

Learning to know the brain

Towards development of the ‘Brain, learning and education’ theme on the crossroad of the neurosciences, cognitive sciences and educational sciences: results of an invitational conference organized by the Dutch Science Council (NWO) on february 5th, 2004:

A summary¹

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Summary

The Decade of the Brain started in the early nineties of the last century. Over this ten-year period a huge amount of knowledge was acquired about the structure and operation of the brain. However, so far relatively little of the insight in the field of cognitive and neuroscience research has been implemented in the domain of learning and education. Yet the knowledge and insights which have been obtained have potential for solving practical teaching problems and for educational innovation. Because of this, the Dutch Science Council (NWO), in consultation with the Dutch Ministry of Education, Culture and Science, set up the Brain and Learning Committee at the end of 2002. This committee was to undertake initiatives to stimulate active exchange between neuroscience, cognitive science and educational science on the one hand, and the practice of education on the other. To this end, the committee organized the Week of Brain and Learning in February 2004, with the title ‘Learning to Know the Brain’. One of the activities was an invitational conference that intended to identify difficulties, obstacles and concrete targets which could bring the goal described above closer by. A report has been made which describes the goals, approach and results of the invitational conference (see note 1). The report gives the recommendations of the Brain and Learning Committee for development of the theme in the form of twenty propositions.

¹ The full report can be downloaded from www.jellejolles.nl or www.brainandlearning.nl. This summary is to be downloaded as webcomment 70519.

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The present *summary report* gives the approach followed by the committee as well as the twenty recommendations. The arguments for these statements as well as the consensus reached in 6 dedicated workshops are given in the full report.

Approach.

Fortyfive scientists and representatives of societal institutions took part in the invitational conference. The discussions, which were organized in six workshops, were based on propositions that had been sent to participants as starting material prior to the conference. The conference ended with a plenary discussion that was chaired by a professional facilitator. The committee then prepared this report using the list of starting propositions, the amendments to them and the results of the workshops and general discussion. The report presents twenty propositions, with their supporting arguments. The committee considers these to be a basis for further development of the ‘Brain, learning and education’ theme. This should involve interdisciplinary collaboration between representatives from the different disciplines and fields.

Results

The conference has shown that – despite the diversity of disciplines in the fields of the neurosciences, cognitive sciences, educational sciences and practical teaching – it was possible and desirable to continue with the dialogue between the different scientific areas and, through this, to stimulate cooperation. This is a clear result which makes the invitational conference, the international scientific symposium and the symposium for teachers and lay people as well as the whole Week of Brain and Learning a success. The committee has the following general recommendations:

- 1) To give special attention to knowledge transfer and to the further development of communication between the disciplines and fields. This is because of ambiguities which appear to exist between representatives of the various -scientific and applied- disciplines with regard to both core concepts, and more specialized insights;
- 2) To focus upon the further development of the ‘Brain, learning and education’ theme through fostering the collaboration between scientists and the science organizations (notably NWO) and the Ministry of Education, Culture and Science. The committee judges an effective communication with those who are confronted with practical realities and policy issues concerning education development of great importance
- 3) To incorporate the subject of Brain and Learning in the new Cognition 2006-2010 framework programme of NWO.

Twenty recommendations for the coming five years

The committee gives recommendations for the further development of the ‘Brain, learning and education’ theme in the form of twenty propositions. The propositions relate to the

subjects ‘the dialogue between the disciplines’ (6 propositions), ‘the brain science perspective’ (3 propositions), ‘the cognitive science perspective’ (4 propositions), and ‘the teaching and educational science perspective’ (7 propositions).

Proposition 1.

Yes, it is possible to conduct the dialogue between the different disciplines with regard to the ‘Brain, learning and education’ theme and it is desirable to expand it.

Proposition 2.

The dialogue between the different disciplines should be conducted with respect.

Proposition 3.

Clarification is required with regard to the various concepts associated with ‘learning’, ‘education’ and ‘teaching’ and the words used to describe them.

Proposition 4.

The understanding that has been acquired through neuroscience research and research in the cognitive sciences has substantial potential for future use in teaching practice, but currently there are only a few applications or educational interventions where its effectiveness has been proven.

Proposition 5.

It is necessary to create clear models and theories with hypotheses that can be tested according to an evidence-based approach in order to provide the educational domain with sound scientific foundations.

Proposition 6.

Neuroscience research and research from the cognitive sciences which is dedicated to the field of teaching and learning can benefit from the large body of knowledge and insights that has been acquired in educational science and in the practice of teaching.

Proposition 7.

In order to deal adequately with learning processes and individual differences between different people it is necessary to have insight into the neural principles (brain structure, brain function, neurochemical processes) that underlie the processes of information assimilation and the mechanisms that are responsible for the plasticity of the brain. This applies both to learning in young people, in adults and in older people.

Proposition 8.

In the debate about brain and learning, attention needs to be given to both genetic and environmental factors. Relevant environmental factors are both biological and psychosocial in nature.

Proposition 9.

The cognitive neurosciences can play an important part in our search for the optimal conditions for learning, and the underlying neural and cognitive mechanisms. In this

regard, considerable weight should be given to research into the distinction between explicit and implicit learning. The same applies for research into the executive functions, given the core role that these functions play in adaptation to a changing environment and to learning.

Proposition 10.

Our capacity to 'learn' and our ability to 'adapt' depend on the efficiency with which we assimilate information and mobilize knowledge which was stored earlier. It is important to analyze how the capacity to adapt and learn changes as a function of age in children, young people, adults and in old people. Similarly important is the role that is played by knowledge, information processing and the use of learning strategies.

Proposition 11.

It is important to perform research into the biological, cognitive and psychosocial factors which are a determinant for individual differences in cognitive performance.

Proposition 12.

If we are to deepen and broaden our understanding of effective learning strategies in applied settings, it is essential to find out more about the mechanisms that underlie people's ability to learn.

Proposition 13.

Information science can make a relevant contribution to a better understanding of people's ability to learn.

Proposition 14.

The yield of the learning process is determined by a large number of factors, only some of which are associated with the functioning of the brain. The quality of the learning environment is very important, and so too are the functioning of the teacher and the didactic insights, educational models and subject-related concepts employed.

Proposition 15.

It is very important to recognize and have a better understanding of the effect of emotions on learning and information processing.

Proposition 16.

We should obtain a clearer picture of the effect of motivational processes on learning and information processing.

Proposition 17.

The quality of the teacher largely determines the efficiency of the learning process. More research needs to be done into factors that affect this quality, such as the teacher's own learning ability and attitude, and in particular processes related to cognitive ageing.

Proposition 18.

It is essential to start a dialogue between scientists and professionals in the practice of teaching in order to further the development of learning options for young people, adults and older people.

Proposition 19.

Research should be performed into the long-term dynamics of learning processes, including the process of development and ageing, as well as into learning problems and learning disorders that can occur in this development.

Proposition 20.

The educational system should switch from an orientation towards 'learning content' towards an orientation which is more 'pupil/learner focussed'.