



AUTOSTEM

GUIDEBOOK

SHORT EDITION



Erasmus+



CREDITS

Title

AutoSTEM Guidebook – Short Edition

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INTRODUCTION

AutoSTEM is an Erasmus+ project that is using automata to promote motivation for STEM education and the development of transversal skills in children. It has produced a set of resources to be used preferably by early childhood education, care workers and primary school teachers.

Automata are fascinating mechanical toys, small sculptures of Kinetic Art. Automata consist of two main parts, a toy with a narrative, and a mechanism that makes the toy move. They can be seen as "mechanical storytelling objects" or as a combination of engineering, cultural awareness and artistic expression.

This guide is an abridged version of a document in which you can find the whole conceptual framework, pedagogical resources and examples of how the AutoSTEM Project has been implemented in schools in Europe. It is intended to be a "Pedagogical Guide", a manual for teachers and educators on how to use the resources that have been created within the project, from a pedagogical aspect.



This guide is divided into five chapters:

- Chapter 1, the **Toolbox**, integrates several documents that can support practice.
- Chapter 2, **Automata**, includes the Pedagogical Guidelines & Construction Instructions (PG & Ci) of the automata.
- Chapter 3, **Events & Workshops**, presents some of the activities developed.
- Chapter 4 refers to the **Case Studies**, based on the research on the activities carried out within the project.
- Chapter 5 presents the **Online Course** available on the project website.

The **AutoSTEM Guidebook**, in this abbreviated version, directs access to all this information, and is organized with QR codes directed to all the important documents, videos or pages. The guide is available in the five project languages.

**SCAN THIS QR CODE TO GET
ACCESS TO THE AUTOSTEM
WEBSITE**





CONTENTS

01

Toolbox

02

Automata

03

**Events &
Workshops**

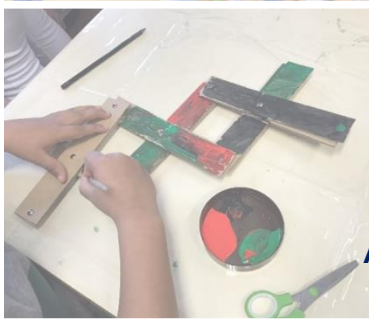
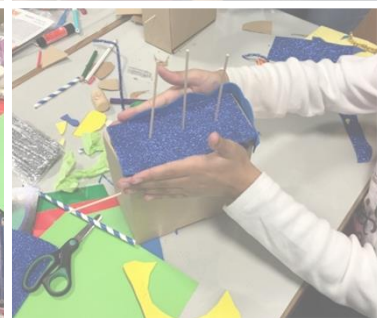
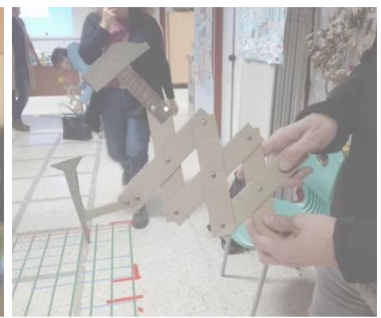
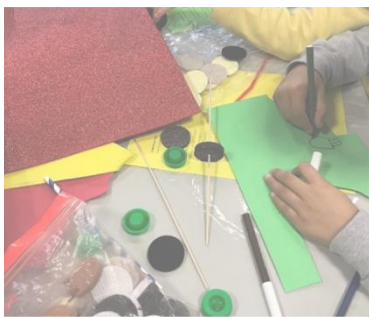
04

Case Studies

05

Online Course





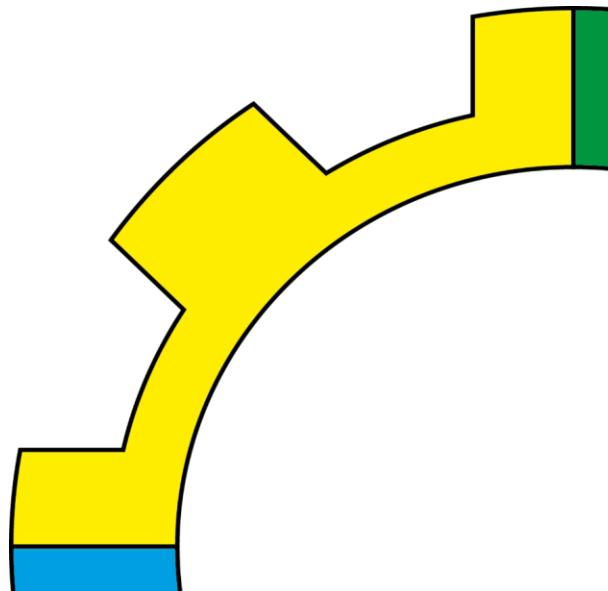
Competition for the European Day of the Environment
Acron: Ameli, domis, princip

AutoSTEM across Europe

01

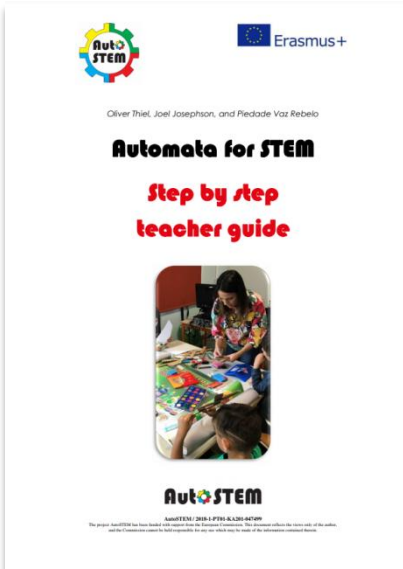
Toolbox

In the **Toolbox** are the resources produced by the AutoSTEM project that will help in using the activities.



01 TOOLBOX

Step by Step Teacher Guide



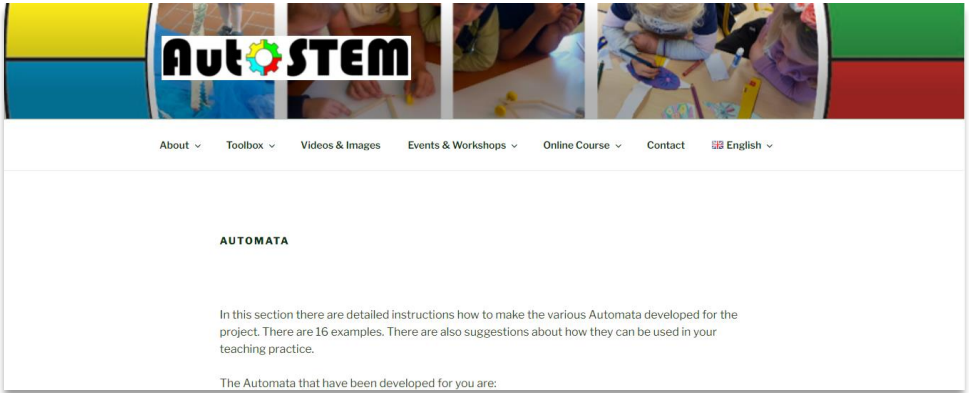
The **Step by Step Teacher Guide** is a document that compiles information about automata and the STEM subjects, the theoretical framework and pedagogical concept and the STEM content that you can teach with our automata. Some key concepts for building the automata are also presented in this document.

This guide should serve as a basis for the teacher's practice in using the activities of the AutoSTEM project.



**SCAN THIS QR CODE TO GET
ACCESS TO THE STEP BY STEP
TEACHER GUIDE**

Pedagogical Guidelines & Construction Instructions



On the page, '**Pedagogical Guidelines and Construction Instructions**' you can find a list of all the automata designed and developed by the AutoSTEM project, however, these will be also presented individually below.



**SCAN THIS QR CODE TO GET
ACCESS TO THE
PEDAGOGICAL GUIDELINES
AND CONSTRUCTION
INSTRUCTION PAGE**

01 TOOLBOX

Scenarios & Narratives



On the **Scenarios & Narratives** page you can find suggestions of scenarios or narratives to develop when using the AutoSTEM project activities. These can provide better uses of all the features of the different automata when teaching STEM subjects.



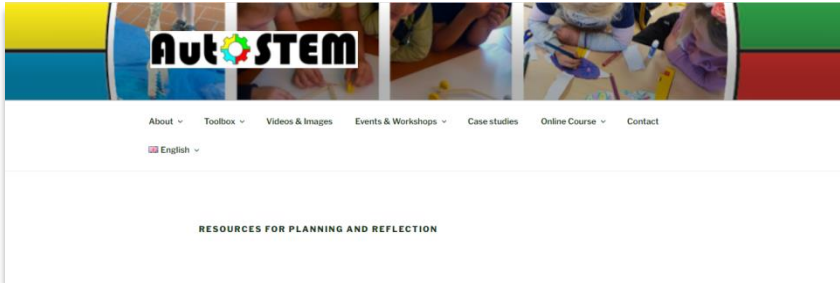
**SCAN THIS QR CODE TO GET
ACCESS TO THE SCENARIOS &
NARRATIVES PAGE**



Resources for Reporting & Evaluating

Within the **Resources for Planning & Reflection** you can find materials that support the planning, recording and reflection on the activities developed with children within the project.

In addition to the full version, these documents can also be referred to separately depending on the template that is used.



**SCAN THIS QR CODE TO GET
ACCESS TO SOME RESOURCES
FOR REPORTING &
EVALUATING PAGE**

01 TOOLBOX

Resources for Reporting & Evaluating

FULL DOCUMENT OF TEMPLATES



INDIVIDUAL TEMPLATES



PLANNING TAMPLATE



LOGBOOK TEMPLATE



**POST QUESTIONNAIRE (6/7
YEARS) TEMPLATE**



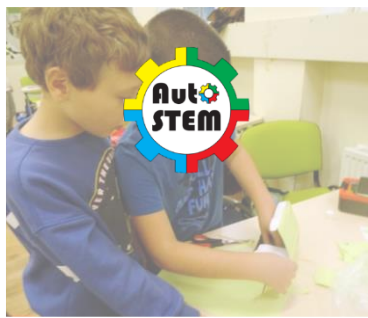
PARENTAL PERMISSION



OBSERVATION GUIDE



REPORTING TEMPLATE

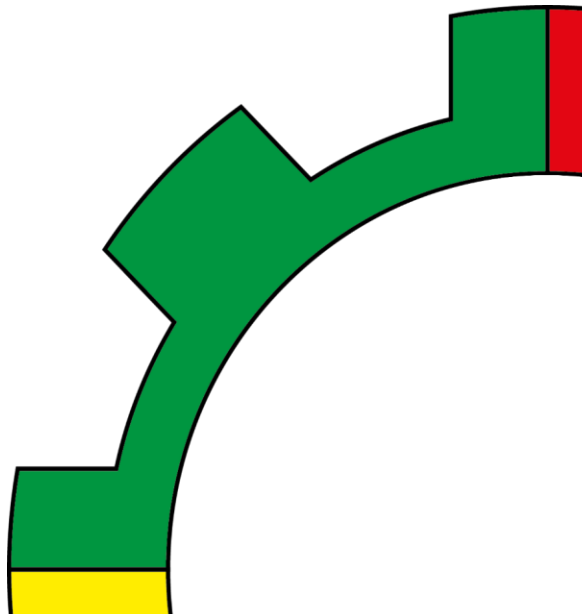


AutoSTEM across Europe

02

Automata

In **Automata** every Pedagogical Guideline & Construction Instruction (PG & CI) for each automata is presented with video tutorials.



02 AUTOMATA

JellyBird

The **JellyBird** is a moving toy made of paper and cardboard that can move its wings like a bird.

Target Group

- 4 – 7 years

Subjects covered

- Mechanisms
- Mathematics
- Biology



SCAN THIS QR CODE TO GET ACCESS TO THE JELLYBIRD PG & CI OR VIDEO



Pedagogical
Guidelines &
Construction
Instructions



Talking Elephant

The **Talking Elephant** is a simple automata made from a cardboard box with the face of an elephant on the front and a lever at the back. Making the lever move makes the elephant look like it is talking.

Target Group

- 4 – 7 years

Subjects covered

- Mechanisms
- Biology
- Mathematics
- Physics



SCAN THIS QR CODE TO GET ACCESS TO THE TALKING ELEPHANT PG & CI OR VIDEO



Pedagogical
Guidelines &
Construction
Instructions



Tutorial



02 AUTOMATA

Dancing Doll

The **Dancing Doll** is a paper doll that fits on the top of a box and turns around when a hand crank is activated, using a mechanism inside the box.

Target Group

- 4 – 7 years

Subjects covered

- Mechanisms
- Biology
- Mathematics
- Physics



SCAN THIS QR CODE TO GET ACCESS TO THE DANCING DOLL PG & CI OR VIDEO



Pedagogical
Guidelines &
Construction
Instructions



Tutorial



Balloon Car

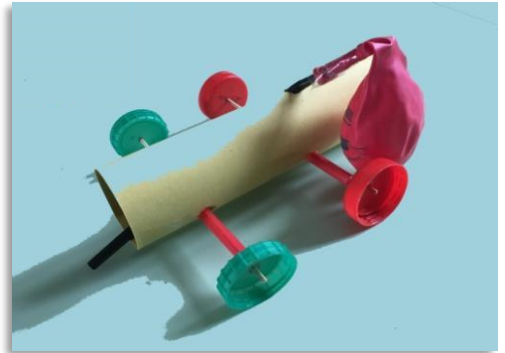
The **Balloon Car** is a moving car made of cardboard, straws and a balloon, that will move on its own when the balloon is inflated.

Target Group

- 5 – 7 years

Subjects covered

- Mathematics
- Physics
- Mechanisms



**SCAN THIS QR CODE TO GET ACCESS TO THE
BALLOON CAR PG & CI OR VIDEO**



Pedagogical
Guidelines &
Construction
Instructions



Tutorial



02 AUTOMATA

Balloon Boat & Amphicar

The **Balloon Boat & Amphicar** is a boat and a car at the same time made from a standard milk or juice carton that will move on its own when the balloon is inflated.

Target Group

- 4 – 7 years

Subjects covered

- Physics
- Mechanisms
- Energy transfers



SCAN THIS QR CODE TO GET ACCESS TO THE BALLOON BOAT & AMPHICAR PG & CI OR VIDEO



Pedagogical
Guidelines &
Construction
Instructions



Tutorial



Snapping Crocodile

The **Snapping Crocodile** is a cardboard moving toy which makes use of a scissor's mechanism. It has the face of a crocodile. Other elements can be added that will move when the mechanism is manually activated.

Target Group

- 4 – 7 years

Subjects covered

- Mathematics
- Engineering
- Mechanisms



SCAN THIS QR CODE TO GET ACCESS TO THE SNAPPING CROCODILE PAGE OR VIDEO



Pedagogical
Guidelines &
Construction
Instructions



02 AUTOMATA

Catapult

The **Catapult** is a simple toy that has the capacity to shoot small, lightweight projectiles a short distance. This toy can be used in a number of different mathematical games.

Target Group

- 4 – 8 years

Subjects covered

- Physics
- Mechanisms
- Mathematics



SCAN THIS QR CODE TO GET ACCESS TO THE CATAPULT PAGE OR VIDEO



Pedagogical
Guidelines &
Construction
Instructions



Acrobat

The **Acrobat** is a moving toy that make acrobatic movements when the linkages are complete, and a rotation movement is made manually.

Target Group

- 4 – 7 years

Subjects covered

- Physics
- Mechanisms
- Biology



**SCAN THIS QR CODE TO GET ACCESS TO THE
ACROBAT PG & CI OR VIDEO**



Pedagogical
Guidelines &
Construction
Instructions



02 AUTOMATA

Wind Turbine

The **Wind Turbine** is made with paper cups or paper sheets that turns around when acted on by the wind. It can be used to move other objects or devices.

Target Group

- 4 – 7 years

Subjects covered

- Physics
- Mechanisms
- Mathematics
- Biology
- Engineering



SCAN THIS QR CODE TO GET ACCESS TO THE WIND TURBINE PG & CI OR VIDEO



Pedagogical
Guidelines &
Construction
Instructions



Tutorial



Colour Spinning Disk

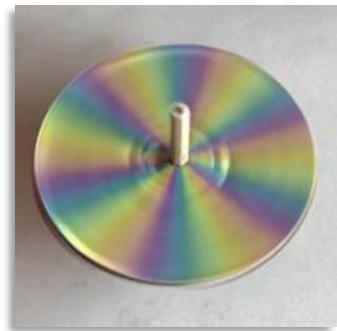
The **Colour Spinning Disk** is a rotating disk whose surface is divided into different colours that appear to change when the rotation movement is triggered, manually.

Target Group

- 4 – 7 years

Subjects covered

- Mathematics
- Physics
- Mechanisms



SCAN THIS QR CODE TO GET ACCESS TO THE COLOUR SPINNING DISK PG & CI OR VIDEO



Pedagogical
Guidelines &
Construction
Instructions



Tutorial



02 AUTOMATA

Eco Car 1

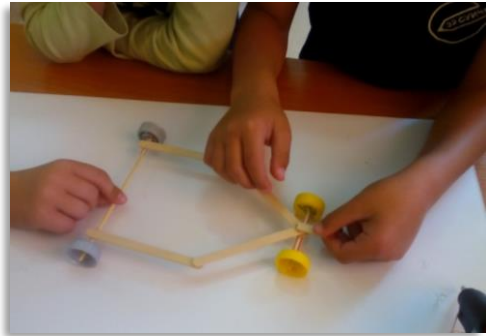
The **Eco Car 1** is a simple car made from wood sticks, straws and bottle tops that can move forward when the mechanism is activated manually.

Target Group

- 4 – 7 years

Subjects covered

- Physics
- Mechanisms
- Mathematics



**SCAN THIS QR CODE TO GET ACCESS TO THE
ECO CAR 1 PG & CI OR VIDEO**



Pedagogical
Guidelines &
Construction
Instructions



Tutorial



Eco Car 2

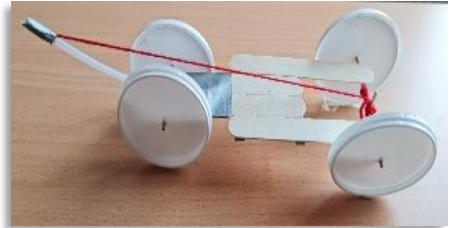
The **Eco Car 2** is also a simple car that can move forward when a different mechanism is activated manually.

Target Group

- 5 – 8 years

Subjects covered

- Mathematics
- Physics
- Engineering
- Mechanisms



**SCAN THIS QR CODE TO GET ACCESS TO THE
ECO CAR 2 PG & CI OR VIDEO**



Pedagogical
Guidelines &
Construction
Instructions



02 AUTOMATA

Elevator

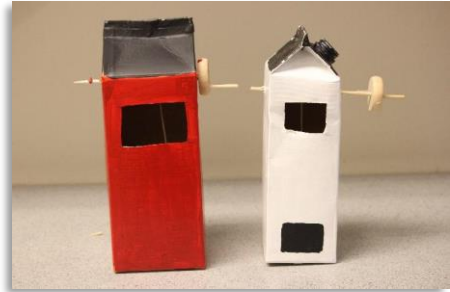
The **Elevator** is a small house made from a milk or juice carton that contains a winch that is used to lift and lower an elevator. This toy's mechanism is activated manually and has a rotation movement.

Target Group

- 4 – 7 years

Subjects covered

- Engineering
- Mechanisms
- Mathematics



SCAN THIS QR CODE TO GET ACCESS TO THE ELEVATOR PG & CI OR VIDEO



Pedagogical
Guidelines &
Construction
Instructions



Tutorial



Drawbridge

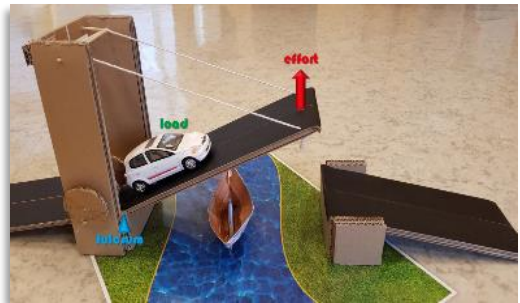
The **Drawbridge** is a toy bridge that can be raised to permit passage of a ship under, or to protect the entrance of a castle.

Target Group

- 5 – 8 years

Subjects covered

- Physics
- Mechanisms
- Mathematics
- Engineering



SCAN THIS QR CODE TO GET ACCESS TO THE DRAWBRIDGE PG & CI OR VIDEO



Pedagogical
Guidelines &
Construction
Instructions



Tutorial



02 AUTOMATA

Returning Tin Can

The **Returning Tin Can** is a tin can with a cylinder shape. A rubber band twisted inside allows it to roll across surfaces but it will return to its point of origin, as soon as it stops.

Target Group

- 4 – 7 years

Subjects covered

- Physics
- Engineering
- Mathematics



SCAN THIS QR CODE TO GET ACCESS TO THE RETURNING TIN CAN PG & CI OR VIDEO



Pedagogical
Guidelines &
Construction
Instructions



Moving Shapes & Two Faces

The **Moving Shapes, Two faces** is a toy made with cardboard that uses a linkage mechanism so that it can move into different geometric shapes .

Target Group

- 4 – 7 years

Subjects covered

- Physics
- Mechanisms
- Engineering
- Mathematics



SCAN THIS QR CODE TO GET ACCESS TO THE MOVING SHAPES & TWO FACES PG & CI OR VIDEO



Pedagogical
Guidelines &
Construction
Instructions



Tutorial



02 AUTOMATA

Grabbing Hand

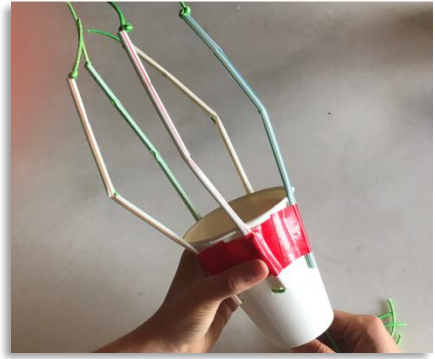
The **Grabbing Hand** is a mechanical hand toy built from paper cups, straws and threads. This toy will move when the threads are pulled.

Target Group

- 4 – 7 years

Subjects covered

- Mathematics
- Biology
- Mechanisms



SCAN THIS QR CODE TO GET ACCESS TO THE MOVING SHAPES & TWO FACES PG & CI OR VIDEO



Pedagogical
Guidelines &
Construction
Instructions

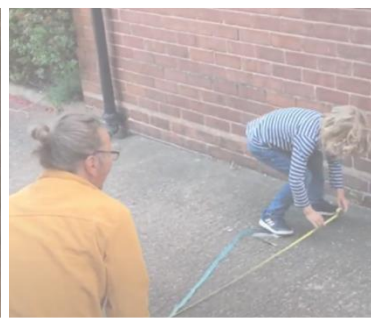
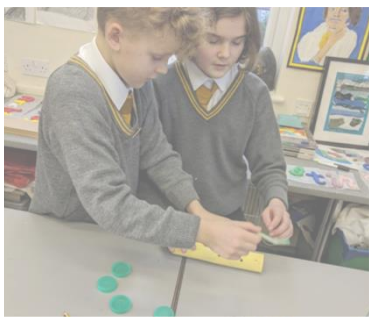


A more elaborate version of the Grabbing Hand was developed, the **Grabbing Hand - Advanced Edition**. In this version, each of the wires that are pulled to cause the movement in the hand, is connected to one of the hand's fingers, this results in an even more realistic hand movement.



**SCAN THIS QR CODE TO GET
ACCESS TO THE GRABBING
HAND – ADVANCED EDITION
TUTORIAL**

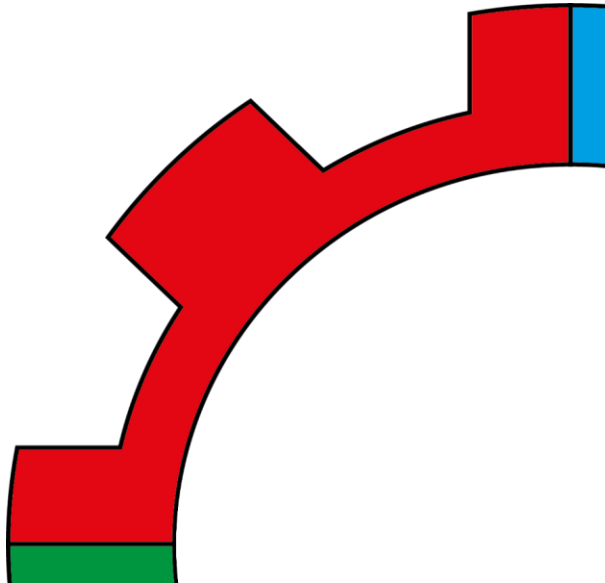




03

Events & Workshops

In **Events & Workshops**
the activities developed
by the project are
presented.



03 EVENTS & WORKSHOPS



On the **Events & Workshops** page, are reports of several activities already used in the AutoSTEM project.

You can find a report on the Erasmus Day 2020 that was celebrated by the project in Portugal, reports of several workshops with teachers and students, a report on the visit of the Portuguese National Agency and also the participation of the project in a number of conferences.



ERASMUS DAY 2020



MULTIPLIER EVENTS



WORKSHOPS FOR

**TEACHERS &
EDUCATORS**

CHILDREN

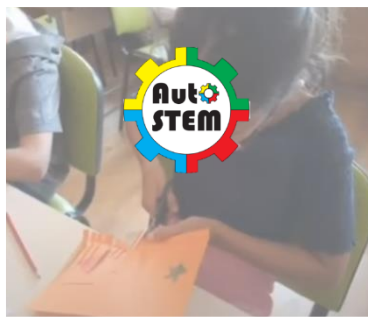


**VISIT OF PORTUGUESE
NATIONAL AGENCY**



CONFERENCES



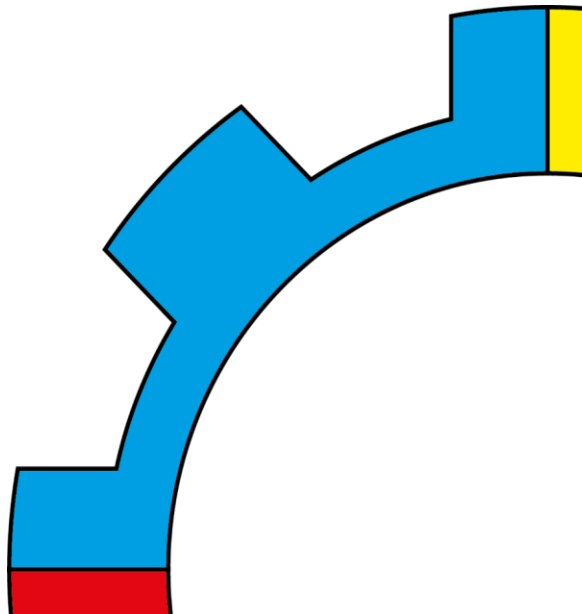


AutoSTEM across Europe

04

Case Studies

In **Case Studies** are the studies and research developed by the project using the resources that have been developed within it's activities.



04 CASE STUDIES

The **Case Studies** report some of the findings from workshops and teacher training carried out by the project partners in their countries.

There are twelve case studies included in three broad areas:

1. **Case Studies with a target audience of learners aged 4-12**
2. **Case Studies with a target audience of teachers**
3. **Case Studies with a target audience of SEN students**



**SCAN THIS QR CODE TO GET
ACCESS TO THE CASE STUDIES
COMPLETE DOCUMENT**

CASE STUDIES WITH A TARGET AUDIENCE OF LEARNERS AGED 4-12

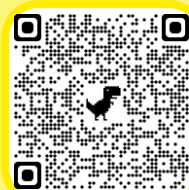
Including an AutoSTEM activity in an annual classroom project 'The garden'



The Travelling (Jelly)Bird



The Ulysses' boat



When two hands are not enough: spontaneous cooperation between children when constructing automata



04 CASE STUDIES

CASE STUDIES WITH A TARGET AUDIENCE OF LEARNERS AGED 4-12

Children's engagement and learning in a moving toys workshops in a primary school



Integration of the AutoSTEM project in the curriculum. Making an Acrobat



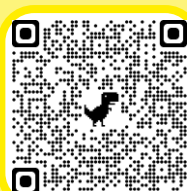
Development of skills for problem detection, choice of work strategy, decision making, activity planning



From guided play to creativity: metamorphoses and stories of a bird



Using Automata in an after-school Science Club



CASE STUDIES WITH A TARGET AUDIENCE OF TEACHERS

Using self-made automata to teach STEM in early childhood teacher education



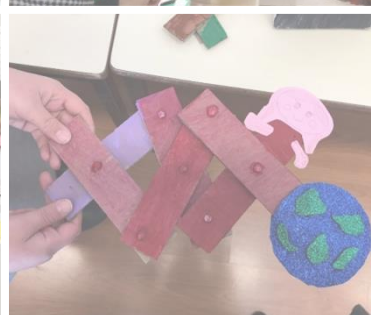
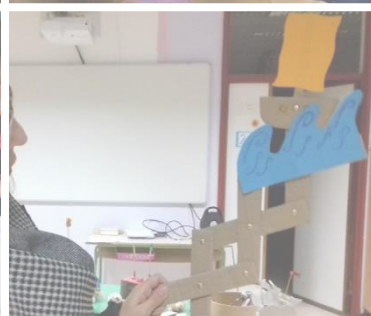
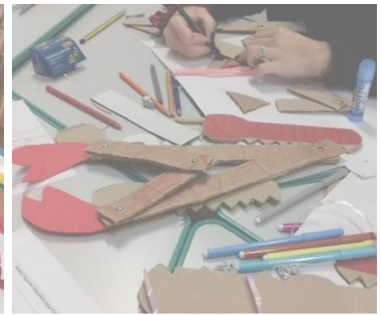
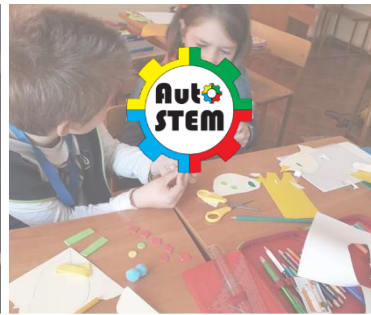
CASE STUDIES WITH A TARGET AUDIENCE OF SEN STUDENTS

Outcomes of Automata for STEM activities with cognitive and physically impaired people



Hearing and touch for seeing: Instructions to promote mental representation of geometric shapes in visual impaired people when constructing a moving toy



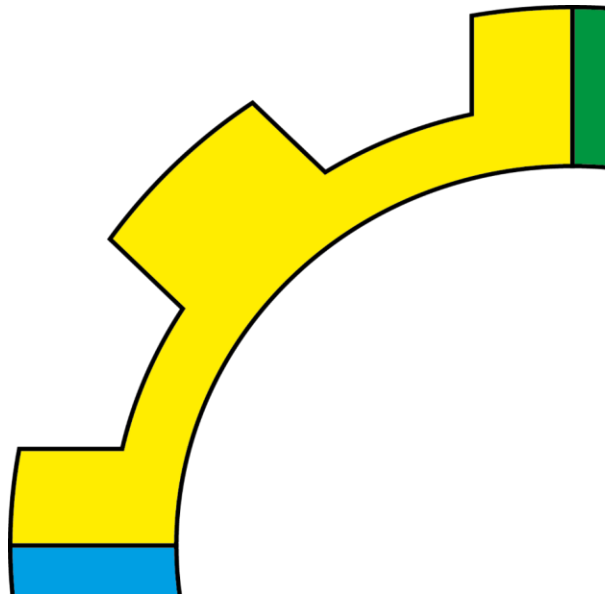


AutoSTEM across Europe

05

Online Course

The **Online Course** is designed for teachers and educators that want to learn to use the project. It is a full, modular course and is available on the AutoSTEM website.



05 ONLINE COURSE

The **Online Course** is designed as a modular course that teachers and educators working with preschool, kindergarten, and young primary age children can use to understand the project better and learn how to use the project's resources autonomously.

The course is organised into 5 modules:



SCAN THIS QR CODE TO GET
ACCESS TO THE ENTIRE ONLINE
COURSE



ABOUT THE PROJECT



**YOUR TURN TO MAKE
AUTOMATA**



**PEDAGOGICAL
BACKGROUND**



STEM CONTENT



**AUTOSTEM IN YOUR
CLASSROOM**





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AutoSTEM across Europe



Partners:



FACULDADE DE MEDICINA
UNIVERSIDADE DE
COIMBRA



QueenMaudUniversityCollege
OF EARLY CHILDHOOD EDUCATION



Associated Partners:



The AutoSTEM team would like to thank all the teachers and children involved in the workshops, training and case studies, and wishes all those interested in STEM subjects meaningful and playful learning when using the AutoSTEM ideas and project materials.



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of the European Union

