**Coding and computational thinking in a maker perspective**

Welcome to this hands-on eTwinning seminar on coding and computational thinking. The seminar will be all about creating and making, using the maker approach to problem solving and learning. We sometimes refer to this as computational tinkering.

The following paragraphs will introduce some of the key concepts, and hopefully inspire you to come up with some great ideas for projects.

**What is computational thinking?**

In recent years, Computational Thinking (CT) and related concepts (e.g. coding, programming, algorithmic thinking) have been promoted by educational stakeholders as skills that are as fundamental for all as numeracy and literacy.

A number of initiatives addressing CT and coding/programing have been carried out, both at international (e.g. EUCode week) and national levels (e.g. introducing programming into the statutory curriculum).

“Computational thinking is the thought processes involved in formulating problems and their solutions so that the solutions are represented in a form that can be effectively carried out by an information-processing agent” (Wing, 2011).

Two aspects emerge from this definition that are particularly significant for education:

1. CT is a thought process, thus independent from technology;  
2. CT is a specific type of problem-solving that entails distinct abilities, e.g. being able to design solutions that can be executed by a computer, a human, or a combination of both.

Computational Thinking (CT) is a **problem-solving process** that includes (but is not limited to) the following characteristics:

* Formulating problems in a way that enables us to use a computer and other tools to help solve them;
* Logically organizing and analysing data;
* Representing data through abstractions such as models and simulations;
* Automating solutions through algorithmic thinking (a series of ordered steps);
* Identifying, analysing, and implementing possible solutions with the goal of achieving the most efficient and effective combination of steps and resources;
* Generalizing and transferring this problem-solving process to a wide variety of problems.

(<http://publications.jrc.ec.europa.eu/repository/bitstream/JRC104188/jrc104188_computhinkreport.pdf>)

### What is a makerspace?

Makerspaces allows us to combine traditional arts and craft subjects with digital fabrication, programmable electronics, microcontrollers, e-textiles etc. It is about working cross-curricular with art, technology, science, math, music etc. It is an approach that positions agency and student interest at the center, asking students to become more aware of the design of the world around them, and begin to see themselves as people who can tinker, hack and improve that design.

A makerspace is a collaborative work space inside a school, library or in another facility for making, learning, exploring and sharing that uses high tech to no tech tools. These spaces can be open to kids, adults, and entrepreneurs and have a variety of maker equipment including micro controllers, 3D printers, laser cutters, cnc machines, soldering irons, sewing machines, cardboard and duct tape. A makerspace however doesn’t need to include all of these machines or even any of them to be considered a makerspace. If you have cardboard, legos or art supplies you’re in business.    
(<https://www.makerspaces.com/what-is-a-makerspace/>)

### Theory

Building on the work of educational theorists like Jean Piaget (constructivism) and Seymour Papert (constructionism) maker-centered learning develops that awareness through interactive, open-ended, student-driven, multi-disciplinary experiences that allow for the time and space needed to develop diverse skills, knowledge, and ways of thinking. In maker-centered learning environments, students imagine, design, and create projects that align the content of learning with hands-on application. Maker education can surface the deep knowledge and resilience in communities, making space in institutions for different ways of knowing and sharing knowledge.  **Maker education isn’t about the *stuff* we can make, it’s about the *connections*, *community* and the *meaning* we can make, and who holds the power to decide what our futures hold.**