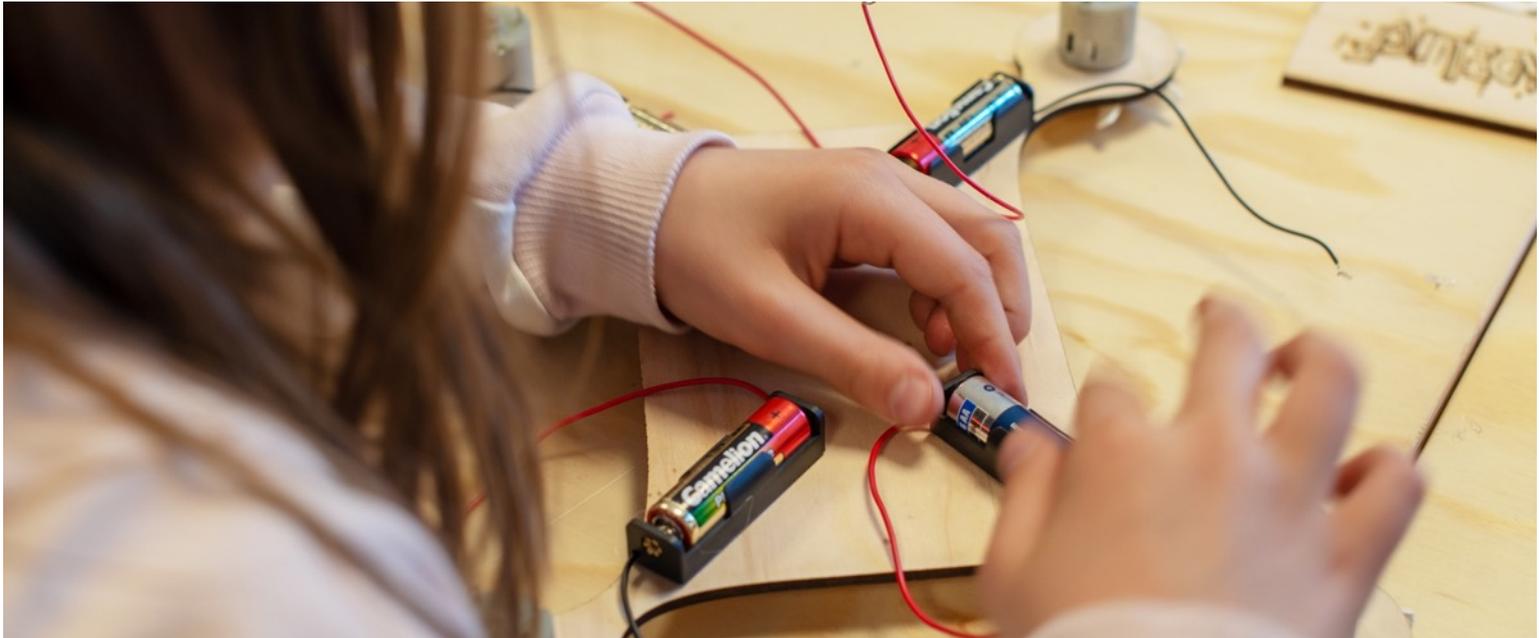




Entrepreneurial skills  
for young social innovators  
in an open digital world



## Workshop Description

# **FROM WASTE TO INVENTION**



**waag**  
technology & society



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## *From Waste to Invention (Waag)*

In 8 weeks children created a prototype for a solution to help solve waste problems in their neighbourhood. Children gathered recycled materials to make a prototype. They used digital fabrication and electronics to further develop the prototype.

First children analyze the **system** of the production and use of a pair of jeans by mapping out the product chain. They will take a holistic view and identify intervention points. After identifying these intervention points they frame the issue in a **problem** definition. For these defined problems children develop **solutions**.

Children start crafting a physical prototype of the robotic solution. by combining and manipulating recycled materials like cardboard and plastics.

The facilitation of the process places attention on entrepreneurship competences. Children are stimulated to work with others, develop creative and purposeful ideas, cope with uncertainty, keep up motivation and perseverance, do planning and management of their project and work on self-efficacy. The approach for this is scaffolding. They first can try themselves, and if they need some help, they get support to take the next step themselves.



**Duration:** 8x2 hours

**Setting:** after-schools

**Group size:** 15 – 20 children

**Age:** 8 – 12 year





## Week 1

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### Welcome – 5 min.

Aim: make children feel welcome in the makerspace

Facilitator instructions:

- Smile and introduce yourself
- Ask if the children have been in the maker space before
- Involve parents if they are there
  
- Give some hints about the programme to spark curiosity

### Introduction - 10 min

Introduce the topic of the workshop series

Facilitator Instructions:

- Briefly tell what the programme of the workshop series is going to be
  - In this programme we will make waste robots using waste material, digital fabrication and electronics.
  - We will learn through making. We will encounter many things we haven't done before, so we will explore how we can use technology to make things.
  - Step-by-step we will make the robot, spread over 8 weeks
- Explain what the makerspace is, and what the rules are (hang your coats and bags, no running in the makerspace, no food and drinks near machines and laptops)
- Explain what the final objective is (making a prototype for sustainable development)
- Explain how we are going to do this (design, digital fabrication)
- Tell what we will do today

### Discussion about waste – 15 min

### Break – 5 min

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## Maker Activity – 50 min

### Aim:

- Children learn what the laser cutter can do and how to design for laser cutting.
- Getting to know each other

### Facilitator Instructions:

- Give a demonstration of the laser cutter and explain how the machine works.
- Explain drawing for a machine is different than a drawing as a gift for a friend. Machines need precise instructions, which in this case is a drawing with clear, black lines
- Scan the drawings and trace the images in Inkscape
- Cut out the first name tags. If it isn't possible to cut them all during the workshop, tell on forehand and cut them out before the next workshop.

### Instruction for children:

- Prompt: design your own name tag on using only one colour marker.
- Name should be readable
- Decorations are allowed
- Stimulate to make multiple design

### Materials:

- white A4 paper
- black markers

## reflect – 10 minutes

- End the workshop by letting the children show each other what they have made/designed
- Ask questions to reflect on the workshop: what did you learn? What was difficult? What was new?
- Tell what we are going to do next week.





## Week 2

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### Welcome - 5 minutes

- Hand out the laser cut name tags
- Ask what we did last week: try to let the group recollect what the steps were for laser cutting (drawing with dark marker on paper, scan drawing, trace, send to laser cutter)
- Show some examples of robots and start a discussion about what a robot is. And what is not a robot? And why it isn't a robot? It is not necessary to agree, the more answers the better.
- Tell what we will make today: a led post-card. Together we will explore how it works. First we start by drawing a robot.

### Draw a robot

Aim:

- Making a design for the LED card.
- Getting an idea of what a robot can be. Young children often have first associations which look a lot like automated humans. Humanoid robots exist, but there are a lot of different types of robots. This exercise is great to open up a more diverse thinking on how robots look.

Facilitator Instructions:

- Before starting to draw you can do an ideation exercise to stimulate thinking in different directions. Follow these instructions from the Apples-Drawing tool from Hyper Island and draw robots instead of apples. <https://toolbox.hyperisland.com/apple-drawing-ideation-exercise>
- Draw a robot: ask children to draw multiple designs and redraw their favourite on the front of a folded piece of thick card.
- Decide where on the drawing the light will come. Use one led-light.

### Break – 5 minutes

### Make the Led Circuit

See: <https://makerbox.waag.org/instructable/ledkaart/>





## Close and reflect – 10 min

- clean up together
- Discuss the homework assignment: gather waste in your own environment and bring it next week

## Week 3

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aim of this week: Map the system, define a problem and prototype a first solution.

facilitation focus: This workshop is quite packed, keep up the pace and enthusiasm!

## Welcome - 5 minutes

Aim: Recollect last weeks steps (drawing, paper circuit, led, battery)

Explain steps of today: first look at the materials, map the waste problem and with the remaining time start prototyping.

## Warm-up: Material Round (5 – 15 minutes)

Aim: Getting a feel of the waste materials, by looking at the materials the children brought from home and get the creative thinking going.

Facilitator Instructions:

During the material round everyone picks a material from the table and tells about it. Make sure everyone gets a turn. Keep up the tempo and make crazy, extreme or silly suggestions. Demonstrate how it works by giving an example of one round. (example: a straw can be use for drinking, blowing, building a cube, or it is a mini-slide for ants)

Instructions for children:

- Choose a material
- Come up with different uses. For the choosen material, think of three uses, of which one use is a crazy one
- Combine: lit two or three children come up with a use of a combination of materials.

Source: <https://www.ontwerpenindeklas.nl/losseles/materialenrondje/>





## Mapping the problem - 40 minutes

Aim: Take a holistic view of the problem of textile industry on a systems level and identify intervention points.  
For instructions see tool Building the Problem

## Break – 5 minutes

## Ideation and 1<sup>st</sup> prototype – 50 minutes

Aim: Coming up with a solution for one of the identified intervention points and starting the prototype of the solution.

Facilitator Instructions: See step 1, 2 and 3 of tool: facilitators guide to prototyping with digital fabrication and electronics for 8 – 12 year olds. Most important today is to end with a solution. If there is no time left to start the prototyping this lessons, just start with it the next week.

## Reflect - 10 minutes

Aim: End the lessons by doing a recap of the systems map. Let the children share the solutions for the defined intervention points.

## Week 4

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aim of this week: Finish the first prototype

Facilitation focus: Have a close look of how it is going, what the most difficult moments are for the children. If they are struggling with this phase, it is good to adjust for the programme in week 5, 6 and 7.

If they find it easy, you can take different steps in week 5, 6 & 7.

## Welcome – 5 minutes





Aim: Recap of last week, let children tell what the problem was and what they came up with during the ideation round.

### **Robot inspiration – 10 minutes**

Facilitator instruction: Thinking about robotics, show examples of robots and how they help us. Show example videos of robots inspired by animal movements.

### **Prototyping – 50 minutes**

See facilitation guide to prototyping for the rest of the activity

### **Break 5 minutes**

### **Continue Prototyping – 40 minutes**

### **Reflect – 10 minutes**

Aim: Make a decision on next week: focus on prototyping or deepen the process

## *Week 5, 6 & 7*

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Week 5, 6 and 7 See facilitation guide for prototyping on the DOIT toolbox. These weeks are difficult to fit in a schedule, since it is a more open process. Read the facilitation guide for prototyping with digital fabrication and electronics for the steps that we took.





## Week 8

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### Prepare presentations – 50 minutes

Facilitator Instructions: Lay out the tables so children can show their prototypes and also make sure there is space for the sketches and early versions of prototypes so they can also show the process

Instructions for children:

- Show final result
- Show the process in steps
- Tell a story

### Break – 5 minutes

Welcome the parents and other visitors that arrive

### Presentation - 50 minutes

Facilitator Instructions: You will be the host of the presentation. Invite all children to present their prototypes. Let them tell their own story and if you think they have missed out to share something interesting or valuable, ask about it so they can tell the complete story.

After the presentations, there will be time for the visitors to walk around and ask further questions.

Instructions for children:

One by one the children will be invited to present their prototypes. Afterwards there will be time to chat to the people you have invited

### Goodbye - 10 minutes

