The Learning Brain

Round tables

Since 1999, a project 'Learning sciences and the Brain' is run by the Centre for Educational Research and Innovation (CERI) which is part of the Organisation for Economic Cooperation and Developement (OECD). The project has resulted in substantial collaboration across disciplines in the domain of Brain and Cognitive sciences and between scientists and educational professionals in many countries in Europe, North America, Australia and Japan. A website on the domain of Learning sciences and the brain has been set up and run by CERI[1]. Round tables are published on this website on issues related to the core subject. The following experts have been interviewed: John Gabrieli, Thomas Insel, Michael Meaney, Terry Robinson, Steven Peterson, Kuniyoshi L.Sakai, Art Kramer, Rudolph Tippelt, Nuria Sebastian Galles, Masao Ito, Jelle Jolles, and Denis Ralph. The present report contains the interview with Jelle Jolles[2], professor of Neuropsychology & Biopsychology, University Maastricht, the Netherlands. The interviewer is dr Emile Servan-Schreiber (Paris, CERI). All interviews can be found at the internet address given below[3]

***Q :** Are there significant differences in learning styles between male and female brains, and should they be taken into account in a school setting?*

Jelle : Yes, there are many differences. Take, for example, a child of eight with three brothers aged nine, 11 and 12 who are better at him in everything: at tennis, at mathematics, etc. Such a boy might develop a negative attitude to learning. Because his brothers do everything better than he does, he may react to this by behaving badly, and this might influence his performance at school.

There are also people who are very good at learning but who might be somewhat restricted in their activities, in their interests. Children who do nothing but study come home from school and all they are interested in is reading, reading, reading, even though social learning is also important. These are individual differences that are determined by the environmental context, such as family and the type of teacher a person has.

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[1] The CERI website on learning sciences and the brain can be found at http://www.oecd.org/department/0,2688,en_2649_14935397_1_1_1_1_1,00.html

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[3] The website containing the interviews on learning sciences and the brain can be found at http://brainalicious.com/index.php?lang=us&page=experts.php&expert=13

With regards to gender, it is known that female babies are better at discriminating auditory sounds. Female infants learn language earlier and at about two years the majority of female subjects are already busy, whereas boys develop later. The prevalence of language retardation in boys is five times higher than in females. So, in some way or another, female brains are better at working with language. There are scientists who are of the opinion that this has an evolutionary base. The theory is that thousands of years ago when cavemen were out hunting, they had to keep extremely quiet and follow their leader, while the females, left in the cave, we free to talk. Verbal communication was also of quite some importance for women, in order to enable them to exchange tasks and duties. Men, on the other hand, had to follow their leader, who guided the way to hunting grounds. There was more pressure to 'be quiet and listen to the leader'. This could be why men don't talk as much as women.

There is not much research on the possible relevance of differences in cognitive functioning between the sexes because over the last 30 years it has been a neglected topic, being considered politically incorrect by the feminist movement. Now the feminists say that yes, we are different, so it is again possible to examine those differences. For many years it was believed that a female couldn't attain the same position in society as a male because they were characterised as having an inferior intelligence. Now we know that female children are better at cognitive tasks, and female children in primary school have a somewhat earlier development of written language.
Boys tend to lag behind for up to six months, in which time the female children are just waiting until the boys have caught up; time that could be used by them to learn other things. From what brain science and cognitive science has taught us, it would make sense to split children into function groups, so that children can attend classes and subjects according to the level they are at. If girls are behind in mathematics or abstract reasoning, for example, why not train them in these subjects during their "catch-up" time? I don't know of any trials that have been done on this topic, but clinical settings and examples have shown that this might work.

Q : *Which cognitive abilities tend to decline or increase during adult life?*

Jelle : Young brains are good at the rapid information processing required for simple tasks or where it is necessary to do many tasks at the same time. For instance, a computer game requires very fast sensory processing, so the young person's eyes are able to detect more stimuli than those of an older person. My son, who is aged 19, is much, much better at this than me, and even people in their thirties are not as good at this type of task as my son and others of his age.

When an old brain has not been compromised by health problems, it is good at a general overview of knowledge, things that you might call experience of life and of higher language functions. This applies especially to people who have completed higher education.

Q : *Should basic knowledge about the brain be incorporated in the school curriculum and teacher training?*

Jelle : Firstly, regarding teacher training, I think it is important that there should be some incentive for continuous education for teachers, because teachers who are now in their fifties may not have had any education since they themselves were trained to be a teacher. Continuous education is common practice for medical doctors or psychologists in a clinic, as they are required to complete additional training in order to maintain their status and be allowed to continue in health care activities. This may be too radical a concept for educators because there are, of course, many other problems for them, but I do think it is essential that they are trained in the advances in knowledge that relate to education and learning. Everyone knows that, for the majority of practitioners, teaching is not currently a very pleasant job: teachers are badly paid, conditions can be harsh, and the teaching force is getting older – and at 40 a teacher is 20 per cent slower than someone aged 24. The teacher may have a class of 40 children who are very young and unruly and have behavioural problems, and this 40-year-old teacher needs to know why he or she has a problem in coping with these children. It is in fact the whole system – including the teacher, the educational system, and the pupil – who could benefit from the teacher having a better education. A better education should include a two way transfer of knowledge between educationalists and practitioners on the one hand and brain and cognitive science researchers on the other.

With regards to incorporating knowledge about the brain into schooling practice, there is an enormous amount of knowledge about the brain in existence and it is not essential for the teacher to know it all. However, cognitive neuroscience is important because cognitive scientists know not only about learning, but also about attention and planning and learning strategies. There are many different kinds of strategies, and I am convinced that a teaching programme could be devised that would allow teachers to update their knowledge about how learning takes place.

With regards to students, a useful book on the practical aspects of learning has been published in the Netherlands that incorporates some knowledge on brain functioning. I passed it to my son, who was struggling with the planning of his university study schedule, and he said it is a very useful book. Sometimes he had tried studying for eight hours without any rest and, from what neuroscience has taught us about the brain, this is not an effective method of studying. I also explained to my son that when he is frustrated because he doesn't understand something and stays up working until 5 am, he is losing out on the precious sleep essential to the restoration of brain functions. In this book (and there are other, similar books) there are many examples of how the brain works. If a student takes just three hours to read it, it could make a big difference to that student, helping him/her understand how his/her brain works and so how to study more effectively. We call this "psychoeducation", which is basically just knowledge about the brain, about cognitive function, and about yourself. I think by providing psychoeducation to children, even at primary school level, we can help them organise their own learning.

In conclusion: Yes, knowledge from the brain science community should definitely be used.

Q : *In your opinion, is there any principle in current schooling practice that runs counter to your understanding of how the brain learns?*

Jelle: Yes, I think there are quite a few examples of this. In secondary school, children are required to be active in the organisation of their own learning package – they are required to go and research it themselves. The principle as such is good – namely, to make the children less dependent on the teacher – however, in this type of school system, the teacher does not teach the children how to do this, or which strategies to use in order to achieve it. I think that children, when given a strategy, say, from the age of six or seven onwards, could improve their school performance greatly, yet this isn't done. The example I have given is of adolescents, but the same applies to children aged six to twelve.

Q : *Do you see any ethical issues emerging from a neuroscientific approach to learning ?*

Jelle: No. On the contrary, I think it is unethical not to use the knowledge that we have gained from brain science and cognitive science. In that sense I think we are now in the same situation as we were 20 years ago in clinical settings. In clinical settings at that time, a doctor might have said "Research is bad because I have my patient and I have to give him all my knowledge and experience". That proved to be the wrong attitude because by doctors increasing their knowledge of medicine and biology and by improving their skills for coping with patients, an enormous growth in medical science has occurred – and there are hardly any medical doctors who would disagree with this. I think the same applies to education; and it is especially important because there are now so very many children who are put together into the one class. By moving to a more evidence-based education system, education might change in a technical way, through which children would get to learn more and feel better about themselves, as well as improving their motivation. It is not only cognitive learning that is important, but also social learning and acquiring the motivation to learn. It is therefore unethical not to use the knowledge we have, because the situation for both the child and teacher will change for the better.