

SELF-MADE AUTOMATA TO TEACH MATHEMATICS IN PRESCHOOL

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Short description of the Workshop Groups: organizers, aims and underlying ideas

*The workshop disseminates findings from the European research project **AutoSTEM**. The aim of the project is to investigate how **automata** can enrich young children's play to promote a better understanding of Science, Technology, Engineering, and Mathematics (**STEM**). It aims to provide preschool teachers and other stakeholders of young children's education of tools and materials to build a didactic path, which is simple, replicable, and valuable in terms of*

- 1) promotion of a motivation for STEM, especially mathematics,*
- 2) promotion of the development of creative thinking, problem-solving, and comprehension ability, and*
- 3) cultural awareness and transversal values such as recycling.*

Automata are fascinating mechanical toys, small Kinetic Art sculptures that can be seen as an amalgamation between engineering, cultural awareness and artistic expression. Due to the combination of narrative and mechanical parts, automata have several possibilities for use within education. Besides being much enjoyed by children, they are easy to create in the classroom. Automata can be built to suit the children's age, with simple to complex designs and motions. When planning with and constructing automata, children can develop different competencies including problem-solving, group work, creativity as well as exploring STEM content.

In the project, we use a relational play-based pedagogy (Hedges & Cooper, 2018) and a dynamic learning concept (Broström, 2017). This approach is child-centred but not entirely child-directed. Play-based pedagogy with its method 'guided play' is a middle ground between direct instruction and free play. It combines elements of teacher-guided instruction with exploration and child autonomy (Weisberg et al., 2016). It has been shown that guided play helps children to a better understanding of academic concepts than direct instruction (Han et al., 2010; Stipek et al., 1995) or free play alone (Chien et al., 2010; Honomichl & Chen, 2012).

In the workshop, we will present the 'snapping crocodile' developed by the project and discuss how they can be used to teach mathematics in the early childhood classroom (preschool and kindergarten). A major part of the workshop will be hands-on work where participants will make their own mechanical crocodile. To participate, you have to prepare: cardboard (at least A4 in size), a wooden skewer or an awl, scissors or a knife, 10 split pins (paper fasteners). Target group for the workshop are preschool teachers and educators.

Dr Oliver Thiel is associate professor for early childhood mathematics education in Norway. Dr Piedade Vaz Rebelo is assistant professor for educational psychology. Both are teacher educators. They have developed AutoSTEM's pedagogical and didactical concepts.

Planned structure:

Insert the planned structure of the workshop in the table below. You can insert rows if needed.

| Planned timeline | Planned activity | Working format /Responsible person |
|------------------|---|--|
| 20 min | Automata in early childhood mathematics education | Short presentation of the project's findings – O. Thiel |
| 50 min | Making a 'snapping crocodile' | Participants make their own crocodile from recycled materials and experience how they are related to maths concepts – O. Thiel |
| 20 min | Pedagogical concepts and ideas | Participants reflect on and discuss how the presented automata can be used to teach mathematics in preschool – O. Thiel |

Venue requirement:

No venue requirements, but the participants should prepare some tools and materials:

- *cardboard (at least A4 in size)*
- *a wooden skewer or an awl*
- *scissors or a knife*
- *10 split pins (paper fasteners)*

References

Broström, S. (2017). A dynamic learning concept in early years' education: a possible way to prevent schoolification. *International Journal of Early Years Education*, 25(1), 3-15.

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