**"Science Education during Preschool Years. A cultural-historical approach"**

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The main purpose of this lecture is to address to the complexity of Science Education in the early years and to focus on the cultural-historical frame of learning in which education in general terms has immediate connection with science and culture, both seen as processes of continuous evolution and interaction (Plakitsi, 2013).

According to the cross-disciplinary approach in the early years curricula (2011), Science Education is considered a unity including Physics, Biology, Chemistry, Environmental Education and Education for Sustainable Development. Concepts are approached within the five learning frames, that is, games, routines, everyday life situations, explorations and organized learning activities, all of which provide pupils a holistic view of the world around them. At this level, all units are dealt through a horizontal linking and not as independent fields of study and furthermore, they are connected with society and culture.

 Within this frame, concepts are considered as a cultural-historical product of the wider community, transmitted to the subject by instruction. The pupil’s actions can be understood in terms of a concept acquired by the subject which makes sense of a whole system of their actions (Blunden 2013). Vygotsky (1987) considered concepts as units of a culture and claimed that the level of development of scientific concepts forms a zone of proximal possibilities for the development of everyday concepts. In his chapter ‘Thinking and Speech’ on the development of scientific concepts, Vygotsky (1987, chap.6,) he intrigued a discussion of an issue on education, that is of extreme importance, concerning the development of scientific concepts during school instruction as well as their connection with the child’s consciousness.

There is a complexity within the social (societal-political) practice which can appear at science education in the early years which has been proved to be a contradictory issue. Furthermore, development is a very complex and contradictory process and it involves qualitative change (Fleer & Veresov, 2018). The development of concepts and categories is dialectically connected with moments of change as an inner element.

Dealing with scientific concepts in a science curriculum in early childhood education gives pupils the opportunity to understand their surroundings, which in fact are their lifeworlds. In this sense, they can talk about their experience, provide explanations, and finally perceive and comprehend the concept. As a next step, emerging topics have to be studied in depth, which means that children will be involved in structured activities mediated by artifacts. Artifacts provide resources to structure activities, mediate conversations, prepare and set up scenarios in which actions and conversations about scientific concepts may unfold (Roth et al, 2013).

Cultural Historical Activity Theory (CHAT) focuses on the connection of school instruction with everyday life and provides artifacts and approaches for analyzing collective activity, interactions within a community of practice and structural change and development (Plakitsi et al 2018). The unit of analysis is the activity which includes the person or group who is acting towards an object, following certain rules and the dynamic relationships that develop within the activity system. Contradictions that occur include the possibility of changing the learners’ opinions and consist of important issues in the process of the collective learning (Engeström, 2016).

Towards this direction, the Activity Theory in Formal and Informal Science Education (@fise) research group in the University of Ioannina, Greece conducted research for a decade and developed a new methodological tool for designing and analyzing Science Education activities, SCOPES. SCOPES includes the key research terms that have been used by the @fise research group, that is, Systems of activity, Contradictions, Outcomes, Praxis, Expansive learning, Science education. Within this frame, scientific learning in the early years is developed in expansive learning cycles, involves object-oriented activities that seek for an outcome, combines theory and praxis and finally focuses on the analysis of contradictions in the activity systems.

Scientific knowledge is considered a result of human actions connected with real life situations and affecting the contemporary world in which learners live. Design and analysis of science education activities within the methodological framework of SCOPES can make science teaching challenging for the classroom community and support and expand the context of science education beyond school instruction. Thus, Science Education can offer the potential of reaching an advanced level of scientific knowledge with connections to the society in its cultural and historical evolution. SCOPES supports learning in multidimensional contexts and addresses to new researchers, curriculum developers and practitioners in science education.

As a next step, we propose an in-depth discussion on the following issues concerning early years Science Education within a cultural-historical frame:

* What is required for the teacher and the students to expand the activity of learning in Science Education?
* How does a teacher consciously and unconsciously conduct her/himself in and toward this trajectory?
* What are the conditions that permit the emergence of a curriculum based on scientific concepts?
* If we consider concept formation as crucially dependent on cultural mediation what is the role of cultural artifacts, including signs?

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