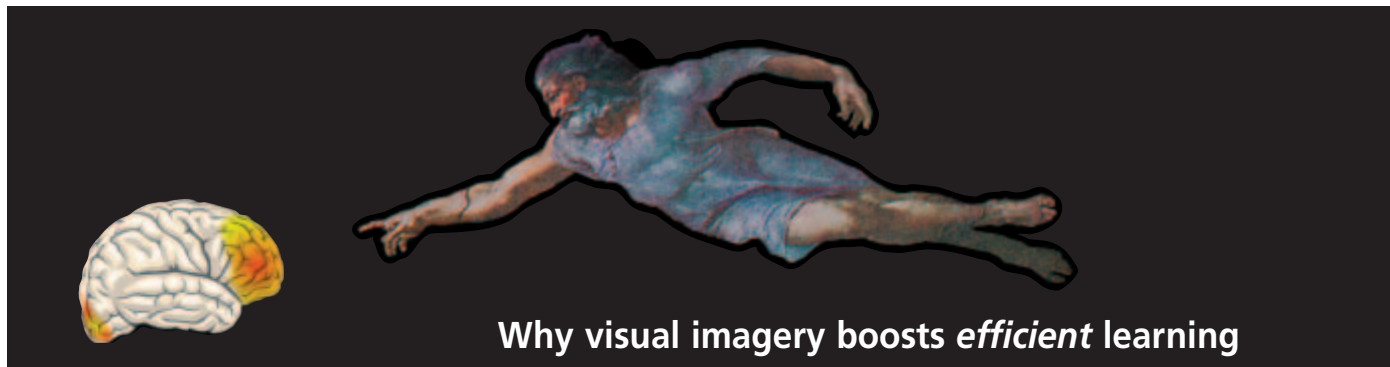


The frontal brain lobes ‘the home of human reason’

The frontal lobes evolved for executive functions such as logical thinking and planning. Our “think-centre” is located here and with it a *working memory*, the contemporary term for short-term memory. It retains brief and limited amounts of new information, allowing for assimilation with existing material in the long-term memory which is distributed all over the brain. Language also supports thinking. Eyes have been used to survey the surroundings for over 400 million years. They have structured the neural network to interpret information; this is true

for primates and hominids. Specific brain areas for human language abilities have evolved over the last 100,000 years. We now translate and express images, feelings and thoughts into words and sentences. Neurological scans of thinking brains reveal activity in the parts associated with language as well as vision. Language is able to create connections between mental images and allow us to add abstract values and changes in meaning. In thinking, it seems that language is linked to vision and an idea is often a mental image with visual characteristics.



As on the cover of: *The Executive Brain - Frontal Lobes and the Civilized Mind*, E. Goldberg, Oxford University Press, 2001

Not language, but images

The evolution of the frontal brain lobes together with the language centre can be considered as the neuro-physiological basis for the rise of higher civilisations. Until recently, the notion prevailed that language allowed for consciousness and that humans could only define and understand the world in terms of language - consider Noam Chomsky's famous theories. But people with serious speech disorders, or even aphasia, are able to think and can carry out purposeful acts. For such reasons neuro-scientists and cognitive psychologists believe the role of language within thinking to be similar to communicating with other people: words are symbols reversing between the non-language thinking processes which, carried by conscious or unconscious emotions, merely take place in images and abstractions. Words as symbols may differ, as *language* does in

every culture. Thus language can be a powerful catalyst of emotions; via the imagination it can create new realities - throughout our life, our brain effortlessly generates appropriate visual images. A few well chosen words can multiply the meaning a picture. Moreover, the role of *conscious* thought is now considered to be much less important than was assumed hitherto, just like the role of language in the thinking processes.

It is no coincidence that the *spoken* is losing its traditional, central role now that new technologies facilitate teaching through *visual* learning techniques. Students who learn easily through listening or reading use powerful imaginative skills to translate new information effortlessly to mental images in the brain. Nevertheless, it is beyond doubt that audio-orientated students also benefit from visual information presented by TV, books and the new media - as well as the so called ‘visually orientated’ students who need to visualise concepts to learn and understand.



Extra important in *bilingual* education

The above explains why image language is (virtually) the same all over the world and easily understood by all students. Videos, charts and transparencies are simple tools to let your students see what you mean at any moment.

Visualisation: students see the meaning of the word

Children taught in a language other than their native tongue face double learning problems because they have to make a double shift. Research shows that new information presented in another language is first translated into the native language in an intuitive manner, symbol to symbol. Only then is an attempt made by the student to understand it by creating mental images. Children with language difficulties, such as dyslexia, experience extra problems in a bi-lingual situation because of the urge to translate the words into the native language first.

Images in levels of learning

Similarity between thinking and seeing

When the eye ‘sees’ something unfamiliar, the image passed on to the brain will be in detail, in so far as it seems important. When the eye ‘sees’ something familiar, the *observation centre* only passes on an abstraction. The more familiar, the more abstract: you hardly notice your own house when you come home, unless you pay special attention. The same applies to thinking: well processed knowledge and understanding engage the thinking process through abstractions (which may then be enhanced or checked with images stored in the memory). To process unfamiliar ideas, the *thought-centre* requires concrete images for thought formation and understanding.

We understand in images

In many cases you only understand something when you can see what it means, when you form a mental image. Abstractions are often translated into images. For example, we create mental images to help us understand concepts such as air pressure, war or models of society. For many, the *feudal pyramid* forms the basis for a wider understanding of the notion of ‘feudalism’. In this way mental imaging expresses the ability of our brains to capture and process large quantities of information; it also makes it obvious that the neural system needs it.



Insight - thanks to the image

If something is explained but no image comes to mind, then you might not have understood the concept. Often when an image does come to mind, a concept seems to be clear: you think you understand it. This image is then stored, most likely in the *visual memory*. It becomes a key for future recall and the basis for further insight and thought development. By classifying we bring order to stored images. We bring structure to schemes and thus to our reality, by using stories, theories or religion, according to our socio-cultural context.

Images as keys to the memory

Scents easily awaken a memory because in the brain the senses of smell and memory are sited next to each other. Sea air brings to mind that first romance at a beach. Emotions and colours occur and images appear: the visual memory is activated. Gradually the memory of past experiences clearly come to mind. The more familiar the memory the more abstract the representation will be. Moreover, the content of the memory changes through learning and experiences. In his final year a graduate has a different understanding of a trapezium than has a first year pupil.