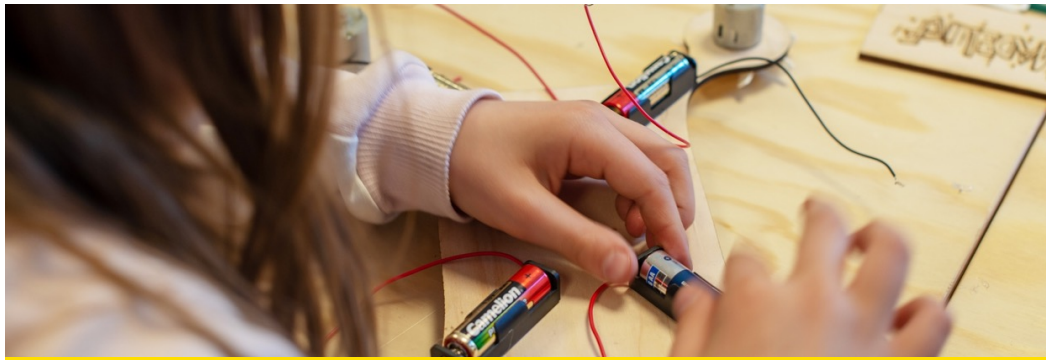
Entrepreneurial skills
for young social innovators
in an open digital world



Workshop Descriptions

# FROM GAME DEVELOPMENT TO COLLECTING ENVIRONMENTAL DATA

ZENTRUM FÜR SOZIALE INNOVATION | CENTRE FOR SOCIAL INNOVATION

This project has received funding from
the European Union's Horizon 2020 research and innovation
programme under grant agreement No 770063





# FROM GAME DEVELOPMENT TO COLLECTING ENVIRONMENTAL DATA (ZSI)

*Authors: Christian Voigt, Margit Hofer, Elisabeth Unterfrauner*

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. Game development is one way to draw in youths who are not overly concerned about climate change but could still contribute to alleviating the situation. Game development has the advantage that there is a literally playful interaction with the problem.

The workshop described in this document aimed for embedding maker sills with social entrepreneurship. Making was centred around physical computing skills as well as prototyping all parts of a final game (e.g. packaging, game instructions or a box for the game). On the other side, social entrrepreneurship required youths to think beyond the game experience and find identify effects the game might have beyond the enjoyment of the game itself. For example, physical exercises (since it will be a modification of a 'catch me' outdoor game) or the potential re-purposing of game data for the analysis of urban environments. Since most youths have an emotional link with playing games, making a game was a suitable context to present workshops involving entrepreneurship, environmental thinking and physical computing in a compelling way.

During six workshops youths went from idea scouting, to learning the robes of game design, physical computing and social entrepreneurship. At the end of the workshop series each of the 3 groups was presenting a prototype in the aula of the school.

Throughout the workshop series a particular focus was on structuring collaboration and managing mile stones, i.e. interim results after each workshop so that everybody had a sense of progress or lack thereof.

Work pretty much started out in small teams of 4-5 and there was one mentor for two teams. Halfway through, the six teams were consolidated to three so that resources in each project area (technical dev, business dev, game dev, social impact dev) could be beefed up and this way every facilitator was looking after one team only which ensured a more continuous flow of support where needed.

Duration: ≈ 6 events a 4 hours
Setting: after-schools
Group size: ≈ 25 children
Age: 15-16 year

This project has received funding from
the European Union's Horizon 2020 research and innovation
programme under grant agreement No 770063

CC BY 4.0
(https://creativecommons.org/licenses/by/4.0)
DOIT http://DOIT-Europe.net | H2020-770063

# Workshop: Objectives, Motivation and Idea Scoping

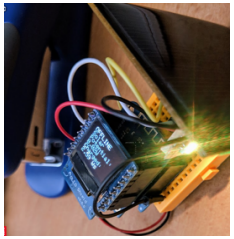
## Welcome - 5 minutes

* welcome and introduction of facilitators and the DOIT project
* understand how to link a game, data collection and problem awareness in a playful way
* steps from idea to first prototype of a game
* considering socio-technical issues as well as the economics of turning a prototype into a product

## Discover questions and data relevant in a social innovation context

- Round table discussion of data driven social innovations taking the examples of a geographical map showing energy savings
- Showcasing different sensors and their data collection capacities (e.g. hands-on playing around with a solar cell, a distance sensor or a particle sensor)
- Discussing the value of data / empirical evidence in general

Experiencing hands-on a device made of 5 main components (display, charger, micro-board, battery and solar cell).



## Mind Map for Ideation

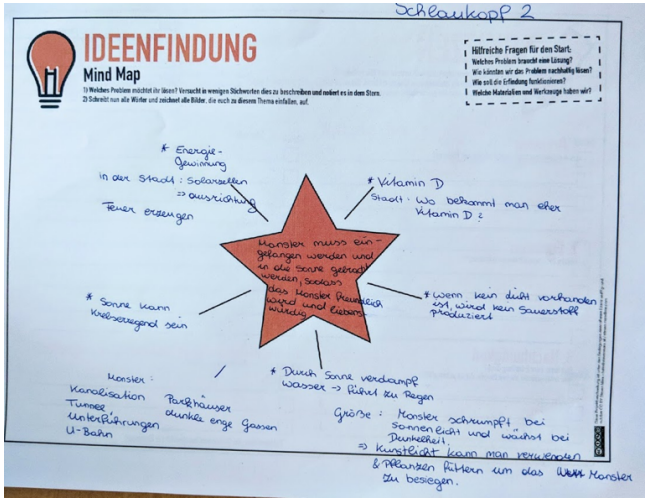
Using the WILMA handbook for an inventor workshop with children we picked several activities such as the mind mapping star below:
*https://w-ort.at/cms/wp-content/uploads/2018/07/WILMA_Handbuch_2018.pdf*

The example below shows case of sunlight data and the mind map resulted in the following concepts: sun supports the generation of vitamin D, light is a precondition for oxygen production via plants, sun lets evaporate water and causes rain, too much sun can cause skin cancer or solar cells transform sun light into electrical energy.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 770063



FROM GAME DEVELOPMENT TO ENVIRONMENTAL DATA (ZSI)




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

Facilitator Instructions:

- Emphasize that no idea is too crazy to be put on paper
- There is no right or wrong
- Work as a team and respect other people's ideas

## Close and reflect – 10 min

The mind map had an immediate impact on the emerging game structure, with students suggesting (1) monsters thrive in dark places such as parking houses, tunnels, subways or narrow alleys; (2) monsters' power growths or shrinks according to exposure to light, (3) the equivalent of exposure to light is the sun light captured by the game gadget, only available to hunters of monsters.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 770063

CC BY 4.0
(https://creativecommons.org/licenses/by/4.0)
DOIT http://DOIT-Europe.net | H2020-770063

# Workshop: Game development

Students learn about various game mechanics in order to adopt those design elements that fit best their initial game plan. Together with the support of a game developer, students discuss in the workshop how they wanted to go about four game elements:

(1) *Roles*: A role describes a personality within the game that symbolizes a core aspect of the game (e.g. roles associated with light or clean air).
(2) *Behavioral modes:* 'Behaviors' describe possible actions attached to a role. Behaviors included attacking, defending, escaping or changing the status of other players.
(3) *Datafication*: Since the game was to make use of sensors, eventually leading to the collection of environmental data, player activities should generate data or be influenced by data. For example, one group used the amount of solar energy captured by a device to determine the speed of the catcher when playing tag.
(4) *Winning condition:* The ultimate goal of the game is described by the winning condition. For example, in a game of tag the game is over when there is nobody left to be caught.

The workshop has three parts: *Learning* from a game (e.g. Wushu), *making* a game, *testing* a game
Game design is made with pen and paper: eg: the players can write on paper the sensor data instead of uploading it. Rather than a sensor they use paper with "sensor" on it.

### Intro and Gameplay

- Short intro on people and schedule for the day.
- Gameplay (Wushu)

The students go outside with workshop leaders, and play a game as intro.
Turtle Wushu: *https://www.youtube.com/watch?v=rGRyMkejMxE*

### Game Making

- Components oft the game just played are identified
- Prototyping a Game

The students split in groups, develop game components on game cards, and based on the cards, try to make a simple game according to their data gadgets. This can be as simple as a ‚hide and seek' game.

- Test the game within a group

Each group tests the game they have designed within their group (outside or inside)

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 770063



FROM GAME DEVELOPMENT TO ENVIRONMENTAL DATA (ZSI)

- Iterate and test again (15 mins)

Based on the test within group, they update or modify the dynamics and test once more.

### Game Tests and Feedback

- Each group presents their game to the class, and then the class tries it out.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 770063

CC BY 4.0
(https://creativecommons.org/licenses/by/4.0)
DOIT http://DOIT-Europe.net | H2020-770063

# Workshop: Business development

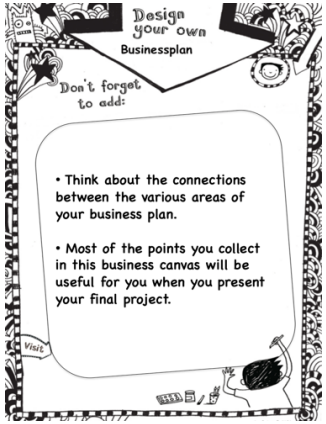
## Analysing the business of existing games

Students were asked to analyse the following aspects of games they themselves or the facilitators had brought to the workshop.

- Value Proposition: Game instructions (find common elements, how do you establish relevance for your audience)
- Marketing: Packaging (find out about function, ethics and being attractive to different target groups)
- Business elements (what could be the size of the target groups, how does the price match research, design, production and shipping ... )

## Develop your own business plan

For this activity, students went through topic blocks




A. *Potential customers* (Who benefits from my product / game?)
B. *Value proposition* (What problems does my product solve?, What customer needs does it serve?)
C. *Distribution channels* (Who can help me with getting my game out?)
D. *Income* (What are my price expectations? How much do similar products cost?)
E. *Key activities* (Where do I make a difference compared to my competitors? E.g. supply network, creative skills, customer network)
F. *Costs (Where does the majority of my costs come from? Do I have possibilities to lower my costs?)*

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 770063



FROM GAME DEVELOPMENT TO ENVIRONMENTAL DATA (ZSI)

# Workshop: Prototyping the game & data collection gadget

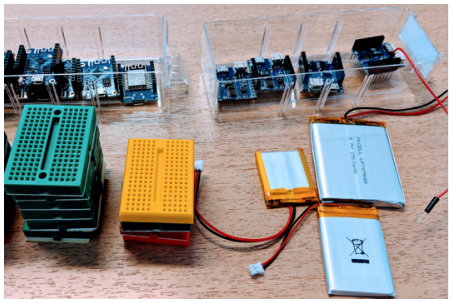
This Workshop focuses on breaking down the gadget and understanding the pieces linked together. The activities start with the core part (micro-board) and then go through the added layers like battery, display and sensors. We are primarily working with working code that can be adopted easily and focus on the tools to change and upload existing Arduino sketches.

## Welcome

Aim: make children feel comfortable with electronics

Facilitator instructions:

- Ask if the children have been in the maker space before
- And provide instructions how many laptops and Internet connections per group would be optimal
- Distribute material to tables



## Introduction to Arduino & Wemos

What students use:
Wemos D1 Mini, USB micro Cable, own Laptop with WiFi connection

*A more extensive online tutorial for the inquisitive mind can be found here:*
*https://www.instructables.com/id/Wemos-ESP8266-Getting-Started-Guide-Wemos-101/)*

The following steps were suggested

***Installing Arduino and Wemos libraries***

- Install Arduino IDE: *https://www.arduino.cc/en/Main/Software*
- Install Wemos on Arduino
    1) Go to Arduino-> Preferences -> Additional Boards Manager URL:

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 770063

CC BY 4.0 (https://creativecommons.org/licenses/by/4.0)
DOIT http://DOIT-Europe.net | H2020-770063

2) copy and paste the following link:
   http://arduino.esp8266.com/versions/2.3.0/package_esp8266com_index.json
   a. Click ok.
3) Go to Tools/ Board/ Board Manager
4) Filter: wemos
5) Select **esp8266** by ESP8266 Community and click install
   a. Close.
6) Go to Tools/Board
7) Select **Wemos D1 R2** & **Mini** under **Tools/Board/**

### Connecting the Wemos

check if the board is visible under

- Tools / Port / COM2 **or**
- Tools / Ports / cu.usbserial.1410
- If its on the list, select it.

### Load and change the Blink sketch

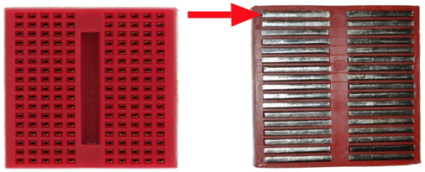
- Go to File/Examples/Basic/Blink and open example sketch
- Check code for LED pin:
  - In loop() digitalWrite(LED, HIGH);
  - LED must be etiher for ONBOARD_LED or D4.
- Compile and Upload the sketch.
- See if the onboard LED is blinking
- Extra: Try to play with blinking times.

## Additional layers: Breadboard, Batteries and Sensors

### Breadboard and External LED

What students use:
Single color LED, protector resistor, breadboard, two jumper cables.
Steps:

- Understand breadboard: rows on each side are connected, columns are separate lines. So each row is like a cable.



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 770063





- Stick the wemos on breadboard, USB cable side on top.
- Connect red Jumper cable from 3.3V to plus leg of LED (the longer one).
- Connect black cable from D4 to minus leg of LED (shorter one).
- On the Clink sketch, change LED to D3 and upload.
- Check if the LED is blinking.

### Battery & charge shield

What students use:
LiPo battery and wemos battery shield
Steps:

- Stick the charging shield on top of wemos.
  - IMPORTANT: usb cable connectors should be on the same side!
- Connect the battery (only one way to connect)
- Remove usb cable
- See if the led continues to blink!
  - If not, maybe battery is low? Charge by connecting usb cable to battery shield

### Sensor

What students use:
Each category, different sensor:

- Air:
  - Wind Sensor,
  - Jumper Cables: 2 black, 2 red, 1 yellow/white
- Noise:
  - Microphone board
  - Jumper Cables: 1 black, 1 red, 1 yellow/white
- Solar:
  - solar panel
  - Resistors: 2 x 1k (voltage divider)
  - Jumper Cables: 1 black, 1 yellow/white

Steps:

- Build sensor connections:
  - Solar: Stick solar on the other side of the
- Plug-in sensor, try analog example

Facilitator Instructions:

- It helps to have the steps printed on the workshop tables of provide a link to a google doc

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 770063

CC BY 4.0
(https://creativecommons.org/licenses/by/4.0)
DOIT http://DOIT-Europe.net | H2020-770063