Cognitive framework-based educational model for developing transferable thinking and reasoning competencies

Abstract

T. Gergely (Applied Logic Laboratory, Budapest, Hungary)[1]

1. The world around us is changing faster than ever before. Life in the 21st century requires people to be prepared to fill a variety of roles — such as workers, parents, citizens, and consumers — in which they will need to apply their knowledge, skills and competences effectively to rapidly changing situations. Further, more and more complex and complicated problem situations are emerging in which resolving the inherent uncertainty requires new skills and competencies.

Our best expectation from future education is that it should support developing new human capacities to help meet emerging challenges and support a successful living. Preparing the new generations for a successful life in this constantly changing economic, technological, and social context requires an education focusing on the development of transferable competencies[2] instead of teaching ready-made schemas. Rather than thinking about specific areas of potentially useful knowledge, education has to focus on the kinds of skills and competences that enable people to thrive in a changing environment, come to terms with, and adapt to change in creative ways.

New approaches are required that support the development of the most important capacities that young people need to find their ways in the increasingly demanding world of the twenty-first century: the capacities of flexible thinking and reasoning augmented with efficient metacognitive abilities.

Of course, in addition to new cognitive skills and competencies interpersonal and intrapersonal competencies will also be important to successful self-realization.

2. We propose a cognitive theoretical framework that defines a *two-level theory of intelligence*. Here *reactive intelligence* is at the basic level and the *proactive one* is at the higher level. Moreover, the proposed framework provides cognitive mechanisms necessary for the realization of these types of intelligence and it also provides tools to realise cross level processes. We also show how the proposed framework is related to the dual system theory of cognition.

In this cognitive framework we develop a constructive methodology of thinking, reasoning and decision making together with the application and operationalisation methodology for decreasing uncertainties of various problem situations. Some important constituents of this methodology are, for example: framing, analysis, modelling, adequate usage of system theoretical approach, adequacy principle to control the adequacy of the level of thinking (compare with the top down, bottom out and middle-out approaches).

At the same time, a new theory of learning is formulated, shifting towards cognition-based "deep" learning from authority-based learning. The deep, i.e. meaningful learning includes understanding of the deeper structure of problem situations and the methods applied to frame and solve them, enabling students to transfer their knowledge and skills to new problem

---

[1] gergely@all.hu

[2] Note that the terms "skills" and "competencies" are sometimes used interchangeably and sometimes with distinct meanings. Here "competencies" are seen to differ from "skills" in the following way: a competency involves the ability to meet complex demands of a situation, by drawing on and mobilising psychosocial resources (including skills and attitudes) in the particular context relevant to the actual situation.

situations. In contrast, rote and superficial learning—simply knowing facts or how to follow procedures—does not lead to transfer.

3. We propose an education methodology that is based on our cognitive theoretical framework and permits (i) the organisation of highly productive educational spaces, where every person can grow creatively, (ii) the organisation of individual education even within the system of mass schooling, (iii) to take into account the quickly changing educational, scientific and technological environment, (iv) to train the transfer of the kernel cognitive mechanisms of problem solving and decision making, (v) to bring joy and satisfaction to students in learning and development.

Education processes by this methodology will be connected to self-regulating development, which can be represented within the proposed cognitive framework.

The educational methodology will give a special content to the concepts of knowledge and knowledge formation. In particular, the proposed philosophy will follow the organic approach according to which knowledge is a special organ of the mind. In the process of humans knowledge acquisition the growth of the knowledge-organ goes through freedom-based self-regulating activities.

4. An important challenge for the education of the next generation is to develop skills and competencies that allow the use of the new infocommunication technology to create better alternatives for the future and for a more meaningful life, before the technology turns people into slaves, and people who exist only to serve.

We show how the proposed cognitive framework-based educational model enables the development of skills and competencies necessary to enable students to be adequate partners of the various intelligent systems in a rapidly evolving technological environment. Thus, we enable the development of skills that can effectively engage the intelligent systems to support their day-to-day activities. Therefore the proposed education methodology will prepare students to apply adequatly various intelligence amplifiers. Note that the development of the mentioned skills and competences is the prerequisite for using an amplifier instead of AI.