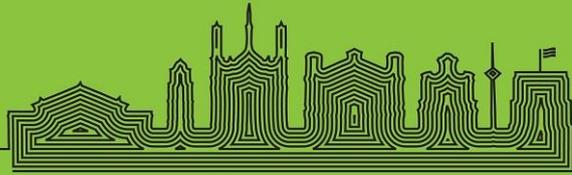




Constructionism 2018

Constructionism, computational thinking
and educational innovation

Vilnius, Lithuania, August 21 to 25



Working Group

Learning to program in a constructionist way

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Constructionism [PH91] is a strategy of education which has its roots in Piaget's constructivist theory of learning as an active process, in which people actively *con-struct* knowledge from their personal experience of the world. In general, students do not just receive pre-built ideas from teachers: they have to make them up by engaging themselves with problems and projects. Papert's constructionism indeed emphasizes the importance of having personally-meaningful goals and "public artifacts" (not necessarily concrete ones: either "a sand castle on the beach or a theory of the universe" [PH91]) that can be shared and discussed with others interested in in the same (learn- ing) enterprise [Res96]. This is sometimes summarized with four P-words: Projects, Peers, Passion, Play and this motto indeed inspired successful educational initiatives such as the Scratch programming language [Res14]. However, while programming is often seen as a key element of constructionist approaches (starting from Papert's Logo, a programming language designed to enable the learning of geometry), the research on learning to program through a constructionist strategy is somewhat limited, mostly fo- cusing on how to bring the abstract and formal nature of programming languages into "concrete" or even tangible objects, graspable even by children with limited abstrac- tion power [RMMH⁺09, HJ07, HAA17]. However, constructionist ideas are floating around mainstream programming practice and they are even codified in some soft- ware engineering approaches: agile methods like eXtreme Programming [BA04], for example, suggest several techniques that can be easily connected to the constructionist word of advice about discussing, sharing, and productively collaborating to success- fully build knowledge together [Res96]; moreover the incremental and iterative process of testing ideas [Res07] fits well with the agile preference to "responding to change over following a plan" [BBvB⁺01].

This working group will study the use of a constructionist strategy to learn to program by considering the multifaceted skills needed by software projects:

- understanding automatic interpreters able to manipulate digital information;
- predicting concrete semantics of abstract descriptions;
- thinking about problems in a way suitable to automatic elaboration;
- devising, analysing, comparing solutions;
- adapting solutions to emerging hurdles and needs;
- organizing team work and productively sharing abstract knowledge.

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