HANDS-ON CRITICAL MAKING: ADDRESSING DISINFORMATION THROUGH STEM MAKERSPACES

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Makerspaces and Making activities have recently attracted increasing interest in education, particularly at school and higher education levels, due to their potential to foster digital competences and 21st-century skills through self-directed, project-based learning activities. However, concrete pedagogical approaches, procedures, and processes for systematically integrating critical thinking into making activities have not yet been explored sufficiently. The Erasmus+ Forward-Looking project *Critical Making – Addressing Disinformation in STEM through Makerspaces* aims to address this gap by designing and piloting approaches that combine Making with the purposeful integration of digital tools and Critical Thinking. The project develops concepts based on project-based learning (PBL) in pedagogical makerspaces and explores how such environments can be used to address disinformation while promoting digital competences in STEM in a comprehensive and hands-on manner through Making and the use of innovative digital technologies and tools.

This hands-on workshop is planned for 90 minutes and combines case studies, guided making activities, and collaborative reflection to reimagine how critical thinking can be promoted through making. It gives pre-service and in-service teachers an insight into and demonstrates how Critical Making can be meaningfully integrated into their STEM teaching practice as an approach to active, creative, project- and inquiry-based learning. The participants will work within a scenario framed as a sustainable city of the future and explore physical solutions to different challenges that such a scenario may entail. Using simple, easily available materials, they will build prototypes that serve both as potential solutions and as conversation pieces for a concluding discussion on critical thinking with a STEM perspective.

During the workshop, participants will be guided through the framing of a sustainable city of the future and offered different choices of tools, materials, and topics to create and explore, supported by the workshop facilitators. Examples include prototyping with simple materials such as cardboard, experimenting with AI robots, and tinkering with 3D modelling. These activities model innovative practices in STEM education that teachers can readily adapt to their own classroom contexts. The workshop is structured as follows: First, we give a short introduction into Critical Making as a pedagogical platform that bridges STEM, Critical Thinking, inquiry, and hands-on experimentation, anchored in relevant research. This is followed by several maker activities, including (1) working on a selection of hands-on "Critical, Making, Informative (CMI)" projects, each accompanied by a description card; (2) an introduction to and guided practice with Design Thinking and low-threshold prototyping using simple materials in a science-centre context; and (3) an approach to working with AI robots as tools for student innovators who design concepts for autonomous urban mobility. The workshop concludes with a collective reflection on disinformation in science and on how to promote scientific literacy, Critical Thinking, and digital competencies through Making.