Computational Thinking and Mathematical Problem Solving, an Analytics Based Learning Environment

White Paper #6: The CT&MathABLE project, a retrospective

Executive Summary

The CT&MathABLE project has addressed a need for technological and pedagogical tools to support effective learning in Computational Thinking (CT) and Algebraic Thinking (AT).During the three year project an international team of experts in six countries developed a learning analytics driven system in which tailored learning pathways were combined with interactive tasks and a set of interactive resources have been created for learners. The project outcome empowers educators to incorporate CT and AT into classroom practices.

The project summit meeting in Stockholm, Sweden in June 2025 summarised the project structure, goals and achievements. This White Paper summarises the project resources and outcomes.

1 Background

Six countries, Finland, Hungary, Lithuania, Spain, Sweden and Türkiye, have contributed to the project, which is co-funded by the Erasmus+ program of the European Union. The three year programme has provided teachers with new approaches to develop students' knowledge in both Algebraic Thinking (AT) and Computational Thinking (CT) in a way that is individually tailored to the learner.

CT&MathABLE was designed to European educational resilience and capacity leveraging digital transformation tools and pedagogies to realise innovative school curricula to enable recognition and validation of skills and qualifications addressing future demands for citizens with the digital skills and computational literacy needed for digital transformation. The project delivers open, relevant and localized educational resources for developing Computational Thinking and Algebraic Thinking of primary and lower secondary school students with novel modes of interaction and high quality content.

2 Results

CT&MathABLE delivered:

- personalized learning trajectories (Learning Paths) in developing competencies of Computational Thinking and Algebraic Thinking combining a learning architecture and cutting edge learning analytics technologies with interactive tasks that have been proven to engage learners in accelerated intellectual development;

- competency frameworks for integrated and automated assessment of learning in Informatics (Computer Science) and Mathematics;

- large scale libraries of interactive tasks designed explicitly to hone Computational Thinking and Algebraic Thinking skills.

An example of the Hands On types of exercises is pictured in Figure 1

Figure 1: Hands-on tasks

3 Summary

Overall the project has delivered new approaches to learning pathways in CT and AT learning. Assessment instruments, which have been fully validated and are summarised in White Paper 4, interactive tasks (See White Paper 5) and a fully integrated learning analytics platform. The project has also conducted many multiplier events, reaching hundreds of educational practitioners and policy makers across Europe, as well as publishing 19 academic and practioner oriented articles in scholarly journals and teacher education magazines, as well as White Papers, videos and newsletters across the consortium. The project resources are available under a Creative Commons License from the main project website `https://www.fsf.vu.lt/ct-math-able`, and these results will remain available as a major project outcome.

Access to resources and all other enquiries about utilisation of project outcomes and learning resources can be directed to the project coordinator Professor Valentina Dagiene (`valentina.dagiene@mif.vu.lt`), or the dissemination coordinator, Professor Arnold Pears (`pears@kth.se`).