cMinds: Teaching Programming towards the Development of Early Analytical Structural and Critical Minds

Why cMinds?

Analytical and critical thinking are transversal learning skills that help an individual excel in wide areas, professional, social, civic and personal. They offer benefits in wide subjects ranging from science and technology to humanities and art. Despite the applicability of analytical thinking through out an individuals' lifetime, development of the skill in early life in the context of school curricula in primary schools is not representative of its importance. Current teaching avenues mainly deploy activities that are not meaningful for young children and do not provide them with the opportunity to establish direct links with real life. Analytical thinking is also missing from early formal technology education. Current teaching practices fall to leverage the inherent link between technology education and creativity, which emerges when children are encouraged to find innovative solutions through brainstorming and problem solving sessions. cMinds aims at bridging such a gap providing children with the opportunity to engage in a process of analytical thinking through meaningful tasks and the creative use of ICT tools.

Our Goals

- To develop age appropriate inquiry and project– based didactical methodologies promoting analytical and structural thinking and the development of creative thinkers in wider inclusive, collaborative educational environment.
- To develop proof of concept learning activities on the deployment of programming as an educational tool that motivates analytical thinking. The activities will encourage children to set goals, explore alternatives, evaluate solutions and iterate optimization.
- To build a collaborative school network through which children and teachers can share ideas, findings and good practice recommendations.
- To validate methodologies and learning activities through their deployment in real life educational setting in the participant countries.
- To reach a wide range of stakeholders and to promote the integration of proposed methodologies and learning design into school curricula through targeted dissemination and adoption strategies.

Partners

Centre for Research and Technology Thessaly, Greece
Sor Trondelag University College, Norway
University of Thessaly, Greece
1st Elementary School of Volos, Greece
Centre for Flexible Learning, Sweden
ZS Kolin, Czech Republic
Economic College of Transilvania, Targu Mures, Romania

Project ID: **509998-LLP-1-2010-1-GR-COMENIUS-CMP**

Pilot Educational Applications

Programming Concepts Pilot Learning Applications

As a first step towards the development of analytical, structural, and critical thinking, this learning tool aims to demonstrate basic programming concepts useful in analytical thinking, such as conditionals, loops, decisions, actions, and more. Graphical tools will demonstrate vividly the concepts based on real-life experiences. For example, loops can be demonstrated through the 4 seasons, case statements through water being directed through closed and open dams, conditions through a car moving through traffic lights, and more.

Problem Deconstruction, Modeling, and Reconstruction

The activity will demonstrate well accepted analytical thinking methodologies and frameworks, starting from the identification of objectives and continuing with problem deconstruction, discovery of alternative implementation routes, outcomes and consequences resulting from a particular implementation, and success criteria. Graphical, on-line available tools will allow children to vividly visualize a fully analyzed problem. Graphical interfaces will prompt learners to follow well accepted analytical thinking paradigms. For example:

- Identifying the current condition
- Identifying a vision / goal
- Identifying existing resources
- Mapping alternative implementation routes
- Identifying prerequisite resources needed for implementing each solution
- Selecting the desired implementation route

Methods and Pedagogy

cMinds is innovative in not only on bringing to the foreground analytical thinking skills learning activities early in life, but in introducing specific, innovative didactical approaches that complement related existing school curricula and increase children's motivation. Visual programming is seen as a tool for developing an analytical mind through its structural and precise nature. Inquiry and project-based learning activities use graphical on-line challenging applications that build on a child's curiosity. Finally, "early results" small steps allow children to build confidence through success motivating further engagement. Given the international nature of the project, mostly graphical user interfaces are deployed to overcome language barriers. Educational activities are designed as a series of simple to follow steps that children are able to follow with relative independence building critical thinking, reflecting upon multiple concepts, and developing individual perceptions on selected challenging problems.

cMinds promotes the involvement of a wider community of experts in the development of didactical frameworks, including both scientists and teachers.

Contact:
Dr. Elias Houstis, enh@uth.gr
Hariklia Tsalapatas, htsalapa@uth.gr
University of Thessaly
Argonafton & Filellinon, 38221 Volos, Greece
Tel: +30 24210 74000
http://www.cminds.org

This project has been funded with support from the European Commission. This publication reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.