The Biology of Learning – A Veggie Tale

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Declarative memory refers to those memories that we can communicate. We can talk or write about memories that have happened to us and facts and places we recall (1). There was some thinking that, once a memory was formed in the brain, it was immovable and unshakeable, kept unchanged in long term storage. However, it appears that this is not the case. If a memory is recalled, for whatever reason, it adopts the characteristics it had at first formation; it is flexible, adaptable and amendable (2).

This amendability is interesting in terms of learning. With this old memory out on the table, we can add to it.

Let me explain.

I took myself off for a short gardening course this week at a local nursery. The topic was vegetable growing and I needed a little bit of inspiration as to what to do with some raised beds in my garden. The two hours was happily spent in discussion with group members and the tutors as we shared tips and tricks for helping a plant to not just survive but also flourish in our vegetable patches.

Kale was mentioned as an option. Now, I have two memories of kale. One is from 3 years ago when I successfully grew a crop that could be cooked deliciously with butter and nutmeg. The other is from last year when the cabbage white butterfly beat me to it. The caterpillars ate the lot and I resorted to purchasing bags of supermarket kale that, well, just weren't the same.

As I started to consider kale again, I was reminded of both these facts as, according to research, my brain had cleverly added the second memory to the existing knowledge of the first memory (3).

I hadn't completely forgotten this issue though as it is an important one for me. The brain prioritises keeping hold of memories that are emotionally relevant rather than neutral ones (4, 5). I adore kale as a veg and the thought of all those buttery spicy aromas was enough impetus for me to ask how I could resolve the caterpillar problem (6). The tutors took us out to their vegetable garden and showed the protective measures they have in place – plumbers' pipe and netting – over their brassica seedlings. The plants had been covered as soon as they were transplanted from the greenhouse.

Throughout the morning my brain's hippocampus (along with a few other structures in the medial temporal lobe) would have been creating and consolidating this new declarative memory of netting the vegetables but also making connections between the other two previous learning episodes I mentioned. However, it isn't just blending the three memories though (2). It uses these new relationships to make inferences about next steps. This new memory gets placed into a mesh of existing experience and the new 'whole' is used when navigating future judgements and events (8)

In this case, all three memories now linked (7), I did two things; I headed home with kale plants bought at the nursery along with a determination to copy what I had seen. They say the fruit of the pudding will be in the eating. I'm hoping that will occur on my dinner plate rather than a repeat enactment of Eric Carle's 'The Very Hungry Caterpillar'!

How does this relate to classroom learning? For me it appears that, due to the ease of amending a short term memory, if we are asking a child to recall a declarative memory, say a fact such as 2 x 5 = 10, we should then expect to build on it. What would we need to add to that fact that would then help them navigate new problems to solve?

I watched a trainee recently revisit halving and quartering. Her Y1 class had grasped how to symmetrically halve simple shapes such as a circle and a square and some had coped with quartering. She now wanted to try halving quantities. She revisited halving shapes and the children could also spot shapes that hadn't been halved, but had just been split into two unequal sections. They were secure in that halving meant two equal sized shapes.

She then took them into the hall and asked them to arrange themselves so that half of the group were stood in 1 hoop on the floor and the other half sat in another hoop. She talked about equal numbers in each. They went on, in pairs, to split numbers of cubes into 2 equal portions. She repeated the activity a few times by giving them different numbers of cubes to share equally. She finished by asking the children to stand on numbers she had placed on the floor that were half of a number she called out. For example, they all found a 5 when she said 10.

We had a good conversation after the lesson about the children who were now independently secure in halving simple shapes and numbers to 20 and those who still needed support. She was already planning a subsequent lesson to build on the declarative memories around halving that each group of children held in their heads. Each group would have something slightly different to do in order to build on the new reconstructed and consolidated memory.

The lesson worked well because she knew the starting point for each group, the memories they had of halving, from work they had previously done. She also knew, from National Curriculum guidance, what knowledge they needed to take on next. She knew from experience the beneficial effect of various hands on activities and used these to encourage memory recall as well as introduce new concepts.

Her own hippocampus had clearly been working hard and it appears to be a wonderfully infectious activity if the children's learning behaviour was anything to go by! However, will they remember this after a period of time?

It is the repeating the retrieval and consolidation of new and old memories, as this trainee had done, that makes a memory durable (2). How much and how often though does this fixative need to be applied for it to be memorable? Does practice make perfect? Does rote learning have its place? And why do some of us appear to have better memories than others?

If I remember, that could be my next area of study…..

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