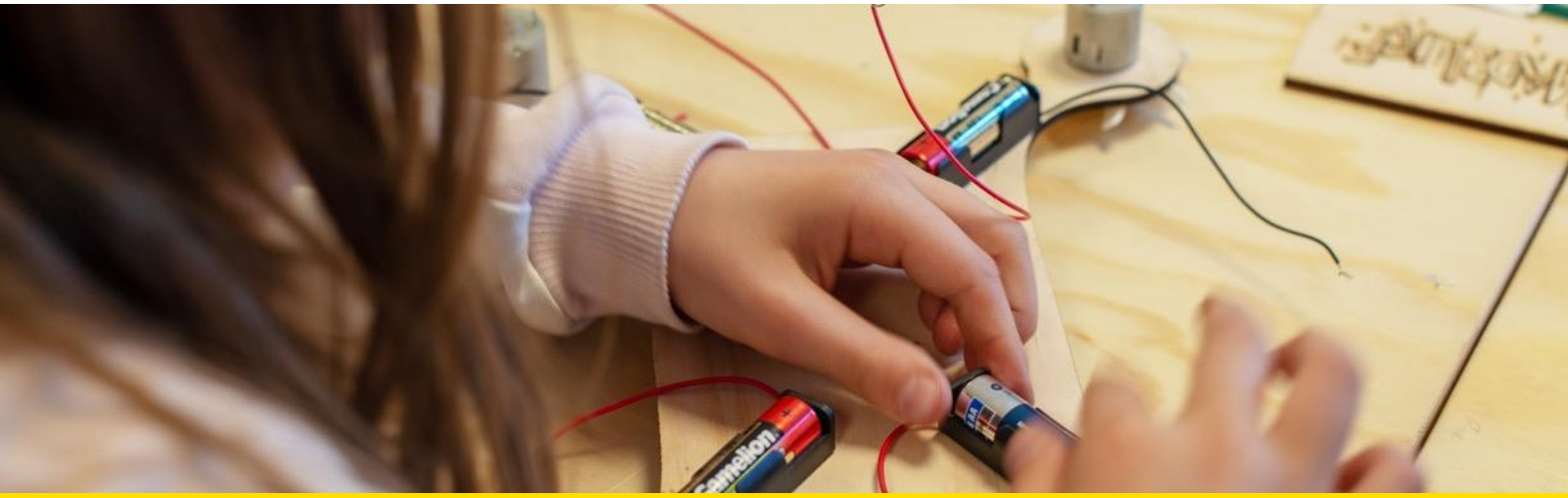
Entrepreneurial skills
for young social innovators
in an open digital world



Workshop Descriptions

Smart House

ZENTRUM FÜR SOZIALE INNOVATION | CENTRE FOR SOCIAL INNOVATION

SMART HOUSE SOLUTIONS (ZSI)

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Although climate change, the need for careful use of energy or rare materials has a visible presence in off- and online media, engagement levels among youths are still very heterogeneous.
One possibility to make children further aware of societal issues and natures is to directly ask them to identify issues and problems they see in their direct environment.
Children are very aware of issues around them, thus they will come up very soon with problems they got aware of at school or at home, at playgrounds or because of issues of loved people.

The workshop described in this document aimed for combining maker skills with social entrepreneurship. Making was centred around physical computing skills as well as prototyping first solutions. Most of the kids have an emotional link with issues in their environment thus it is a great way to get them into first programming, linking to entrepreneurship, environmental thinking and societal responsibility in a compelling way.

The workshop was designed and promoted as tinkering and inventor workshop during 4 days as holiday programme for kids from 7 till 14.

Throughout the workshop series a particular focus was lied on 3 levels:

- Tinkering
- Programming of microcontrollers (Calliopes)
- Entrepreneurship

The children were working in groups and there were four facilitators for 19 children. Important was also to understand that tinkering skills of the young kids are not that advanced, thus taking care and guiding them when using potentially dangerous tools like hot glue gun or very sharp knifes for cutting thick card boards is obligatory.

Duration: ≈ 3 days à 5 hours
Setting: holiday activity or school project
Group size: ≈ 20 children
Age: 8-12 years

Workshop 1: Objectives, Motivation and Idea Scoping

Welcome -

30 minutes

* Welcome and introduction of facilitators and the DOIT project
* Kid creates an own name tag till the group is complete. The name tag is also used as ‘completion’ guide, thus for each completet day, the kids get a stamp on the backside of the name tag. The reason for doing this combination of name tag and completion guide has several reasons:

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- first drafting and fostering creativity by working on a name tag and getting to know each other
- motivation to complete and gaining a certificate once all the fields were stamped
- at the end of each workshop day, the kids got the stamp after showing and telling what/how they did – this was a sort of 'closing procedure' on all workshop days

Understanding how a robot (and programming) works

45 min.

*‚Being a robot'
*Aim of this exercise: This exercise is used to make kids understand that robots or any other machine that is programmed would only do exactly those things that are programmed by humans. In this activity, students will attempt to "programme" the facilitator to make a Nutella bread sandwich.

Thus, the 'Nutella Bread Man' exercise requires

- bread
- knife
- Nutella (or butter, jam, …)
- plate

How it works: One facilitator plays the robot. Tell the class that you are a computer and that you are going to follow their instructions. Proceed by interpreting the instructions in the most literal manner possible. The kids' task is to let the robot make a Nutella bread by commanding the facilitator (ie. "Put some Nutella on the bread"). Thus, some of the steps that the kids are programming will not be that exact, so that the Nutella bread man tries to i.e. put some Nutella, but the glass jar is still closed.
By doing this exercise, the kids understand that programming needs a very exact description of what the robot (or micro-controller) needs to do.

Consolidate learning and understanding of programming principle

15 min

*Exercise ‚Clean your Teeth' (Group exercise: two by two: one is programming, one is the Robot)
*Aim: consolidating the understanding of programming principle

Each kid gets a (new, still packaged) toothbrush and some toothpaste. One kid plays the robot who brushes his/her thees, the other one 'programmes' his/her group partner. The 'robot' is only allowed to do exactly what the programmer says, thus the kids need to be very precise in their instructions.

Understanding what is needed to have an electric circuit

60 min

*Making a toothbrush monster or bug
*Aim of exercise: This exercise makes kids understand on how to wire battery and a motor. They get an understanding on how electricity makes a motor vibrating (closed circuit)

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Each kid is allowed to make with his/her toothbrush now a toothbrush monster.
With hot glue and a soldering iron, wires, a vibrating motor, and a coin cell lithium battery, to transform their toothbrush into a mini robot bug. The vibration from the motor moves the DIY creature across smooth surfaces.

Understanding the possibilities of microcontrollers (i.e. Calliopes)

45 min

*Experimenting with microcontrollers
*Aim: Understanding the potential of microcontrollers; checking out different functions and features of Calliopes
*Preparation: Programme at least 5 Calliopes
*Setting: Table groups with pre-programmed Calliopes.

The task: The children are allowed to test and experiment with the Calliopes, trying to understand how the Calliope reacted when doing certain actions (ie. when shaken, the Calliope gives a sound or by pressing a button the LED lights up). Thus, the kids get an understanding of what possibilities a Calliope has.

Workshop II: First Programming & working with Calliope

Analog programming – first step in programming

45 min

*The Rabbit field
*Aim of exercise:

- Gaining a first understanding of programming by an analogue format
- Combine programming with physical exercise
- Making first steps in programming

Necessary material:

- long paper role with some holes (min. 7 holes)
- pens
- paper stripes in different colours and with “codes” on it (jump, seed, repeat, skip, if-then)
- some 'carrots' (in any material you find convenient like paper, some cuddly toy or even real ones)
- one 'stone' (in any material you find convenient like paper, some cuddly toy or even real ones)

Instructions:

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Prepare a long paper (ie. 5 meter) stripe and make approx. 7 holes (approx 30 cm) and cut some paper stripes (see list of materials)

1.Explain to the students following scenario: what you see is a rabbit field. You are the rabbit and you jump from one hole to the next and seed some carrots. As soon as they have reached the end of the field you ask the student what they have done. They would realise that they have done a series of 'jump - seed' steps. Ask the student to lay down the paper stripes with “codes” of what they have just done.

2. Let the students start again with the carrots for seeding, but before they start you put in one hole a stone. A hole that includes a stone cannot let a carrot grow, thus the student would need to skip the seeding in this hole and jump over that hole. At the end of the field, you ask again the student to lay with the paper stripes his/her activity.

3. Take away the stone and let the students seed in any hole. At the end you give them the stipe 'repeat' x times. The students will have to lay the stripes jump-seed only once if they include the stripe 'repeat'.

4. Discuss with the students how the stripes would have to be laid down if you use the 'repeat' stripe in case one stone lies already in the hole. As soon as there are some ideas, give them the 'if - then' stripe.

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optional:

Divide the students into groups. Ask each group to write a 'programme' for the other group. Therefore, give them each a 'start' paper stripe and some plain paper stripes so that the students can write their own programme. Once they are finished, the other group needs to read the programme and test/do what is written there.

Mind Map for Ideation

30 min

*Ideation for smart houses
*Aim:

- Gaining an overview of associated concepts and relationships after an intense discussion
- At his stage all ideas go in pretty much without a filter
- Beside collecting ideas, it’s also a goal to make everybody in the group aware of everybody else’s ideas

Material: long sheet of paper, pens

Instructions: The facilitator fosters the ideation of ideas and solutions by asking questions like:

- What are issues and problems when it’s too hot and what could help?
- What happens when the weather is too cold in the house and what could help?

Instructions: All ideas shall be noted down on a long sheet of paper. At this stage it is not important if solutions can be realised in reality, but it is the idea that counts. In a second step, the kids can present their ideas for solutions and first discussions on how it could be built.

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Thirdly, the kids can group together for realising and creating a prototype in teams.

The group members discuss together on:

- What functions the prototype needs to have
- What materials to use
- For whom the invention is build
- What alternative solutions that might improve the prototype

Make clear, that they need a plan for completing their prototype, thus ask each team also to agree on different tasks, timing etc.
Ask the team to write everything on a sheet of paper and also ask them if they would like to split the different tasks between them.

Workshop III: Creation

Programming

1,5 h

*Programming
*Aim:

- Gaining an overview of associated concepts and relationships after an intense discussion

*Materials:

- PC or Laptop
- Internet
- Calliope

Under *https://lab.open-roberta.org/* or *https://makecode.calliope.cc/* you will find visual design programmes, that are web-based code editors for physical computing. It provides a block editor, similar to Scratch or Code.org, and also a JavaScript editor for more advanced users. Let the kids discover different functions and provide very small tasks for them at first.

As small helping support, a short ‘cheat sheet’ can be produced, ‘ready-made’ codes that the kids help to understand on how to programme certain functions. Still, the kids would then need to manipulate and adapt it in this way that it fits to their prototype.

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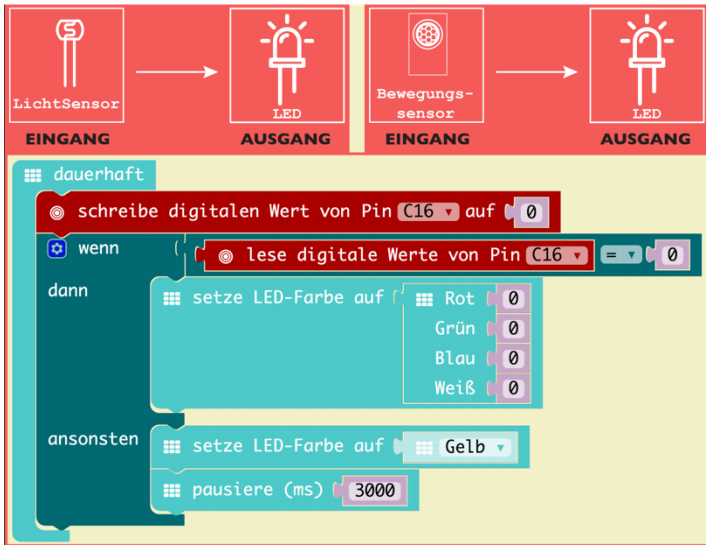

Programming the prototype

30 min

*Materials:

- PC or Laptop
- Internet
- Calliope

Once the functions and conditions are discussed, the kids can start thinking about how to programme the Calliope (ie. sound signal once the temperature reaches a certain degree; blinking signal if it gets too cold, …) for their specific needs of their invention.

Creation of Prototype

45 min – 1h

*Prototyping
*Aim of exercise:

- Making a first prototype
- Experiment with different materials for prototyping
- Re-creation and improvement
- Use of tools (hot glue gun, sharp knifes)

*Materials:

- All different types and sizes of materials like cardboard, plastic cups or plastic packaging, …

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- Decoration materials (for later stage)
- Pens, colours, aqua colours
- Scissors, knifes, hot glue guns, pins, paper clips,…
- Coloured paper

Instructions: Once the children have managed to programme the Calliope, the kids can start thinking about what materials they need for their prototype. Mostly kids would rather go to the material box and simply take what they think they would need. It is recommended to use cardboard in different sizes and shapes, since is a very good material for the children to work with.
Also, use trash for the creation (especially plastic) since you can provide a sufficient amount of materials for free and kids can build on a very creative basis their prototypes.

Workshop IV: Presentation

Presentation of Prototype

45 min – 1h

*Present your prototype
*Aim of exercise:

- Foster presentation skills
- Reflect on your prototype

*Materials:

- Big sheet of paper
- Colours

Instructions: For the children it is a very high motivational factor if they know already at the beginning of the prototyping that they will present their ideas later. This can be either to the other students or teachers, or you might even invite parents and other relatives for an ‘exhibition presentation’. Ask the children to make a poster, presenting their prototypes. Let the children decide upon what information they find relevant to present and discuss with them their poster.

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