#ASKnet
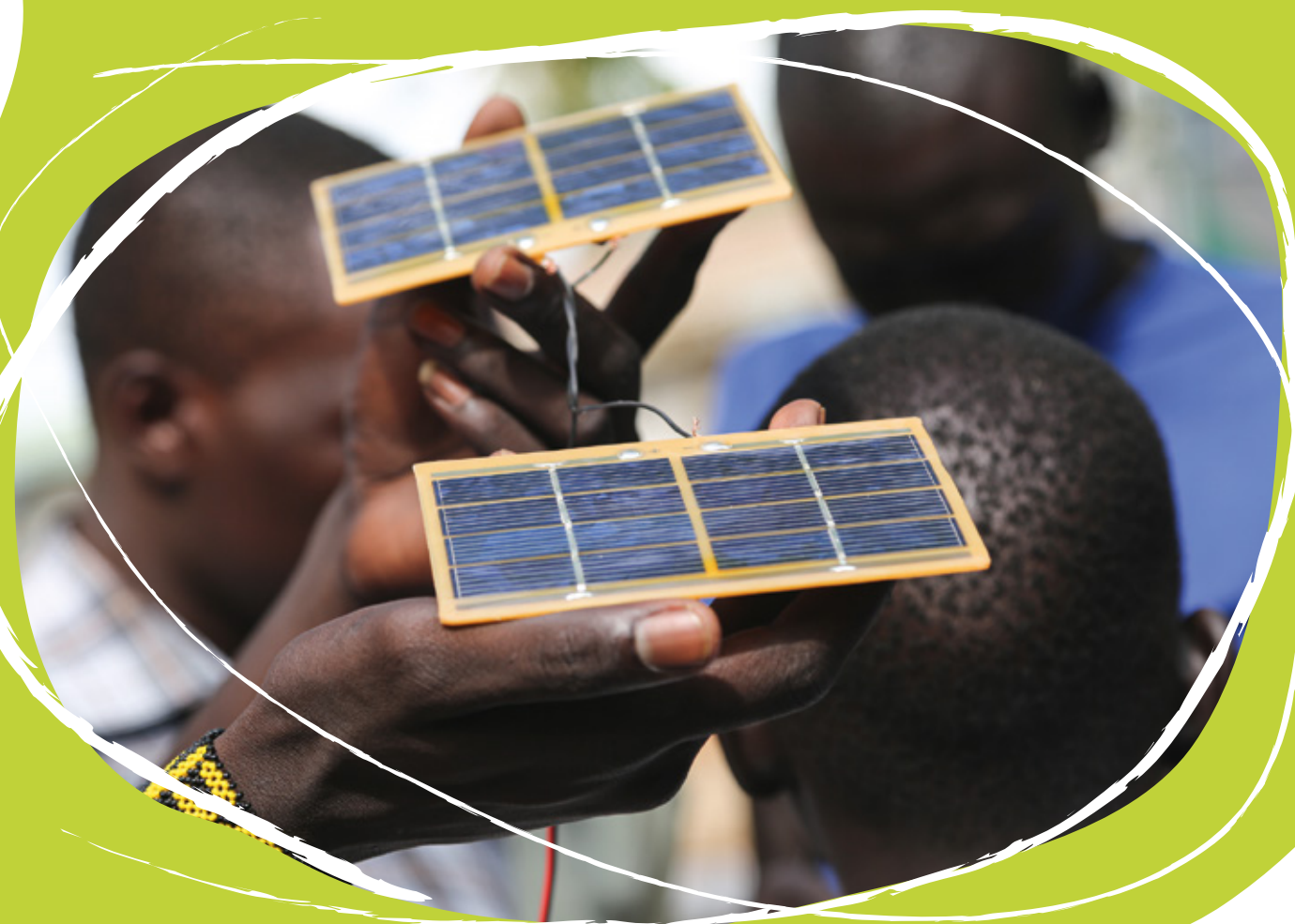
Access to Skills and Knowledge network

OPEN HARDWARE GUIDE
Pioneering Open Tech Innovation from South Sudan
SECOND EDITION

Example #1

Phone Stand
CC-BY-SA (digital) CERN-OHL-P-2.0 (hardware)

Tools:
scissors
ruler
cutter
flat space
mobile phone

Materials
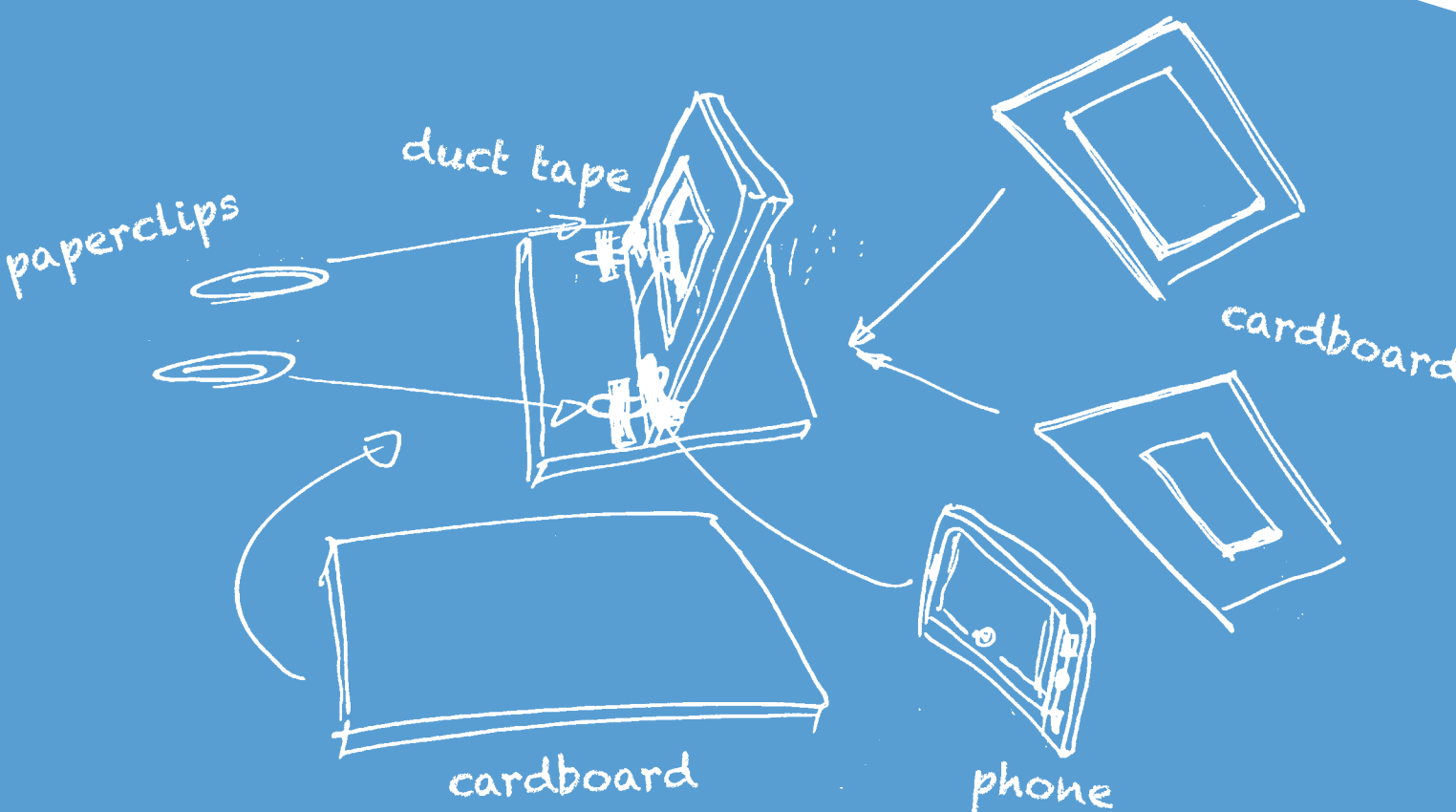cardboards
liquid glue
paper clips
tape (optional)

Tips and Usage
- Keep away from water
- Portable, flexible and easy to maintain

paperclips · *duct tape* · *cardboard* · *cardboard* · *phone*

Steps:

1. Preparation of working space
2. Get the cardboard and place on the table
3. Measure the length and thickness of the phone and choose outside measure
4. Start cutting the back of the phone holder
5. Measure the phone holder part if not done already and cut the phone stand.
6. Cut the side flaps and glue them together, depending on the phone size
7. Cover it with duct/gaffer tape (optional)
8. Insert the phone in the back of the phone holder
9. Join the top flap with stand using paper clips

Open for improvements
- Make some extra holes on phone holder in order to charge your phone directly.
- Make extra holes for the headset
- Make holes to support the volume side

Open Questions:
- What other materials are possible?

Example #2

LED Light
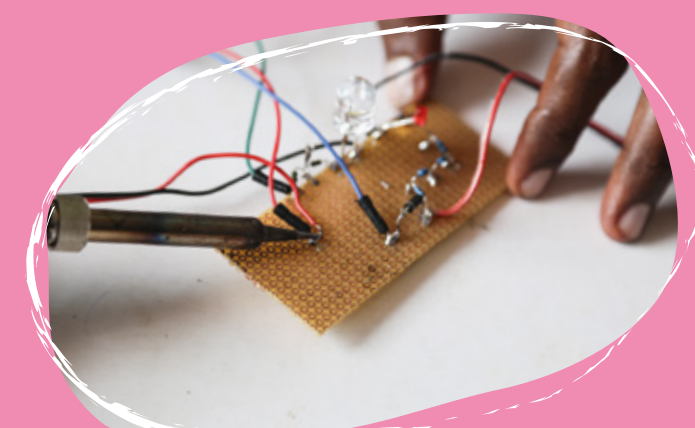CC-BY-SA (digital) CERN-OHL-P-2.0 (hardware)

Tools:
Breadboard (test circuit board) + wires
Helping hand (magnifier & clamps)
Multimeter
Soldering iron plus support
Soldering wire

Materials
Resistors (600, 25, 10 Ohm)
USB (male)
Red LED 2V
Big white LED 3V
Switch
Diode

LED LIGHT rechargeable · *OFF ON* · *red* · *white* · *USB mate*

Steps:

1. Measure battery voltage
2. Calculate and sort out resistors
3. Measure and cut circuit board
4. Identify the negative and positive lines
5. Start to solder the resistors (solder on board)
6. Solder the big LED lamp
7. Connect the batteries and LED to the switch
8. Solder charging red LED
9. Light up the big LED
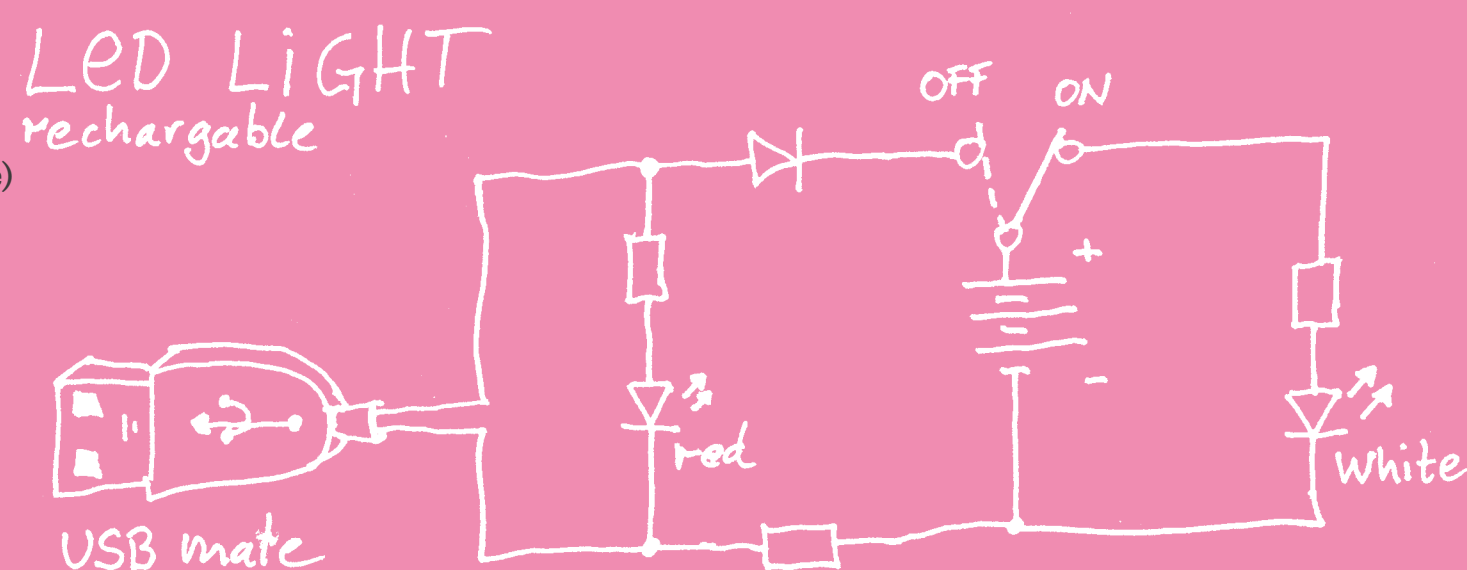
Tips and Usage
- Draw your own electrical current diagram
- Take safety measures while handling soldering iron
- Always test on a breadboard before soldering
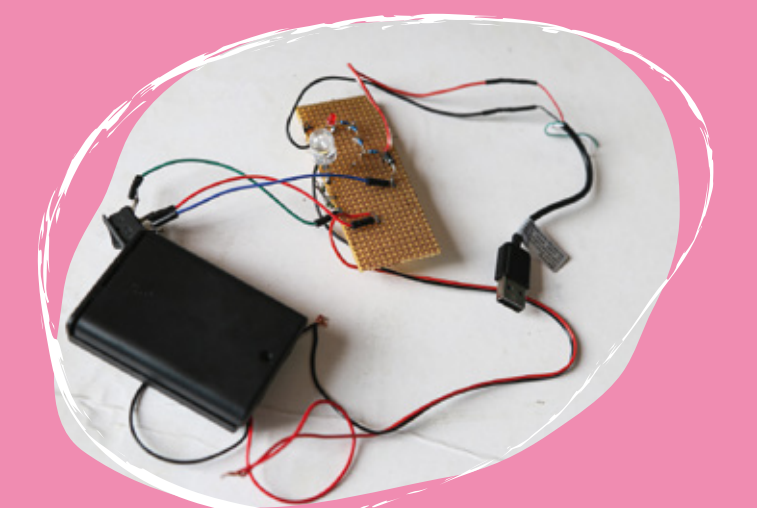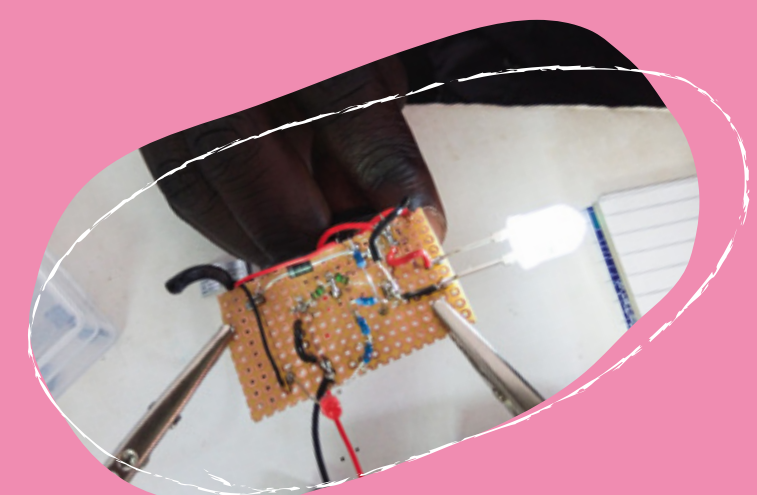
Open for improvements
- Show red LED only when charging
- Build a casing

Open Questions:
- How to prevent the battery from discharging too much over time with simple electronics?

Example #3

Solar Charger
CC-BY-SA (digital) CERN-OHL-P-2.0 (hardware)

Tools:
Color-coded wire (red and black)
Soldering iron
Soldering grease
Soldering Sucker
Helping hand (magnifier & clamps)
Soldering wires

Materials
Solar panel 8V +/- 250mA
Resistor 1200 Ohm (1. option)
Resistor 600 Ohm (2. option)
1 Diode (for either Option I or Option 2, Option 2 is recommended)
Capacitor one 10 µF
Capacitor two 100 µF
Female USB
5V Regulator
Circuit board
LED light (red one)

SOLAR CHARGER · *USB female* · *1.Option* · *2.Option*
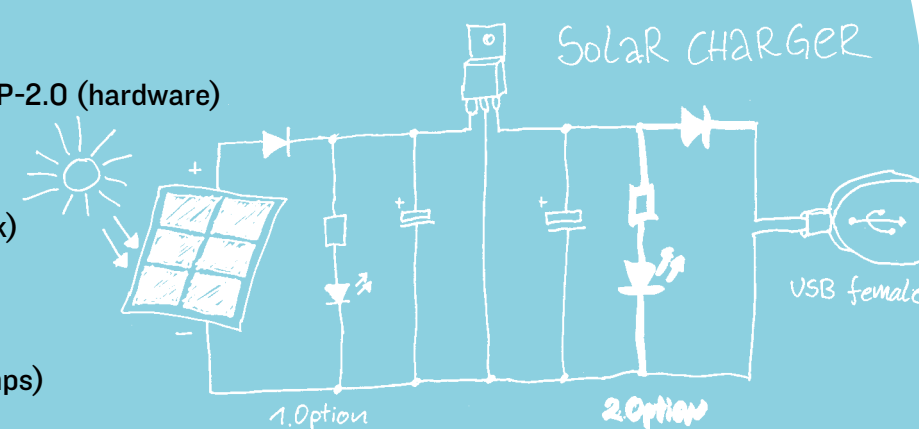
Steps:

1. Draw diagram of the charger for easy understanding (optional)
2. Open your ASKotec kit for tools
3. Get circuit board and solder the diode and LED in place
4. Solder the resistor in the front of the LED
5. Connect to the LED lights to the negative side
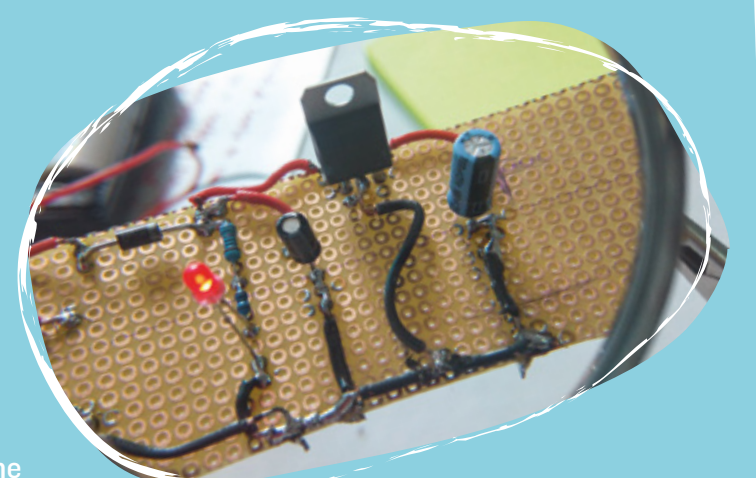
Tips and Usage
- Can be used for charging phones
- Environmentally friendly
- Saves money
- Test with mobile phone or LED light
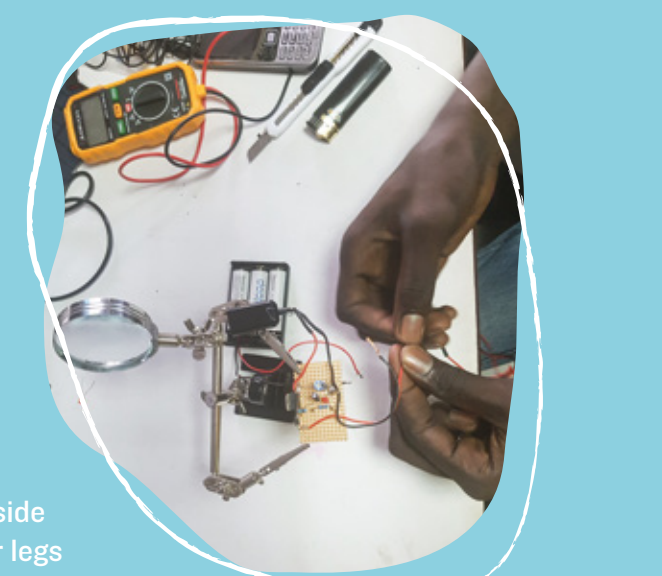
6. Solder the capacitors with long side connected to the outer regulator legs
7. Fix regulator with black side facing you and connect between diode and resistor
8. Connect the other side of the regulator to the capacitor (long side connected)
9. Connect all the negative sides together
10. Cross the middle pin to the negative with side to LED
11. Behind the diode (1. option) or to the right capacitor connect the positive wire from solar panel and the other negative to the negative side
12. Connect female USB. Positive on red and negative on black
13. Test the Solar Charger in the sun

Open for improvements
- Build a casing

Open Questions:
- How to find + and – wires on female USB (if not red and black)?
- What if somebody has no access to materials, how to use old electronics?

With financial support from the Federal Ministry for Economic Cooperation and Development

What is Open Hardware?

Introduction

Open Hardware (OH) or "Open Source Hardware (OSHW) is a term for tangible artefacts — machines, devices, or other physical things — whose design has been released to the public in such a way that anyone can make, modify, distribute, and use those things."[1]

The general benefits of open source methods and open tech innovation are:
Access to knowledge and product designs
Fast and distributed exchange of skills and knowledge
Accelerated innovation due to collaborative development
Low development costs and more expertise
Easy adaptation and customization

What do you need for Open Tech?

Tools & Materials:
Depends on the technology. Always try local sourcing first!

Licence Example:
A proper licence for the product design. For design-files, digital work: cc-by-sa Creative Commons License) [2]
For hardware, functionality: CERN-OHL-P-2.0 (Open Hardware License) [3]

Open Source Software: Linux and platform independent if possible. Examples: see section Resources

[1] www.oshwa.org/definition
[2] www.creativecommons.org/licenses/by-sa/4.0/
[3] www.ohwr.org/cernohl

AfricaOSH   www.africaosh.com/
AfricaOSH is a pan-African community of makers and educators who are dedicated to advancing open science and hardware across the continent.

GOSH   https://openhardware.science/
The Gathering for Open Science Hardware serves the needs of the global community through meetings, publications and common activities.

Open Tech Skills

Training and Team

Motivational Skills
Experience   Improvisations
Creativity   Basic Tool Skills
Knowledge   Good Listening   Hopeful
Entertaining
Time Management Skills   Passionate
Social Skills
Mission   Commitment
Hands-on Skills   Explanation Skills
Approachability   Visionable
Technical Skills   Flexibility   Word Skills

Open Tech Linux Software Installation

(on Ubuntu based OS)

Please run:
sudo apt update
sudo apt upgrade

sudo apt install gdebi software-properties-common libavcodec-extra ffmpeg redshift firefox libreoffice shutter vlc pinta pdfshuffler geogebra darktable gthumb trash-cli gimp inkscape openshot kazam audacity kdenlive freecad librecad fritzing kicad

Open Hardware Process - Documentation Principles

One key instrument of Open Hardware is clear documentation. In order to stay on track while developing or adapting a product, it is highly recommended to document the process to create an easy pattern to follow: Open Hardware Guide. This saves time and prototyping iterations.

Therefore good sketches and pictures of the steps are needed, that trace the development process clearly and simply in the order that it happens. The following template might help as you take important notes along the way:
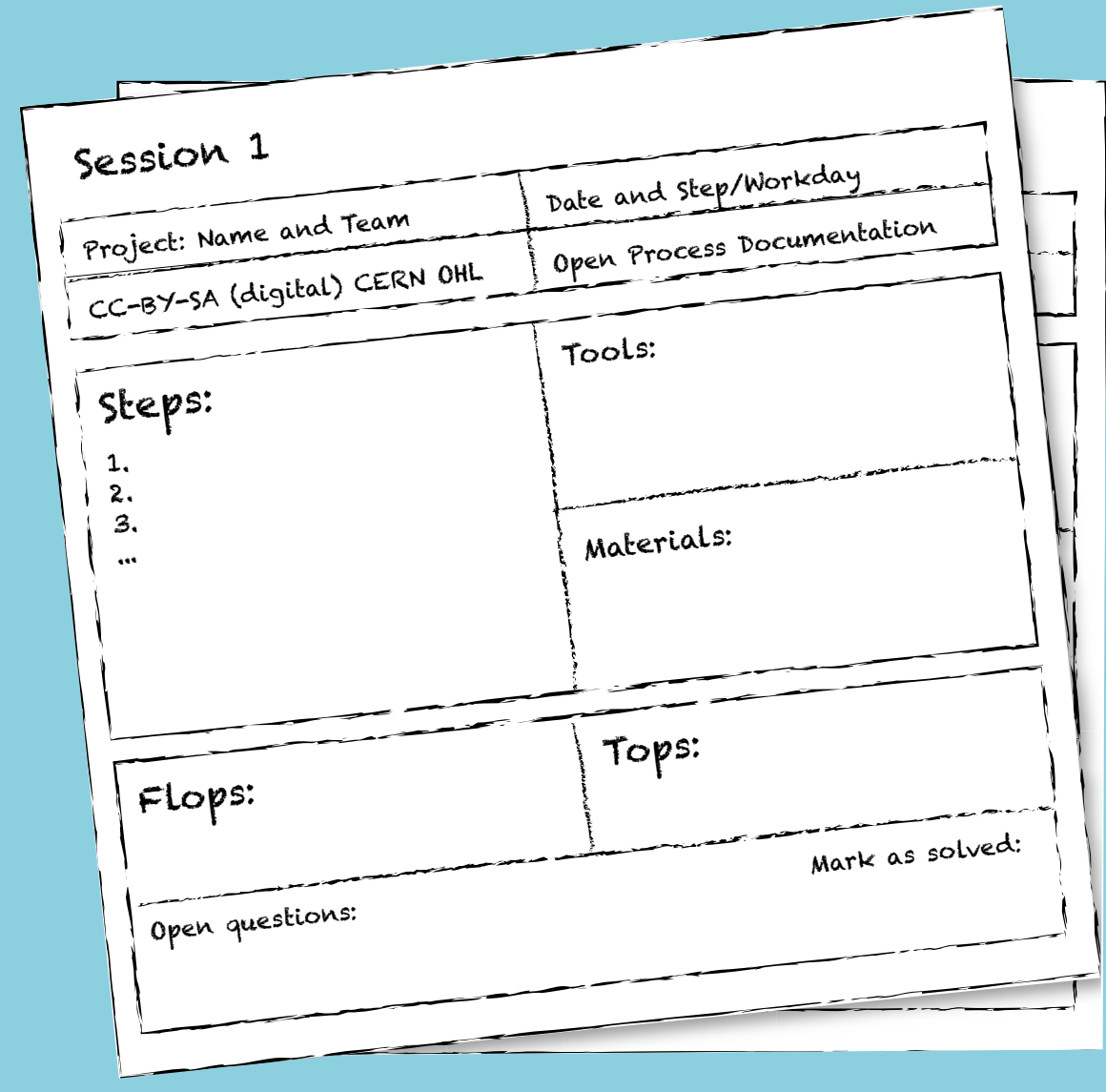
Steps: Follow all working procedures & note the process step-by-step in the order it happens. Keep it clear and simple, note additional tips or details.

Flops & Tops: What went wrong and should be avoided? What went right and is noted as best practice?

Open Questions: What challenges, problems still need to be solved?(NB: This section is key to make progress and help others to participate in the process and get on board the project)

Open Process Documentation - Open Tech Guide

Using your Open Process Documentation (OPD) the next part is to create a "clean and visualised Open Tech Guide for the current version.
This Guide is key to empower further development and innovation.

+ References (weblinks, credits, resources, if available)
Check the Open Documentation Guide:
https://openculture.agency/open-educational-resources/

EXPLORE! IF YOU FIND AN ERROR ... CHECK THE RESOURCES, FIX IT, MODIFY IT AND KEEP DOING GREAT STUFF!

#ASKotec

Access to Skills and Knowledge – open tech emergency kit

Freely sharable and collaboration based Open Technologies are a form of Open Source that can also act as accelerators for peace and empowerment.
A versatile, robust and mobile trainer's kit with more than 40 items designed to tackle a range of basic education, innovation and self-training challenges #ASKotec enables "Access to Skills & Development" in the field ... anywhere! It provides tools and materials to learn and distribute knowledge and product development.

The kit contains: basic electronics and connections, soldering and cutting tools, mechanical and measurement tools, a Linux computer and some adapters and guidelines and additional things to get creative and start innovation on the spot.

The kit can be used on site, in the field and can function as a startup tool-set for building a co-working space, learning hub or any other innovation community setup.
It is designed to be modular, mobile and adaptable to any location or situation to share knowledge and empower innovation.

#ASKotec was created by the participants of the Let's Go jHUB project.

Check it out!
https://askotec.openculture.agency/
'Access to Skills and Knowledge Open Tech Emergency Case' is a resource kit for community trainers, designed as a light and handy mobile workshop creation set, equipped with a broad range of items needed to teach others hands-on skills. The kit is especially valuable to communities where access to tools, power and materials is often scarce.

#ASKotec contents may include:

Books (I jHUB booklet, I solar book, I Open Learning Guide)
I small trainers notepad
I blue HP notebook (Linux Elementary OS installed)
I clipboard with paper
I protractor / square rule
I pencil pouch (pen, pencil, ruler, cutter, 9V battery w/ wire connection, USB current meter, small Post-It Notes, highlighter, pencil sharpener, saw blades, small brush, I6GB USB memory stick)
twine
I pair of scissors
I 'helping hand' tool with magnifying glass
I travel plug adapter
I upgrade electronics kit
I little electronics box (incl. solar charger pieces)
I first aid kit incl. burn ointment
3 circuit boards
2 bread boards
4 x 4V solar panels
I2V solar panel with adapter (in box)
foam padding for PC
small multimeter
crocodile clips, jumper wires, twin wires
2 packets of 4 rechargeable AA batteries (2000 mAh)
3 x AA battery cases with switch
I bag of switches
I big multimeter
I soldering kit (3 extra wires, 2 rolls of solder, I sucker, I solder iron + stand, I pack of extra tips, soldering grease and solder remover)
I wire stripper
I universal mobile phone repair tool set
assorted heat shrink tubes
I pack of 4 USB plugs
2 sizes zip ties (black - short, colour - long)
I small hacksaw
I pair chopsticks
I mechanical tool set (Black and Decker)
disposable cleaning pads
2 sizes of small zip-lock bags (I50 and 380 ml)
I LED light strip
I ASKotek table of contents + packing / unpacking guide
I small combination padlock (for locking case itself)
I coloured combination chain lock (for locking case to something secure)
I black dustproof / waterproof hard case 520 x 4I5 x I95 mm

Resources

#ASKnet OPEN TRAINING:

#ASKtraining PLATFORM
https://training.asknet.community/modules/asktraining_overview/
Browse modules, assemble your training sequence, and easily adjust settings. Gain mastery over the #ASKtraining platform. Learn to navigate modules, resources, and filters effortlessly, empowering yourself to craft dynamic and engaging training sessions.

#ASKotec - BUILD YOUR OWN MOBILE MAKERSPACE
https://training.asknet.community/modules/ASKotec-building/
Learn how to build your own #ASKotec "Access to Skills and Knowledge - open tech emergency case" and follow the instructions and resources.

#ASKnet COMMUNITY REPAIR CAFE
https://github.com/ASKnet-Open-Training/CommunityRepairCafe
A community repair cafe offers tools and equipment where community members can bring in not working electronic devices for fixing or repair. Includes smartphones, cell phones, radios, power extension cables, solar panels, printers and solar lights.

#ASKtraining #ROSHOP
https://training.asknet.community/modules/ROSHOP/
Responsive Open Source Modular Housing Prototype (#ROSHOP)
Using open source tools and platforms,#ROSHOP is a media and digital culture informed housing prototype for complex post-conflict and politically unstable environments. Embracing citizen participation and strengthening community well-being, #ROSHOP supports learning with rapid development of quality building.

OPEN TECH, OPEN HARDWARE + ELECTRONICS:

OPEN! METHODS & TOOLS FOR COMMUNITY-BASED PRODUCT DEVELOPMENT
https://opensourcedesign.net/
Current practices of open source product development & concrete guidance to support design process efficiency of open source product development projects.

OPEN SOURCE HARDWARE ASSOCIATION
https://www.oshwa.org
Open hardware community ensuring technological knowledge is accessible to everyone. Collaborative development of technology that serves education, environmental sustainability, and human welfare.

OPEN SOURCE EDUCATION
https://opensource.com/education/13/4/guide-open-source-education
A guide to free and open source education. Stories about creating, adopting, and sharing open source solutions.

AFRIMAKERS
http://www.afrimakers.org
Empowers makers in Africa to develop sustainable projects using rapid prototyping to solve local challenges.

APPROPEDIA
http://www.appropedia.org/Welcome_to_Appropedia
Sharing knowledge to build rich, sustainable lives.

BRAILLERAP
https://www.braillerap.org/en/index.html
BrailleRap is an open source Braille embosser, originally derived from 3D printers. Use it to emboss not only text in any language on various media including paper, card, PCB, aluminum, into Braille vector graphics, but also plans of buildings, animal shapes or country maps.

CRITICAL MAKING
https://criticalmaking.eu/
Framework used by SalvageGarden in the practice of co-creating assistive devices. We focus on critical and socially responsible making to contribute to an open society via open source innovation.

OPEN HARDWARE CANVAS
https://github.com/ohwmakers/ohcanvas
Develop by Open Hardware Makers project. Clarify your hardware project idea and think strategically about project goals, plans, and the resources you'll need.

IFIXIT
https://www.ifixit.com
The free repair guide for everything, written by everyone.

INSTRUCTABLES
http://www.instructables.com
Share what you make with the world, and tap into an ever-growing community of creative experts.

MAKER ACADEMY
https://tolocar.org/en/academy/
3D Design, Scanning, Printing - Learner Modules.
Demonstrate potential applications and to teach basic application skills as preparation for practical workshops that are typically offered in fab labs.

MAKERS MAKING CHANGE
https://www.makersmakingchange.com/s/resources
Assistive technology helps people with disabilities live, work, and play with more independence and live life to the fullest.

OPEN SOURCE ECOLOGY
http://opensourceecology.org
Open source industrial machines can be made for a fraction of commercial costs, designs shared online free, to create an open source economy which increases innovation by open collaboration.

PAPER-DUINO
https://paperpcb.dernulleffekt.de/doku.php?id=arduino_clones:arduino_clones_main
A compilation of Arduino clones CC-BY-SA 4.0 Int. by Wolfgang Spahn

SALVAGE GARDEN – Assistive Tech Makerspace
https://salvage.garden/what-we-do/
Community Makerspace Singapore, SEA, and globally focused on Assistive Tech, low-cost bespoke solutions for persons with disabilities, and openSourced hardware.

TINKERCAD
https://www.tinkercad.com
An excellent, intuitive, free and simple CAD tool for 3D Design, electronics & coding.

WIKI-HOW
http://www.wikihow.com
"We're trying to help everyone on the planet learn how to do anything. Join us."