologies are well-suited to work with our brain's natural tendencies and provide rich and memorable learning experiences.

Gamified learning taps into our social drive for training that is interactive, competitive and inherently motivating. Virtual reality has been shown to promote improved recall and deeper learning because it feels authentic and engages our emotional and psychological responses. Microlearning improves learning sustainment as it allows for repeated, engaging exposures to new information in innovative contexts.

Digital learning, employed as part of a thoughtful, multi-stage development process, can combine the power of modern technology with the potential of the human mind to add enduring value to our businesses.

This is the third of three articles exploring challenges and opportunities in modern workplace learning. Please click to access our previous articles *Best of Both Worlds: Blending new and proven approaches to workplace learning and Workplace Learning: Managing the present, anticipating the future.*

PART 1

Introduction

Training works best when it is designed to fit with how our brain naturally learns. This article will review three topics that impact successful adult professional learning and discuss how digital technologies available today can support a brain-friendly modern learning strategy. We will discuss:

The role of the social brain in knowledge acquisition and the use of serious games and gamification to encourage social learning;

Experiential learning and how content learned through Virtual Reality (VR) simulations are encoded in the brain;

Memory, recall and how microlearning can overcome the brain's natural forgetting process and lead to permanent retention.

The Social Brain

Humans are social creatures: we are evolved to notice and imitate the behaviours and emotions of others and our brains achieve peak performance when we learn by interacting with peers. This is why collaborative learning, online as well as face-to-face in a classroom, prove more effective than independent eLearning alone.

The well-known 70/20/10 model of adult learning suggests that 70% of what we learn, we learn by doing (Wroten, 2014). This includes skill-building through the work that we do independently, but also includes our collaborative efforts.

Another 20% of our learning comes directly from other people, through seeking advice, informal discussion and, increasingly, social media. This learning is natural and organic but learning professionals can facilitate knowledge sharing through encouraging social networks or building their use into the organization's learning strategy.

64%
of professional learners strongly value face-to-face training sessions.

The final 10% is what we learn formally, in a physical or virtual classroom. This training is a vital piece of the overall learning agenda. Even with the many options available today, learners overwhelmingly recognize the importance of classroom training: in one study, 64% of those surveyed found classroom courses to be essential or very useful for learning what they needed for their jobs (Towards Maturity, 2015).

This kind of learning meets our real psychological need for human contact and offers the chance to talk it out, problem-solve in groups and generate insights collaboratively in a safe environment. There is also great value in developing a relationship with an instructor who demonstrates authentic mastery of the skills we are working to acquire.

It is worth noting that all three sources of learning include interactive, collaborative elements, not only the 20% that comes from peer-to-peer teaching. This suggests that tapping into the social brain will enhance all stages of our workplace learning strategy.

While face-to-face training continues to be the ideal method for deep learning, today's fast-paced work environment has created barriers to extensive classroom sessions. However, we can augment our learning strategy by employing effective digital tools and techniques.

Games and Gamification

Gamification and Serious Games are two trends in program design which have moved beyond buzzword status and achieved permanent positions in the workplace learning field.

Our first task is to distinguish between the two.

Gamification: This is the lower-hanging fruit. This technique takes existing course content and makes it more engaging by adding game-like elements—for example, by awarding points for completing a quiz, badges for passing a module and ranking players on a leaderboard that recognizes achievement among peers.

Serious Games (also called Learning Games): A more profound shift in content delivery occurs with Serious Games. Here, content is delivered through the game itself, often embedded in an engaging storyline that includes interesting characters or avatars and an immersive world complete with quests and challenges that link content mastery to progress in the game.

Serious Games offer a low-risk opportunity to experience the consequences of different actions in a context that mimics real-life and has obvious applications to learners' professional roles. Both game-based strategies offer significant benefits:

- Game mechanics or game-based learning have been proven to dramatically increase engagement and completion rates (Sitzmann, 2011).
- The immediate feedback provided by the game mechanics quickly rewards and reinforces the targeted skills.
- Simulated environments make risk-taking—a necessary part of learning—less intimidating and creates a safe space for failure.
- Friendly competition and recognition of success is deeply motivating for many learners.
- Games naturally promote interaction and tap into the social learning drive that leads to learning success.

Experiential Learning

The brain processes different kinds of information in different ways. Concepts, facts and steps in a process tend to be learned on a cognitive level, processed through the brain's rational faculty, the prefrontal cortex, through mental repetition, study and observation.

Behaviours like showing attention, communicating respect, and using eye contact and body language effectively are processed differently. These pass through a more primitive part of the brain, the basal ganglia. This part is associated with habit formation and emotion. When appropriate behavior is rewarded with a smile, the brain produces dopamine, a feel-good hormone, which reinforces the behaviour. Inappropriate actions, on the other hand, get a frown and no dopamine burst; they thus become weaker, making these behaviours less likely to be repeated.

What conclusions about learning are suggested by these functional divisions in the brain? One is that, to master the "soft skills", we need to see others' reactions, because interactive feedback and emotional response are the keys to developing skillful behaviours.

However, when we learn in real life—by interacting with team members on the job, for instance—we naturally make mistakes by saying the wrong thing, failing to restrain anger or reacting without thinking through the consequences. Mistakes are compounded when we are upset or anxious, as heightened states of emotion trigger our flight or fight instincts and bypass our rational faculties. The trick to ensuring a successful learning experience is to combine the authenticity of learning through experience with the psychological safety of learning in a classroom.

Parts of the Brain

Prefrontal cortex, or cerebral cortex: this area of the brain is responsible for decision-making, planning and reasoning.
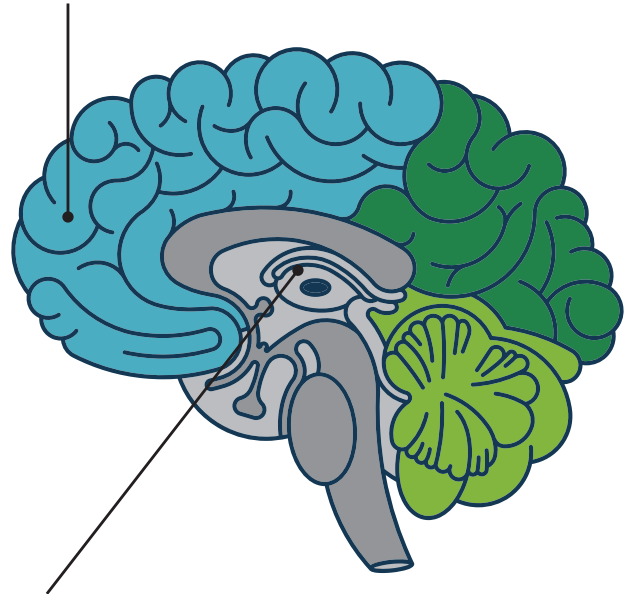
Basal ganglia: this area impacts emotions and feelings and aids in forming habits and shaping behavior.

Virtual Reality and the Brain

A benefit of role-play and simulation in the face-to-face classroom setting is the opportunity to try out new behaviours in a relatively low-risk and authentic context. We know that interactive practice is one of the tried and true methods for skill building, but how can digital technology deliver similar benefits?

One option is Virtual Reality, which is becoming increasingly practical, affordable and common in workplace learning programs. The most common approach, 360-video, allows users to see, hear and interact with a virtual world through use of specialized viewers costing as little as $15.

Like live practice, Virtual Reality simulations target the emotional processing centres and give learners realistic input into how their actions would be received by others.

Employees who have been exposed to Virtual Reality-based on-the-job training overwhelmingly found the experience to be richer (84.5%) and more authentic (55%) than traditional e-Learning (The eLearning Guild, 2018).

To date, the most successful applications of VR to workforce training have been in industries where acting safely in stressful circumstances was the goal. For example, VR immersion has been used to train first responders in a medical emergency, or workers operating heavy machinery. It has also been used by retailers such as Walmart in preparing employees to deal with irate customers amid the mayhem of a Black Friday sale.

Virtual Reality lets users immerse themselves in a stressful situation that feels very real—again and again. Repeated practice managing emotionally-charged moments takes the edge off, so trainees learn to think rationally, behave calmly and make decisions under pressure.

In a professional development context, the potential of VR technology can be tapped in any scenario where

a) behavioural competencies need shaping or b) emotional reactions may interfere with effective performance.

Such possibilities include developing programs on empathy, emotional intelligence, managing conflict, and public speaking, among other applications. As one L&D professional put it, "VR offer(s)...an additional practice step between theory and application," (quoted in The eLearning Guild, 2018).

A major advantage is that Virtual Reality is easier to retain than content learned via other digital technologies. One recent study showed that immersive VR experiences are remembered up to 10% better than visual information presented in 2D on a computer screen. (Krokos, E., Plaisant, C. & Varshney, 2018).

VR Simulations are remembered 2X better than 2D video!

Another study found 2 times the short-term recall from 3D versus 2D video training (Schöne, B., Wessels, M. & Gruber, T. Curr, 2017). Researchers suggest that this is because Virtual Reality content is encoded in the brain as an autobiographical experience—as something that really happened to you—whereas conventional training is not.

The more a learning experience engages our senses and emotions, the more it sticks and the more likely it is to cause significant behavioral change. Virtual Reality stimulates the mind and imagination just as photos and videos do, but even more vividly, and VR simulation lets learners put new concepts into practice and see the results in a way that feels like real life.

Memory and Recall

We know that we forget a lot of what we learn, and that retention is a key challenge for maximizing the impact of training.

In fact, there are sound evolutionary reasons for forgetting. We are exposed to massive amounts of stimuli all the time, day after day.

For example, as you read this right now, consider the various signals you are receiving from your environment. What does the back of your head feel like? How many different individual objects and colors can you see? What sounds can you hear?

Think about what information you have recently been exposed to. How many conversations have you had today? How many words have you read? Have you listened to the news, the radio, a podcast? How much of this data will you still have in your head tomorrow at this time?

Because our world, even before the Internet, has always been an experience of information overload, forgetting is a natural adaptive process that contributes to our survival by freeing up memory and attentional resources for new information and stimuli.
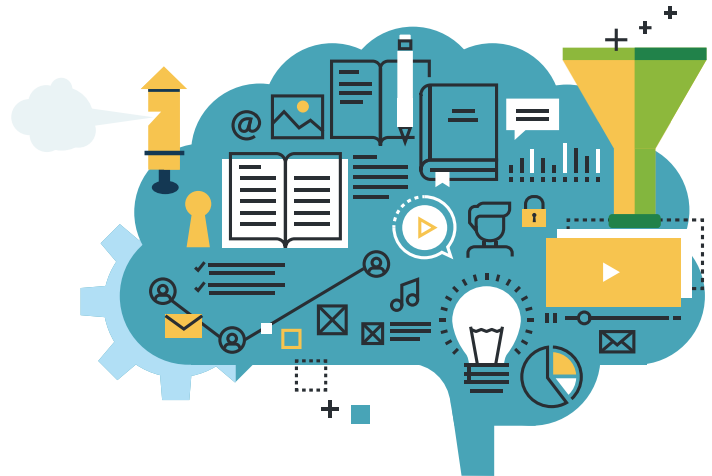
How Microlearning Promotes Retention

The brain does not purge randomly, but according to the principle of "use it or lose it". Unfortunately, there is often a lag between learning and application on the job, and neurological research shows that up to 90% of new information can be lost within a week if no reinforcement mechanisms are in place (Kohn, 2018).

However, forgetting is not inevitable!

Simply pushing learners to recall information and put it to use shortly after the training circumvents the forgetting process and leads to long-term retention. This could mean a quiz question with feedback, delivered via mobile device, or a manager asking the trainee to summarize the main points.

> *Microlearning—often accessed via a mobile device— can dramatically increase retention and memory when delivered as a post-training booster.*

These "boosters" can be very short and simple: research demonstrates that 5-second, 30-second or 5-minute boosters are equally effective (Kohn, 2018). The key is that the intervention asks the learner to make an effort to recall and apply the information, which sends a signal to the brain that this data is useful and should be kept in working memory.

This is where microlearning can profoundly increase the return on training investment. Simply put, microlearning focuses on a single skill or concept. It is typically very short, under 5 minutes, and often delivered via mobile device. Since the complexity microlearning modules can deliver is limited, it is best used in tandem with more in-depth training methods and is ideally suited for post-training boosters.

Examples of microlearning content include:

- A video or animation followed by questions
- A short quiz (even a single question!)
- A discussion question related to the training, perhaps accessed on a social media platform
- A Job Aid or performance support accessed at time of need
- An infographic
- A blog post
- A simple game

Microlearning is quite cost effective if used as part of a blended learning strategy, where live training is integrated with digital elements into a single curriculum.

CONCLUSION

People learn best when learning is social, interactive, engaging and experiential, and when strategies are employed to ensure that new knowledge and skills are retained. Effective training means real changes in performance—the end goal of all professional learning and development programs. Traditional face-to-face training, along with digital tools such as Virtual Reality, gamification and microlearning can optimize the functioning of the oldest learning technology of all—the human brain.

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