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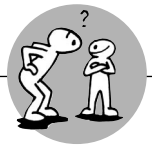


Understanding the child's brain

In this section you will:

1. Read the answers to some frequently asked questions about brain-based learning;
2. Visit a pre-school, a nursery class and a reception class where the practitioners work using brain-based learning techniques;
3. Meet four young children in these three settings, who will become quite familiar to you as you read through the book.

Step 1: Answering some frequently asked questions

What exactly is 'brain-based learning'?

'Brain-based learning' is a term used to describe how to apply theories about the brain to help children to maximise their potential for learning. Once you understand the theory behind brain-based learning, you can put its various aspects into practice and enhance the learning of the children in your care.

Is this a scheme that means that I have to start to work more formally with the children in my setting?

Absolutely not! Brain-based learning is not a scheme or a curriculum. It is a method of working that derives from an understanding of the current research into how the brain develops. We know that young children learn best through play, and the techniques that are described in this book should be incorporated into the work done on the foundation stage curriculum.

Will I need additional resources to implement brain-based learning in my setting?

You should not need to make any major purchases to implement the techniques that are described in this book. Most of your work will simply involve being creative with the resources that are already available.

Will implementing these techniques increase my workload?

Using these techniques will probably involve different work, but not necessarily more work. Brain-based learning is simply a more informed way of teaching. In fact, because you will be enhancing the learning of the children in your setting, the same time commitment should lead to far greater productivity.

If I implement brain-based learning, will it necessitate major changes of policy within my setting?

Implementing the techniques in this book should not necessitate any additional paperwork or radical alteration of current policies. Practitioners find that once they gain a better understanding of the brain and how it works, they may need to reconsider and improve upon some of their ways of working, but this does not necessitate major policy changes in most cases.

How do brain-based learning techniques fit in with the literacy and numeracy strategies?

Different practitioners implement the literacy and numeracy strategies according to their individual situations. In Part Two we discuss how to structure the more formal sessions, but brain-based principles, such as using movement, music, and visual, auditory and kinesthetic learning, apply equally to the formal and less formal sessions.

Is brain-based learning just the latest fad for education?

Brain-based learning is not a 'fad'. If the practitioner understands how the brain learns, then her teaching will be more informed and more effective. In this book you will find descriptions of the current research into how the brain functions, along with suggestions of techniques that will help to maximise children's learning. It is simply not possible to learn in a way that is not brain-based!

Step 2: Let's meet a brain

> To have a good brain, first you have to exercise and then you must eat lots of apples.
>
> Owen, aged five

In this chapter we are going to meet a human brain and learn a little about how it works. In other words, we're going to get the hard bit over first – but don't let this put you off! The intent is simply to provide a very basic overview of the major components of the human brain. Later, we will use this information as a reference point, allowing us to more easily visualise what is happening inside the minds of children as they undergo the enriching, brain-based learning experiences described in this book.

> *When it comes to building the human brain, nature supplies the construction materials and nurture serves as the architect that puts them together.*
>
> Ronald Kotulak[1]

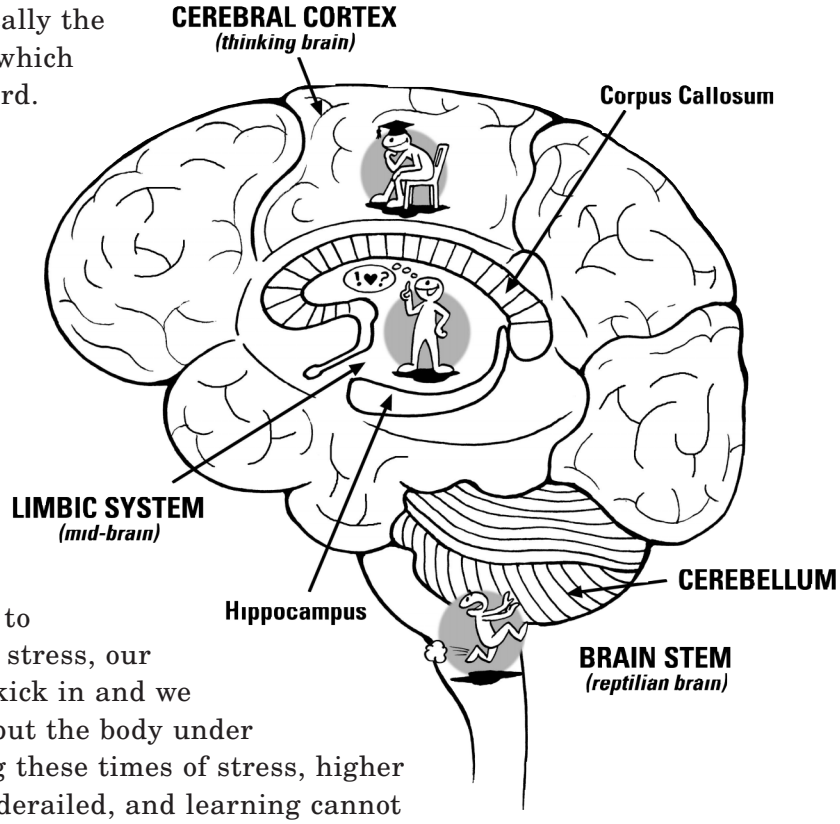
Over the years, experts have developed numerous theories about the nature of intelligence and its relationship with two powerful and sometimes conflicting forces: nurture and nature. Recently, researchers have made more progress than ever before, and the mysteries of intelligence have begun to unravel. For instance, scientists have recently managed to count the numbers of brain cells within specific areas of the brain and can calculate the phenomenal number of interconnections that are made as these cells communicate with one another. Scientists now have technology that allows them to look deep inside the living, functioning brain and observe electro-chemical activity as thoughts and emotions are developed and processed. As the mysteries of the brain are unravelling, many long-held theories are being disproved and new ones developed.

What is becoming increasingly clear is that the first few years of life are the most critical in terms of physical brain development. The most significant period for the wiring of the brain is during these years. Typically, this process is nearly complete by the age of 12. We now know that there are various windows of opportunity for learning between birth and the age of three or four, but that nature gives a child's brain a second chance between the ages of about four and 12. This means that an enormous responsibility lies in the hands of parents and early years practitioners.

At the micro level, the human brain consists of about one hundred billion nerve cells, called *neurons*. These neurons can be thought of as very simple data processors, which work together to solve a particular problem as it is presented to the brain. The human brain is able to easily perform tasks that the largest, most expensive computers today find impossible to accomplish. Some everyday examples of these tasks include understanding spoken human language, identifying objects by sight, sound, smell, touch and taste, and writing and understanding literature. Whereas computer processors typically attack problems sequentially, one piece at a time, the power of the human brain lies in its ability to orchestrate the activities of billions of individual neurons working together. Thus, the human brain can be likened to a symphony conductor.

Neurons develop *dendrites* for transmitting information to other neurons and *axons* for receiving information. As patterns of thought are first initiated and subsequently repeated, the participating neurons continually process and communicate. In doing so, they build stronger and more direct dendrite-to-axon pathways, called *synapses*, to other neurons. In other words, with repeated stimulation, these connections become even stronger and more established, and the brain has in effect 'learned' how to solve that particular problem. At this point, the brain is ready to undertake further learning. Interestingly, those neurons that do not generate synapses quite literally die off.

At the macro level, the brain can be thought of in three parts: the *brain stem*, the *limbic system* and the *cerebral cortex*. These parts of the brain are divided again into specific areas, each with an individual and complex role to play. Some areas process information gleaned from the senses, while others process different aspects of our emotional responses. Some are responsible for laying down certain types of memory, while others help us to 'read' cues from other people and make appropriate emotional and physical responses.



The brain stem is physically the lower part of the brain, which connects to the spinal cord. The brain stem and cerebellum are often referred to as 'the reptilian brain'. This part of the brain is primarily responsible for the body's survival systems: for regulating our life support mechanisms such as heart rate and breathing, and for what is known as the 'flight or fight' response to perceived danger. Under stress, our basic survival instincts kick in and we produce chemicals that put the body under heightened alert. During these times of stress, higher order thinking becomes derailed, and learning cannot take place effectively. It is for this reason that ideal learning environments are those that reduce a child's stress level to its absolute minimum.

Between the brain stem and the cerebral cortex is the limbic system. This is sometimes referred to as 'the mid-brain'. The limbic system consists of several structures that manage our emotions and are responsible for some aspects of memory. The lower structures of the limbic system control our more basic emotional responses, while the higher ones are responsible for making a more intellectual response. For example, if you were to hear an unfair criticism of your work, the lower areas of the limbic system would deal with your more spontaneous responses such as blushing or shaking, while the higher areas would process the social issues that might help you to make a measured response to your critic. This makes sense, as the higher parts of the limbic system are in closer contact with the cerebral cortex, where the most sophisticated thought processes take place.

The cerebral cortex is the largest part of the brain. It is sometimes referred to as 'the thinking brain'. The cerebral cortex is physically separated into two hemispheres, rather like two halves of a walnut. Scientists are constantly discovering more about the left-right relationship. Communication between the two hemispheres is needed for even simple tasks to be undertaken. For example, when listening to a piece of music, the left hemisphere is responsible for identifying the