Biopedagogy

Ladislav Kováč

Humans are the only animals that are subject to cumulative cultural evolution. Biological evolution would be too slow to allow for the invention and continuous improvement of complex artefacts, both material and abstract. One of the mechanisms that makes it possible for humans to pass on social, cultural and technological advances over generations is teaching. Some scholars believe that teaching itself might be an exclusive human trait; others argue that teaching is more prevalent in nature, if it is defined as cooperative behaviour that promotes learning, independent of the mental states and cognitive intentions [1].

The science, art and profession of teaching is known as ‘pedagogy’ and its biological basis might well be dubbed ‘biopedagogy’. Pedagogy embeds the learner into a particular culture by exposing the developing mind to cultural values and practices. Human teaching represents two disparate but closely linked activities—education and instruction. To ‘educate’ means to unfold the latent potential of the learner and to cultivate human nature by promoting impulses that conform to a culture and inhibiting those that contradict it. ‘Instruction’ is the provision of knowledge and skills.

According to the ethologist Konrad Lorenz, human nature, which is a result of biological evolution, functions as the “inborn schoolmaster” [2] by both allowing and constraining the learning of all the products of cultural evolution. Lorenz received the Nobel Prize for his discovery of ‘imprinting’: the irreversible, life-long fixation of a response to a situation encountered by an organism during development. Imprinting is not specific to humans, but humans have evolved, along with the formation of the central nervous system, more sophisticated mental organs that we call the social brain, the group mind and the darwinian soul. As the physical development of an organism proceeds in stages, so does the mental development. Some of these stages represent critical periods that are

particularly sensitive to imprinting. The rapid acquisition of the mother tongue for instance apparently represents such a specific period in human development.

According to Lorenz, during and shortly after puberty, humans are prone to a specific kind of imprinting from a culture and its abstract norms and values, driven by a need to become members of a reference group striving for a common ideal [2]. We might call this developmental stage of humans the ‘second (or ideational) imprinting’. This imprinting presupposes a stable society with firmly established norms and values and, in turn, it serves to ensure that stability. The British neuroscientist Sarah-Jayne Blakemore [3] corroborated that the human brain undergoes protracted development and demonstrated that adolescence, in particular, represents a period during which the neuronal basis of the social brain reorganizes. This provides opportunities, but also imposes great responsibility to high-school and university teachers.

Jan Amos Comenius, a seventeenth century Moravian educator, already suggested that the mastery of teaching consists in recognizing stages of mental development in which a student is prepared and eager to learn stage-specific knowledge spontaneously. In his view, a teacher is more similar to a gardener, who gives plants care and nutrients to allow them to develop, grow and flourish. Comenius also anticipated the crucial role of positive emotions in pedagogy. His commandment *Scola ludus*—The School of Play—expresses the fact that teaching and learning can, and should be, associated with pleasure and joy by both teachers and students.

Human nature evolved during the Pleistocene about 1.8 million to 10,000 years ago to cope with a hunter–gatherer lifestyle. Yet, modern humans live in and adapt to vastly different environments created by cultural evolution. Apparently, the human genetic outfit is highly versatile and encompasses abstract ‘cultural loci’. Such a cultural locus is an ‘empty slot’ that functions only when

it is filled with a meme from the cultural environment; memes would be akin to ‘alleles’ that are specific to a particular cultural locus. This cross-talk of biology and culture makes humans symbolic animals—our social brain allows us to behave altruistically towards ‘symbolic kin’ with whom we share no genetic relationship; and our group mind embraces not only our relatives and friends, but also our tribe or nation and possibly humanity as a whole. Education, and in particular imprinting, essentially determines the extent, quality and scope of this deployment.

A developing child has to pass all crucial periods of learning successfully to become a mature human—and humane—being. As Lorenz noted, once a sensitive period has elapsed and the opportunity to learn has been missed, the ability to catch up is considerably reduced or irreversibly lost. We live in a time when cultural values and norms are rapidly changing, often within less than a generation. The ideational imprinting of developing adolescents becomes a problem when the traditional role of family and school is displaced by new social forces such as the internet, Facebook, Twitter and the blogosphere. How to preclude that young people do not develop as persons with stunted social brains, with narrow group minds attuned to fleeting reference groups and with fragmented darwinian souls, and how to promote the development of strong personalities is a challenge for the education of the twenty-first century.

CONFLICT OF INTEREST

The author declares that he has no conflict of interest.

REFERENCES

1. Caro TM, Hauser MD (1992) *Q Rev Biol* **67**: 151–174
2. Lorenz K (1966) *On Aggression*. London, UK: Methuen
3. Blakemore SJ (2010) *Neuron* **65**: 744–747

Ladislav Kováč is a cognitive biologist at Comenius University, Bratislava, Slovakia. E-mail: kovacl@fns.uniba.sk

EMBO reports (2013) **14**, 294; published online 5 March 2013; doi:10.1038/embor.2013.18