



INNOVATIVE PEDAGOGY AND THE HISTORY OF EDUCATION

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Questions about the nature of the mind and process of education originate in ancient Greek philosophers. What is the role of language? What is the relation between the structure and function in education? Are people free in their choices? Important ancient philosophers, Democritus, Plato, Aristotle and Lucretius, had tried to provide answers to these questions in different ways, while Descartes, Spinoza, Hume, Kant and many others continued where the former stopped at the end of late antiquity. Even today, in the age of technology, contemporary researchers from the fields of philosophy, cognitive science, neurobiology, and artificial intelligence ask similar, albeit technologically informed, questions. Among them are questions about the relation between human and machine or between teachers/students and learning environment and the implications they carry for solving traditional problems inside education, i.e., the problem of mental causation, or the problem of consciousness as well as various mental activities, for instance, decision-making, critical thinking and problem-solving.

Steps need to be taken towards a connection of different disciplines built around the philosophy of mind and use of innovative technologies in education, which are involved in cognitive modelling and preparing appropriate learning environment in education. The gap between neurochemistry, cognitive science, neurobiology and other rapidly developing disciplines on one side and education as part of social sciences on the other may seem wide and even unbridgeable except by analogy, metonymy and metaphor. Yet there exist short pathways by which to travel from one to the other problem in education and back, and the study of chaos offers one such path. Brains are composed of elementary parts called neurons, and societies are made of individuals each with a brain. The organization of a brain's functions in terms of large numbers of neurons is governed by chaotic dynamics and is expressed in global state transitions, such as from sleep to waking, walking to running, breathing to speaking, teaching to learning, etc.

Teachers need to bring to attention a form of learning that transcends logic and rhetorical appeal and can be best understood as a chaotic state transition in a brain's dynamics. In order to achieve substantial changes in the process of education, such as introducing innovative strategies of learning or innovative learning environment, for example based on artificial intelligence and intelligent learning systems, the current process of education must be led to the edge of chaos where all is possible and then reformulated in terms of cognitive modelling.

Innovation, Society 5.0 and Education

From the experiences of recent decades, it seems clear that the existing educational system, as a whole, is perceived as an ailing system that fails to meet the needs of a major portion of the society it serves. If this process is to be innovated, then every aspect of it

must be studied and reconsidered in the light of new and different social expectations, for example the expectations of Industry 5.0¹ or Society 5.0². The appropriate architecture needs to be defined on the basis of cognitive science and methods of artificial intelligence, while taking into account that a school system is a dynamical system which follows the dynamical systems theory. The adequate innovative learning environment includes a cognitive model that adopts both, information-processing and the human mind's structure, and one needs to consider how to build an intelligent tutoring system and appropriate learning environment (a virtual teacher) and/or intelligent teaching/learning based upon such a system (Aberšek, Borstner, Bregant, 2014).

One of the problems of contemporary society is that the educational system must be able to train youths for life, equipping them with not only knowledge and different skills, but in particular teaching them how to confront everyday challenges and problems, and in turn, how to resolve them. Young people have to develop their cognitive competences, but also cooperativeness and social competences, since these are one of the basic conditions for life-long learning and improved employability. In order to achieve this, flexible forms of learning have to be implemented (Aberšek, 2018).

The characteristics of today's generations, defined from different perspectives (sociological, technological, psychological, philosophical), and their expectations, are a new challenge for modern-day schools. The educational process should be more closely related to the individual's needs, their personal development and the cultural environment in which they live. The complexity of all the things affecting the youth of today (the environment, technology, a large amount of immediately accessible information, the possibility of direct communication with the entire world, newest insights from the fields of cognitive and neuroscience, AI, etc.) requires a well thought-out and quicker response on behalf of the creators of school policies than it did in the past, mainly because the social environment in which we live (society, technology, etc.) is changing very rapidly, and because the school of today must prepare students for occupations and social environments, which at this moment don't even exist yet. All these changes in the social environment in turn require different, innovative ways of learning and teaching, to which the entire school system must be able to adapt on a paradigmatic level. Such great changes cannot be achieved by taking small steps.

Summing-up

In the innovative learning and teaching strategy, special attention should be given also to increasing the level of interest and motivation in youth. Research shows that students who are exposed to innovative didactic and innovative learning environment, express a less depreciative attitude towards school (Flogie & Aberšek, 2017). Social interaction is integral to the healthy psychosocial development of adolescents. *Because healthy development during adolescence is complex and fraught with both challenges and opportunities, both parents and schools may need to conscientiously educate adolescents about the potential risks the problematic or maladaptive engagement with specific ICT tools or applications can bring about in their lives.* (Shaljan & Myint, 2017). The use of

1 Industry 5.0 provides a vision of industry that aims beyond efficiency and productivity as the sole goals and reinforces the role and the contribution of industry to society.

2 Society 5.0 is a human-centered society that balances economic advancement with the resolution of social problems by a system that highly integrates cyberspace and physical space.

modern technologies by youths in the context of social competence should be given special attention because it plays an important role in the process of socialization.

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