Why neuroscience and learning are good companions

Do you know...?

Do you know that when you're curious it's as much of a buzz as a bar of chocolate, a game of tennis or a flutter on the horses? Why do we find curiosity so pleasurable? When we are curious our brains are stimulated by dopamine, a neurotransmitter that works on our internal reward systems; rats find it so addictive they will press a bar to stimulate dopamine receptors in their brains rather than eat, drink or sleep. Dopamine is our own internal reward neurotransmitter, and it's just as addictive for us as it is for rats.

This is wonderful news if you're involved in helping people learn because so long as you can make them curious you're making learning enjoyable and they'll want to come back for more, again and again and again.

Your invitation to come on a journey

I invite you to come with me on a journey of exploration of the inner workings of your brain and body when you're learning. By understanding some of the mechanisms of your brain whilst you process information, learn, remember and experiment you will grow and develop as a learning professional. By understanding some of the neuroscience about the changes that happen in our brains when people learn, you can design and deliver far more effective training sessions, learning environments, lectures, coaching

Figure 1.1 Introduction
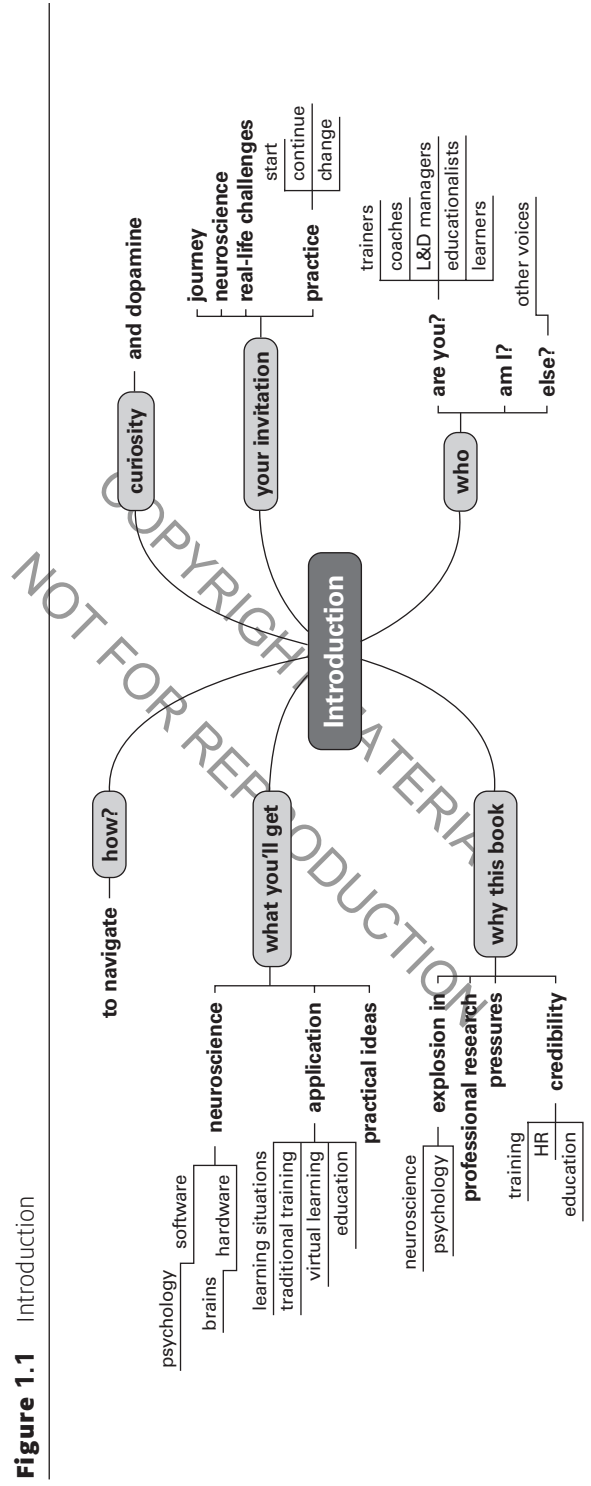
conversations or presentations. And you might even learn to learn more effectively yourself.

We all learn – it's in our human nature – because if we didn't learn, we wouldn't survive. Even the simplest organisms learn in order to avoid being eaten or hurt by predators in a dangerous environment. As we've progressed from living in caves to our current digital age, have we got into some habits in education and training that might be stopping people from learning in the most natural way? With the growing interest and research in neuroscience, the body of evidence to help us devise the most effective learning environments has grown, and it's up to us, as professionals, to take advantage of all that knowledge and new information.

What you'll get by reading this book are practical ideas to implement, in the face-to-face or virtual world of learning, from some of the neuroscience available to us. You'll find research to back up what you're already doing, to inspire you to try new things and maybe even some things that you might decide to stop doing. With this new knowledge at your fingertips you'll increase your credibility with peers and also with your managers, clients or sponsors because you'll have objective evidence to support what you do in terms of changing behaviours, increasing knowledge and improving skills. You'll also be able to influence your learners by explaining exactly why you're asking them to participate in particular activities.

You'll get answers to real-life challenges, like how to get managers to be more involved when people come back from training programmes, how to persuade clients that you can't train an entire new system just with a two-hour presentation and how to motivate and persuade sceptical people that compliance training can be cost-effective and enjoyable at the same time.

Throughout the book I'll start with an outline of each chapter and finish with a summary. Figure 1.1 provides a visual outline, in mindmap form, to tell you about the main elements of this chapter so you can prime your brain to be ready for what you're going to read.

Who you are as the reader

This book has been written for people like you who are learning professionals in a variety of roles and environments. You might be a learning and development manager, human resources director, a trainer in a team, a digital or e-learning designer, an independent trainer, an independent development consultant, working in organizational development, a coach, a teacher, a university lecturer or someone who develops technical knowledge or skills

with colleagues as part of another role. You may be someone who's learning for yourself, either through a formal education route, for work or perhaps even for pleasure, and you want some ideas to keep you motivated, to help you take in information and to make it stick so you can apply it when you need to.

You may train communication skills like confidence, persuasion or negotiation or you may train business skills, presentation skills, leadership skills, supervisory skills or it could be skills related to particular roles like customer service or sales. You might be working with information transfer so you're teaching product knowledge or operational training like health and safety, compliance, or finance updates. You may be creating digital, online experiences or designing virtual reality environments. Perhaps you spend time working in virtual classrooms using webinar or conference technology. You may spend your time working on attitude change and shifts in belief, whether that's at a senior level or more widely in a change programme. Perhaps you're a coach and are encouraging other people to come up with ideas, options and possibilities. You might be working on the shop floor with apprentices all the way through from PhD students to chief executives and you're sure to be working with a wide range of ages, nationalities and cultures. Perhaps you work digitally and design and deliver e-learning, video, virtual reality or online workshops. However you work, whoever and whatever you design for, train or teach, you have one thing in common – you're changing brains, whether that's your intention or not.

And you're probably not a fully trained neuroscientist though you may, or may not, have some knowledge of psychology, memory, learning or educational principles. Like me you are probably curious about new ideas you can pick up to develop your practice and skills; after all, that's why you are reading this book.

Most of the time I'm going to use the generic word 'trainer' to describe readers like you, who help people learn, develop or change their behaviours. It's easier to read than having to plough through trainers, learning and development professionals, human resources professionals, digital designers, learning facilitators, educators, coaches, lecturers or anything else you may call yourself. I hope this works for you; if not, then please substitute your own word every time you see 'trainer'.

I'll refer to learning, training and sometimes education but whichever word I use I'd like you to think about your role as a professional who's there to help other people learn. You can't learn for them; you can only create an environment that makes it easier for them to learn and understanding some

of the results from neuroscience research can help you be more effective. I hope after reading this book you might change some of what you do, develop what you do, start something new or even drop something altogether because you'll have a framework and some evidence to back up and support what works for learners, their organizations and you.

Why this book has been written now

For a long time training, learning and education have felt a bit like the poor cousins of finance, sales and operations; often the first department or activity to be cut when there are cost reductions happening. Whilst not impossible, it is notoriously difficult to measure the return on investment in training because so many other factors contribute to improved performance and so sometimes trainers struggle to get budgets or persuade other colleagues to take their services seriously. I'm sure I'm not the first trainer to arrive at a workshop to be told that one or more of the participants has been called away to an 'urgent operational matter' or that 'I just have to pop out to a really important meeting – hope you don't mind'. It leaves you feeling powerless because clearly everyone else in the environment sees training as a 'nice to have' rather than a 'need to have'.

Some things are harder to measure than others. Everyone recognizes that airline pilots need to be taught to take off and land accurately but there's less emphasis on making sure their skills are up to scratch. Robert Cialdini (2001) in his book *Influence: Science and Practice* talks about 'captainitis': the tendency for other crew members to allow their own expertise, training and common sense to be overridden by the lead of the captain, often leading to serious errors and even crashes. If they were given more training in the so-called 'soft skills' of recognizing and challenging human behaviour it is possible they would avoid some of these accidents.

Happily now there is more evidence for the value of people skills, which includes the design, training and teaching skills that you have. A research report published in 2015 (AllThingsic) suggested that people skills are worth £88 billion to UK industry alone, so there is more evidence mounting that training in these areas is vital and training the trainers ought to be at the top of that list.

And of course we've now got the neuroscience research, data and logical analysis to show that soft skills aren't soft at all. They are grounded in neuroplasticity, priming, memory research, cognitive psychology, social

psychology and the nuts and bolts of what goes on in your head when you communicate with someone. There are numerous books published now about neuroleadership, neuroeconomics, and how your brain works at work and organizations are beginning to recognize that how we learn is just as important as what we learn. The Chartered Institute of Personnel and Development (CIPD) brought out three research reports between 2012 and 2014 describing the impact that neuroscience is going to have on learning. In the third report Neuroscience in Action (2014) the final conclusions say:

> Despite the great case study examples featured in this report, we have found that there are very few organizations openly using neuroscience in practice. There are two explanations for this. Firstly, perhaps it is simply too early for widespread adoption, and there is a knowledge–application gap. Or secondly, that many of the overall principles of neuroscience are finding their way into L&D practice, without being labelled as such.
>
> (*Neuroscience in action: Applying insight to L&D practice* (2014))

Bringing you up to date in this second edition, the CIPD and other bodies now actively promote the practical application of neuroscience as one of their core topics and are working to bust many neuromyths and older, less evidence-based models of learning. So this book is here to help fill some of those gaps.

The reasons I'm interested in the neuroscience of learning

This area fascinates me because I'm curious and was brought up asking questions about learning. A long time ago my dad, who was a teacher, brought home some coloured, wooden blocks to help me with my 'number bonds' because I was struggling with multiplication. I remember the feel of them, the bright colours, the sound they made as you shuffled them around and even the smell. Using those blocks helped me get past the struggle I'd had with numbers; and I still do multiplication by working in blocks of numbers. Having a dad as a teacher meant we talked about learning a lot at home and my dad knew that children needed to be 'doing' to learn, but his methods weren't always popular and he didn't have lots of measurable evidence to back up what he said – apart from the children who flourished. So I spent years listening to my dad and unconsciously learning about how people learn, but there was no way I was going to be a teacher because most

of my experience of formal learning was essentially someone talking and writing key points on a blackboard – commonly known as 'chalk and talk'.

At university I studied Psychology and Communication and became fascinated by how our brains work; both the real physical hardware and the processing or software. But despite the interest in brains I took a tangent and began my working life as a computer programmer. Like many others at the time I endured multiple two-week-long training courses, most of which we sat through just itching to get back to work so we could experiment for ourselves and really get on with learning. We didn't find being talked through screenshots any more effective as a learning tool than the chalk and talk method.

My career took me in the direction of technical support and eventually I was given the role of 'Training Manager' which I didn't really want because my experience of training so far hadn't been engaging and I didn't want to inflict similar experiences on my colleagues. I had kept up to date with the world of psychology though and was curious to see how psychology might be useful but didn't have a clear route to making training more engaging until, at a training exhibition, I came upon a pirate ship! The pirate ship was full of trainers who used accelerated learning methods to train subjects that some people considered traditionally boring, like finance and accounting. But these 'pirates' brought their subjects to life and made them a) fascinating and b) easy to learn. Suddenly I realized there was a way of bringing psychology and neuroscience into the training room and I'm still hugely grateful to them for catapulting me into the fascinating, exciting and collaborative world of learning. Since then I've worked with thousands of people and many trainers keen to introduce brain friendly learning to their working methods. I created the Brain Friendly Learning Group as a way of sharing research, good ideas and challenges and people have been asking whether there's something they can read that brings it all together.

I want to share research, stories and practical examples of how neuroscience is already being used in training and learning and to stimulate new ways for you to implement them in your practice – wherever and with whoever that may be.

This is just the start of a journey for all of us who teach others and I'm still curious as to what else we can learn, how we can apply it and what the results are for our learners, organizations, communities and perhaps even nations.

The definition of neuroscience for this book

It seems that neuroscience has changed over the years. When I talk to people who studied psychology in the 1980s at about the same time as me, the view is that it was about the actual brain and how it works. It was seen as the science of what could be observed and measured in the physical brain and nervous system; it was the electrical and chemical activity, the anatomy and structure and the neurotransmitters and hormones that had an effect on the brain. Neuroscientists might record from electrodes placed in the nerve cells of snails and other simple organisms in order to understand how neurons worked. They'd devise mathematical models for the transmission of electrical signals in neurons of the giant axon of a squid. They'd mess about with the brains of rats and see what that did to their behaviour and they'd dissect brains to identify the structures or look at brain scans to identify activity in certain areas; in short the biology of how the brain works.

However, in recent years this definition has expanded considerably. Wikipedia suggests it's now 'the scientific study of the neurosystem'; and it's become a blend of many disciplines including psychology, physiology, philosophy and even computer science, engineering and physics. It may be that it's the brain scans that have expanded this view of neuroscience. Some research suggests that people give more credence to pictures of brain scans than any number of equally useful cognitive psychology findings so other scientists interested in how brains work may have picked up the 'neuroscience' label almost to validate their own findings with the general public (Munro and Munro, 2014).

What you'll find on this journey

In this book we're going to take this wider view of neuroscience because some of the studies that help us understand learning and training are behavioural, cognitive and social rather than purely biological, and therefore you'll get a far wider and more realistic view of the information that's currently available to us. (See Chapter 2 for more about neuroscience.)

As you read through you'll come across some of the slightly messy, squidgy hardware of the brain. The hardware relates to the biology and physiology of your brain, your nervous system and the chemical interactions of neurotransmitters and hormones.

You'll also delve into some of the software of your brain as it relates to learning and what cognitive psychology, developmental psychology and behavioural psychology have to say about learning. What's the latest in memory research? How will an understanding of social psychology help you create more effective learning environments, whether face-to-face or digital? How does your conscious and unconscious awareness of the world around you affect what you perceive, how well you learn and how you behave?

The focus will be on applying this neuroscience to the practical world of learning, education and training. How will you improve people's memory for information? How will you help people develop new habits? How can they forget old ones? How can neuroscience influence such old chestnuts as how to get managers involved in training and how do you design and train technical or compliance topics without being boring or getting stuck in the detail? What can the world of digital and virtual learning pick up from the application of neuroscience (despite the advances in technology you are still working with physical, messy brains that haven't changed much over the millennia)?

I urge you to use this book as a starting point and to go and read blogs, papers and other books that expand on the subject. Talk to your colleagues; mix with neuroscientists and other academics; take part in discussion groups; attend conferences; attend un-conferences and challenge, question and experiment yourself. Do whatever you can to improve your training and to help other people learn. Learn how to exploit and apply scientific secrets for learning success.

Other Voices

You're also going to hear from some other people who work in some of the same places you work in – people who have applied ideas from psychology and neuroscience and have tested them in their environments. I've asked them to contribute in their own words so that you get the story direct and I hope you find them inspiring and enlightening and they would like you to borrow and share their ideas too. Many of them will use the term 'brain friendly learning' which I'll define more fully in Chapter 4. Some of them have applied the ideas more broadly than just in a learning environment and find they have pervaded much of what they do both at home and work.

Here's your first 'Other Voice'. Pam Welsby runs a training consultancy in Slovenia and is one of those people for whom thinking about how people learn and think has pervaded her whole business.

Other Voices

Pam Welsby, *CEO and Founder, Fast Forward International*

More than 20 years ago in the East Midlands, I was first exposed to Accelerated Learning which immediately fit with my training style of Learner Centred, Highly Participative and Interactive.

Many years later, now running my own Learning Consultancy throughout Central Europe, I was searching for some further development in this field and found Stella Collins and Brain Friendly Learning. I convinced Stella to come to Slovenia and she provided the Brain Friendly Learning for Trainers programme for my team and some of our customers. I loved it.

This fresh and updated approach inspired me not only to think about how we could upgrade our training and development style and approach, but also how we could integrate the principles of Brain Friendly Learning into our brand, and our approach throughout the total sales, marketing and learning processes. This, I could see, was a key way to differentiate us in our market whilst also inspiring our clients in every contact with them to understand and realize the importance of aligning learning and communication with how our brains work, how we learn as human beings and as unique individuals.

So, two years later, I have now developed a sales process that includes documents and offers for the client that make use of colour, pictures, images or symbols to more simply explain and show our way of working. In sales presentations to clients we never actually present, but take toys and touchy feely items to make certain points, use posters and activities to let them experience our approach and utilize more of their senses and even use music to get them in the right 'state' for our short time together.

In our first contact with our potential customers we seek to immediately share something about Brain Friendly Learning and how this is an integral part of our way of working and how and why it works. We created a marketing campaign that did not directly sell anything, but more challenged their thinking and introduced a more creative way of working. The campaign consisted of e-mails, letters, and phone calls but also included sending them a postcard, a free book about change, a pencil and brain (for when they needed some extra brainpower) and some of the communications we sent included how our brains work, the impact our beliefs can have on our actions, how we each perceive the world differently and much more.

All of this is a precursor to the experience they have when they come and learn with us, where we also work hard to incorporate more and more of the brain friendly tools and techniques, but starting to use it in our sales and marketing activities also has a positive impact on our clients and increases the chances of them choosing us as their learning partner.

A start on the 'How can I...?'

You've already discovered that dopamine is released when you are curious but how can you make people curious and is there a discernible effect on their learning? Will questions like this one help? Let's explore a piece of genuine scientific research and a much more practical piece of research in a real learning environment and see what we come up with that you can use in your environment.

When you're asked a question do you try to guess the answer? Or do you encourage others to guess when you're asking the questions? Is it good practice to guess or is there a danger that people might guess the wrong answer and then remember it?

It seems, perhaps counter-intuitively, that we learn better after guessing, even if we guess the wrong answer first. Researchers at the University of California (Yan *et al*, 2014) tested whether people learned better when they were shown two linked pieces of information or had to guess the answer to a question such as 'What is the capital of Brazil?' They had either to guess the answer for 8 seconds and were then shown the correct answer, Brasilia, for 5 seconds, or they were simply shown the linked information 'Brazil – Brasilia' for 15 seconds. Which condition do you think improved the recall of the correct answer when people were tested later? It turned out that even when people guessed the wrong answer to the question, often Rio de Janeiro, their recall was better than when they'd simply been shown the correct information. And this effect persisted for up to 61 hours afterwards (they didn't measure any further than that).

We put this theory to the test in a 'Brain Friendly Masterclass' workshop (thank you to Sue Daly of Resolution for Change for asking us to participate in her experiment) and our experience seemed to tally with the research. In our small-scale experiment we were first asked a difficult quiz question and told to guess the answer, but not to reveal it. Then we were given another guess at four options. Finally we were shown the answer to check if we were correct. We identified those questions we'd guessed correctly and those we'd guessed wrong.

Four hours later, after a significant amount of other new information, we were tested again on the same questions. Whilst ours wasn't a scientifically rigorous experiment the results were broadly similar to those of the researchers; we could remember the correct answers we'd guessed at four hours later. The current explanation for this finding seems to be what's called 'semantic activation'; whereby a mental 'web' of knowledge and facts associated with

the correct answer is activated and leads to better storage of the correct information. The researchers at the University of California said 'The basic idea is that this [guessing-related] activation… affords a richer encoding of the subsequently presented target'.

A question that arises is, were people curious as they guessed as to which was the right answer and did that release a shot of dopamine which somehow made the facts more enjoyable and more memorable? We don't know because that wasn't being investigated by this set of researchers and you can't create hypotheses in hindsight, but it's an interesting thought.

So what? – takeaway ideas to experiment with

Let's start to put this into your context. Scientific research is all very well but what does this mean for you in a practical learning situation?

Try this experiment: rather than telling a colleague something at work and expecting them to remember, instead ask them a question and invite them to guess. Whether they guess right or wrong show them the correct answer. The research indicates they'll remember your information more accurately if you encourage them to guess first before revealing the correct information. And it doesn't even matter if they guess wrongly at first – so long as you present the correct information quickly after the guess there's a stronger possibility they will remember it more accurately later.

This is also an easy tactic to implement in a digital environment. Ask the question and prompt the learner to guess before they click on or reveal the answer. You don't even need to record whether they got it right or wrong because guessing itself will improve their chances of remembering.

How to navigate this book

If you've got plenty of time or this is really important to you, read the book from beginning to end. Each chapter has an overview, research nuggets relating to the topic and you'll find 'curiosities' – pieces of research that are fascinating, potentially challenging or just seem to be unexpected for our current levels of knowledge.

There are stories and case studies because the research shows that humans relate to stories which are usually more 'sticky' than facts, though there'll be

plenty of facts too. There are plenty of questions to stimulate your thinking and help with memory – can you remember what neurotransmitter is released when you're curious? There are takeaways, top tips and ideas to experiment or try out – ideas you can implement with your learners. Some will be specific to particular areas of learning or training and some will be more generally applicable, whether you're working face to face, digitally or remotely.

At the end of each chapter you'll find key points to help you summarize what you've read in order to boost your memory.

Alternatively you can choose to dip in and dip out, choosing chapter headings that relate to what you do, or perhaps use the summaries or headings as another way of identifying what that chapter might hold for you, based on your role and interests.

If you choose to go through in a chronological order you'll explore some of the neuroscience basics, some of the terminology and ideas that relate to learning and we'll also question what to do if someone decides to blind you with science or 'neurohype' and tells you 'research says'. After that we'll consider some of the key areas in the process of learning and what evidence there is to show us how people pay attention, adapt to different ways of learning or create strong memories. You'll also discover the neuroscience behind some of the other areas that might affect learning like the face-to-face or digital environments or the impact people like managers can have on successful learning.

Summary

The most important things you've read about in this chapter:

- Dopamine, a brain chemical, is released when you're curious – it's addictive.
- You're on a journey to find out what neuroscience can help you with in practice.
- Neuroscience is achieving a wider recognition in training and learning fields.
- Neuroscience is a broad topic covering many aspects of how our brains work – we're going to concentrate on practical applications to learning.
- Asking people to guess an answer helps them remember better.

You can choose how you navigate through this book.

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