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Psychology and neuroscience in learning

Learn about the influence of cognitive styles and neuroscience on effective learning, and the shift away from simplistic learning styles theory

Introduction

Research is continually advancing our knowledge of how psychology and neuroscience can support effective learning. As a result, several neuroscience models are being applied to learning design and delivery, and there's evidence that commonly used models, such as learning styles, are oversimplified.

This factsheet looks at the influence of cognitive styles and neuroscience on learning. It also explores emerging thinking from neuroscience and examines brain-friendly learning models such as RAD, SCARF and AGES. The factsheet concludes by considering the emerging concept of neuroplasticity in learning.

CIPD viewpoint

Research into the psychology of learning and neuroscience is providing significant insights that improve the design and delivery of learning. Previously, too much emphasis has been placed on over-simplistic models such as learning styles, which suggest that a learner has a predisposition to benefit from certain methods of learning.

Recent findings from psychology and neuroscience studies offer new perspectives on how to facilitate learning in a 'brain-friendly' format in which learning transfer and retention is more likely. However, this has yet to be translated into widespread changes in practice, leading to a missed opportunity for many organisations to enhance learning effectiveness. As research in this area is continually advancing, there's a need to constantly assess the validity and application of emerging methods.

The CIPD is at the heart of change happening across L&D, supporting practitioners in providing insights and resources. We are proud to be at the 'epicentre' of this changing

world of L&D.

How do psychology and neuroscience apply to learning?

Applying psychology to the design and delivery of learning has often been limited to a small number of models. And, in recent years, these key models have been critiqued and shown to be too simplistic.

The discipline of neuroscience provides other models and insights into how to facilitate effective learning and there's a growing body of psychological evidence that is giving organisations opportunities to enhance learning effectiveness.

However, it's an area where research is continually advancing so there's a need to constantly seek evidence and assessment of such methods and approaches.

Changes in thinking around the psychology of learning styles

Papers published by Kolb in the 1970s and Honey and Mumford in the 1990s have dominated thinking on the psychology of learning and its application, as provided by Cassidy in this [overview of learning styles](#)

Honey and Mumford's 'learning styles' theory proposes that learners can be classified into four distinct learning styles: activists, theorists, pragmatists and reflectors.

Many learning practitioners have widely promoted and followed the concept of learning styles. However, [learning styles have also been critiqued](#), as they are considered to:

- be an oversimplification of the complexity of how we learn
- have no secure evidential base to support the theory (although it's important to be aware of the limitations of any learning model and the field as a whole)
- be, at best, one of a range of factors determining how learners engage and react to learning, which also includes the environment, context, instructional methods and learning aims
- not result in consistent learning gains
- unhelpfully stereotype learners, which can limit the learner's perceptions of effective learning strategies.

However, the concept of learning styles does highlight that, where practically possible, all

learning interventions need to have a range of methods and ways to access them, as learners will benefit from a variety of delivery methods.

Video: Neuroscience helps us understand how we learn at work

In this interview with Jan Hills, Founding Partner and Head of Heart + Brain, we explore how neuroscience helps us understand how people learn – and change behaviour – in the workplace.

Play Video

Please scroll to the bottom of the factsheet to view the transcript of this video.

How is the CIPD involved in the developing science of learning?

Psychology and neuroscience are becoming the bedrock of learning and development diagnostics. Cognitive insights and neuroscientific findings are much less prescriptive than the learning styles approach.

We included specific questions around emerging areas of insight, and the extent to which employers use various individual and team learning and diagnostic techniques, in our 2012 Learning and talent development survey report. Later in 2012, the CIPD worked with leading neuroscientists and cognitive researchers and called into question the well-known diagnostics of how individuals and teams learn. We began to further explore the latest thinking in the developing science of learning, which is also highlighted in our [Learning in the workplace factsheet](#).

Our 2014 case study report, [Neuroscience in action: applying insight to L&D practice](#), demonstrates the value of neuroscience for learning practitioners and highlights its use as an evidence base for practice, a tool for reflection, and a way to break down barriers.

However, our [2015 Learning and development survey report](#) found that only a quarter of respondents were aware of neuroscience findings and were using them in practice. This presents a significant challenge for L&D practitioners, who need to embrace emerging neuroscience concepts and consider their positive impact on learning design, facilitation and delivery.

Cognitive styles

Cognitive styles are similar to learning styles in that they're thought to be physiologically based and therefore relatively stable. As with learning styles, there are competing and overlapping theories. Although different authors may use different terms to describe them, two of the more widely accepted types of cognitive style are the **verbal-imagery** dimension and the **holist-analytic** dimension:

- **Verbalisers** represent information in the form of words, while **imagers** tend to think pictorially. Verbalisers therefore learn best through text or the spoken word, while imagers learn best from graphic representations of information.
- For the holist-analytical dimension, the organisation of information is the key consideration. **Holists** take a global, top-down view of information; **analytics** break information into its component parts. Holists therefore tend to prefer a breadth-first structure that gives an overall view of a topic before introducing detail. Analytics prefer a depth-first approach, where each topic is explored fully before moving on to the next.

There are various tools on the market for diagnosing cognitive styles, but again there are issues with their reliability and validity. And, like learning styles, what this means for instructional practice is a more difficult question.

Learning to learn

If you accept that it's better to deliver learning interventions in multiple ways at multiple times, you'll achieve better learning outcomes. Perhaps more importantly, those who support people learning effectively can add value by encouraging learners to reflect on how they learn. Most theorists agree it's beneficial to support learners to do this.

An increased awareness of how each of us think and learn, sometimes known as 'metacognition', is therefore perhaps the most important advantage of applying learning theories from neuroscience. Learners who are aware of a range of different learning strategies are more likely to better prepare for their learning experience.

The fundamental difference between the concept of fixed learning styles and flexible learning strategies is that instead of adapting instruction to the learner, the learner chooses the approach that's most appropriate to the task at hand. The issue becomes as much one of learning skills as learning styles or strategies. The challenge, then, is to provide metacognitive support for learners that enables them to reflect not just on what they learn, but also how they have learned something and why.

Models that apply neuroscience to learning

There are a number of models emerging from neuroscience ideas that can be applied to learning design and delivery which we outline below. However, as with any theory related to learning, these short summaries give only the briefest introduction to the thinking behind the models. And, with our knowledge continuing to expand, there are also challenges to these emerging ideas.

RAD

In The neuroscience of joyful education, Willis highlights the importance of learning being a stress-free and enjoyable experience for effective outcomes. She uses the acronym RAD, which relates to specific brain areas and functions, to encourage learning professionals to integrate neuroscience into their practice.

- **R (Reticular activating system [RAS]):** All information enters the brain through sensory inputs but only a fraction makes it through the unconscious RAS filter. Effective learning content should therefore be non-threatening, novel and engaging.
- **A (Amygdala):** The part of the brain's limbic system which acts as a filter to send information to the reactive or reflective areas of the brain. Learning requires reflection, which is supported by stress-free environments in which positive past experiences and strengths are highlighted. Stressful environments should be avoided, which lead to a fight, flight or freeze response.
- **D (Dopamine):** This chemical neurotransmitter, linked to our sense of pleasure, is released during pleasurable experiences. Effective learning is supported by creating positive associations with existing knowledge and past success, and through engaging and creative activities.

Dr Itiel Dror provides further insights about minimising cognitive overload.

SCARF

Rock based the SCARF model on human behaviour, focusing on how the brain responds to threat and reward. These five factors - Status, Certainty, Autonomy, Relatedness and Fairness - have a strong bearing on how we engage in social, interactive and collaborative settings. The model proposes that learning increases as threats are minimised and rewards maximised. Learners display increased engagement when they perceive reward, and less when they sense threat.

- **S (Status):** Learning that's perceived to enhance status (leading to a promotion, for example), will be motivational.
- **C (Certainty):** If we lack certainty about a situation our impulse may be to disengage,

whereas clear steps and a sense of order can increase learning transfer.

- **A (Autonomy):** A degree of autonomy in learning is a key factor in reducing stress, as it means we have some influence over what is taking place. There's a contrary impact if we are denied autonomy; effective learning involves some choice and control.
- **R (Relatedness):** If we feel trust, empathy and social connection during learning, oxytocin is released in the brain, which increases engagement.
- **F (Fairness):** A sense of unfairness stirs hostility and threat, but learning which is perceived as fair and justified is motivational.

AGES

AGES (Attention, Generation, Emotion and Spacing), promoted by Davachi et al, is a model to support effective learning, which we explore in the infographic below. It draws on established psychological principles and proposes that learning is more effective when these four factors are considered in the learning design and delivery:

- **A (Attention):** We need to ensure minimal distractions and avoid cognitive overload; undivided attention is essential for effective learning. Novelty and varied techniques and approaches enhance attention.
- **G (Generation):** We maximise the likelihood of positive engagement and formation of long-term memories when learning has personal meaning and significance. L&D practitioners should relate learning to existing knowledge and support personal, meaningful associations and applications.
- **E (Emotion):** This is a key factor in fostering attention and enhancing memory function. Generating positive emotional experiences and social activities is key to effective learning transfer. Conversely, if learners have a negative emotion associated with learning, such as a fear of failure, they are less likely to engage.
- **S (Spacing):** It's better to distribute learning in discrete blocks delivered over short time periods than cram lots of content into a prolonged session. 'Chunked' learning results in more effective transfer and aids long-term memory.

The infographic below explores the AGES model in more detail.

Neuroplasticity in learning

The concept of neuroplasticity, which is emerging from neuroscience research, suggests that the brain has plasticity and is able to keep developing and changing. There are many examples that show how areas of the brain increase their capacity for processing when regular activity stimulating that function occurs.

This is a direct challenge to the belief that learners can become permanently entrenched in certain thought processes and skills; it defies the thinking that 'you cannot teach an old

dog new tricks’.

[One of the most quoted studies](#) highlighting the potential and impact of neuroplasticity involved London taxi drivers, whose intense learning of London routes (‘the knowledge’) caused measurable development in their brains which changed their brain structure. Our [podcast on behavioural science](#) provides insights on this study, and how behavioural science can be applied in today’s businesses.

For learning practitioners, the concept of neuroplasticity provides an empowering message that learning and progression can take place for those who are willing to engage and work at it, regardless of age, background or culture.

[AGES model of learning infographic](#)

(64 KB)

[Useful contacts and further reading](#)

Contacts

[Head Heart Brain](#) (neuroscience practitioner)

[NeuroLeadership Institute](#) (neuroscience research and practice)

[Professor Shane O'Mara](#) (neuroscience researcher and practitioner)

[Stellar Collins](#) (neuroscience and brain-friendly practitioners)

[Think Change Consulting](#) (neuroscience practitioners)

Books and reports

COLLINS, S. (2015) *Neuroscience for learning and development: how to apply neuroscience and psychology for improved learning and training*. London: Kogan Page.

HILLS, J. (2014) *Brain-savvy HR: a neuroscience evidence base*. London: Head Heart + Brain.

Visit the [CIPD and Kogan Page Bookshop](#) to see all our priced publications currently in print.

Journal articles

DRANITSARIS, A. (2013) Lessons to learn. *Human Resources*. January. pp50-52.

KENNER, M. (2018) Businesses must embrace brain-friendly learning, says neuroleadership expert. *People Management* online. 22 January.

VAN DAM, N. (2013) Inside the learning brain. *T+D*. Vol 67, No 4, April. pp30-35.

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This factsheet was last updated by David Hayden.

Video transcript

Psychology and neuroscience really help us to understand how people learn and how they change behaviour in the workplace.

So, for example, we're beginning to understand that in order for people to adopt new behaviours, they need to adopt new habits. Something like 70% of everything we do, including our job, is habit, so you will not create new habits by going on a one day program or a two day program. That takes a much longer period of time. What this is telling us is learning needs to be more of a process so that we embed those new habits over a period of time so people adopt the new behaviour.

The second way, I think, psychology and neuroscience are helping us to change the way we learn in organisations is by helping leaders understand how their own brain works and how the brains of their followers work. And in understanding this, they can adapt their style and adapt the way they are working with their teams, and helping them learn on the job for example. So one of the ways to think about that is if leaders understand that their people need to know not just **what** they're doing but **why** they're doing it, they can be better role models.

Many learning programs have really told people what you want them to know, so you've either lectured them, or someone's described a new model or a new theory, and people have then been expected to adopt that model or theory into the workplace. What neuroscience is showing us is people are much more motivated to change behaviour, and much more motivated to adopt new ways of working, when they have the insight from themselves. Creating insight is a very different way of delivering information. You need to put it in context for the learner. You need to help them have the experience for themselves of the new understanding, and you need then to help them be able to think

about how they apply that new understanding to their role or their job.

The second way I think neuroscience is pointing us in the direction of a different way of designing learning programs is, for example, how we get people's attention in a learning program and how we get them to retain what they are learning. So we know, for example, that people will remember much more about what they've learnt if they're engaged with it. So you know traditionally we may have had many different learning media in a program - that's becoming even more important. But we also want to engage people to get their attention in terms of what the learning means for them, why is it going to make them more successful. And then I think the other aspect of engagement is how are they going to apply it? So if we help people to understand what the learning means in practical terms in their role, we're increasing the number of neural networks that are linked to that learning, and we stand a much better chance of people than actually applying it. So for example, having clear goals about what they're going to do after the learning event or after the e-learning event, monitoring those goals, getting some sense of reward for behaving differently - all of those things make learning more likely to stick.