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

Newsletter 4

April 2024

Dear Readers,

In this 4th Newsletter, we will inform you about the progress made in the project, we will continue with the series of Consortium introduced, inform about the project news and latest developments.

CONTENT

1. Briefly about CT&MathABLE

The main aim of “Computational Thinking and Mathematical Problem Solving, an Analytics Based Learning Environment (CT&MathABLE)” is to facilitate the students' digital transformation across various aspects. This includes enhancing their digital competencies and self-awareness through learning-analytics, improving computational thinking (CT) and algebraic thinking (AT) via interactive tasks, incorporating the STEM approach for task-oriented learning, developing assessment tools for CT with learning-analytics, and providing interactive tasks and assessment tools in a format that can be integrated with different learning management systems. The project seeks to establish a learning-analytics based framework to cater to personalized learning paths for students in the 9-14 age group across Europe. The primary objective is to enable all children within this age range to bolster their computational and algebraic thinking skills by engaging in Computer Science and problem-solving tasks, as these competencies are crucial in the 21st century.

2. Ankara University (ANKU) and Faculty of Educational Sciences

Ankara University (ANKU) was founded on June 13, 1946 (the First University of Republic Period 1923-…). The vision of Ankara University is to be an innovative university that conducts high-quality research, utilizes knowledge and skills for the benefit of humanity and the country, and makes a difference at a universal level.

Currently, our university hosts over 4700 international students from 128 different countries. In terms of international academic employment, our university ranks 4th among Public Universities and 6th among all universities. Moreover, it has an annual mobility of over 1100 in exchange programs. Our university is one of the leading institutions in Turkey in terms of the number of international students, international academic employment, and the exchange mobility, and holds one of the highest levels of awareness of internationalization.

Furthermore, the university has been fulfilling the global requirements of internationalization within a specific strategy. Additionally, it holds memberships in several prestigious networks, including the Silk-Road Universities Network, the European University Association (EUA), the Magna Charta Universitatum, and the Capitals of Universities of the World Network.

Faculty of Educational Sciences

University in Numbers

100+	128+	536+	4730+	55	1100+
Bilateral Cooperations with Different Countries	International Students from Different Countries	Bilateral Agreements	International Students	Programs in English	Annual Exchange Mobility

Ankara University's Faculty of Educational Sciences, established as the Faculty of Education by the decision of Ankara University Senate on March 31, 1964, is Turkey's first faculty of education.

With the regulation made in 1983, it took the name of the Faculty of Education Sciences.

Our faculty offers education through the Department of Educational Sciences, the Department of Computer and Instructional Technologies Education, the Department of Fine Arts Education, the Department of Mathematics and Science Education, the Department of Special Education, the Department of Basic Education, the Department of Turkish and Social Sciences Education, and the Department of Foreign Languages Education. The institutional vision is to contribute to knowledge production through theoretical and applied research in the field of educational sciences; to examine and develop solutions to the educational problems of society based on education rights, equality, and respect for human rights; and to be a leading institution in determining policies and sharing knowledge with the national and international academic community, public and private institutions, civil society organizations, and individuals.

ANKU and CT&MathABLE

ANKU is a participant in the Erasmus+ Project "Computational Thinking and Mathematical Problem Solving, an Analytics Based Learning Environment (CT&MathABLE)". Computational Thinking (CT) and Algebraic Thinking (AT), which are the main focus of the project, are viewed as essential skills to be incorporated within the outlined model. The project strives to introduce a learning-analytics based framework that caters to personalized learning paths for students aged 9–14 throughout Europe. This approach is intended to enhance computational and algebraic thinking abilities of all children within this age group, which are vital competencies for the 21st century, through the incorporation of Computer Science and problem-solving tasks. Furthermore, the project has specific aims concerning teachers, instructional designers, and school curricula. Among these goals is the utilization of the CT&MathABLE system, allowing teachers to integrate technology within classroom environments and observe the impact of tailored instruction in conjunction with the formal curricula. ANKU is responsible for forming the Framework of interactive tasks which contribute to Learning Path for computational thinking and algebraic thinking and the development of assessment tools.

3. Ozkent Akbilek Secondary School (Türkiye)

Ozkent Akbilek Secondary School

Özkent Akbilek Secondary School was built by a businessman in the 2006-2007 academic year.The school is built on a total area of 6386 square meters, with the school building 2386 and the garden 4000.There is 1 kindergarten, 20 classrooms, science and computer laboratories,library, multi-purpose hall and canteen in the school building. The school is built on a large garden where students can do all kinds of social activities comfortably. There are 2 basketball, 1 voleyball and 1 mini football field in the garden.

Our school provides full-time education from 9am to 4pm. There are students at the 5th,6th, 7th and 8th grades in the school.We have a total of 41 permanent training personnel. There is 1 principal and 2 assistant principals in the school administration.

Different kinds of social,cultural and sports activities are held in our school.Participation in competitions organized throughout the district,province and Turkey is ensured. Almost every year, TÜBİTAK 4006 project is prepared in the school.Other activities such as quiz shows, poetry concerts, visual art exhibitions, technology and design exhibitions, year-end festivals and trips are organized with the participation of all teachers,students and sometimes parents. All the teachers in the school are willing to learn and implement innovations in education.

Our school participated in the project-based learning competition organized by Finland Luma Center with a project involving foreign students, and the project became one of the best practices.

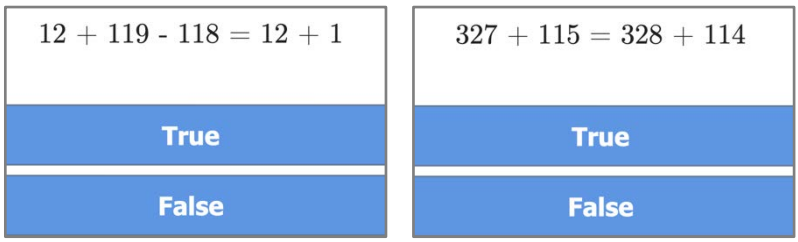
The head of the project is Orhan ÇİMEN (project management,administration activities) Financial manager is Volkan AYHAN (responsible for financial issues)

The main responsible tecaher in the projcet is Nilüfer Tan YENİGÜN (project implementation activities,communication with the partners,dissemination activities)

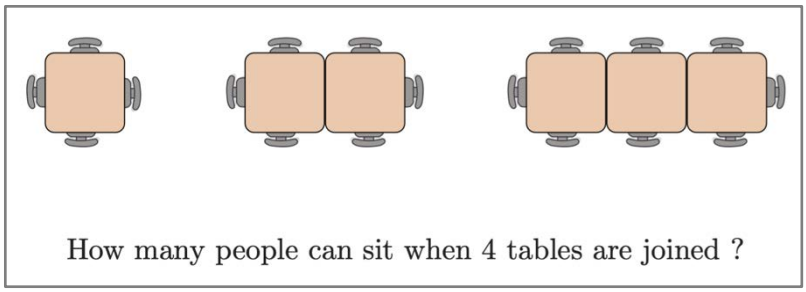
4. The assessment instruments (COMATH)

The Turku Research Institute for Learning Analytics (TRILA), University of Turku (UTU) is responsible for the development of assessment instruments for AT and CT of students aged 9–14 years (COMATH). Our aim is to develop research-based assessment instruments, which teachers can use to assess AT and CT skills of their students and provide support accordingly.

Based on the definition of AT and CT learning outcomes developed by our partners and our systematic reviews of existing AT and CT assessment instruments, we have developed assessment instruments for three different age groups: 9–10 (COMATH1), 11–12 (COMATH2), and 13–14 years (COMATH3). Each COMATH instrument is consisted of test items for assessing different AT skills (e.g., functional thinking and equations & inequations) and CT skills, including algorithmic thinking and other CT skills that students in particular age group should master.

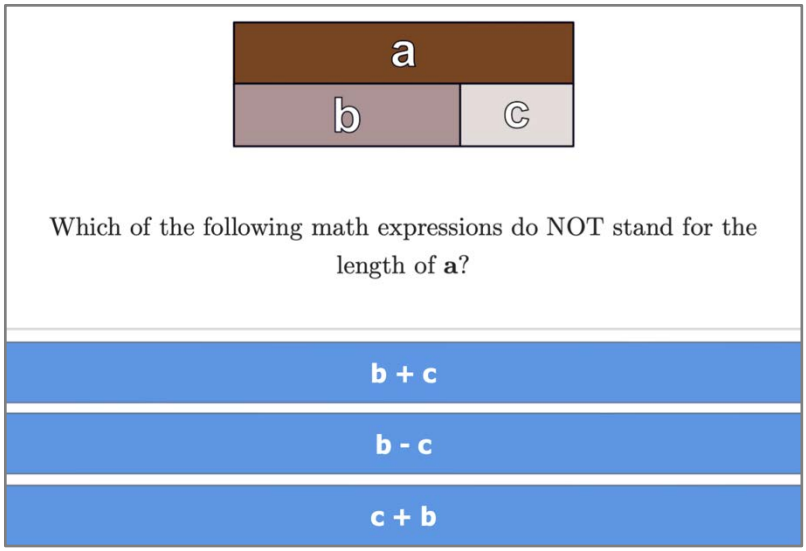


AT test item assessing generalised arithmetic skills of students aged 9–10 years

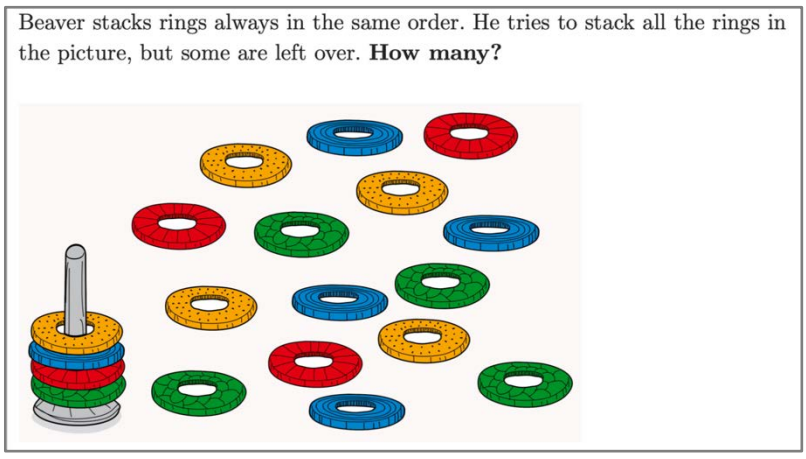


How many people can sit when 4 tables are joined ?

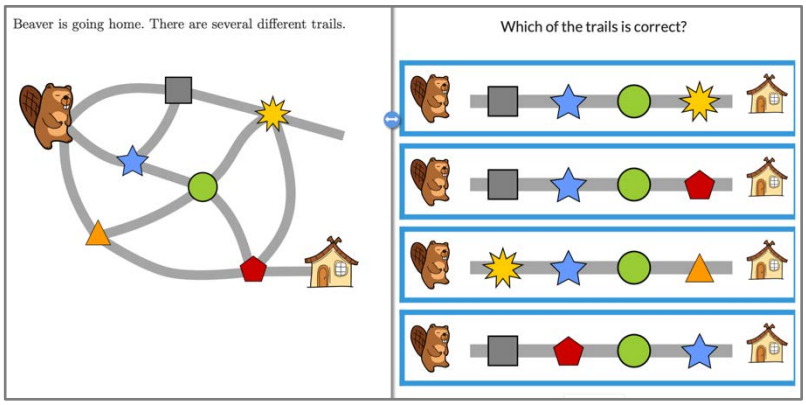
AT test item assessing functional thinking of students aged 11–14 years



AT test item assessing representational skills of students aged 9–12 years



CT test item assessing algorithmic thinking of students aged 9–12 years



CT test item assessing algorithmic thinking and other CT skills of students aged 9–12 years

To ensure the validity and reliability of our assessment instruments, after we had initially developed test items, they were evaluated by students, subject teachers, and researchers from our partner countries in terms of comprehensiveness and comprehensibility of the items and usability of the instruments. After the modification according to the received feedback, the instruments were implemented in ViLLE, a digital learning environment, and translated into eight languages (English, Finnish, Hungarian, Lithuanian, Turkish, Swedish, Spanish, and Basque). During autumn 2023–spring 2024, we conducted a pilot to test our developed instruments with more than 3 000 students and their teachers in six EU countries (Finland, Hungary, Lithuania, Turkey, Sweden, and Spain). Based on the first pilot results, COMATH instruments will be further developed and test again in autumn 2024.

5. Project meeting and workshop in Muğla

Duja Hotel-Muğla

A meeting will be organized in Muğla at Duja Hotel for the purpose of "Implementation results of the first pilot and results from the systematic review". The Turkish team is taking the necessary measures for the meeting to be productive and is looking forward to meeting with the project team. The principals and teachers of Özkent Akbilek Secondary School, who are project partners, will also attend the meeting. A workshop will be held at a secondary school in Muğla, where views on the current status of the project will be shared. It is also hoped that the planning for the next meeting can be discussed on the final working day in Muğla.