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Introduction

One of the most important goals of modern education is to develop the dispositions and skills necessary for life-long independent learning. As pointed out by the European Council (2018), though learning by heart, memorizing facts or concepts is still an important skill, it is not sufficient to survive and thrive in modern knowledge-based societies. Much more crucial become these abilities which serve as tools for solving complex, interdisciplinary problems, such as: critical and creative thinking, formulating problems, predicting, drawing conclusions, computational thinking, planning and evaluating one's own learning, generating new ideas or sharing/discussing knowledge with others.

In the case of young children, the general learning dispositions might be perceived as inborn, granted. Young children are skillful observers, attentive listeners, tireless explorers, intrigued engineers and constructors, etc. (Simoncini, Lasen 2018). Driven by their natural innate instinct they tend to explore their environment with all the senses, trying to make sense of the world, understand how things work and why. Well before formal schooling begins, children have extensive conceptual knowledge that aligns with the scientific disciplines of biology, chemistry, physics and psychology, as well as emergent scientific reasoning skills (Brenneman 2011).

Unfortunately, many contemporary preschools and elementary schools, instead of taking care of the development of a child's intellectual dispositions, place too much emphasis on academic achievement. As Lilian Katz explains, "academic goals are those concerned with acquiring small discrete bits of disembedded information, usually related to preliteracy skills, that must be practiced in drills, and worksheets, and other kinds of exercises designed to prepare children for later literacy and numeracy learning. In an academic curriculum, the items learned and practiced require correct answers, rely heavily on memorization, on the application of formulae versus the search for understanding, and consist largely of giving the teacher the correct answers that the children know she awaits" (Katz 2010: 1–2). Intellectual learning, on the other hand, tries to engage and stimulate children's minds, inviting them to the quest for understanding. The concept of deep, intellectual learning emphasizes higher-order cognitive skills, such as: reasoning, hypothesizing, predicting, concluding, etc., as well as working collaboratively, thinking and interacting critically and actively with the content being learned (Warburton 2003). When young children investigate a scientific concept or process, they ask research questions, conduct experiments, draw conclusions and design solutions, being eagerly employed and intellectually challenged at the same time.

"Deep learning" perspective on science and math education underlines the following features:

- interdisciplinary vs. separate subjects learning (Warburton 2003): interdisciplinary problems involve various pieces of knowledge and skills resulting in holistic insight, and the ability to perceive the complex interconnections between the components of human life (social, environmental, economic),
- constructing knowledge vs. reproducing information (Marton, Saljo 1997): engaging in making/negotiating meanings with others, relating ideas to one's own previous knowledge and experience, discovering organizing principles to integrate ideas, examining the logic of arguments, etc.
- meaningful vs. theoretical context of learning: perceiving the direct connection between knowledge and everyday life reinforces learning, strengthens the pragmatic dimensions of new knowledge.

As a result, learning becomes strategic, deepens children's metacognitive abilities to reflect on one's own knowledge, as well as fosters a transfer of intellectual abilities into new contexts, new tasks, new challenges.

To summarize, as Katz points out "children should be helped to acquire academic skills in the service of their intellectual dispositions and not at their expense" (Katz 2010: 7). Ironically, such an idea is neither new, nor revolutionary. Popularized and elaborated in the 20th century by educational scientists and practitioners such as Maria Montessori, Célestin Freinet, John Dewey, etc., it dates back to the 17th-century epistemological reflection, such as the Galilean "Book of Nature."

We invite you to read, rethink and redefine the ideas of modern math and science education of a young child.

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