brain & behaviour

It's important to make the right connections as quickly as possible, says Susan Greenfield

You have just introduced the topic of complex numbers to your maths class. After marking their homework, you are fully aware they haven't really grasped the concept. The thing that is probably furthest from your mind is contemplating how their brain cells are connecting (or not). But insights from neuroscience suggest that making pupils aware of how much, or how little, they have grasped straightaway could be vital.

One of the major jumps in neuroscience understanding over the past 20 years has been an appreciation of the flexibility - or plasticity - of the brain in response to experience. It is now widely assumed this ability of the brain to learn is a result of changes in the strength of connections - or synapses - between networks of brain cells.

As early as 1949, Donald Hebb, the psychologist, proposed a theory that has become a backbone of modern neuroscience and a key mechanism for learning and memory in the brain. He said that if one neuron repeatedly causes the firing of another neuron, the efficiency of the connection between those cells increases. In other words - neurons that fire together, wire together. As we are repeatedly exposed to a new stimulus, the efficiency of the connections between neurons associated with that stimulus increases. The next time you encounter
stimulus, those neurons will have an enhanced response.

We have just completed a pilot project at The Institute for the Future of the Mind in Oxford which explores how knowledge from cognitive neuroscience could be applied to support teachers’ decision-making in the classroom. A group of 20 Advanced Skills Teachers (ASTs) investigated scientific concepts in areas such as attention, memory, creativity, emotion and development disorders.

Throughout the project, the process of brain plasticity has turned out to be a powerful paradigm for learning and education. The group members realized that as they introduce new concepts in the classroom they change the strength of connections of synapses in the brain.

Indeed, we discussed whether teachers are the only professionals required to change brain connectivity every day.

But how does this help you with your maths class and pupils’ grasp of complex numbers? While discussing the concept of brain plasticity and neural learning mechanisms with the ASTs, one of the key ideas that arose was possible personalised feedback in the classroom.

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Clearly, not every pupil is going to grasp each new concept immediately. However, the mechanism of brain plasticity supports the good practice of showing pupils precisely where and how they have understood a particular concept, idea or process. If a pupil is not made aware of their misunderstanding immediately, they will continue to use neural networks associated with that misunderstanding.

The longer they continue to use that network, the stronger and more embedded that network will become.

Personalised feedback provides pupils with an appreciation of their understanding and encourages them to strengthen neural connections associated with the correct understanding. The sooner they reinforce the correct network, the more likely they are to embed that learning.

During the programme, we stumbled across a number of examples like this, where the science behind learning supported their experience-based understanding of good practice. As one member of the group said: “The project has made me challenge some of my assumptions and led to some new approaches in the classroom. It has also provided some of the scientific roots behind the things I already do, giving me confidence in my methods.”

One of those methods is working through homework with individual pupils and getting them to explain what they understood. This takes time but, as neuroscience suggests and the teachers found, it is time well spent.

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