SEEDS OF CHANGE

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INTRODUCTION: SOWING SEEDS OF CHANGE

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What does it mean to sow seeds of change, in a world facing pressing demands for sustainability? What does the action of planting seeds do, when the problems are so large and complex? Where do we even start?

Sowing seeds of change means recognising that small actions can grow into transformative shifts. It also acknowledges that it is not just about addressing immediate issues, but about thinking long-term, strategising and imagining how it may grow in the future. Seeds do not grow into plants on their own - they need resources, maintenance, and care from its surrounding environment in order to thrive. Sowing seeds of change means that individuals, communities, institutions, and governments must collectively be committed to nurturing this change.

We believe that biodesign education is one promising form of change. As a consortium, we are driven to grow these seeds - as knowledge, actions, networks, infrastructure, and mindsets. The Biodesign Modules we have developed are one practical step towards creating fertile ground for these seeds to thrive.

The COCOON consortium identifies biodesign methods to mainstream at a larger scale, with a clear focus on integrating these approaches into a range of fabrication environments. Building upon the groundwork established in our BioFABLAB concept (see D2.3), our aim is to make biodesign methods flourish beyond traditional laboratory settings while drawing from existing laboratory protocols and health and safety practices.

COCOON modules are designed as resources for diverse users, including learners and trainers in higher education, vocational education (VET), professional contexts, and life-wide learning (LWL). This inclusivity guided our selection criteria, where we prioritised methods which balance safety, scalability, transferability, and adaptability to varied learning contexts.

Aligning with our positioning, this short report summarises what methods were selected for mainstream prototyping for our 14 modules. Our selection criteria and justification are outlined in the following.

1-Leveraging Expertise of Partners:
Each partner institution brings expertise and strengths to the COCOON consortium, thus, we selected methods that allow us to build upon our range of existing knowledge, research, and practises. This robust foundation ensures that the methods we mainstream have demonstrated evidence of success in learning contexts, as well as being a unique and collaborative contribution to the educational field. See section 2 for Partner Expertise.

2-Applicability to Design Fields for Sustainability:
In *Growing the Future - Transferable Innovative Biodesign Practices (D2.2)*, we identified three key design fields, in which biodesign is the most promising. Presented as a Design Matrix, these included: "Biodesign and Textile Field", "Biodesign and Product Design Field", and "Biodesign and Architecture Field". In this deliverable, we have identified another field relevant to the COCOON scope - the image-making field, which includes, but not limited to, alternative techniques in photography, film, and printing. Our revised Design Matrix is visualised below:

Biodesign and Textile Field	Biodesign and Product Design Field
Biodesign and Architecture Field	Biodesign and Image-Making Field

3-Transferability and Scalability
One of COCOON's key aims is to mainstream biodesign, making it accessible and applicable across various learning environments. Therefore, our modules are designed to be reproducible and scalable beyond a single institution or infrastructure. A fundamental aspect of our methodology is the adaptability of each module - the selected methods that are not inherently dependent on highly specialised equipment, materials, or knowledge. Simultaneously, we have presented a range of methods that span in temporality (i.e. some take several hours to complete, while others take several weeks) and difficulty (i.e. some require more biological knowledge than others). This enables individual learners and trainers to select methods based on their existing social, physical, financial, and information resources.

4-Practice Meets Theory
We have selected methods to effectively engage learners in foundational bio-ecological knowledge with hands-on experiential learning. This approach ensures that learners not only acquire theoretical understanding but also gain practical skills and know-how in working with biodesign processes. Through these methods, learners can observe, experiment, and reflect in action (see also D3.3 Learner's Curriculum for details on educational frameworks and methodologies), promoting creativity, problem-solving, and critical thinking necessary for cultivating sustainability competencies.

The rest of this report is structured as follows. In section 2, we outline the expertise of each COCOON partner institution to contextualise selection criterion 1 (Leverage Expertise of Partners). In section 3, we present how each of our modules responds to the selection criteria we have identified. We conclude by briefly discussing the implications of these efforts for future practises, policy, and decision-making in section 4.

PARTNER EXPERTISE

Aalto: Design with Biomaterials

Aalto University has been exploring *'Designing with Biomaterials'* within the broader contexts of design - including, but not limited to products, textiles and fashion, material science, interaction design, and speculative design. This approach involves co-designing with living organisms (and once-lived organisms) including plants, algae, bacterial cellulose, and fungi to develop novel materials and functionalities which can replace conventional fossil-based ones. Aalto also focuses on interacting with and understanding the local ecosystems - by advocating organisms, materials and techniques that are culturally and environmentally significant to Finland. In so doing, *'Designing with Biomaterials'* not only encompasses creating new solutions but also being aware of the contextual resonances of the design prototypes we create.

Combining *'Designing with Biomaterials'* with the FabLab concept, Aalto University has also set up the **bioMakerStudio** as a new space to work with biomaterial explorations. It includes the tools and assistance needed for a person who has never been in the laboratory aimed at growing living plants, fungi, algae, and cellulose. The space has been hosting higher education courses, Master's thesis projects, and community workshops to foster knowledge transfer in and beyond academia. Aalto's modules have been developed and tested in this space, ensuring accessibility to designing with biomaterials.

IAAC: Design with Living Systems

The Advanced Architecture Group (AAG), part of the Institute for Advanced Architecture of Catalonia, has been exploring *"Design with Living Systems"* within the context of Architecture and Ecology. This approach involves co-designing with living organisms including flora, fauna and fungi, and incorporating their ecological systems as part of the design solution. In particular, the AAG has been focusing on the integration of flora and fungi into architectural projects, understanding how on one hand they can produce food, and on the other, provide ecosystem services like energy, construction material, improve air quality, etc. Not only does the integration of living organisms provide many benefits, but it also drives an approach to design that is no longer human-centric. Solutions must take into consideration the needs and requirements of the living organisms. In addition, by understanding their natural processes, these processes can be harnessed or manipulated within the field of design.

The AAG has successfully implemented many nature-based solutions that stem from the approach "Design with Living Systems", including green walls, facade systems, and urban furniture, to name but a few. All solutions integrated living plants or fungi, and capitalised on their ecological systems to provide multiple ecosystem services. These successes have been translated into the modules.

Cofac/ISMAT: Design with Circular Systems

COFAC | ISMAT has established itself as a leader in integrating circular systems into design education within Portugal, showcasing a pioneering role in the national academic landscape. The institution was the first in the Portuguese education University to introduce an innovative master's course in Design for Circular Economy, aligning with global sustainability priorities. Additionally, for over three years, ISMAT's undergraduate Design degree has offered optional curricular units in Circular Design and Biodesign, providing students with cutting-edge knowledge in emerging design fields. These educational programs emphasize project-based learning, allowing students to engage deeply with real-world challenges. By addressing pressing local and regional issues, these initiatives have facilitated the development of impactful solutions that bring principles of circularity and biodesign to the forefront of urban and regional development.

This project-centered approach has not only enhanced student learning but also served as a dynamic platform for advancing research and pedagogy in design. Through the collaborative creation of solutions to real-life challenges, students, educators, and researchers at ISMAT have collectively refined design methodologies, processes, and tools to better align with the principles of nature-centered biodesign. These iterative and practical experiences have enabled the development of innovative approaches that are more attuned to the unique requirements of biodesign, focusing on circularity and ecological integration.

The institution's dedication to embedding sustainability into its educational framework positions it as a significant contributor to advancing the European Union's vision for circular design and sustainable innovation.

External Expert:

Jorge Lopes - The COCOON project benefits significantly from the expertise of its External Expert, Jorge Lopes, a distinguished leader in the field of biofabrication research and application. With extensive experience in additive manufacturing and a pioneering role in advancing diversity within biofabrication studies and applied projects, Jorge Lopes brings invaluable insights to the project. As the head of BIOLAB in Rio de Janeiro, he has successfully implemented real-world biofabrication approaches in various projects, demonstrating the practical and transformative potential of these methods. His expertise has been instrumental in COCOON's efforts to promote the transition from traditional Fab Labs to Bio Fab Labs, fostering a paradigm shift in educational and professional practices. Furthermore, his deep knowledge of additive manufacturing in the contexts of biodesign and biomaterials has provided critical guidance in the development of methodologies and tools, reinforcing COCOON's commitment to innovation and sustainability in design education.

FB: Design with biofabrication

The FB group is focusing on “Design through Biofabrication”. This process is the integration of biodesign and fabrication which allows the group to teach the user to make almost anything with the new biomaterial or textile. The FB group is directly connected to Fab Lab Reykjavik, a makerspace focusing on digital fabrication, therefore the group can leverage advanced fabrication and prototype techniques to bring greater depth to the biodesign modules. A key strength of the group is their ability to translate technical and complex design methodologies into engaging and accessible learning materials. These resources are tailored not only for students and practitioners in technical fields but also for broader audiences, including educators, hobbyists, and community members interested in biodesign and sustainable innovation. All of these expertises will be applied to the biodesign modules that COCOON aimed to create. Fostering inclusion, education, and usability into each module ensuring repeatability and adaptability.

Expert Partner:
Unruly Matters Ltd. - led by Thora Arnardottir, is a consultation and research studio specialising in biofabrication, biomaterials, and microbial interactions. Thora’s expertise in biodesign and biotechnology, combined with her research roles at institutions like the Hub for Biotechnology in the Built Environment (HBBE), Newcastle University and teaching at MA Biodesign program at Central Saint Martins, London, drives her innovative, process-oriented solutions. Her studio embraces the dynamic and unpredictable nature of living systems to develop sustainable, nature-integrated designs. By merging microbiology, material science, and design, Unruly Matters prioritises.

BIODESIGN MODULES

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Modules in Brief

The COCOON Bio-Design Modules teach green skills and sustainable innovation through bio-based design. These modules help people learn, teach and start businesses using bio-design. They focus on safe materials and organisms like mycelium and microbes. This will lead to new bio-based solutions. Users can use the modules to create their prototypes. This leads to sustainable bio-design in the prototyping space. These new bio-prototypers will help make sustainable materials the norm in production.

The modules are designed to help users learn by combining theory and practice. This helps learners understand bio-prototyping and gain hands-on experience.

The modules can be followed independently by a single person in a Fab Lab, Biology classroom and in most cases even at home. The modules will introduce the theory behind how organisms or materials behave. Clear instructions help learners think critically about how methods can promote sustainability.

The modules introduce what the method is for and why it matters, and they explain the main ideas, like how mycelium binds materials. They also show:

- how the method can be used in the real world and encourage users to experiment ;
- how to use the theory to make something. Procedural instructions let users apply what they have learned;
- what to do in the right order. Each step is explained in detail, showing users why they are doing it;
- diagrams to make complex processes easier to understand;
- safety tips how to fix problems and what you should achieve;
- information on tools and resources needed.

The Green Lab Inventory (outlined in Deliverable D2.3) can be helpful and it can be updated accordingly if there is any need for that.

Health and Safety: You can safely use a classroom or kitchen to make many of these modules, but you should be aware of the requirements of the biosafety level 1 (BSL1) or higher and always follow the instructions accordingly.

COCOON Biodesign Modules

Cocoon Biodesign Modules have been developed and tested by the Cocoon partners in their laboratories. In this document, we introduce the basic information about the 14 biodesign modules chosen according to the earlier-mentioned criteria.

SCOBY Biomaterial

Contributors: Ena Naito (Aalto), Þóra Óskars (FB)
Expertise: Design with Biomaterials

Design Matrix: Biodesign and Textile Field; Biodesign and Product Design Field
•Previously used in fashion design, packaging designs, product designs, etc.

Transferability and Scalability
•Can be easily replicated, prepping/growing conditions are easy to create (can grow at room temp, off-the-shelf materials can be appropriated).
•Has the potential to be further applied to biosorption processes, electronics, the food industry, and biomedical fields[1].
•Versatile post-processing techniques & applications (using fab techniques).
•Food safe, not hazardous for learners to take home.

Practice x Theory
•Learners can engage with oxidative fermentation process to create functional materials.
•Engage with biomaterial aesthetics (i.e. imperfection, inconsistency in growth).
•Changing variables (temp, growth medium, etc.) to understand the effect of growing conditions on the material outcome.
•Understand and implement circular principles, as the biomaterials are 100% biodegradable and can be returned to the soil.

[1] https://www.sciencedirect.com/science/article/pii/S0959652621006740

Plant Dyes and Pigments

Contributors: Ena Naito, Ronja Tammenpää (Aalto)

Expertise: Design with Biomaterials

Design Matrix: Biodesign and Textile Field
•Mainly used in fashion & textiles

Transferability and Scalability
•Can be easily replicated with basic kitchen tools and space.
•Extracting colour is a faster process compared to growing biomaterials. Therefore, it can fit well into many courses and workshops.
•Not hazardous for learners to take home.
•The technique is versatile with other types of organisms and plants.

Practice x Theory
•Learners can engage with the colour extraction process and colour chemistry.
•Engage with bio-colour aesthetics (i.e. imperfection, inconsistency, natural fading).
•Changing variables (pH, temperature, plant matter, etc) to understand the effect of conditions on the colour outcome.
•Understand and implement circular principles, by using food and plant waste to use for design outcomes.

Cyanobacteria Anthotype

Contributors: Brynna Justice, Müge Yildiz, Ena Naito (Aalto)

Expertise: Design with Biomaterials

Design Matrix: Biodesign and Image-Making Field
•Previously used in graphic design and analogue prints as replacement of cyanotypes.

Transferability and Scalability
•Can be easily replicated with basic kitchen tools and space.
•Not hazardous for learners to take home.
•Low chance of contamination.
•Technique is versatile with other types of organisms and plants.

Practice x Theory
•Learners engage with photodegradation processes through a hands-on approach.
•Engage with bio-print aesthetics (i.e. imperfection, inconsistency, natural fading).
•Changing variables (pH, temperature, UV, etc) to understand the effect of conditions on the print outcome.

Bio-foam

Contributors: Anna Reneau, Þóra Óskars (FB)

Expertise: Design with biofabrication

Design Matrix: Biodesign and Product Design Field,
Biodesign and Architecture Field
•Can be used to replace plastic packaging or foam products.

Transferability and Scalability
•Can be easily replicated with basic kitchen tools and space.
•Not hazardous for learners to make in their homes.
•Has potential to be further applied to packaging, product design, and prototyping.
•Technique is exchangeable with other types of cellulose.
•Potentially to drive people to investigate other bio projects like DIY cardboard or paper making.
•Can be used as a material in other project after postprocessing.
•Foodsafe, not hazardous for learners to take home.

Practice x Theory
•Learners can learn about plant cellulose.
•Learners can modify the ratios and determine if there are new physical properties.
•Understand and implement circular principles, by using waste paper for design outcomes.
•Engage with the field of design and understand how the biofoam can be utilized into other projects.

Mycelium Composite

Contributors: Anna Reneau, Hafey Hallgrímsdóttir, Þóra Óskars (FB)

Expertise: Design with biofabrication

Design Matrix: Biodesign and Product Design Field, Biodesign and Architecture Field
•Used in construction and also in furniture

Transferability and Scalability
•Can not be easily replicated at home as contamination is a large problem with this project.
•Final product is a non hazardous material for learners to take home.
•The final material potential to be further applied to packaging, product design, and the architectural fields.
•Post-processing techniques are not known at this time.

Practice x Theory
•Learners can work with mycelium.
•Learners will acquire hands-on learning to learn standard practices for sanitizing dry material.

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Mycelium Leather

Contributors: Margrét Katrín Guttormsdóttir, Hafey Hallgrímsdóttir, Þóra Óskars (FB)

Expertise: Design with biofabrication

Design Matrix: Biodesign and Textile Field; Biodesign and Product Design Field
•Primarily explored as a substitute for non-biodegradable textiles, but currently explorations exist for product design too.

Transferability and Scalability
•Can easily be replicated in different locations; however, the process of growing must be adapted to fit the local climatic conditions.
•Scaling is possible, but working with living systems always poses a challenge and unpredictability.
•There are a lot of further opportunities for exploration, in terms of its applications and postprocessing.

Practice x Theory
•Learners should understand the natural growth behaviours of the mycelium.
•Monitor and take care of a living organism, considering variables such as light, moisture etc. that can impact its growth.
•Engage with the field of design and understand how pattern design can influence the properties of the textile.
•Understand and implement circular principles, as the textiles are biodegradable and can be returned to the soil to grow the next generation of textiles.

Yeastogram

Contributors: Anna Reneau, Þóra Óskars (FB)

Expertise: Design with biofabrication

Design Matrix: Biodesign and Image-making Field
•Mainly used for artist expression.

Transferability and Scalability
•This module can be done in a small space.
•This project can be used in a class setting by changing the design of the lightbox to accommodate more yeastograms.
•This is a fast process compared to other organisms.
•Much of the preparation is done in advance and can be made simpler.
•Not hazardous for learners to take home.

Practice x Theory
•Learners can make a growth medium and understand that it is the method of growth for the yeast.
•User can fully customize the yeastogram by the use of fabrication techniques.
•Users can also fabricate their lightbox to their own specifications.

Pits & Peels

Contributors: Carla Paoliello, David Palma (COFAC)

Expertise: Design with Circular Systems

Design Matrix: Biodesign and Product Design Field; Biodesign and BioArt
•Previously used in packaging designs, product designs, art etc.

Transferability and Scalability
•Being based on using food waste materials, the access is Universal.
•Can be easy to develop simple circular systems to collect food waste at scale.
•It's easy to replicate and create a mass production system.
•Given the fiber characteristics, it can be used to Bioceramics products.
•It's highly recommended for disposable products design.
•Food safe, not hazardous for learners to take home.

Practice x Theory
•Learners can engage design with circular systems and economy frameworks.
•Highly connected with companies focus on transition to green and sustainable products - 100% Biodegradable.
•The biofabrication methods have a fit with moulding | additive manufacturing processes and techniques, allowing design forms and shapes freedow.

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Pods food waste Biomaterial

Contributors: Carla Paoliello, David Palma (COFAC)

Expertise: Design with Circular Systems

Design Matrix: Biodesign and Product Design Field; Biodesign and BioArt.
•Previously used in packaging designs, product designs, art etc.

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Root Textiles

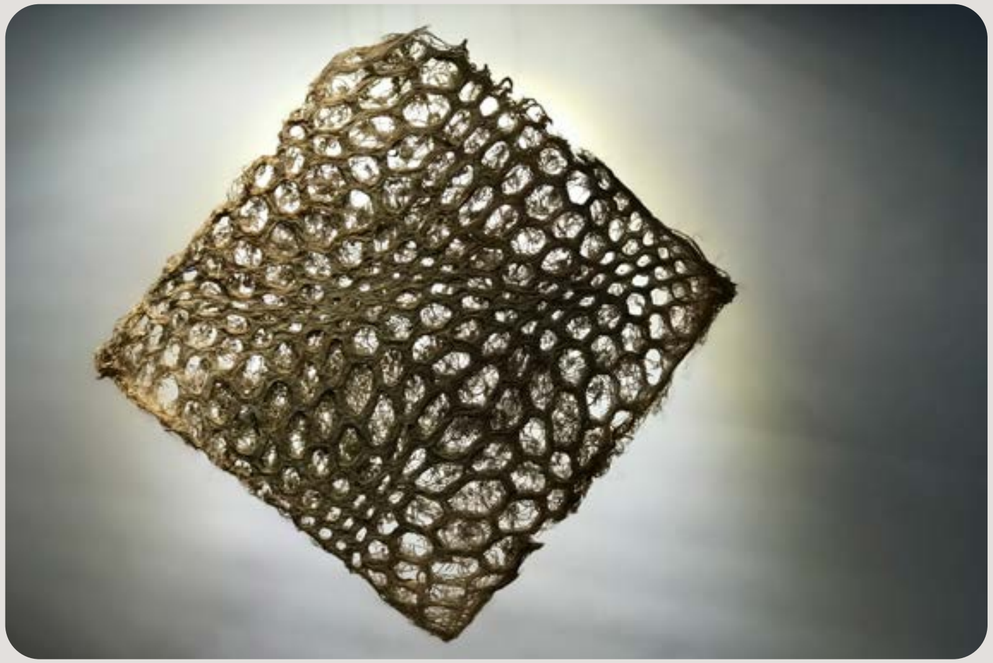
Contributors: Fiona Demeur and Chiara Farinea (IAAC)

Expertise: Design with Living Systems

Design Matrix: Biodesign and Textile Field, Biodesign and Product Design Field, Biodesign and Architecture Field
•Primarily explored as a substitute for non-biodegradable textiles, but currently explorations exist for product design and architectural applications.

Transferability and Scalability
•Can easily be replicated in different locations; however, the process of growing must be adapted to fit the local climatic conditions.
•Scaling is possible. Artists such as Diana Schrerer and
•Zena Holloway have proven the possibility, but working with living systems always poses a challenge and unpredictability.
•There is nothing hazardous regarding this module, and it can be carried out by all age groups.
•There are a lot of further opportunities for exploration, in terms of its applications and postprocessing.

Practice x Theory
•Learners must capitalise on the natural growth behaviours of the plant, and thus understand how the root systems of plants behave and then apply it.
•Monitor and take care of a living organism, considering variables such as light, moisture etc. that can impact the growth.
•Engage with the field of design and understand how pattern design can influence the properties of the textile.
•Understand and implement circular principles, as the textiles are 100% biodegradable and can be returned to the soil to grow the next generation of textiles.



Plant Biophotovoltaics

Contributors: Fiona Demeur and Chiara Farinea (IAAC)

Expertise: Design with Living Systems

Design Matrix: Biodesign and Textile Field, Biodesign and Product Design Field, Biodesign and Architecture Field
•Utilised for lighting strategies, can power small sensors and LED's.

Transferability and Scalability
•Scalability is possible, and Plant-e are demonstrating how lighting strategies in towns/cities can be powered by biophotovoltaics. However, currently, the energy captured is very low and thus the applications are limited.
•Setting up the system is not hazardous, but care must be taken with all the small parts and materials used.
•Once the system is understood, the possibilities open up in terms of application. Further exploration is required to understand the integration of such systems and what other benefits or opportunities they could provide.

Practice x Theory
•Understand the natural processes of plants and harness the energy (ecosystem service) that is produced as a result of the natural processes.
•Monitor and take care of a living organism, considering variables such as light, moisture etc. that can impact the growth and the amount of energy produced.
•Setting up an electrical circuit.

Supernutrient Bricks

Contributors: Fiona Demeur and Chiara Farinea (IAAC)

Expertise: Design with Living Systems

Design Matrix: Biodesign and Textile Field, Biodesign and Product Design Field, Biodesign and Architecture Field
•Mycelium has been used to create bricks, insulation panels, lampshades etc.

Transferability and Scalability
•Many examples already exist where mycelium has been used in architectural pavilions or for product design, thus scalability is possible.
•Can be replicated; however, people do need to work in sterile environments to avoid contamination during inoculation.
•Food safe, can be grown in a kitchen for example.
•The properties of mycelium open up interesting possibilities in terms of applications.

Practice x Theory
•Monitor and take care of a living organism (mushroom), considering variables such as light, moisture etc. that can impact the growth.
•Utilisation of the entire living organism from the mushroom itself, to the mycelium.
•Aligning the choice of mushroom species with their application and design.

© Advanced Architecture Group, IAAC

Form - Casting Biomineralised Material

Contributors: Thora Arnardottir (Unruly Matters)

Expertise: Biofabrication

Design Matrix: Biodesign and Textile Field, Biodesign and Product Design Field, Biodesign and Architecture Field
•Sustainable building materials (e.g., tiles, bricks, facade panels).
•Sculptural forms and artistic installations

Transferability and Scalability
•The MICP process can be replicated across diverse locations using locally available aggregates.
•The process can scale from small material experiments to industrial-level applications. Examples include architectural components and soil stabilisation in engineering contexts.
•The module utilises accessible materials and low-energy bacterial growth conditions; however, controlled environments (e.g., shaking incubators, proper moulds) are recommended for precision.
•Not hazardous, but learners must handle ammonia and biological materials with proper precautions.

Practice x Theory
•Learners gain knowledge of the biomineralisation process, focusing on metabolic activity and urease enzyme production by Sporosarcina pasteurii.
•Encourages understanding of sustainable material creation by leveraging bacterial growth and calcium carbonate precipitation.
•Demonstrates the environmental impact reduction compared to traditional cement and construction materials.
•Design and fabricate moulds to guide and contain material formation, exploring flexibility in form and scale.
•Monitor the progression of biomineralisation through pH and structural assessments, building observational and problem-solving skills.

© Arnardottir

Bioluminescent Light in a Bottle

Contributors: Christopher Bellamy & Thora Arnardottir (Unruly Matters)

Expertise: Biofabrication

Design Matrix: Biodesign and Product Design Field; Biodesign and Interactive Design FieldProduct Design Field, Biodesign and Architecture Field
•Interactive installations that use light-responsive living materials
•Sustainable and aesthetic alternatives to artificial lighting systems

Transferability and Scalability
•The cultivation of bioluminescent dinoflagellates (*Pyrocystis fusiformis*) can be conducted with minimal technical requirements using accessible materials like reef salts and glass containers.
•The process can scale to larger installations or industrial applications, as seen in projects like Studio Roosegaarde's "Glowing Nature".
•Suitable for all skill levels, as the module provides straightforward steps for growing and maintaining cultures. The process can be performed at room temperature with basic light-dark cycles.
•Non-toxic and safe for all ages, provided that organisms are not released into natural ecosystems.

Practice x Theory
•Step-by-step cultivation of *P. fusiformis*, including preparing growth media, managing light cycles, and maintaining optimal environmental conditions.
•Experiment with different vessel designs (e.g., glass jars, silicone moulds, hanging grow bags) to create interactive light displays.
•Explore post-cultivation possibilities such as creating interactive installations, testing alternative growth media, and experimenting with different light-dark cycle timings.

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SEEDS OF PRACTISE AND POLICY CHANGES?

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The COCOON consortium has identified key bio-design processes and methodologies ready for mainstreaming, which have been developed into 14 modules. We have carefully selected methods that leverage our partner institutions' existing expertise, transferable and scalable, as well as those that effectively combine hands-on practises and theory. This short report not only foregrounds what is feasible in educational environments today, but also aims to act as a groundwork for future decision-making on growing the range and scales of modules we have presented.

The COCOON has been significantly contributing to the European Union design framework by developing policy recommendations that integrate biodesign and biomaterials knowledge and practices into the frameworks of design education and professional fields. Through its research and innovation activities, COCOON identifies gaps in current educational policies and proposes structured pathways to embed sustainable Biodesign practices at multiple levels of educational and professional contexts across the European Union. These recommendations align with the EU's broader goals of fostering ecological innovation and sustainable growth, emphasizing the importance of equipping future designers and makers with the skills and competencies required to address environmental challenges through material innovation and biodesign methodologies.

Cocoon project has researched and developed biodesign modules under deliverable D.3.4 Ten Biodesign Modules, along with its teaching and learning methodologies (D.3.2 and D 3.3), act as pivotal tools in reinforcing the EU's transition towards sustainability in design practices. By offering adaptable educational frameworks that cater to different focal points—such as experimental approaches, research-driven methodologies, and professional innovation—the COCOON project strengthens the role of design education as a key driver in achieving the objectives of the European Green Deal. These tailored approaches not only enhance the adaptability of design education to various stakeholders but also cultivate the next generation of professional "game changers" who can actively contribute to systemic shifts in design practices, materials usage, and sustainability. Through this multifaceted approach, the COCOON project ensures that its contributions resonate deeply with the EU's sustainability and innovation agendas, paving the way for impactful policy transformations in the design field.

Conclusion

The mainstream adoption of these biodesign modules has implications for educational institutions, professionals, industries, and individual designers seeking to explore more ecologically responsible design methods. Looking ahead, we hope to catalyse the acceleration of bio-design education - both through bottom-up action of individual educators and through larger policy frameworks - fostering more opportunities for cross-disciplinary collaborations and accessible entry-points into the realm of biodesign.