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Developing a science learning ecosystem

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Editorial by Dr. Sofoklis Sotiriou

Developing a science learning ecosystem

Science education should be an essential component of compulsory education for all students. Policies should support students, teachers, parents and the wider community to improve access to and provide everyone with the opportunities to pursue excellence in learning and learning outcomes and to ensure young people are motivated to learn and to be fully equipped to engage in scientific discourse and facilitate further study in science education. This is the vision for opening the school[1] (EU, 2016)[2] to new learning experiences and to new partnerships with external stakeholders that promote student learning. Such educational experiences are based on collaboration at local level between formal, non-formal and informal science education providers, enterprises and civil society in order to integrate the concept of open schooling, including all educational levels, in science education. These developments seem to offer a unique opportunity to bridge the gap between the different worlds of formal education, of informal learning and that of business by developing an appropriate catalysing process: A **connected science learning ecosystem** where youth may encounter a wide range of learning experiences and be supported by adults and peers in ways that could lead to future opportunities in personal, academic, professional, and civic realms. This requires educators and organizations to think beyond the bounds of their own institutions to consider how collective action at the level of networks can provide opportunities and address inequalities in a way that more isolated efforts cannot. When discussing how youth might thrive in such an ecosystem—and what sort of interventions we can develop to help all youth do so—the idea of pathways[3] has often come up as a useful metaphor that invites us to consider youths' "learning lives" over time and across the many contexts (e.g., home, school, university, community organizations, science centres and museums, web and social media, world of work) where learning may occur. While there are many ways to productively conceptualize such pathways, we simply invoke pathways as a metaphor

[1] https://www.openschools.eu/

[2] Hazelkorn, Ellen & Ryan, Charly & Beernaert, Yves & Constantinou, Costas & Deca, Ligia & Grangeat, Michel & Karikorpi, Mervi & Lazoudis, Angelos & Pintó, Roser & Welzel-Breuer, Manuela. (2015). Science Education for Responsible Citizenship. 10.2777/12626.

[3] Sotiriou, S., Bybee, R., & Bogner, F. X. (2017). PATHWAYS – A Case of Large-Scale Implementation of Evidence-Based Practice in Scientific Inquiry-Based Science Education. International Journal of Higher Education, 6(2), 8–17. https://doi.org/10.5430/ijhe.v6n2p8.

for thinking about ways to provide structure to youth experiences – **Learning Paths** –, how they might “connect to” or “build upon” one another and thus allow a young person to pursue goals that require extended engagement or persistence across multiple contexts and learning opportunities. Learning paths take many forms influenced by emerging research and discoveries, changes in the needs and interests of society, and changes in personal interests or opportunities. Some individuals describe their learning path as an upward trajectory, pointed towards a clear goal. Others describe their path as more irregular, resembling steps or, more often, an erratic bumpy line. Learning opportunities are made possible and shaped by the learning ecology that one inhabits.

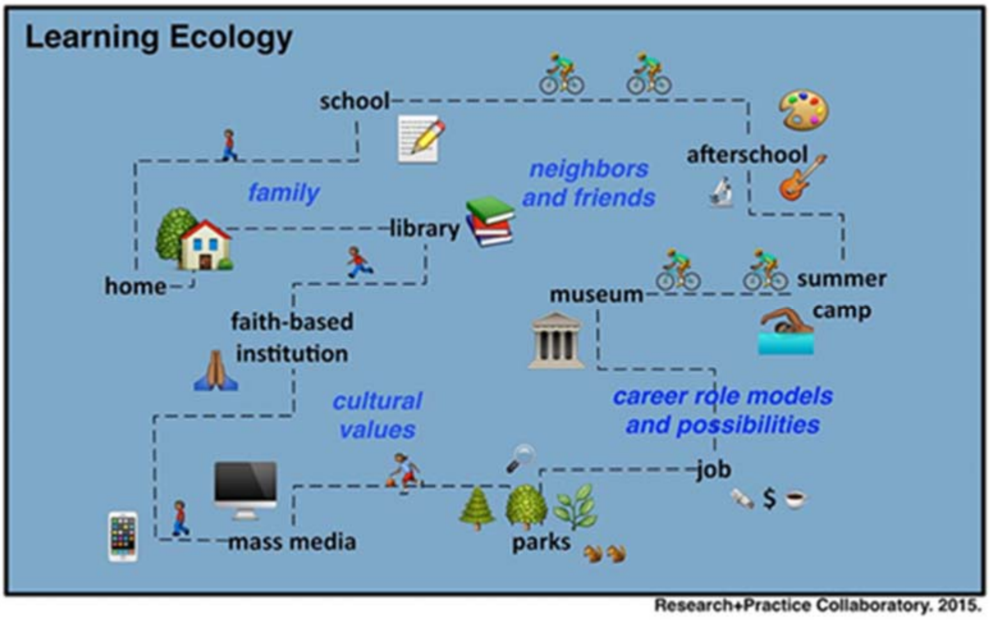

Figure 1: *A graphical representation of the Science Learning Ecology[4] that describes the learning paths of individuals in the form of a science learning continuoum.*

A **Learning Ecology** is the physical, social, and cultural context in which learning takes place. Like natural ecosystems, learning ecologies (see Figure 1) have physical dimensions, which may or may not include easy access to nature, science museums, or advanced science programmes or internships. However, we are less used to thinking about the sociocultural dimensions of learning ecologies. Robust science learning ecologies, like their counterparts in nature, are characterized by diversity, redundancy, and local adaptations. This means that a robust science learning ecology contains a wide variety of programmes, across a range of institutions and places, allowing youth different and multiple ways to engage with science in the form of a learning continuoum.

[4] https://www.nsta.org/connected-science-learning/connected-science-learning-march-2016/stem-learning-ecologies

In this framework, individuals take increasing levels of ownership over their own learning as they grow older and gain more experience. Several collaborative partnerships and networks are being created to optimize opportunities across a range of institutions and organizations (see for example the Open Schools for Open Societies partnership of institutions of formal and informal learning https://www.openschools.eu/). Open Schools Journal for Open Science provides the place for the presenation of the students learning paths in this unique open schooling enviroment.

In this issue, at the end of 2022 we are presenting students work from Greece, Bulgaria, and Turkey. Themes are focusing on the COVID-19 Pandemic, technology, and sustainability.

Authors have evaluated the perceptions and views of high school students about distance education, and they found that almost two-thirds of the students stated that distance education is not an adequate and effective learning model. Even though today is the age of technology, students' reporting that a more effective learning will be achieved with face-to-face education shows that the distance education model should be developed and improved. Working further on issues related with the COVID-19 Pandemic another review study compares the lowest concentration levels of SARS-CoV-2 RNA that two different methods can detect, examining several reviews and research papers in the field.

Moving to technology innovations and sustainability authros present their mode a smart sustainable city. The model demonstrates the use of sustainable forms of energy and incorporates Internet of Things functionalities to simulate energy efficiency, monitoring of air quality, and safety. The city was designed to raise awareness about problems people living in cities face, as well as to inspire relevant technology-based innovative solutions in the context of the Sustainable Cities and Communities (Sustainable Development Goal 11). Furthermore, authors present their study on materials used in the smart phones industry and their potential impact to our health and to the enviromentent. Another contribution focuses on Innohavtive pedagogicall approaches for the implementation of innovartive activities related with the Sustainable Development Goals.

Finally, authors, in a rather innovative study, explore the possibilities of using cellular automata to simulate the predator-prey interaction. A cellular automaton is a discrete model that allows it to be used for various computational purposes. Knowledge of the behaviour and evolution of different biological and ecological systems will allow us to adapt more quickly to different possible scenarios.

In this issue, we introduce a new opportunity for teachers in our journal. In every issue we will host research work of a teacher who is also acting as a researcher in education. We belive that this offers a significant add-on to our journal and to the overall effort of Open Schooling.

Nice reading and warm wishes for the New Year!