

D6.3 CRITICAL MAKING PRACTICAL GUIDELINES

About this document

Date	30th of June 2023
Dissemination level	Public
Responsible Partner	VTT
Work package	WP6 - Evaluation, Impact, Future Implications
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This project has received funding from the European Union's Horizon 2020 Research and Innovation programme under grant agreement No. 101006285.

DOCUMENT HISTORY

Version	Date	Contributor	Comments
v1	27/03/2023	all	draft outline
v2	03/05/2023	Maria Åkerman, Claudia Fabian, Barbara Kieslinger, Alexander Kutschera, Sandra Mamitzsch, Christina Rebel, Ricardo Ruiz Freire, Ann Joshua, Hanna Saari, Lisa M. Seebacher, Regina Sipos, Teresa Schaefer,	Contributions from all co-authors
v3	15/06/2023	Hanna Sari, Ricardo Ruiz Freire	Review and editing
v4	30/06/2023	Barbara Kieslinger, Claudia Fabian	Final edited version based on review feedback

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LIST OF ACRONYMS AND ABBREVIATIONS

CC4D	Community Creativity for Development
DOI	Digital Object Identifier
GIG	Global Innovation Gathering e.V., Germany
H2020	Horizon2020 – The European Research Framework Programme
OSHW	Open Source Hardware
GOSH	Global Open Science Hardware
R&I	Research & Innovation
RRI	Responsible Research and Innovation
TUB	Technische Universität Berlin, Germany
VTT	Teknologian Tutkimuskeskus VTT OY, Finland
WIF	Wikifactory Europe SL, Spain
WP	Work Package
WP1	Project Management
WP2	Building the critical making knowledge-base: concept & methods
WP3	Case Action: GENDER
WP4	Case Action: YOUNG TALENTS
WP5	Case Action: OPENNESS
WP6	Evaluation, Impact, Future Implications
WP7	Dissemination, Exploitation and Communication
ZSI	Zentrum für Soziale Innovation, Austria

EXECUTIVE SUMMARY

Critical Making has been exploring the potential of the maker movement for social and responsible innovation. By engaging directly with the communities in participatory research processes the consortium aimed to show how maker spaces and maker practices can offer new opportunities for young makers of all genders to contribute to an open society via open source innovation.

Next to the academic insights, Critical Making also brought forward a number of very practical findings, mostly targeted towards makers and makerspaces. We call it the “**Critical Making Wundertüte**”. The following table gives an overview of the practical guidelines developed in the course of the project. All these resources are available now from the Critical Making website, via the Wikifactory platform and distributed further by project partners. Our main target groups for the practical guidelines are individual makers, makerspaces, start-ups and entrepreneurs, policymakers, researchers and civil society organisations.

main elements	short description	target group(s)	format	languages
1. Introduction & core values	core aspects to consider Critical Making core values	All stakeholders	digital, print on demand (included in the zine)	English
2. Guidelines for gender inclusive making	an introduction to inclusive making; recommendations for makerspace manager	makerspaces	digital and download for print on demand	English, French, German, Ukrainian
3. Guidelines for critical making education	concrete guidelines based on interviews CM manifesto/poster flashlight box	teachers, teacher trainers, makerspaces	digital, print, physical box and flashlight material	English
4. Guidelines for critical making open hardware	recommendations from mentors and a reflection tool for sustainable making	makers, makerspaces mentors, trainers	digital, print on demand, paper + cards	English
5. Guidelines for evaluation of critical making projects	The gamified Critical Making Reflective Framework and a reflection tool for sustainable making	makers, makerspaces mentors, trainers	Digital as an online game paper + cards	English

1. CRITICAL MAKING GUIDELINES

INTRODUCTION & CORE VALUES

The Critical Making project started in 2021 aiming to critically study the innovation processes in the maker movement regarding the RRI aspects, especially in relation to gender, openness, recruitment of young people and, more generally, their social responsibility. As a practical outcome of this participatory research the Critical Making proposal planned to provide tools and guidelines to the project's target stakeholders.

The Critical Making project team recognised a clear need for practical guidelines to cater to all project stakeholders, considering the diverse range of individuals and organisations involved. These stakeholders encompassed various groups, including researchers, individual makers, makerspaces, start-ups and entrepreneurs, policymakers and civil society organisations. Throughout the different work packages, it became evident that each stakeholder group had distinct roles, responsibilities, and expectations concerning Critical Making. To address this need and ensure a unified approach, the team strategically consolidated all the outcomes from the different project activities into a comprehensive set of Critical Making guidelines. The guidelines aim to provide practical and actionable recommendations for all stakeholders involved in critical-making projects. The team sought to create a valuable resource that would serve as a reference point for responsible-making practices across Europe and beyond by synthesising the collective wisdom and expertise gained from the project's research, co-design processes, and stakeholder consultations. The Critical Making guidelines seek to bridge gaps in knowledge, align diverse perspectives, and foster a cohesive understanding of Critical Making principles among target groups, ultimately promoting a harmonised and ethical approach to making in the context of the European Commission's objectives.

Critical Making core values

The Critical Making guidelines build upon six core values, which have emerged during the course of the participatory research:

6 core values of Critical Making

Impactful: Critical Making aspires to really make a difference. It seeks to improve life and build a sustainable future.

Social & Diverse: Critical Making reflects on the social dimensions of making, the living realities of those persons involved and concerned, as well as the ethical implications of their work. Critical Making thereby addresses societal challenges and needs. That's why it is so important to strive for diversity and inclusiveness.

Local & connected: Critical Making is happening locally, working on the ground and adapted to a particular socio-cultural context. Thereby, critical making implies an engagement with local communities as well as global networks – thinking globally and making locally.

Reflexive: Critical Making re-thinks and re-constructs the dominant mainstream maker culture from a critical stance, reflecting on underlying power structures and their implications.

Open: Critical Making promotes open collaboration, including the sharing of skills and knowledge. It boosts creativity in the ecosystem of makers by making processes and results accessible.

Joyful & meaningful: Critical Making is still about the joy of and in making, but adds meaning to it. What is made critically is made with a specific purpose of individual or social kind.

2. GUIDELINES FOR CRITICAL MAKING IN EDUCATION

The guideline comprises different procedures to utilise Critical Making as an educational approach to raise sustainable innovation awareness while teaching young people the necessary skills to drive it. The Critical Making in Education Guideline consists of:

- The Critical Making Box,
- a manifesto,
- a podcast series with five interviews, and
- a guidelines' booklet.

2.1 The Critical Making Box

Background and Purpose

The Critical Making Box contains a complete kit for building a basic flashlight from few and accessible materials, and it includes an instructions' booklet with assembly instructions. The flashlight was adapted from a previous open source solution and further developed to become an example tool for applying Critical Making in educational settings. It was applied in the WP4 workshops throughout the Critical Making project. Beyond that, the box was used to disseminate Critical Making Work Packages' outcomes. Moreover, the box was delivered to many interested partners.



Final Critical Making Box.



Flashlight kit.

Resources

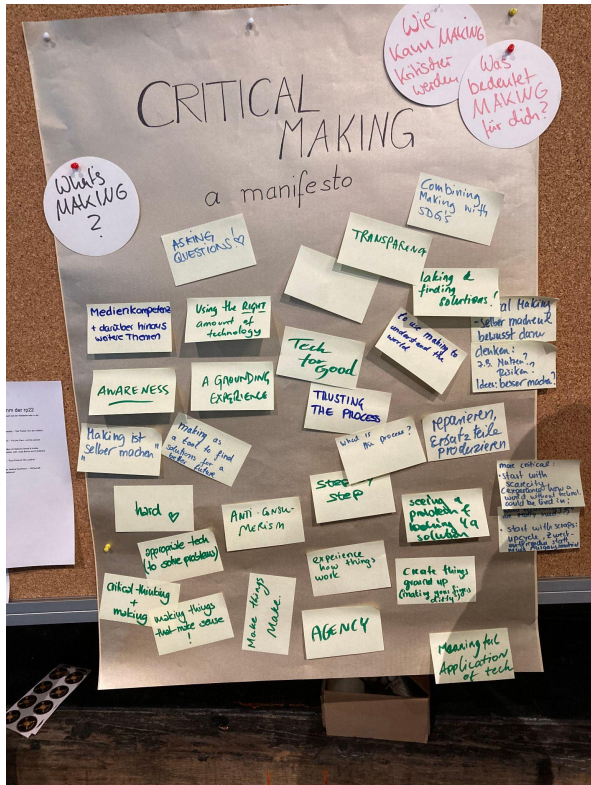
The complete box is published as an open source resource and the assembly instructions, tutorials, list of required materials, and the laser cutter production files are available online.

- Repository: <https://github.com/vektorious/cm-flashlight>
- Video tutorial: <https://youtu.be/E4OWXI0p4hw>

2.2 The Critical Making in Education Manifesto

Background and Purpose

The Critical Making in Education Manifesto is a poster with crucial identified statements for frame-working Critical Making in education. It is based on discussions and feedback received during six workshops in 2022. The first version was further refined after online review by the community and after feedback collecting during its exhibiting at re:publica Berlin 2023. The manifesto embodies crucial learnings for Critical Making in Education.



Input for the manifesto collected during a workshop at re:publica 2022.

Critical Making in Education 

MANIFESTO

As Critical Makers ...

- we provide support, not services.
- we ask questions.
- we find and create solutions.
- we work together.
- we learn with and from each other.
- we use making to understand.
- we strive to be inclusive.
- we share.
- we seek meaningful use of tech.
- we are responsible for our creations.
- we create transparency.
- we repair, reuse, recycle and repurpose.

The critical making project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101002265

Version 1.0, check out the latest version at manifesto.criticalmaking.eu
Comments or changes? Submit them at https://github.com/vektorious/critical_making_manifesto



Final manifesto distributed as part of the Critical Making Box. It is also available online.

Resources

The source files of the manifesto are on GitHub repository, allowing further discussions and edits by the community beyond the Critical Making project, so it can live on. A print-ready PDF version is shared via the Critical Making Website

- Repository: https://github.com/vektorious/critical_making_manifesto
- Link: <https://manifesto.criticalmaking.eu>

2.3 Critical Making in Education interview series and guidelines' booklet

Background and Purpose

The Critical Making Guideline for Education provides five interviews with international critical makers involved in education. The interview recordings are available online as a podcast series. In addition, short articles around each interview are blog posts on the Wikifactory website. The interviews were the basis for the Critical Making in Education Guideline' booklet, where key statements and recommendations compose a zine-style foldable-poster.



The critical making guidelines for education are designed as a foldable zine.

Resources

The recorded interviews are online at archive.org, and the articles are published on Wikifactory in the Critical Making community. The Guideline Booklet is published online and available in printed format. The resources are on the following links:

- FabLab Nepal: Empowering Communities Through Technological Access (Pradita Pradhan)
 - Audio: <https://archive.org/details/pradita-final-interview>
 - Article: <https://wikifactory.com/+criticalmaking/stories/fablab-nepal-empowering-communities-through-technological-access>
- SparkleLab: Revolutionising STEM Education in the Philippines (Rosanna Lopez)
 - Audio: <https://archive.org/details/auphonic-rosanna-interview-final>
 - Article: <https://wikifactory.com/+criticalmaking/stories/revolutionising-stem-education-in-the-philippines>
- BiT Makerspace: Building a Robust Ethiopian Innovation Culture (Bezawork Tilahun)
 - Audio: <https://archive.org/details/auphonic-bezawork-interview-final>

- Article: <https://wikifactory.com/+criticalmaking/stories/bit-makerspace-building-a-robust-ethiopian-innovation-culture>
- Noni Hub: Equipping Youths to Prototype for Local Needs (Mustapha Dauda)
 - Audio: <https://archive.org/details/critical-making-interview-mustapha>
 - Article: <https://wikifactory.com/+criticalmaking/stories/noni-hub-equipping-youths-to-prototype-for-local-needs>
- Filling in the Gaps in Iraq (Nawres Arif)
 - Audio: <https://archive.org/details/nawres-arif>
 - Article: <https://wikifactory.com/+criticalmaking/stories/filling-in-the-gaps-in-iraq>

Guidelines Booklet Repository:

https://github.com/vektorious/critical_making_education

2.4 Target groups

The guidelines for Critical Making in education can be used in schools and makerspaces by teachers, educators, civil society organisations and interested people alike.

2.5 Use cases

Makerspaces can be powerful sites for students to engage in social justice issues through critical making projects. The Critical Making Guideline for Education can help educators facilitate these projects by providing frameworks to examine issues of power, privilege, and social inequality. As an instance, guidelines might encourage students to identify a social justice issue they care about, investigate its root causes, and design and build solutions seeking to address the issue. The guidelines might also emphasise the importance of engaging with diverse perspectives, seeking feedback, and using prototypes to raise social awareness to provide prompt action. The Critical Making Guideline for Education learning and growth, but furthermore contributing to positive social change.

3. GUIDELINES FOR GENDER-INCLUSIVE MAKING

3.1 Purpose

The goal of creating gender-inclusive making guidelines is to share available knowledge and expertise on how to render the making scene more inclusive and evaluate these tips in heterogeneous real-life settings. While gender is an important dimension, this action, owned and commissioned by Cin Pietschmann, took a broader approach to inclusion and addressed several dimensions of marginalisation. The material produced is based on Cin's master thesis on this topic, as well as their own experience as a maker. Further, the collected insights and materials were enriched by the community engaged in the Critical Making initiative, and furthermore discussed with six makerspaces and one makerspace network across Europe, Asia and Africa. The content was systematised in two different formats:

- The [Manual for Creating an Inclusive Makerspace](#) specifically targets maker spaces or communities willing to start a makerspace on their own and strive to organise it in a way that counteracts existing structures of inequalities.
- The [Introduction to Inclusive Making](#) portrays making and main concepts and strategies of inclusion from a reflexive approach. Taking inclusiveness as a starting point, it targets anyone interested or already engaged in making to reflect on their practices.

Both materials are shared on the Critical Making website and remain open for comments and additions from the community. Additionally, both the introduction and the manual are available as printed versions.

Creating an inclusive and welcoming makerspace

This manual was created with the purpose of offering resources and tips on how a makerspace and its community can become more inclusive, diverse and welcoming to those who might feel under-represented and less visible in the Maker Movement and its community.




This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement no. 101019381




An Introduction to Inclusive Making

In this introduction you will find approachable explanations to some terms and theories concerning Inclusive Making. It is aimed at anybody that is interested in Making or already involved in Making. With this introduction we want to offer a more accessible approach to Making.



Main author: Cin Pietschmann, with the support of the Critical Making Team

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement no. 101019381



Critical Making Manual for Creating an Inclusive Makerspace

3.2 Background

The idea for the guidelines on gender inclusive making originates from an online participatory co-design process with 12 makers from around the globe, which sought different measures to render making and maker communities more gender-inclusive.

The guidelines themselves were then mostly drafted by Cin Pietschmann, who is an active member of the German maker space xHain, in Germany. Their draft was shared amongst all participants of the co-design process to collect feedback. Based on the feedback provided, the guidelines have been subsequently revised. The reworked guidelines were then published on the Critical Making website asking readers to leave comments as they read it, to further incorporate feedback. In addition, the guidelines were presented at the 'FireShonks' event in December 2022 where listeners were also asked to comment and provide feedback on the recommendations included in the published guidelines. The guidelines were then translated into German, Ukrainian and French - languages spoken by Consortium Members - to make them accessible to people not feeling confident with their English skills.

Afterwards, the manual for gender-inclusive making was evaluated in different contexts. By the means of a call for contribution amongst the GiG-network, makerspaces were asked to discuss the guideline doing a small workshop in their makerspace and to provide feedback and share their insights at a focus group interview afterwards for a small remuneration: Saad Chinoy with Salvage GardenAssistive Makerspace (Singapore), Raveen Rizgar with Suli Innovation House (Sulaymaniyah, Iraq), Mathew Lubari with Community Creativity for Development (CC4D), BiTmakerspace (Bahir Dar, Ethiopia), and Fablab Winam

(Kiumu, Kenya). Additionally, feedback from the makerspace Happylab Vienna (Austria) as well as the German network Verbund offener Werkstätten has been considered. On the basis of received feedback and insightful comments, the guidelines have been evaluated and extended to their current version.

3.3 Use Cases

The guidelines for gender-inclusive making are an inspirational source for both individual makers and the makerspace managers on how makerspaces can become a welcoming place for people not part of the maker community yet. Even though it can be hard to implement all the recommendations mentioned in the guidelines, makerspaces can use distinct guidance sets in their local settings and contexts.

Furthermore, rather than fostering individual reflection on gender-inclusiveness in making, the guidelines spark collaborative reflections and actions within a makerspace. Those reflections and actions are proposed in a workshop concept, where several members of a makerspace (ideally with diverse backgrounds) use the manual on inclusive making as a starting point to think about the inclusiveness in their space, and at the same time elaborating proposals on how to address processes of exclusion with concrete actions. The workshop concept is available [online](#).

3.4 Target groups

The main target groups of the gender-inclusive making guidelines are makers and makerspaces that would like to become more inclusive. They provide starting points for reflection and change. Thereby, they aspire to counteract the problem that gender-inclusive making and inclusive making in general are not yet an inherent part of the making community.

3.5 Formats

The gender-inclusive guidelines were published as an online source on the Critical Making website ([Manual for Creating an Inclusive Makerspace](#) and [Introduction to Inclusive Making](#)) in English, German, French and Ukrainian, offering the possibility that they can also be translated to more languages in the future. They are also offered as PDF-documents to be printed out and displayed in the physical makerspaces.

4. GUIDELINES FOR SOCIALLY RESPONSIBLE OPEN HARDWARE PROJECTS

Based on the Task 5.4 study, we compiled a summary of guidelines on how to promote social responsibility as part of open hardware development. The guidelines are targeted to organisations promoting maker activities and have been published as an easy to access online publication. The following text is part of the publication of the guidelines in a zine as part of the [Low-Carbon Research Methods Group conference](#) 2024.

4.1 Introduction

Technology has become ubiquitous, and the negative societal effects are showing. One way to address this and to create sustainable futures is by learning from interdisciplinary techniques of responsible innovation by critical makers and other grassroots innovation communities. This is what Critical Making is about.

Through supporting grassroots innovators and accompanying research, with the EU Horizon 2020 supported "Critical Making" project, we added scientific insights into the potential of the maker movement. We focus on critical and socially responsible making, and show how a new understanding of global maker communities can offer opportunities to contribute to an open and sustainable society.

Thanks to the project we were able to create a group-mentoring program for a cohort of 18 makers from all around the world who worked on hands-on projects with sustainability focus. They received support for material to build prototypes and to document them as Open Hardware, they reflected on their practices in entry- and exit interviews – and most importantly participated in

trainings on the 5 dimensions of Sustainability in making: Make Things That Make Sense, Share How You Make, Include Ecosystem Services, Integrate Local Knowledge, Build for Continuity.

The primary target groups of these guidelines are makers, with the secondary target to reach makerspace managers and organisations promoting maker activities as multipliers to reach the primary target. Throughout our quite practical & co-creative research, we found that these principles apply not only to Open Hardware makers, but to designers, engineers, participatory researchers and many other professions who want to make sure their actions contribute to a more sustainable world.

With our small Zine, we want to give you, our dear reader, the chance to learn our method by going through the same learning and reflection process: the self-reflection tool will help you to explore how you “score” in the five dimensions, alongside self-reflection questions that help you to identify strong spots and dimensions where you can improve. Once you complete the first assessment, you are invited to navigate how you can promote social responsibility within open hardware development, based on the five dimensions. QR code links to online teaching courses by 5 practitioners in the field will also be provided as additional guidance. After applying this process and your learnings to a concrete project, you are invited to carry out the self-reflection assessment again and discern if this was a “life-changing experience” for yourself. Additionally, the zine will contain our experiential learnings from the process of creating a decentralised, online, low resource mentoring programme. We hope the tools and know-how will inspire you to adapt or recreate the Critical Making method in your own community!

4.2 Formats

A3 Paper folded to A5, with the "board game" (5 dimensions spider web tool) on one side and instructions and explanations on the other side. Ideally a tiny pouch is added on the back side for "playing cards" that include self-reflection questions. It's in a booklet of ca. 5 pages of A4 paper folded in half.

This poster/zine format was submitted and accepted by the DIY Methods Unconventional Conference by the Low-Carbon Research Methods Group¹ and will be physically mailed to the conference's participants in September 2023, and furthermore published in the conference proceedings freely available online.

4.3 The 5 Principles of Sustainable Making

Coming out of a co-creative workshop in December 2019, when a group of global makers convened at the DOTS conference to discuss what Sustainability as a principle means for the makerspace movement, and what 'Sustainable Making' as a field of practice would be. Being true to the saying that "Systemic problems require systemic solutions," the team sought to present Sustainable making as a set of connected concepts rather than a single 'big idea'. Below, you will find the outline of the first of five principles, which inspired the open hardware mentoring session:

1. Make things that make sense: Create products and solutions that solve fundamental, real-world problems. The ideology behind the open source knowledge and distributed manufacturing movement is fundamentally disruptive and revolutionary. It seeks to establish a globally distributed knowledge and design commons that supports localised production of value in communities across the [world](#)². This means that the makerspace movement is on a mission to democratise the global manufacturing industry by increasing access to knowledge, skills, and tools that enable those who had largely been left out to engage in production and commerce. Democratisation in this case goes hand in hand with Localization, in that production of goods is being supported to occur in proximity to the communities and places where they are most needed. This would result in shorter supply chains, and production that is more context specific, and highly responsive to local challenges. This is the precise intention behind Principle 1; that making should be informed by the local context in question and thus seek to address the challenges at hand.

2. Integrate Local Knowledge: Build from within the community by working with local practices, materials and traditional resources. What it means to design 'with' and not 'for', how to engage communities with humility and respect, and the various processes available out there to facilitate this? At some point, a quote came up which succinctly captures what inclusivity represents; "If you do

¹ <http://www.lowcarbonmethods.com/>

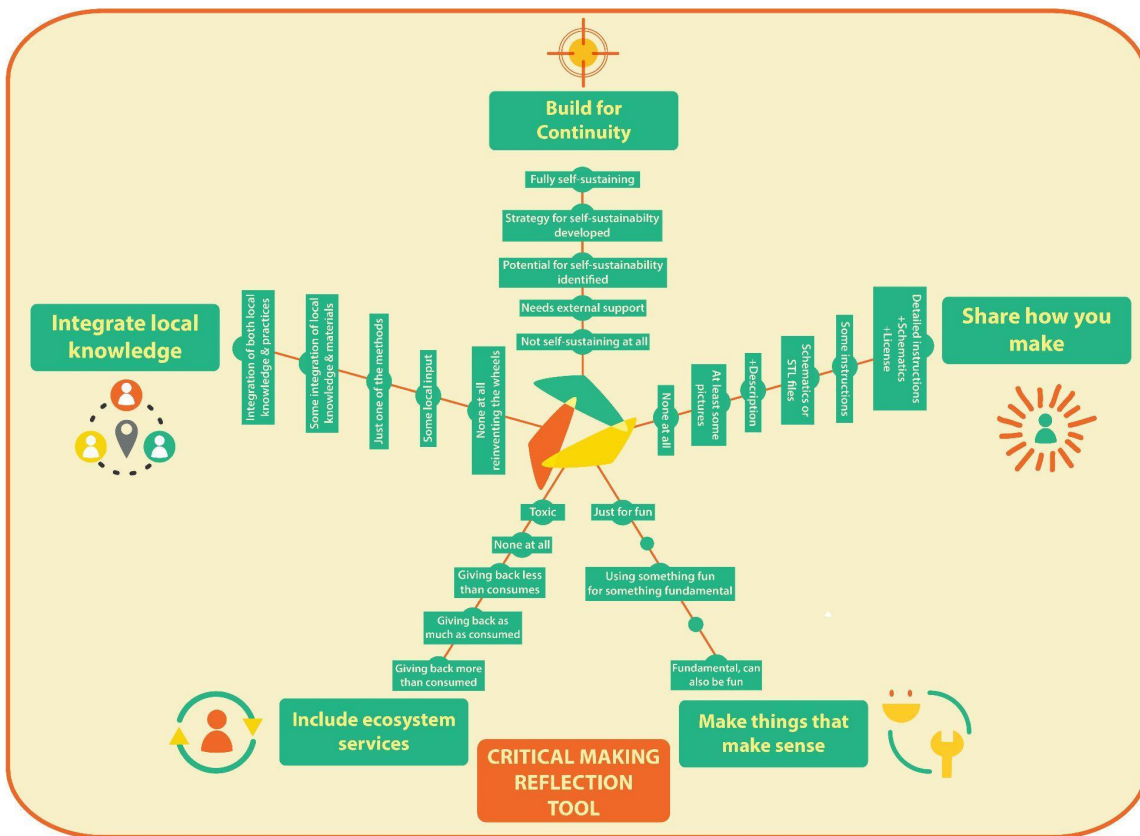
² <https://wiki.p2pfoundation.net/Cosmo-Localism>

something FOR me, but WITHOUT me; you do it AGAINST me.” Participation is empowerment, and empowered participation is democracy. Integrating the culture, local knowledge, lived experience and perspective of the communities we work in and with is essential for social innovation.

3. Include Ecosystem Services: Aim to give back more than you take from the environment and include accounting practices that value the natural resources used.

4. Build for Continuity: Design for the present and future; build social capacity, & aim for financial self sufficiency.

5. Share How You Make: Develop a set of guidelines that provide a framework for openly documenting everything about the making of the project.



Critical Making Reflection tool based on the 5 Sustainable Making Principles

These 5 principles of sustainable making delivered by the participants very much relate to the 6 principle of Critical Making:

- 1. Open:** Critical Making promotes open collaboration, including the sharing of skills and knowledge. It boosts creativity in the ecosystem of makers by making processes and results accessible.

2. **Local & connected:** Critical Making is happening locally, working on the ground and adapted to a particular socio-cultural context. Thereby, critical making implies an engagement with local communities as well as global networks – thinking globally and making locally.
3. **Social & Diverse:** Critical Making reflects on the social dimensions of making, the living realities of those persons involved and concerned, as well as the ethical implications of their work. Critical Making thereby addresses societal challenges and needs. That's why it is so important to strive for diversity and inclusiveness.
4. **Reflexive:** Critical Making re-thinks and re-constructs the dominant mainstream maker culture from a critical stance, reflecting on underlying power structures and their implications.
5. **Impactful:** Critical Making aspires to really make a difference. It seeks to improve life and build a sustainable future.
6. **Joyful & meaningful:** Critical Making is still about the joy of and in making, but adds meaning to it. What is made critically is made with a specific purpose of individual or social kind.

Sustainable Making and Critical Making principles share common threads and complementary aspects in their approach to responsible making.

The first principle of Sustainable Making, "Make things that make sense," aligns with the Open principle of Critical Making, which promotes open collaboration and sharing of skills and knowledge. Both directions emphasise the importance of creating products and solutions that address real-world problems and engage with the local context.

The second principle of Sustainable Making, "Integrate Local Knowledge," resonates with the Local & Connected principle of Critical Making. Both principles advocate for working with local practices, materials, and traditional resources and highlight the significance of engaging communities and incorporating their culture, knowledge, and perspectives into the making process.

The third principle of Sustainable Making, "Include Ecosystem Services," relates to the Impactful principle of Critical Making. Both principles emphasise the need to consider the environmental impact of making and strive to give back more

than is taken from the environment. They also promote accounting practices that value natural resources and aim for a sustainable and balanced decision-making approach.

The fourth principle of Sustainable Making, "Build for Continuity," shares similarities with the Reflexive principle of Critical Making. Both principles emphasise the importance of designing for the present and future, building social capacity, and aiming for financial self-sufficiency. They encourage critical reflection on power structures, social implications, and the long-term viability of the projects.

The fifth principle of Sustainable Making, "Share How You Make," aligns with the Open principle of Critical Making, which promotes open documentation and sharing of the making process. Both principles emphasise the importance of transparency, collaboration, and developing guidelines or frameworks that enable others to learn from and build upon the work.

In summary, while the principles of Sustainable Making primarily focus on addressing real-world problems, responsible resource use, and localised production, the principles of Critical Making encompass a broader perspective, emphasising social dimensions, critical reflection, impact, and the meaningful purpose behind the making process. Together, these principles provide a comprehensive framework for fostering responsible and impactful making practices.

4.4 Guidelines

1. Make Things That Make Sense: Curating A Curious Mind That Goes Beyond Conventional Thinking

"doing what you can, where you are, with what you have" - Saad Chinoy

Recommendation:

Makerspaces should encourage individuals to cultivate the skill of adaptability to make the most of their current circumstances and available resources to foster an open mindset. Doing so allows individuals to take apart commercially made

mass-produced objects, and let people learn how to modify and create something meaningful and effective for their community and the wider world.

Full teaching:

<https://wikifactory.com/+criticalmaking/stories/saad-chinoy-curating-a-curious-mind-that-goes-beyond-conventional-thinking>

2. Integrate Local Knowledge: Advancing Empathy As A Tool For Commitment To Care And Responsible Innovation

“valuing differences amidst conflict means look[ing] at it with naturality and kindness [for the sake] of the collective process” - Georgia Nicolau

Recommendation:

Makerspaces should promote “learning by doing and doing by learning” as it generates knowledge from various perspectives or disciplines. Individuals can reflect on their actions, evaluate their outcomes, and refine their approaches by actively making or creating something. Thus, this iterative cycle of doing, reflecting, and learning contributes to continuous growth and improvement.

Full teaching:

<https://wikifactory.com/+criticalmaking/stories/georgia-nicolau-advancing-empathy-for-commitment-to-care-and-responsible-innovation>

3. Share How You Make: Cultivating The Skill Of Documentation & Transferring Of Knowledge

“openness is related to the freedoms of open knowledge... freedom to make, produce, copy, remix, and then your transferring knowledge and experiences of making... to solve specific problems” - Emilio Velis

Recommendation:

Makerspaces should encourage the dissemination of diverse perspectives and expertise, fostering a collective and collaborative approach to problem-solving. In aiming to democratise access to information, it enables individuals to share their insights, methodologies, and practical know-how with others, openly, enhancing the collective intelligence of a community.

Full teaching:

<https://wikifactory.com/+criticalmaking/stories/em%C3%ADlio-velis-cultivating-the-skill-of-documentation-knowledge-transfer>

4. Build for Continuity: Reversing Power Dynamics In Community

“you cannot do the work alone; you have to engage the voices” - Bahar Kumar

Recommendation:

Makerspaces should organise a structure that enables individuals to understand there are a lot of opportunities for bright young people within their localities. When offering meaningful roles and responsibilities, there is a shift in power from traditional hierarchical structures to a more inclusive and equitable environment fostering authentic partnerships.

Full teaching:

<https://wikifactory.com/+criticalmaking/stories/bahar-kumar-reversing-power-dynamics-in-community>

5. Include Ecosystem Services: Generating A Cycle of Thinking for Longevity

“Sustainable making needs to consider building for continuity” - Aravindh Panch

Recommendation:

Makerspaces should promote ideas that allow short-term solutions that have been created by society and turn them into long-term projects and have it adapt to the different timely situations. To consider present resources and anticipate future outcomes.

Full teaching:

<https://wikifactory.com/+criticalmaking/stories/aravindh-panch-generating-a-cycle-of-thinking-for-longevity>

5. GUIDELINES FOR EVALUATION OF CRITICAL MAKING PROJECTS

5.1 Principles for responsibility evaluation in making

Maker communities have been celebrated for potential positive social, political and environmental impacts. Alongside the positive examples, there has been debates whether these positive impacts are truly delivered on a larger scale. Although different approaches and frameworks to investigate responsibility in research and innovations have been developed in increasing numbers during the last decades, there has been no comprehensive framework available to explore and support responsibility of innovations in citizen-driven grass roots activities such as maker spaces.

The existing RRI frameworks have been developed for the purposes of governing research and innovation activities in institutionalised research and innovation institutions and they largely fail to grasp the particularities of grass roots innovations. In addition, according to critics, mainstream RRI approaches tend to be relatively euro-centric and not as such applicable in the Global South where grassroots innovations are particularly relevant in responding to the needs of communities. We must for example take into account that grassroots innovation – especially in the Global South – happens with very limited resources, and with hacked, tinkered, pirated technologies but in return (and opposed to conventional innovation) with a very high involvement of local communities and everyday people in the co-design process. Following from this, responsibility evaluation of maker spaces should be based on **co-evaluation and tailored evaluation frameworks** which address directly questions that are relevant for grassroots innovators and innovation processes.

Co-evaluation

Co-evaluation is a method that has been successfully used in participatory research, including citizen science projects. It differs from top down evaluation by putting emphasis on co-creating the evaluation questions and evaluation process (data collection methods and data points) with engaged participants (Schaefer et al. 2021). Co-evaluation also underlines the need to define the goals of evaluation together with participating actors. While doing this, the expected impacts and potential side-effects of the projects will become reflected already during the design of the evaluation methods with all the important stakeholders.

Resources for co-evaluation methods

- Schaefer, T., Kieslinger, B., Brandt, M., van den Bogaert, V. (2021). Evaluation in Citizen Science: The Art of Tracing a Moving Target. In: , et al. The Science of Citizen Science. Springer, Cham.
https://doi.org/10.1007/978-3-030-58278-4_25
- Co-evaluation white paper of Co-Act:
<https://coactproject.eu/news/participatory-evaluation-for-sustainable-social-transformation-the-coact-co-evaluation-whitepaper/>

5.2 Evaluation frameworks and tools for Critical Making

Critical Making project has collected and elaborated tools tailored for evaluating the responsibility of making for the use of different audiences.

Critical Making Responsibility Framework

To provide thinking tools for systematically reflecting the different dimensions of social responsibility of making, Critical Making project has co-created an evaluation framework particularly tailored for studying and evaluating grassroots innovations and maker practices. The Critical Making Responsibility Framework (CMRF) includes a set of reflection questions that aim to support the capacities of responsible practice including anticipation, reflexivity, inclusiveness and responsiveness with questions that directly address the context, meaning making, strategies and potential pathways of maker movement. The CMRF framework includes a matrix of 14 different responsibility dimensions of making with their explanations, examples and suggestions for reflexive questions to address these issues.

	Anticipation	Reflexivity	Inclusiveness	Responsiveness
Context	Ability to understand and act upon the ongoing changes in social, historical, political, economic, cultural, religious contexts (trends & weak signals) and other circumstances and what kind of opportunities, restrictions and requirements they may provide in the future.	To become aware of how social, historical, political, economic, cultural and religious context have affected on ones activities (innovations, projects etc.) and what kinds of contexts their reactions & innovations might create, (eg. vicious circles or hope, and for whom?)	To become aware of exclusive, contextual patterns - to understand that you don't by accident exclude others (like women, elderly, etc) - understanding how exclusion works and supporting people based on the contextual patterns of exclusion	To understand the particular societal needs arising from the context and to respond to them through making & innovations and in addition knowing "how to react and whom to contact to influence the societal rules of the game.
Framings	not applicable	To become aware of how used language and terminology shapes the taken actions and what kinds of values and interests are mobilised, maintained or challenged with the language used. Shared framings can help and hinder dialogues and once that is recognized, something new can be learned.	To reflect upon and become aware of the wordings that are used, or the setup of the space, and whether they create inclusion or exclusion? Does the shared umbrella of interpretation lead to missing any perspectives?	not applicable
Spaces/ Strategies	To become aware of one's own strategies to act, to learn to deliberately build strategies towards desired futures and to be able to anticipate what kinds of futures (and future spaces of action) the applied strategies create.	To become aware of how chosen strategies influence other people or environment - what are the risks and rewards for the surrounding community and environment of the chosen strategies	To become aware of the norms and conventions that "made the space" of making & innovations: if excludes someone, become aware of these norms and conventions, physical structures and language.	To explore how available resources will influence what you do (skills in the team; tools available) and how to act to expand them.
Pathways	To become more aware of what sort of pathways are supported: what future pathways are made while doing concrete projects, and reflect upon the potential plurality of it, to anticipate the impact of the ethical pathways. To recognize the path dependencies, become aware of what one can change with the created pathway and what not.	To become aware of one's own role and the situatedness of the activities carried out: how those impact/influence the environment. By recognizing the various pathways (anticipation), the potential social and ecological impacts can be reflect upon.	To reflect upon whether the developed or imagined pathways maintain existing exclusive structures, do they create new exclusions, new divisions between people? How can they be made more inclusive?	To investigate what kind of support the desired pathways would need in the broader social context (knowledge, funding, policy changes etc.) and/ or whether they may face resistance and to consider how this support can be gained and resistance addressed.

The target groups

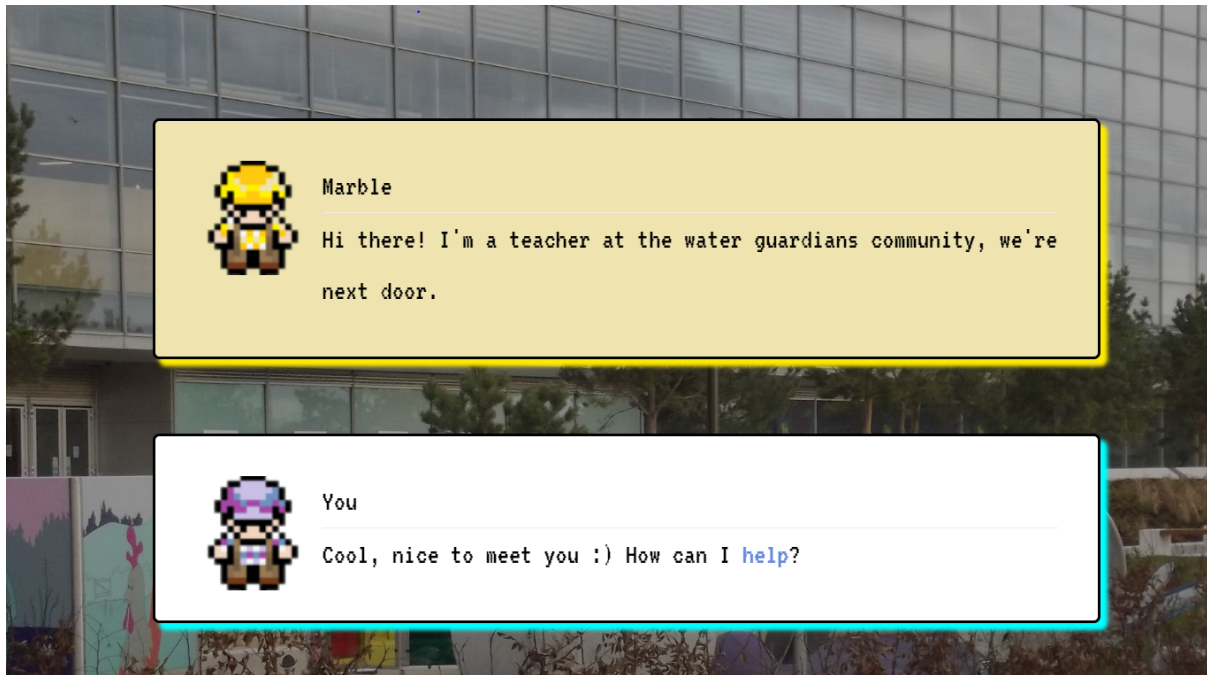
Research community: Critical Making Responsibility Framework enriches the general RRI approaches with insights of grass roots innovation studies on the social embeddedness of making. It provides conceptual tools for researchers to explore the forms, barriers and enablers for responsible making.

Resources

- Sipos, R., Åkerman, M., Saari, H. & Kieslinger, B., 2022, Proceedings of the Fab 17 Research Papers Stream. [Zenodo](https://zenodo.org/record/7432067), p. 57-71 15 p. [10.5281/zenodo.7432067](https://doi.org/10.5281/zenodo.7432067)
- Regina Sipos & Maria Åkerman (2023) Introducing the Critical Making Responsibility framework for analysing responsible innovation processes in grassroots practices, Innovation: The European Journal of Social Science Research, DOI: [10.1080/13511610.2023.2195583](https://doi.org/10.1080/13511610.2023.2195583)

5.3 Critical Making on-line game for makers

Critical making online game for makers is an elaboration of the Critical Making Responsibility Framework. While the original framework addresses academic audiences and allows them to dive deep into different dimensions of responsibility in making, the online game aims to invite makers to explore the responsibility of their activities in a fun and engaging way.



The idea of the game development was initiated by a group of makers that the Critical Making project team engaged to give feedback on how to make the 14 questions of CMRF meaningful and easy to answer for makers. The fourteen reflection questions have been turned into an online game that allows for critical self-reflection, learning and sharing in the midst of playing a fun and engaging online game with puzzles and quests to solve. The questions that have been co-created with makers have been integrated inside the game as points of reflection and looking into one's own maker practices. The game is designed so that any maker interested in developing their sustainability and responsibility practices can play it and get new insights of their impacts - from makerspace leaders to casual participants. No prior knowledge of the responsibility topics are assumed. Having had help from maker practitioners and a game designer with in-depth knowledge of the maker movement in many phases of the game design process has ensured that the language used is accessible and the

questions asked understandable, while the game logic also makes playing fun and engaging.

Target groups

Makers interested in learning about critical making or responsibility for their actions.

Resources

Critical Making game: <https://play.criticalmaking.eu/>

5.4 Critical Making Self-Reflection Tool

The Critical Making Reflection tool is based on the 5 dimensions of Sustainability in making identified by the GIG community. These dimensions are Make Things That Make Sense, Share How You Make, Include Ecosystem Services, Integrate Local Knowledge, Build for Continuity. They reflect well the 5 core values of Critical Making that are introduced in the introductory part of this deliverable. The tool includes a set of cards with questions that address the different sustainability dimensions and invite the users to critically think about the social and ecological responsibility of their projects. An important part is also the Critical Making spider spider web tool, which allows people to evaluate how far they are in taking into account different sustainability dimensions and identify where there is a need for improvement. The cards and the spider tool can be also used separately.

Target groups

Makers interested in learning about critical making or responsibility of their actions

Resources

Sipos, Regina, Kieslinger, Barbara, Schaefer, Teresa, Seebacher, Lisa M., Akerman, Maria, & Mamitzsch, Sandra. (2022). Critical Making Case Actions and Methodologies: A Methodological Toolbox. Zenodo.

<https://doi.org/10.5281/zenodo.5948298>

5.5 Other tools and resources

In addition to the tools that are particularly tailored for evaluating responsibility in making, there are a lot of RRI tools for citizen science projects, which provide valuable resources for designing evaluation methods for grassroots innovations projects engaging citizens. We want to highlight here a few that could be a useful starting point for exploring responsible citizen science practices.

- Co-evaluation tool: an open source tool for co-evaluation of projects <https://discovery.dundee.ac.uk/en/publications/co-evaluation-tool>
- Societal Readiness Thinking Tool: tailorable tool for RRI evaluation of projects. <https://thinkingtool.eu/>
- Online course: Basic regulations and ethics for citizen science <https://eu-citizen.science/resource/321>
- RRI tools EU: a wide array of RRI related tools for different use cases <https://rri-tools.eu/>

ANNEXES

Guidelines for gender inclusive making

Creating an inclusive and welcoming makerspace

This manual was created with the purpose of offering resources and tips on how a makerspace and its community can become more inclusive, diverse and welcoming to those who might feel under-represented and less visible in the Maker Movement and its community.



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement no. 101006285



https://criticalmakegeu.files.wordpress.com/2023/06/guidelines-for-inclusive-making_20pages_download.pdf

Guidelines for critical making education

EDITORIAL:

Empowering Educational Innovation: Makerspaces as Catalysts for Change

In a rapidly changing world, empowering local communities to drive educational innovation is crucial for preparing future generations. Makerspaces play a pivotal role in this transformation, providing resources and support for sustainable solutions to local challenges. By organizing collaborative learning events, makerspaces inspire local innovation and foster problem-solving skills among young people. Additionally, by embracing engaging and imaginative approaches, makerspaces contribute to transforming education, making it more exploratory and fun, and sparking children's curiosity. Moreover, makerspaces have the power to promote sustainable education and environmental awareness, encouraging a mindful approach towards climate change challenges. By collaborating with schools and educators, makerspaces can enhance learning opportunities beyond the traditional classroom, reaching communities in the countryside and supporting diverse learning styles and needs. Together, let us embrace these guidelines to empower local communities and create a brighter future through educational innovation.

Promoting Sustainable Education and Environmental Awareness

Makerspaces should promote sustainable education by focusing on projects that raise environmental awareness, such as utilizing green energy solutions and fostering a sense of mindfulness and responsibility towards the environment.

"A discourse with young people about technology and the environment encourages them to be more mindful of the climate change challenges."



- Mustapha Dauda
(Nori Hub, Ghana)

Transforming Education with Engaging and Imaginative Approaches

Makerspaces should contribute to transforming education by fostering engaging and imaginative approaches that spark children's curiosity, incorporating interactive elements and creative projects to enhance their learning experiences.

"Changing to a more exploratory and fun education system is necessary for children's future happiness."



- Rosanna Lopez
(Sportfields, Philippines)

Inspiring Local Innovation through Collaborative Learning

Makerspaces should organize collaborative learning events, such as hack-a-thons for young people, that inspire local innovation and problem-solving skills among participants, with a particular focus on addressing educational needs and enhancing learning experiences.

"Youth hack-a-thons encourage local innovation."



- Bezawork Tilahun
(BIT Makerspace, Ethiopia)

Collaborating with Schools for Enhanced Learning Opportunities

Makerspaces should collaborate with schools and educators to expand learning opportunities further than traditional classrooms, expanding their outreach beyond the capital city to work with cities in the countryside, overcoming challenges through effective communication, flexibility, and aligning makerspace activities with school curricula to support students' diverse learning styles and needs.

"Working with schools and teachers can be a rewarding experience, but it has challenges."



- Pradita Pradhan
(Fredrick Neppel)

Empowering Local Communities for Educational Innovation

Makerspaces should empower local communities to drive educational innovation by providing resources and support for creating sustainable solutions to local challenges.

"A local maker movement can act locally to develop local innovation and sustainable solutions."



- Nawres Arif
(ScienceCamp, Iraq)

Instructions on how to fold the Guidelines



To learn more about this project, visit our webpage:
<https://criticalmaking.eu/>

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101040835



Edu Guide lines

Guidelines for critical making open hardware

Guidelines for Open Hardware Poster (double-side)

EDITORIAL


The Critical Making Mentoring Programme aims to foster responsible-making practices in maker communities globally. Packed with expert and practical insights, the program's teachings are available as video recordings and blog posts. This guideline poster provides the shortest possible summary.

The aim is to empower makers and promote ethical decision-making throughout the open hardware ecosystem. Hopefully, it will help you to confidently navigate the intricate landscape of responsible making, fostering a future where technology and innovation thrive harmoniously with societal and environmental well-being. Enjoy!

Curating A Curious Mind That Goes Beyond Conventional Thinking

Makerspaces should encourage individuals to cultivate the skill of adaptability to make the most of their current circumstances and available resources to foster an open mindset. Doing so allows individuals to take apart commercially made mass-produced objects, and let people learn how to modify and create something meaningful and effective for their community and the wider world.

“Doing what you can, where you are, with what you have”




- **Saad Chinoy**
(SalvageGarden/Assistive Tech Makerspace, Singapore)

Advancing Empathy As A Tool For Commitment To Care And Responsible Innovation

Makerspaces should promote “learning by doing and doing by learning” as it generates knowledge from various perspectives or disciplines. Individuals can reflect on their actions, evaluate their outcomes, and refine their approaches by actively making or creating something. Thus, this iterative cycle of doing, reflecting, and learning contributes to continuous growth and improvement.

“Valuing differences amidst conflict means looking at it with naturalality and kindness for the sake of the collective process”




- **Georgia Nicolau**
(Instituto Procomum, Brazil)

Cultivating The Skill Of Documentation & Transferring Of Knowledge


Makerspaces should encourage the dissemination of diverse perspectives and expertise, fostering a collective and collaborative approach to problem-solving. In aiming to democratize access to information, it enables individuals to share their insights, methodologies, and practical know-how with others, openly, enhancing the collective intelligence of a community.

“Openness is related to the freedoms of open knowledge... freedom to make, produce, copy, remix, and then you retransferring knowledge and experiences of making... to solve specific problems”

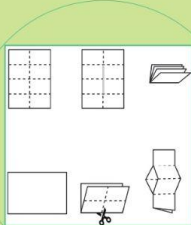


- **Emilio Velis**
(Appropedia Foundation, El Salvador)

OPEN HARDWARE



To learn more about this project and find the full material of the mentoring programme visit our webpage: criticalmaking.eu/



Instructions on how to fold the guidelines


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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101026275

Generating A Cycle of Thinking for Longevity

Makerspaces should promote ideas that allow short-term solutions that have been created by society and turn them into long-term projects and have it adapt to the different timely situations. To consider present resources and anticipating future outcomes. To preserve the environment, we must shift our perspective and view it as the ecosystems within which we exist.

“Rather than extracting ourselves from nature, we should strive to be responsible users and supporters, recognizing our interconnectedness with the environment”




- **Aravinth Panich**
(Greenspace Academy, Sri Lanka)

Reversing Power Dynamics In Community

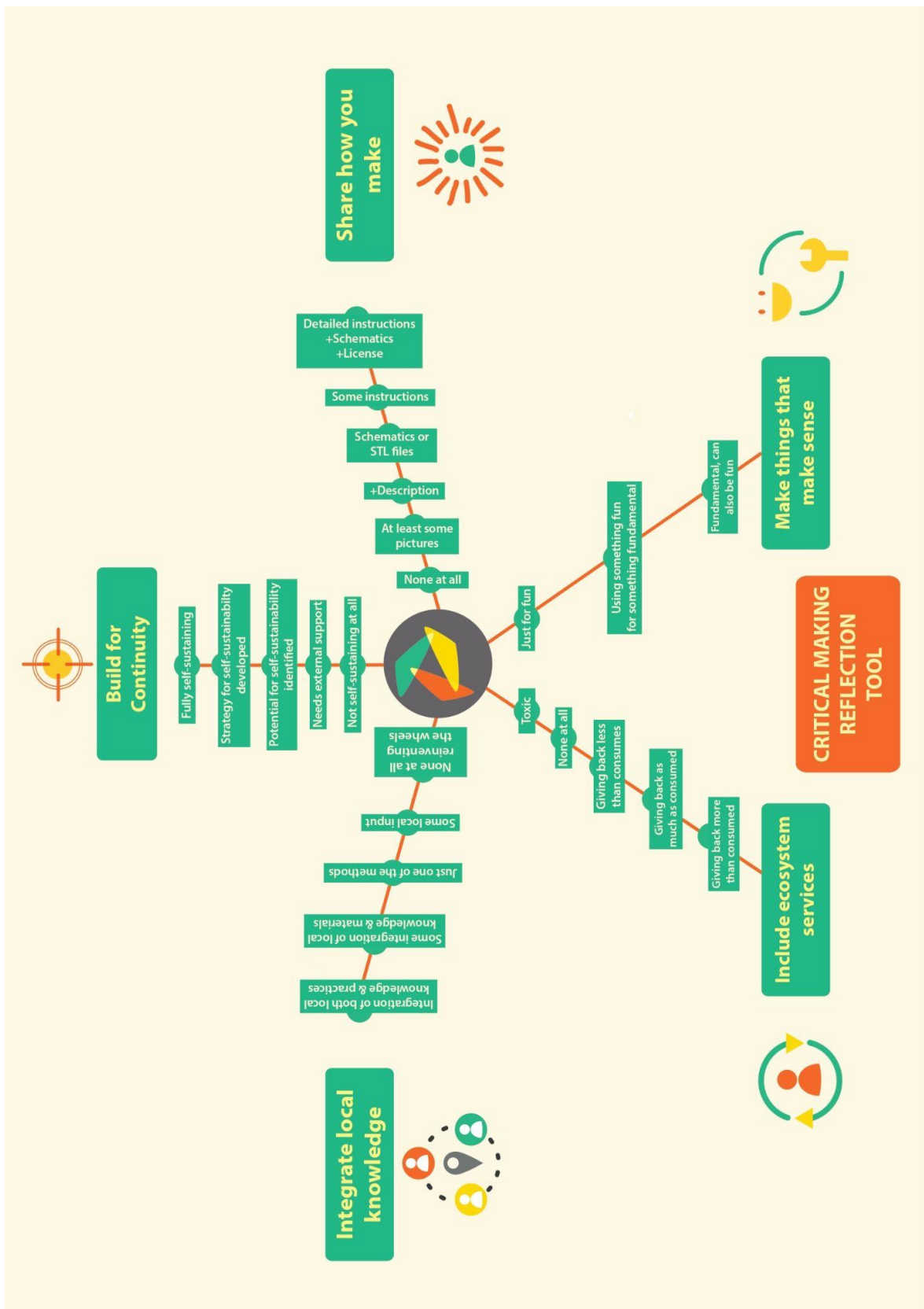
Makerspaces should organize a structure that enables individuals to understand there are a lot of opportunities for bright young people within their localities. When offering meaningful roles and responsibilities, there is a shift in power from traditional hierarchical structures to a more inclusive and equitable environment fostering authentic partnerships.

“You cannot do the work alone; you have to engage the voices”



- **Bahar Kungur**
(Impact Hub Kocimorodu, Nepal)

Critical Making reflection tool (as a board game)



Guidelines for Open Hardware – Blog Posts and Masterclasses

Saad Chinoy: Curating A Curious Mind That Goes Beyond Conventional Thinking

Covid-19 one could say, is a thing of the past. However, the lingering effects can still be seen today. Although pain, suffering, isolation, and many online Zoom calls are associated with this period, some positive outcomes have emerged from the pandemic. For example, we can look towards the trailblazing organisation [TechForGood](#). It utilised the pandemic as a source of inspiration to bring individuals from the community to uphold principles that employ appropriate technology, design thinking, and sustainability to create assistive tech.

As Saad Chinoy states, "an unintended consequence of being forced to do online things has this unexpected positive benefits of equalising everyone and so.. we are relatively better now at trying to troubleshoot tech issues, and so that's exactly the skills the people who volunteered could bring to the table and trying to apply that skill [to help fix tech]". The Professional Geek individual Saad embodies the qualities of a geek, a maker, and a coffee enthusiast and, as a result, continues to catalyse spaces for creativity to flourish. As the co-founder of [SpudnikLab](#), a startup geared toward tackling the digital divide, he emphasises affordable technologies and teaching digital skills. Additionally, Saad has spearheaded [SalvageGarden](#), a nonprofit maker space in Singapore focusing on developing assistive technology to empower individuals in need.

Computers against Covid is one of many projects that Saad works on. The project aims to refurbish laptops and re-home these devices to low-income families so they may still be digitally connected. While Singapore is known for its high level of connectivity and digital infrastructure, there can still be disparities in access to technology, particularly among marginalised or economically disadvantaged groups. Covid-19 has played a huge role in unearthing this information. We see this pan out in a journal article titled, "[FROM DIGITAL EXCLUSION TO UNIVERSAL DIGITAL ACCESS IN SINGAPORE](#)" where according to their research it's said stated by the Infocomm and Media Development

Authority (IMDA), a substantial percentage of resident households in "[The Lion City](#)", precisely [89%](#), have access to a computer. In comparison, an impressive [98%](#) have access to the Internet (IMDA, 2019). However, it's important to note that these statistics alone do not provide insights into access ownership, duration, or quality.

Even though streamlining efforts by the government are running smoothly , the results are seen through the efforts of nonprofits such as [EngineeringGood](#) where they have "distributed more than 6,000 laptops as of March 2022" and continue to increase this number. In the end, it is all in the goals of teaching members of society to use the opportunity provided by a nonprofit or charity to answer a call or cause that helps give back to the community. Not only that, projects such as TechforGood and EngineeringGood enable the volunteers to heighten their skills as they live a life of opportunities. To teach members of society with no previous experience in such fields how to modify, fix, and create something meaningful and effective.

Some other projects Saad has been working on that "Make Things Make Sense" are: STEArtsM, [Careables](#)

Please take a moment to watch Saad's makerspace mentoring video below.

<https://wikifactory.com/+criticalmaking/stories/saad-chinoy-curating-a-curious-mind-that-goes-beyond-conventional-thinking>

Georgia Nicolau: Advancing Empathy; For Commitment To Care And Responsible Innovation

Georgia Nicolau, an esteemed participant in the critical making mentoring program, hails from Brazil and possesses a diverse skill set, such as being a creative professional, researcher, writer, trained facilitator, and consultant. Her expertise lies in the realms of social organisations, collective action, innovation, and culture and the arts. Notably, she played a pivotal role in co-founding the Procomum Institute in 2016—an NGO that champions the commons-oriented approach in her Southern American country. At the institute, she serves as Program Director, enabling partnerships and institutional development.

She initiates an in-depth exploration of the pedagogy employed by the Procomum organisation. Their pedagogy serves as a means to comprehend the foundation of their community-focused work particularly in terms of integrating local knowledge. What does this mean, you ask? And also, why is this important? To address these questions effectively let us explore the analysis of the seven principles underlying the organisation's pedagogy.

First is faith in people and their encounters. The notion that every person matters, and the participation of each member is fundamental to reaching the results one is striving to achieve. Second is an abundance logic; to trust people's values horizontally, where individuals can distribute decision-making and power. In other words, placing trust in individuals and their inherent capabilities by treating them as equals and recognizing their diverse perspectives and experiences. It emphasises the belief that everyone has something valuable to contribute, regardless of their position or background. Thirdly, the concept of affection can be linked to the idea of filling one's cup before tending to others. It emphasises the importance of nurturing and caring for oneself first to cultivate personal growth and well-being. We can only create a sustainable environment conducive to supporting and helping others effectively by attending to our needs first. Fourth is serendipity, which means to identify collective findings in spontaneity, and not always in the initial planning. Fifth, learning by doing and doing by learning, generating and provoking knowledge and reflection where practice feeds theory and vice versa. Sixth, detachment and simplicity; pay attention to the essence of each encounter as it provides useful meaning to create and make. Lastly, divergence is wealth; the concept of conflicting ideas breed new strategies, wavelengths in thinking, and ways to adapt by conducting one's behaviour to act calm and collected.

By comprehending the method employed, one can gain a deeper understanding and appreciation for the impactful work carried out by LabProcurum. This is evident through the tangible outcomes of their projects, such as [Lab Negritudes](#), [LaCuida](#), and different Working Groups in various topics. Certain projects bring attention to the critical intersectional issues concerning class, race, and gender within Brazil's borders. Others shed light on the challenges posed by climate change, particularly in relation to floods and landslides, with a specific focus on the vulnerable regions of [Santos](#) and [Baixada Santista](#). Additionally, these projects address the concerns surrounding indigenous populations and the

preservation of the [Atlantic forests](#). The region is home to nearly 4,000 indigenous peoples and encompasses significant expanses of the Atlantic forest, both of which face economic pressures and real estate speculation, posing significant threats to their existence.

LabProcomum actively provides resources and integrates their pedagogical practices in the work through empathy & care, power, and action & memory; therefore, paving a way for society to access these tools and ideas. As a result, Labprocurum's endeavours extend beyond self-interest, as they firmly believe that knowledge is meant to be shared for the benefit of the commons. They operate as an international organisation, while equally embracing local contexts, thus fostering a cosmopolitan network. This approach broadens possibilities by transcending individual limitations and opening up new horizons for all.

Please take a moment to watch Georgia's makerspace mentoring video below.

<https://wikifactory.com/+criticalmaking/stories/georgia-nicolau-advancing-empaty-for-commitment-to-care-and-responsible-innovation>

Emílio Velis: Cultivating The Skill Of Documentation & Knowledge Transfer

Emilio Velis, serving as the executive director of the [Appropedia Foundation](#), brings a wealth of expertise in sustainability and international development. His work encompasses various facets of the open movement aiming to create social impact. Emilio initiates a vital conversation that dives into the essence of documenting and highlights its significance in the context of knowledge transfer. As Emilio describes, documentation is the process by which different motivations try to explain a series of statements that reflect facts about the world as experiences and narratives. Open-source documentation aims to facilitate collaboration and humanise the process by bridging connections between individuals. Thus, creating a chain reaction which begins by: an idea written down, to creation, implementation, utilisation, and ultimately finding solutions. Documenting presents an opportunity for others to understand and appreciate the shared knowledge. In addition, the personal value each contribution holds can motivate others to think critically, build upon ideas, and

explore alternative possibilities. In essence, this paves the way for the development of [digital gardens](#).

Documentation is not just a method meant for others but also for oneself. As Emilio states, "Documentation is a love story from your past self". The process of writing and recording cultivates good communication skills when 'making things that make sense'. The art of documentation allows individuals to capture and preserve knowledge. It serves as a repository of insights, experiences, and lessons learned. Individuals must organise their thoughts, clarify their ideas, and articulate their concepts in a way that makes sense to others. Such practice cultivates good communication skills and enhances the ability to convey complex ideas coherently and understandably.

In addition to communication skills, it promotes reducing organisational gaps as documentation plays a crucial role in collaborative environments. When working with a team, clear and well-documented processes, guidelines, and project documentation ensure everyone is on the same page. It enables seamless knowledge transfer, facilitates collaboration, and reduces dependency on specific individuals. Proper documentation allows team members to be more streamlined, understand each other's work, build upon existing knowledge, and work together effectively.

Through documentation there is a dialogue between the maker and the community at different stages of processes. Opening up to the idea of distributing one's wealth of knowledge throughout the stages invites the community to provide input and ask questions sparking a discourse that shapes the project's direction. The community can then offer valuable insights, identify potential pitfalls, and suggest alternative approaches, influencing the maker's decisions for the better.

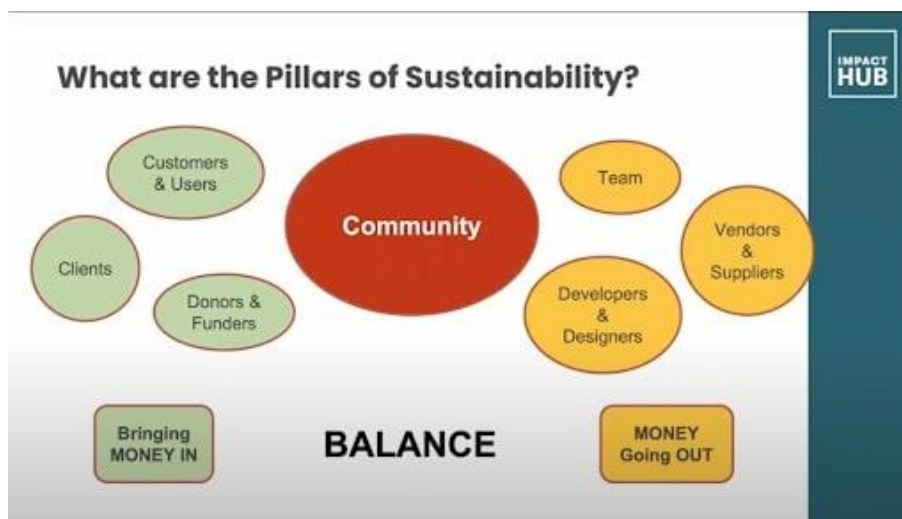
Please take a moment to watch Emilio's makerspace mentoring video below.

<https://wikifactory.com/+criticalmaking/stories/em%C3%ADlio-velis-cultivating-the-skill-of-documentation-knowledge-transfer>

Bahar Kumar : Reversing Power Dynamics In Community

In this mentoring video presented by Bahar Kumar, we dive deep into what entrepreneurial communities look like and to also discover the impact/need for building such spaces. Bahar serves as Director at [Impact Hub Kathmandu](#), formerly [Nepal Communitere](#). In this role, she leads a vibrant community-based innovation hub that supports ambitious changemakers, enabling them to transform their ideas into successful ventures. With a deep commitment to empowering visionaries Bahar employs methodologies like human-centred design to gain profound insights into the communities' needs. By understanding these needs she strives to design innovative and relevant solutions that address pressing challenges. Her expertise in community engagement and innovative problem-solving has been instrumental in fostering positive change.

Through her multifaceted experiences and qualifications, Bahar Kumar exemplifies a dedicated leader and advocate for social innovation. Her work at Impact Hub Kathmandu showcases her unwavering commitment to empowering entrepreneurs and catalysing positive social impact. As she mentions, “it is through entrepreneurship that we can build impact at scale; to question how we can do good in this time of real need in our world and that is through scale. ImpactHub is making an intentional effort to grow in the Global South and to consider who we want to bring in our products and services to have a voice and a balance”. The act of scaling means building a collaborative community, providing entrepreneurial support, offering physical and virtual infrastructure, connecting, and supporting the impact entrepreneurial ecosystem.

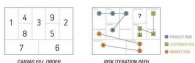


Balancing the Pillars of Sustainability

One of the main topics covered in this video is the funding crisis and what it means to have a business model not dependent or driven by donors; instead to be self-sustainable. In order to be a sustainable organisation one needs a business model to understand how to profit and survive as a business by reinvesting that money into the community or into the products. As Impact Entrepreneurs, the objective is to consistently reinvest in impactful projects, and to ensure one is on the right path. Such a first step begins with utilising the Lean Business Canvas model and to start asking yourselves two essential questions: who are the ideal champions to support the organisation's work financially, and, how can your team ensure you have the right individuals on your team to drive success.

By looking at the images above one can better understand the steps for attaining sustainability. The lean business model demonstrates how "...sustainability is survival around balancing the money that comes in and the money that comes out..." as mentioned by Bahar. The model can be used for a product or service because ultimately it all relates to the problem and the people you are serving.

PROBLEM <small>List your top 1-3 problems.</small>	SOLUTION <small>Outline a possible solution for each problem.</small>	UNIQUE VALUE PROPOSITION <small>Single, clear, compelling message that states why you are different and worth paying attention.</small>	UNFAIR ADVANTAGE <small>Something that cannot easily be bought or copied.</small>	CUSTOMER SEGMENTS <small>List your target customers and users.</small>
	KEY METRICS <small>List the key numbers that tell you how your business is doing.</small>		CHANNELS <small>List your path to customers (inbound or outbound).</small>	
EXISTING ALTERNATIVES <small>List how these problems are solved today.</small>	HIGH-LEVEL CONCEPT <small>List your "X" for "Y" analogy e.g. YouTube = Flickr for videos.</small>	EARLY ADOPTERS <small>List the characteristics of your ideal customers.</small>		
COST STRUCTURE <small>List your fixed and variable costs.</small>			REVENUE STREAMS <small>List your sources of revenue.</small>	



Lean Canvas

Created by Steve Blank / Revised version available at www.leancanvas.com

Lean Business Canvas Model

Once you have a visual understanding of who you want as key players and what stations people should be at, the next step is onboarding, and this begins with

understanding how to communicate one's work. Communication tools such as social media platforms, slide decks/pitch decks, videos, and concept notes are all great tools to organise the way you communicate, but more importantly, the how is where we need to focus our attention towards. Stories of human transformation and testimonials engage the masses because a personal narrative and testimony provides hope and inspiration as they are relatable, emotionally evocative, and provide a sense of hope or inspiration. Through these stories, people can identify and feel a sense of belonging based on real-life experiences. These narratives show individuals overcoming challenges and achieving personal growth or success therefore, motivating others to take action.

Please take a moment to watch Bahar's makerspace mentoring video below.

<https://wikifactory.com/+criticalmaking/stories/bahar-kumar-reversing-power-dynamics-in-community>

Aravinth Panch : Generating A Cycle of Thinking For Longevity

Ecosystems services encompass the vital benefits that nature bestows upon us to sustain life on our planet. Diverse natural elements such as forests, wetlands, rivers, oceans, and the myriad of animal species inhabiting our world are all examples of how different ecosystems exist. During Aravinth's enlightening mentoring session, you will have the opportunity to delve into the different roles in safeguarding these ecosystems for the well-being of our planet. To deepen our understanding of the intrinsic value that nature brings to human lives, we must incorporate practices that keep us accountable and acknowledge the true worth of natural resources within our maker practices.

Aravinth, an ardent social entrepreneur, dedicates his efforts to empowering underserved communities in war-affected regions of Sri Lanka. His work focuses on enabling these communities to address local socio-economic and environmental challenges effectively. As a co-founder of [DreamSpace Academy](#), a non-profit social enterprise, Aravinth actively fosters positive change through various impactful initiatives. DreamSpace Academy operates on challenge-based learning, grassroots innovation, and impact venture building. Such innovative approaches allow individuals within the community to tackle pressing issues by

fostering a collaborative environment where ideas and solutions can thrive. By empowering residents with the necessary tools, knowledge, and support, Aravinth and his team facilitate a process that leads to sustainable transformation.

We understand that to make things make sense, you need to share how you make, build for continuity design (thinking long term), integrate local knowledge, and lastly, as Aravinth discusses, we must not forget to include our ecosystem services. The importance of needing ecosystem services, as Aravinth states, is because they are "being evaluated to draw equivalent comparisons to human-engineered infrastructure, goods and services. Understanding the value of nature to human well-being helps us make more informed decisions about managing and protecting natural ecosystems." Moreover, we can promote responsible behaviour and encourage sustainable practices by holding people accountable for their actions concerning ecosystem services. Recognizing the value of nature's contributions to our well-being can drive individuals, businesses, and policymakers to adopt more environmentally friendly practices, protect biodiversity, and actively work towards conserving and restoring ecosystems.

There are three ecosystem services: Provisioning, where we have direct services (from nature), i.e., fresh water, food and nutrition. Cultural, which provides immense economic and personal services such as recreation, tourism, or spiritual and aesthetics. Lastly, Regulating and Maintenance are things we do not have to take care of; in other words, indirect work done by nature. Evaluating ecosystem services and understanding their value to human well-being helps us make more informed decisions about managing and protecting natural ecosystems. By holding people accountable for their actions and promoting responsible behaviour, we can strive towards a more sustainable future that balances human needs with preserving the natural world. Here is an action list

DreamSpace encompass Ecosystem services:

- BioFilter: Biofilter made from *Syzygium cumini* (java plum) seed extract to remove cadmium pollution in water
- BioComposite: A biocomposite material using mycelium as an alternative sustainable material

- BioPlastic: Biodegradable bioplastic made from Palmyrah Pulp from naturally grown Palmyrah trees on the coasts
- BioGas + BioFertiliser: Biogas digester and fertiliser pellets from cattle manure with the service of dung beetle
- [OceanBiome](#): Prioritise ocean research to chart a course toward active involvement in Ocean Protection. By doing so, they aim to empower the next generation of leaders with oceanic knowledge and instil a sense of responsibility and a commitment to ocean literacy and stewardship. Ultimately, the aim is to nurture a generation of ocean ambassadors in Sri Lanka.

Please take a moment to watch Aravinth's makerspace mentoring video below.

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