



Deliverable 6.3

TOOLKIT FOR USE OF EDUCATIONAL MODULES

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Table of Contents

1. Introduction	4
1.1 FIT4FOOD2030 project and its competence-building objectives	4
1.2 Purpose of the deliverable	4
2. The FIT4FOOD2030 educational modules	5
2.1 Educational modules	5
2.2 The educational module development phases	5
2.2.1 Prototyping	5
2.2.2 Piloting	9
2.3 Module selection	10
2.4 Module adaptation: Some suggestions	11
2.5 Overview of the educational modules	12
2.5.1 City Lab Amsterdam: Applications in Food and Nutrition Analysis	12
2.5.2 City Lab Athens: Eat It, Don't Skip It!	13
2.5.4 City Lab Barcelona: Fostering change in your system for the promotion of healthy and sustainable diets. Part I - Validating a system map and identifying areas where changes are needed	14
2.5.5 City Lab Barcelona: Fostering change in your system for the promotion of healthy and sustainable diets. Part II - Building visions of concrete areas of the system and action plans for change	14
2.5.6. City Lab Budapest: System Thinking for Food System Sustainability.....	15
2.5.7 City Lab Budapest: Our Food System and Us.....	17
2.5.8 City Lab Milan: Valuable Market.....	17
2.5.9. City Lab Milan: Visions of Future Food	18
2.5.10 City Lab Sofia: I <3 Food	19
2.5.11 City Lab Sofia: Nutrition	19
2.5.12 City Lab Sofia: Specific features of the food system	19
2.5.13. City Lab Tartu: Taste Alternative Protein.....	20
2.5.14 City Lab Tartu: Beeswax Food Wrap	20
2.5.15. City Lab Tartu: Food and Vacuum	21
3. Analysis of modules per key characteristics	21
3.1. Format	21
3.2. Type of learning with society.....	22
3.3 Target audiences	22
3.4 Implementation contexts	24
3.5 Duration.....	24
3.6 Content areas	25
5. Next steps	26

6. Educational module annexes 26

1. Introduction

1.1 FIT4FOOD2030 project and its competence-building objectives

FIT4FOOD2030 supports the urgently needed transformation of Research and Innovation (R&I) on Food and Nutrition Security (FNS) in Europe. To achieve that, FIT4FOOD2030 will create a sustainable, multi-stakeholder platform, mobilizing a wide variety of stakeholders at the level of cities, regions, countries, and Europe wide. Known as the FOOD 2030 Platform, this network will make R&I policies on FNS more coherent, build competences of current and future researchers, entrepreneurs, policy-makers and society at large, and raise awareness around FOOD 2030.

The three inter-linked structures of the FOOD 2030 Platform are:

- EU Think Tank: the link between the EC and Member States & Associated Countries, with a global outreach;
- Policy Labs to increase and align public/private R&I policies/programs on FNS, building on and expanding existing national/regional networks; and
- City Labs to develop/pilot action-oriented trainings for students, consumers, researchers and professionals linking Science Centers/Science Shops to networks of the Milan Urban Food Policy Pact cities.

Via the structure of the City Labs, WP6's key objective is to deliver a set of transformative, hands-on future-oriented educational modules on food system Responsible Research and Innovation (RRI) and R&I for primary, secondary and university-level students as well as professionals such as entrepreneurs and social agents. In this context, Responsible Research and Innovation principles have been embedded both in the activities' design process and the activities themselves to foster multi-stakeholder engagement, critical thinking, collaborative learning skills and transdisciplinary approaches to food systems learning.

The City Labs have developed a combined total of 15 educational modules, self-standing units of study or training, that are nevertheless interrelated with other such units and which can be combined in a number of ways to build up a programme of activities. Each contains a detailed step-by-step guide for module delivery and is presented in its integrity in Section 6 with the help of internal hyperlinks.

1.2 Purpose of the deliverable

The objective of Deliverable 6.3 is to present the near-to-final educational modules developed so far, as well as insights for module selection and adaptation by future users. It is recommended that this deliverable is consulted in parallel with Deliverable 6.2 which contains insights from the piloting phase of the educational module development. Nevertheless, some of the broad conclusions from the piloting phase are summarized in Section 2.2.2 of the current document.

It is envisaged that interested users of the educational modules will be able to download the full set of modules, or each module individually from the project website (www.fit4food2030.eu), after

being able to filter the modules according to key characteristics. With this in mind, Deliverable 6.3 groups the modules according to characteristics such as target audience, content area, focus on Food 2030 priorities and so on, as outlined in Section 3.

The deliverable has been compiled based on the educational module guidelines. It is informed by semi-structured interviews carried out by Work Package 6 leads with the City Lab coordinators.

2. The FIT4FOOD2030 educational modules

2.1 Educational modules

The City Labs have developed a combined total of 15 educational modules, self-standing units of study or training, that are nevertheless interrelated with other such units and which can be combined in a number of ways to build up a programme of activities. Each contains a detailed step-by-step guide for module delivery, which can be found in Annexes 1 to 15.

During the educational module development process, each City Lab has taken into consideration their area of expertise (e.g. science centres have significant experience in producing hands-on workshops of shorter duration) and the vision of future-proof food systems developed in their City Lab in order to select the target audience and educational level, the learning approach (deep learning or light learning), the topic (connected with the FOOD 2030 Research & Innovation priorities) and the specific competences addressed by the educational modules they develop.

2.2 The educational module development phases

N.B. This overview makes reference to the methodology developed by FIT4FOOD2030, expected to be published online as part of the FIT4FOOD2030's Tools for Transformation.

2.2.1 Prototyping

City Labs began by **prototyping** (Task 6.3) ideas for educational modules coming from consultations or workshops with City Lab participants. Those ideas were generated using multi-stakeholder co-creation methodology developed by the project's methodology team (WP1, led by VU), and a wealth of bilateral exchanges with City Lab members or other experts recommended by the stakeholder network of the City Lab or already in the local and national networks of the City Lab host organisations (i.e. science centres, science museums, innovative schools, and living labs).

Prototyping allowed those ideas to take a visible, tangible or functional form, namely development into a set of draft guidelines for the delivery of the educational module. Different stakeholders were consulted about it at an early stage of development, allowing improvement without committing too many resources.¹ Guideline drafts gave way to fuller prototypes that specified all the details necessary to run live piloting with the intended audiences of the educational modules. Table 1 gives an overview of potential steps that can be taken to arrive at a viable prototype, based on the experience of the City Labs, while figures 1 to 7 illustrate some of the steps.

¹ See Nesta (2018). 'Proof of concept, prototype, pilot, MVP - what's in a name'. Available online at: <https://www.nesta.org.uk/blog/proof-of-concept-prototype-pilot-mvp-whats-in-a-name/>

Table 1. Potential general steps towards an educational module prototype. Steps A and C are co-creation formats prepared by the methodology design team at Athena Institute, VU Amsterdam (WP1). In practice, the development process varied from City Lab to City Lab.

Step A: Workshop on co-creating competences

With the help of a fictitious persona (see Figure 1 for an example), potentially inspired by real-life actors from national or local (show-) cases, participants brainstorm the steps needed for actors in the food system to acquire skills and knowledge. They compare these with a set of competences cards for Responsible Research and Innovation and food systems competence elaborated by the project, and rate them on a matrix according to their urgency and level of coverage/representations in the current education or (professional) practice (see Figure 3). The outcome of such a workshop could be that modules will go on to address in particular competences under-represented and needed urgently.

Step B: Formulating learning goals.

As a subsequent step, learning goals can be formulated for the competences identified. City Lab coordinators were provided with further guidance on possible taxonomies, including formulating learning goals for Responsible Research and Innovation².

Step C: Co-creating (out-of-the-box) modules

A morphological matrix – a table often used in design processes – is at the heart of this exercise for module design. The first column lists variables needing consideration, and the subsequent columns present possible options or versions the variable can take (see Figure 4). A pre-defined table was prepared with the educational module variables and options in mind. Participants can randomly select options and brainstorm collectively on a module/activity that could respond to all the parameters (Figure 5). Ideas can be presented in a plenary (Figure 6), further selected or combined until a coherent module has been achieved. Some ideas generated during such a workshop are presented in Textbox 1.

Further resources for co-design are available from the EU-funded SySTEM2020 project³ and could be used complementary to the workshop described above:

- Sets of trigger cards to help participants consider the issues of engaging different target audiences and inclusion in designing (informal) learning opportunities
- Matrices and tables for the prioritization of module ideas generated by participants in terms of impact (high to low) and difficulty of implementation (easy to difficult)
- An ideation canvas for refining of module ideas/solutions
- A framework to assess the modules according to utility, viability and feasibility

Step D: Securing stakeholder commitment

² See, for example, the EnRRICH project Deliverable 2.3, ‘The EnRRICH Tool for Educators’, available online at: https://www.livingknowledge.org/fileadmin/Dateien-Living-Knowledge/Dokumente_Dateien/EnRRICH/D2.3_The_EnRRICH_Tool_for_Educators.pdf

³ See SySTEM2020, Eva Durall, Aalto University, ‘Co-design workshop materials’, available online at: <https://system2020.education/wp-content/uploads/2019/11/All-resources.pdf>

Developers are encouraged to consider early on who among their network is willing to translate the educational module into a working prototype, or to prototype the module in its early iterations. They could propose different degree of involvement to the network: from consultations on the content of the modules, to module co-authorship, to hosting and being involved in the implementation of the module prototype. An idea tried by the City Lab Milan was providing participants to the co-creation workshops with a postcard (potentially listing the various ways they could be involved), and inviting them to email or call to discuss their preferred role once they have reflected on the co-creating workshop outcomes (Figure 7).

Step E: Co-development of the module

Smaller meetings or interactions can be arranged with stakeholders to gather their input to the modules, pitching ideas, generating commitment and building connections with their activities. The educational module template developed by the project can provide the basis to discuss the different module components in more detail.

When such meetings are unplanned and informal, it might be helpful to write down shortly after some details about the encounter: what prompted the meeting, ideas relevant for module design, decisions or plans for follow-up. Keeping track of such interactions can document how module development occurs and trace back influences and key decisions.

Step F: Testing proof of concept

Doing small tests with one or two users can help demonstrate that an idea is feasible. For example, the coordinator City Lab Tartu went through the educational modules quickly with one user, tried out the hands-on activities and talked through the dialogue methods to receive feedback.

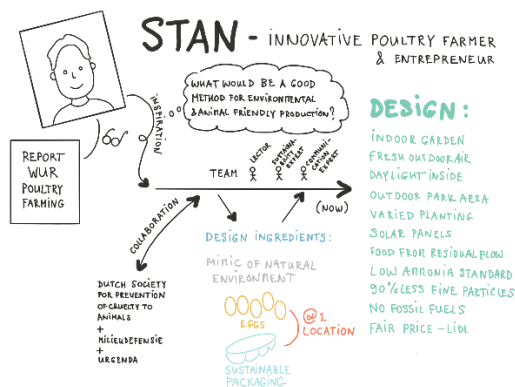


Figure 1. Persona Stan. Developed by the City Lab Amsterdam



Figure 2. Brainstorming. City Lab coordinators' training, Amsterdam, November 2018

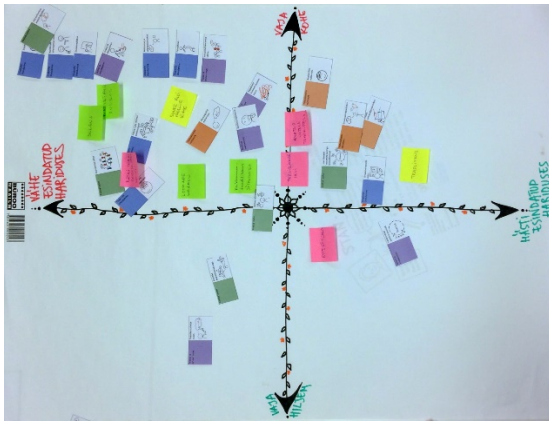


Figure 3. Competence matrix produced by the City Lab Tartu

LEARNER'S LEVEL	PRIMARY SCHOOL	MID SCHOOL	HIGH SCHOOL	EARLY BSc	LATE BSc	EARLY MSc	END MSc	PROFESSIONAL
Discipline /FIELD	SOCIAL SCIENCES	SCIENCE	ENGINEERING	ARTS & DESIGN	ARTS	INFORMAL LEARNING	TRADITIONAL LEARNING	
INTELLIGENCE /TYPE	BOUNCE SMART	PEOPLE SMART	WORK SMART	LOGIC SMART	NATURE SMART	ORAL SMART	PICTURE SMART	MUSIC SMART
FOOD SYSTEM ELEMENT(S)	PRODUCTION	DISTRIBUTION	PACKAGING	LOGISTICS	INNOVATION & ENTREPRENEURSHIP	WASTE MANAGEMENT	FINANCIAL SERVICES	ALL ELEMENTS
FOOD2030 FOOD SYSTEM THEME	PRODUCTION & HEALTHY DIET	FOOD LOSS & WASTE	FOOD SECURITY & NUTRITION	FOOD SYSTEMS & RESOURCES	FOOD SYSTEMS & RESOURCES	FOOD SYSTEMS & RESOURCES	FOOD SYSTEMS & RESOURCES	FOOD SYSTEMS & RESOURCES
WORK (TIME) FORMAT	INDIVIDUAL	IN PAIRS	GROUPS					
INSPIRATION /SOURCE	COMMISSIONER	NEWS	SHOWCASES	SELF-INVENTED	FICTITIOUS PROJECT			
ANOTHER VARIABLE								
.....								

Figure 4. Pre-defined morphological matrix developed by the City Lab Amsterdam

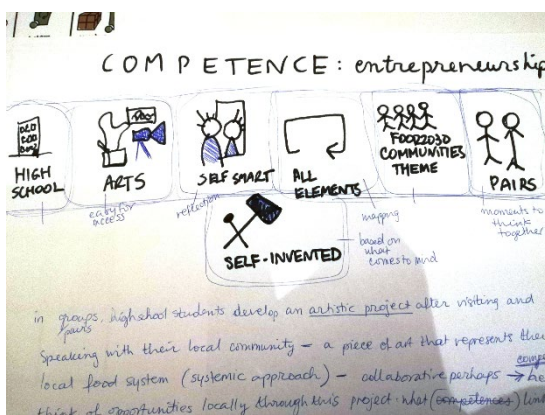


Figure 5. An example of the use of the morphological matrix to generate ideas for a module related to entrepreneurship.



Figure 6. Participants present their module ideas in plenary. City Lab Budapest.



Figure 7. Postcard prepared by City Lab Milan to inspire participants about taking a role in the educational module design phase

Textbox 1. Example of a module idea coming from a group of City Lab participants after using the ‘Co-creating (out-of-the-box) modules’ exercise

Idea 1

“The module would target primary school students. They argued that many of the competencies identified to be necessary for a future-proof food system need to be developed at an early age. The aim of the module would be to introduce students to the food system, and the concept and practice of food system sustainability. It would encompass knowledge about healthy and sustainable diets, and also developing an understanding of how the supply chain operates. They would learn in groups through carrying out small projects. They would participate in various activities from planting vegetables to visiting firms that are active in food production. Older students from high school or university level could take part in the course as mentors or assistant teachers to leverage the effect of peer learning. An additional idea was to create a face for the course, like “Rob the Robot”, and build up the course around a story, such as, “Rob comes back from the future to warn the children that they need to do something urgently in order to avoid a climate crisis”. Already active influencers could act as partners to propagate the course and its message on social media.”

Idea 2

“The module would target the development of the competencies of analytical thinking, conflict management, cooperation, system thinking and future planning through a complex organizational development training. The course would support food system innovators in starting their own social or community enterprises. The idea is based on an already existing training that is offered to CSOs, which could be further developed and specified to the needs of the food system and to the interests and needs of various target groups. The idea of the group was to find those times in life when people are faced with significant decisions, such as the end of high school, and the final year of university studies (BSc or MSc) and target them with the module. In addition to the previously described, they also mentioned professionals who would like to make a significant shift in their professional life after working as an employee of larger organizations for 10-15 years.”

2.2.2 Piloting

In the FIT4FOOD2030 case, **piloting**⁴ (Task 6.4) refers to validating the educational modules ‘live’, in a real context, with a small group of the target audience of the training before implementing or scaling up. Problems are spotted and measures are taken to address them before rolling out the training delivery, to other audiences and in other contexts. At the end of the piloting, it is possible to say that the educational module works in an optimal way and can be taken to the market, i.e. published for external users interested in FIT4FOOD2030 and competence-building.

The piloting process of the 15 FIT4FOOD2030 educational modules took place in schools, science centres and museums, and universities, and reached the target audiences of primary school students (n=20), secondary school students (n=410), high school students (n=85), university students (n=40), professionals (n=71) and mixed groups of adults and children considered as general public (n=258). As expected from the piloting phase, in almost all cases, minor changes were introduced by the educational module developers following the piloting. These changes (and their rationale) are presented in Deliverable 6.2 and are already reflected in the guidelines contained in Section 6, the annexes.

⁴ See Nesta (2018). ‘Proof of concept, prototype, pilot, MVP - what’s in a name’. Available online at: <https://www.nesta.org.uk/blog/proof-of-concept-prototype-pilot-mvp-whats-in-a-name/>

In short, the following aspects, reoccurring across the piloting experiences, can be considered relevant for future users of the educational modules:

- In general, the educational modules worked well in practice, presented interesting topics for participants and triggered discussion and reflection.
- Following the piloting experience, the education module developers chose to add **more structure and guidance** to various components of the educational module (e.g. the AFNSA work groups; adding specific sub-steps to the club meetings of Eat It, Don't Throw It!) to maximise the beneficial outcomes that can be delivered.
- Striking a **good balance between the ambitions of the educational modules and the limited duration of the activities they foresee**: ideally, the modules would go in depth and result in participant confidence about using system thinking tools, rather than simply raise awareness. For the delivery of this objective, City Lab coordinators feel that longer engagement is needed. It was felt, at the prototyping phase, longer durations can be off-putting, especially in the recruitment of participants, and more difficult to fit into certain implementation contexts such as classrooms. Having said that, participants to some of the longer educational modules reported wishing the experience to have been even longer. Perhaps, preparations such as teaser trailers of the educational modules can be helpful in the recruitment, persuading audiences of the value of the module and securing their longer commitment.
- **Real-life stakeholder engagement** is considered a key element of the modules but is difficult to deliver within modules of limited duration. Where the areas of work can be known in advance, module organisers or facilitators can prepare the ground work for engagement (stakeholder identification and invitation to participate in course events e.g. in the cases of modules AFNSA from the City Lab Amsterdam and System Thinking for Food System Sustainability from the City Lab Budapest).
- The **importance of facilitation skills** in achieving the educational modules' objectives, and in particular in creating several kinds of beneficial objectives (making the link between concrete hands-on activities or insights from one aspect of the system and the broader food system perspective; making **connections between the general level of the activity and the personal level of participants, fostering** future-oriented creative thinking.

2.3 Module selection

When selecting from among the educational modules, future users are recommended to have a clear understanding of:

- **Objectives**
 - If timing and resources allow, they could run an exercise of co-creating competences (see Section 2.2.1) with stakeholders to identify the competences considered urgently needed and yet under-represented in education or (professional) practice
- **Resources** (technical, financial, human resources and time)
- **Target audience**, and **stakeholder groups** they would potentially like to engage with.

- To engage a stakeholder group that is not part of their regular audience, it is recommended to frame one's communication accordingly, find the 'multipliers' – individuals or organisations that can mobilise the target group(s) – present them the activity and engage them in the development of the activity and in the communication process.
- The other way around, regular audiences might not always welcome a new type of activity without having been well informed and prepared.

As a subsequent step, when setting up the activity, particular attention should be paid to these key aspects of the planning and execution of the module (for which various tips and examples are available in the guidelines of the module selected):

- The **topic**
- The **venue** and what kind of implementation context it will allow
- The **activity schedule** and **timing**
- **Moderation/facilitation**
 - Advice for facilitators is available from the Hypatia project⁵ on implementing gender-inclusive activities, acknowledging biases and stereotypes and making sure they are not perpetuated in interactions with participants and stakeholders.
- **Communication** around the event
 - Stress the tangential benefits

2.4 Module adaptation: Some suggestions

When considering the adaptation of the module to new implementation contexts, future users of the modules are encouraged to:

- Identify the key differences between the module parameters and their desired implementation context;
- Consult the module guidelines in depth – the module developers suggest variations on steps of the activities and other recommendations – and Section 2.5 where some 'Reflections on adaptation' are collected for each module;
- Invite professionals from their local contexts (e.g. food system specialists, educators with experience working with a target audience) to critically reflect on the design and learning objectives of the educational module, propose adaptations or complementary exercises;
- Not feel limited by a single module's scope: elements of other FIT4FOOD2030 educational modules and external resources⁶ can also be combined to produce a new hybrid module that can meet the target audiences' competence-building needs.

⁵ <http://www.expecteverything.eu/hypatia/gender-facilitation-guidelines/>

⁶ See, for example, the catalogue of 40 sources of content, activities and formats prepared by FIT4FOOD2030 in Deliverable 6.1, available online at: https://fit4food2030.eu/wp-content/uploads/2019/01/FIT4FOOD2030_D6.1_Catalogue-On-Analysis-Of-Contents-Formats-And-Needs-For-Trainings.pdf

2.5 Overview of the educational modules

This section provides a ‘In a nutshell’ description of each of the 15 modules and of key aspects such as stakeholder involvement, considerations for the adaptation process, etc. per City Lab in alphabetical order.

2.5.1 City Lab Amsterdam: Applications in Food and Nutrition Security Analysis

Audience	Bachelor- and Master-level students
Format	University course blending lectures, work groups and project work
Duration	Four weeks, full time (± 160 hours)
Participants	10-25
Facilitation	1 course coordinator, 2-3 ‘coaches’
Difficulty for participants	Beginner in terms of topic, but about 2 years of academic training in any discipline is required. Relatively intense in terms of preparation, with several reading materials in advance of lectures and workgroups
Difficulty for facilitators	Facilitators need to have a good understanding of inter- and trans-disciplinary research and its importance for Food and Nutrition Security studies and food system transformation

The educational module in a nutshell: A four-week full-time course that equips students with the analytical and practical skills necessary for an inter- and trans-disciplinary research approach to Food and Nutrition Security challenges. The course is composed of:

- A series of lectures with contributions from guest lecturers from the food system
- Work groups that build on the lectures with in-depth assignments
- Project work on a real-life problem and delivery of evidence-informed policy advice on a project commissioned by an external institution, such as a city authority or community actor

Stakeholder involvement: food system actors (e.g. municipality, province, civil society actor, etc.) to commission a real-life problem; citizens, local businesses and industry to reflect on problem statement or main research question; researchers from various fields to participate through guest lectures

Reflections on adaptation:

- The module foresees the possibility to involve a key food system actor as project commissioner for the course, to propose a real-life challenge which students can tackle
- Depending on the local context and how solicited stakeholders are, individual stakeholder interviews can be replaced with ‘sensing the field’ – students visit food related events (discussion evenings, debates, conferences, etc.) and could interview stakeholders on the spot
- The following exercises, delivered at various stages of the module, could be adapted for use with different audiences such as professionals and teachers outside of the context of a full-time university course:

- **Newspapers and system understanding assignment:** exploring parts of the food system, its challenges and relevant actors through the collection and discussion on articles from at least three newspapers of different political orientations
- **Mini-interviews assignment:** explore different perspectives on food system transformation and the application of a ‘systems approach’ from the position of different stakeholders
- **Training on Transformative interviewing:** an interviewing technique that supports interviewees to reflect on actions, identify learning points and set goals for next steps

2.5.2 City Lab Athens: Eat It, Don’t Skip It!

Audience	High school students (ages 16-17)
Format	Interdisciplinary after-school project
Duration	2h per week during school term time (approx. 25 weeks)
Participants	10-15
Facilitation	2 advisors/guides

The educational module in a nutshell: Interdisciplinary project for high school students addressing a societal challenge from food and nutrition security perspective by setting up a social enterprise in collaboration with external stakeholders. The activities are carried out as part of a weekly after-school club and the objective is the development of a product (with a related business plan) that tackles the challenge. In their groups, students take on roles found in a real-life enterprise.

Reflections on adaptation:

- The education module is suitable to tackling various challenges relevant to local communities.
- This educational module could also be suitable for use with first year university students in combination with elements from other City Lab modules (e.g. workshops with prototype, competition etc.), or introduced as part of entrepreneurship education in a vocational school.
- The activities could be adjusted to be implemented in a shorter time frame; for example, if the participation in the Virtual Enterprise Competition or the creation of the Business Plan is removed, then fewer teaching hours would be needed.

2.5.3 City Lab Athens: Food Waste

Audience	Secondary school students
Format	Short classroom course
Duration	2-3 sessions of 1h each (also suitable to 2-3 class periods of 50 min to 1 h each)
Participants	10-15
Facilitation	Min. 1

The educational module in a nutshell: triggering awareness about the issue of food waste from a food systems perspective with the help of materials and (local and European) (show)cases. Student feedback focuses on building critical thinking skills and the elaboration of an Action Plan can take the module outside of the classroom.

2.5.4 City Lab Barcelona: Fostering change in your system for the promotion of healthy and sustainable diets. Part I - Validating a system map and identifying areas where changes are needed

Audience	Professionals: broad range of stakeholders
Format	Workshop using a problem-based learning approach
Duration	4-5h (plus additional time for coffee breaks)
Participants	20-30 participants divided groups (no larger than 8 to 10 participants)
Facilitation	1 per group

The educational module in a nutshell: A problem-based learning workshop about understanding the complexity of the system and thinking in a systemic and transdisciplinary way about change:

- Facilitate reflection and learning around the system of promotion of healthy and sustainable diets by building consensus on a shared vision and adapting a pre-designed system map to a local context
- Identify areas of the system where changes are needed

Reflection on adaptation: While this activity has been specifically designed to be implemented in a non-formal education context with professionals that aim to work collectively on a strategy for changing the system of promotion of healthy and sustainable diets in their local context, developers consider that it can be adapted to different circumstances or scenarios. For example, it could take place:

- Within projects aiming to transform the local system of promotion of healthy and sustainable diets
- Within a classroom aiming to build knowledge around the promotion of healthy and sustainable diets
- During a congress for participants to build knowledge around the promotion of healthy and sustainable diets and for organisers to adapt and improve the map with new perspectives

Moreover, the impact of this educational module will be higher if it is linked to further activities following up on the action plans (e.g. at the level of the region, city, neighbourhood, school).

2.5.5 City Lab Barcelona: Fostering change in your system for the promotion of healthy and sustainable diets. Part II - Building visions for concrete areas of the system and action plans for change

Audience	Professionals: broad range of stakeholders
Format	Workshop using a problem-based learning approach
Duration	2.5h min.

Participants	20-30 participants divided groups (no larger than 8 to 10 participants)
Facilitation	1 per group

The educational module in a nutshell: A problem-based learning workshop to facilitate the development of action plans by building future scenarios and action plans for change:

- Identify leverage points (i.e. the areas to intervene more effectively in the food system) where participants want to see changes and an intervention is needed
- Co-define a vision for the specific area of the system map
- Define an action plan with R&I lines and actions

Reflection on adaptation: While this activity has been specifically designed to be implemented in a non-formal education context with professionals that aim to work collectively on a strategy for changing the system of promotion of healthy and sustainable diets in their local context, developers consider that it can be adapted to different circumstances or scenarios. For example, it could take place:

- Within projects aiming to transform the local system of promotion of healthy and sustainable diets
- Within a classroom aiming to build knowledge around the promotion of healthy and sustainable diets
- During a congress for participants to build knowledge around the promotion of healthy and sustainable diets and for organisers to adapt and improve the map with new perspectives

Moreover, the impact of this educational module will be higher if it is linked to further activities following up on the action plans (e.g. at the level of the region, city, neighbourhood, school).

2.5.6. City Lab Budapest: [System Thinking for Food System Sustainability](#)

Audience	University students, professionals, adults (16+) from different backgrounds
Format	A course blending workshops, access to content on an online platform and sessions with local stakeholders
Duration	Between 22.5-28.5 h split across a 5- to 8-week period <ul style="list-style-type: none"> - 12 h of facilitated workshop time - 7.5 h individual work using the online component - 3 h dedicated to preparation and stakeholder meeting - (optional) 3x2h for group practice
Participants	12-20
Facilitation	Min 1.

The educational module in a nutshell

Concept: Develop food systems thinking and systems practice abilities via engaging in a co-creative, experiential learning-based process that focuses on a (local) food system challenge:

- Engaging in a (minimum) 5-week-long (see Figure 8.) co-creative systems mapping and systems understanding process in teams
- An online course and learning support system that introduces various food system aspects, dynamics, challenges and opportunities (accessible at <https://courses.essrg.hu/>)
- A variety of stakeholders are consulted by participants on their perception of the actual local food system. Participants are also supported in taking the systems thinking tools into their own professional practices.

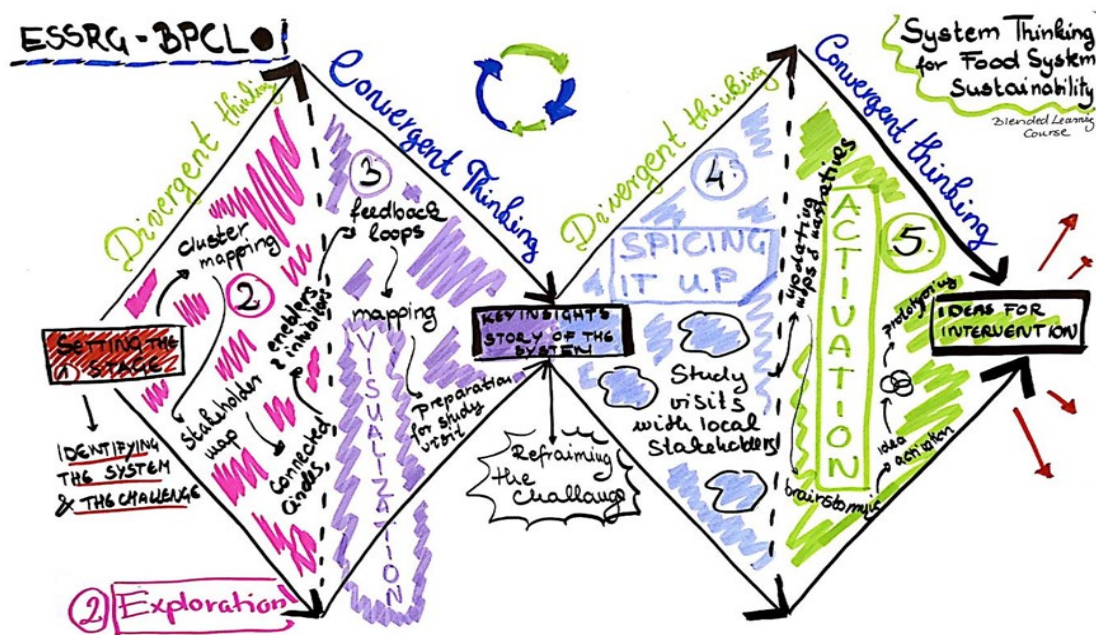


Figure 8. A visual representation of the concepts covered by the 5-week long ‘System Thinking for Food System Sustainability’ course

Reflection on adaptation

- The module has been tested with the participation of university students and young professionals with diverse backgrounds and is suitable to be offered as an open course for adult learners. It is designed to be implemented as an evening course over the course of several weeks. However, it is also suitable to be implemented in a university setting or in a modified format, can be rolled out with the participation of high school students.
- The online and offline components are designed to support each other; however, they can also be implemented separately. The offline sessions are centred around experimentation and experiential learning that all target the development of the competency of systems thinking. The online learning management system provides the necessary background information and lexical content that participants can build on during the offline sessions.
- The material is also appropriate for learning communities or small groups wishing to create a Community of Practice. In this case, the readings can be processed at home and then discussed in a group setting even without an experienced facilitator.

2.5.7 City Lab Budapest: [Our Food System and Us](#)

Audience	University students (ages 18-25) General public (16+)
Format	Workshop
Duration	At a minimum: 90 min – version aimed at university students 150 min – version aimed at a general public
Participants	10-25
Facilitators	1

The educational module in a nutshell: Using co-creation and reflective exercises to increase self-awareness and generate discussion about the food system and the role and responsibilities of each individual in it

- Guided reflection through association & open discussion
- Developing conceptual maps of the food system in small groups



Figure 9. Participants, in groups of 3-5 people, draw/create a representation of the food system on the flipchart before them. They are free to draw, write, use the post-its, trend cards and pictures and any additional material that they would like.



Figure 10. Example of a concept map made by participants during the prototyping session, ‘Technology in the forefront’

2.5.8 City Lab Milan: [Valuable Market](#)

Audience	Adults; families
Format	2 connected interactive activities
Duration	3h
Participants	10-20, working in groups of 5
Facilitation	Max. 2
Difficulty	Intermediate

The educational module in a nutshell: Activating citizens in the recovery and redistribution of food and increasing awareness of the issue of food waste and the nutritional value of recovered food, all the while taking part in a concrete action and reflecting on solutions. The module contains two activities:

- Recovering food surplus at risk of becoming food waste at neighbourhood markets
- Experimental activity about the nutritional value of the food collected through an inquiry-based approach and discussion on reasons behind food waste

Stakeholder involvement: vendors, ethical purchasing groups; supermarkets as alternative settings to neighbourhood markets. Nevertheless, the developers consider that it is important to keep a social angle and involve actors active in food poverty. Other ideas include organising the activity in collaboration with training on how to share food, e.g. Too Good To Go (Europe) and Food Cloud (Ireland).

Reflection on adaptation:

- **Implementation context:** neighbourhood market + museum or school lab, or any other space that can be equipped with the utensils necessary for experimentation

2.5.9. City Lab Milan: [Visions of Future Food](#)

Audience	High school students; University students
Format	Workshop
Duration	1.5h
Participants	20
Facilitation	1
Difficulty	Intermediate; regarding facilitation skills, manage the visioning process requires specific competences

The educational module in a nutshell: What will we be eating in the future? A visioning process through the development of a future scenario with artistic tools:

- Creation of a personal meaning map
- Experimental activity on proteins in insects-based food
- A visioning activity leading to future scenarios with novel foods
- With the possible intervention of a researcher

Reflections on adaptation:

- **Implementation contexts:** classrooms, STEM career orientation events, university and research centre open days, etc.
- **Stakeholder involvement:** food system professionals, educational experts, artists



Figure 11. Selection of photographs illustrating the different stages of 'Visions of Future Food'

2.5.10 City Lab Sofia: [I <3 Food](#)

Audience	Primary school children (age 9-10)
Format	Short school course
Duration	4-5 sessions x 35-40 min; 1 session per week
Participants	10-15
Facilitation	1-3; facilitation can also be carried out by older students

The educational module in a nutshell: Learn through gamification about healthy food, food production and food origins. The module consists of five activities: the ABC of food, Traffic lights of food, Food and health. Fruits and Food and health. Fruits II.

2.5.11 City Lab Sofia: [Nutrition](#)

Audience	Secondary school children (age 12-13)
Format	Short school course
Duration	6 sessions x 45 min; 1 session per week
Participants	10-20
Facilitation	1-2; facilitation can also be carried out by older students

The educational module in a nutshell: Learn about nutrition and healthier diets, including example tasks that could be elaborate between courses.

2.5.12 City Lab Sofia: [Specific features of the food system](#)

Audience	Professionals: journalists, other food system actors
Format	Training
Duration	4 sessions x 1 hour
Participants	30

Facilitation	4-5
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The educational module in a nutshell: Training and networking event connecting journalists with the food system perspective and the latest insights from food system professionals, including on new perspectives for transformation

2.5.13. City Lab Tartu: [Taste Alternative Protein](#)

Audience	Primary to high school students; families
Format	Hands-on workshop
Duration	75 min
Participants	20, teams of 4
Facilitation	1

The educational module in a nutshell: Starting a conversation on alternative proteins through a hands-on activity of preparing seitan patties. The workshop integrates and interlinks the cooking and eating process with discussions of health, sustainability, and scientific analysis.

Stakeholders involvement: restaurant manager, cooking teachers, nutritionists

Reflections on adaptation:

- Curriculum connection: biology topics linked to proteins
 - [An activity card and teacher guide are available](#)
- Possible limitations: ideally, the activity requires cooking equipment and an implementation setting where participants are allowed to consume food

2.5.14 City Lab Tartu: [Beeswax Food Wrap](#)

Audience	Secondary and high school students (12+); families
Format	Hands-on workshop
Duration	45-60 min
Participants	20, teams of 4
Facilitation	1

The educational module in a nutshell: starting a conversation on food packaging and methods to preserve food through a hands-on activity of making one's own beeswax food wrap

Stakeholder involvement: shops and markets selling packaging-free food; waste management, food preservation and materials experts

Reflections on adaptation:

- Limitations for adaptation: requires some equipment
- Curriculum connection: environmental topics, social and civic education

2.5.15. City Lab Tartu: [Food and Vacuum](#)

Audience	Primary to high school students; families
Format	Hands-on workshop
Duration	45-60 min
Participants	20, teams of 4
Facilitation	1

The educational module in a nutshell: Discovering how science and research are changing our food system through an exploration of food preservation methods and a hands-on activity, working out the instructions to make one's own vacuum chamber to exemplify vacuum packaging and freeze drying

Stakeholder involvement: nutrition and food preservation experts; innovators; physics teachers

Reflections on adaptation:

- Curriculum connection: the chemistry and physics behind food preservation and vacuum chambers
- [An activity card and teacher guide are available](#)

3. Analysis of modules per key characteristics

An additional aim of this deliverable is to provide a meaningful classification of the educational modules that could eventually be translated into a resource filtering function on the FIT4FOOD2030 website, thus envisaging a more interactive route for potential users of the educational modules. For this purpose, this section classifies the modules according to key characteristics (which are also accompanied by small descriptions) considered relevant for possible users.

3.1. Format

Hands-on/experimental workshops

These are engaging and energising activities, usually of short duration, that involve an element of making/designing using one's hands.

- Taste Alternative Protein!
- Beeswax Food Wrap
- Food and Vacuum
- Valuable market
- Visions of Future Food

Workshops

- Fostering change I (Validating a system map and identifying areas where change is needed)
- Fostering change II (Building visions for concrete areas of the system and action plans for change)
- 'Our Food System and Us'

Courses

These are modules composed of several sessions envisaged for formal education settings, potentially stretching over several weeks or months.

- Applications in Food and Nutrition Security Analysis
- Food Waste
- Nutrition
- System Thinking for Food System Sustainability
- Specific Features of Food Systems

Activity Club

These are modules composed of several sessions that stretch over several weeks or months outside of classroom hours, in an after-school, extra-curricular club context.

- EatIt, Don't Skip It!
- I <3 Food

3.2. Type of learning with society

The educational module development in the FIT4FOOD2030 project was inspired by the EU-funded EnRRICH project and methodologies such as community-based participatory research. For EnRRICH, a key design principle for RRI in higher education is 'education with society'. When it comes to concretely applying this principle in educational modules, the project distinguishes two approaches, a light and a deep approach⁷.

In general terms, the '**deep approach**' describes a real-time and real-life activity where students learn by performing a project that responds to a real need and which is implemented in coordination with actors outside the classroom.

⁷ Tassone, V. and Eppink, H. 2016. EnRRICH Tool for Educators: (Re-)Designing curricula in higher education from a "Responsible Research and Innovation" perspective. EnRRICH project deliverable. URL: https://www.livingknowledge.org/fileadmin/Dateien-Living-Knowledge/Dokumente_Dateien/EnRRICH/D2.3_The_EnRRICH_Tool_for_Educators.pdf.

Table 1. Educational modules taking a ‘deep learning’ approach

<p>City Lab Amsterdam’s Applications of Food and Nutrition Security Analysis includes project work on a real-life problem and delivery of evidence-informed policy advice on a project commissioned by an external institution, such as a city authority or community actor, formulating problem statements and main research questions in direct consultation with the commissioner. Piloting included The Food Council Metropolitan Region Amsterdam as Commissioner; the real-life problem, as it was presented by this institution to the students, is available as an Annex of the module.</p>
<p>City Lab Athens’ Eat It, Don’t Skip It! module envisages the setting up of a student enterprise that tackles a concrete societal issue, in connection with stakeholders from the food system. The pilot example resulted in grEATboxes.</p>
<p>City Lab Budapest’s System Thinking for Food System Sustainability involves consulting a variety of stakeholders on their perception of the local food system. Professionals involved are also supported in taking the systems thinking tools into their own practices.</p>
<p>City Lab Barcelona (FIT4FOOD2030 Catalonia)’s problem-based modules Fostering change I (Validating a system map and identifying areas where change is needed) and Fostering change II (Building future scenarios and action plans for change) work towards Action Plans that tackle the transformation towards sustainable and healthy food systems. Stakeholders involved take ownership of the plans. Matchmaking to establish partnerships to carry out the actions can also be envisaged.</p>

A '**light approach**' develops similar competences and discusses similar needs and challenges but confines itself to imparting knowledge in a classroom context, with hypothetical projects. The level of engagement of outside actors is less deep, with site visits, excursions or guest lectures. Implementation tools highlighted by EnRRICH include deliberative methods, dialogic tools, role play for collaborative skills and the design and evaluation of hypothetical projects.

For example, City Lab Athens’ module **Food Waste** triggers discussion through the presentation of cases of national initiatives tackling food waste. Students are encouraged to reflect on the differences between approaches and place themselves in the positions of different stakeholders and envisage solutions to the issue.

3.3 Target audiences

Table 2. Clustering of the modules according to their target audience

<p><i>Primary school students</i></p> <hr/> <p>Food and Vacuum I <3 Food Taste Alternative Protein!</p>	<p><i>Secondary school students</i></p> <hr/> <p>Food and Vacuum Food waste Nutrition Taste Alternative Protein!</p>
<p><i>High school children</i></p> <hr/> <p>Beeswax food wrap Eat It, Don’t Skip It! Food and Vacuum Taste Alternative Protein! Visions of Future Food</p>	<p><i>University students</i></p> <hr/> <p>Applications in Food and Nutrition Security Analysis (AFNSA) System Thinking for Food System Sustainability Our Food System and Us Visions of Future Food</p>

<hr/> <p><i>Adults</i></p> <hr/> <p>Our Food System and Us Valuable market</p>	<hr/> <p><i>Families</i></p> <hr/> <p>Beeswax food wrap Food and Vacuum Taste Alternative Protein! Valuable market</p>
<hr/> <p><i>Professionals (e.g. journalists, researchers, etc.)</i></p> <hr/> <p>Fostering change I (Validating a system map and identifying areas where change is needed) Fostering change II (Building visions for concrete areas of the system and action plans) Specific Features of Food System System Thinking for Food System Sustainability</p>	

3.4 Implementation contexts

With a few exceptions, most modules can be delivered in a host of implementation settings:

- Informal education venue or event (e.g. science centre, science museum, science festival)
- Formal education space (e.g. classroom)
- Community/stakeholder space (e.g. local markets)

3.5 Duration

Table 3. Clustering of the modules according to their duration

<hr/> <p><i>About one hour</i></p> <hr/> <p>Beeswax food wrap Food and Vacuum Food waste Taste Alternative Protein!</p>
<hr/> <p><i>Several hours to one day</i></p> <hr/> <p>Fostering change I (Validating a system map and identifying areas where change is needed) Fostering change II (B Building visions for concrete areas of the system and action plans) Our Food System and Us Specific Features of Food Systems Valuable market Visions of Future Food</p>

<hr style="border: 0.5px solid blue;"/> <p style="color: green; font-weight: bold;">Several weeks</p> <hr style="border: 0.5px solid blue;"/>
<p>Applications in Food and Nutrition Security Analysis</p> <p>Eat It, Don't Skip It!</p> <p>I <3 Food</p> <p>Nutrition</p> <p>System Thinking for Food System Sustainability</p>

3.6 Content areas

While each educational module aims to bring a food systems perspective, the systematic treatment of the subject and the hands-on engagement moment often begins from a concrete aspect of food systems. A non-exhaustive list of general content areas is presented below, having been built bottom up with a light content analysis of the modules. If necessary, the modules allow for future categorisation.

Table 4. Clustering of the modules according to broad thematic areas

<p style="color: blue; font-weight: bold; text-align: center;"><i>Sustainable and healthy food and nutrition</i></p> <p style="text-align: center;">Taste Alternative Protein!</p> <p style="text-align: center;">Eat It, Don't Skip It!</p> <p style="text-align: center;">I <3 Food</p> <p style="text-align: center;">Nutrition</p>	<p style="color: blue; font-weight: bold; text-align: center;"><i>Food packaging</i></p> <p style="text-align: center;">Food and Vacuum</p> <p style="text-align: center;">Beeswax food wrap</p>	<p style="color: blue; font-weight: bold; text-align: center;"><i>Food preservation</i></p> <p style="text-align: center;">Food and Vacuum</p> <p style="text-align: center;">Beeswax food wrap</p>
<p style="color: blue; font-weight: bold; text-align: center;"><i>Food waste</i></p> <p style="text-align: center;">Beeswax food wrap</p> <p style="text-align: center;">Eat It, Don't Skip It!</p> <p style="text-align: center;">Food waste</p> <p style="text-align: center;">Valuable Market</p>	<p style="color: blue; font-weight: bold; text-align: center;"><i>Food system</i></p> <p style="text-align: center;">Fostering change I (Validating a system map and identifying areas where change is needed)</p> <p style="text-align: center;">Fostering change II (Building visions for concrete areas of the system and action plans)</p> <p style="text-align: center;">Our Food System and Us</p> <p style="text-align: center;">Specific Features of the Food System</p> <p style="text-align: center;">Visions of Future Food</p>	<p style="color: blue; font-weight: bold; text-align: center;"><i>Social and cultural issues around food</i></p> <p style="text-align: center;">Taste Alternative Protein!</p> <p style="text-align: center;">Valuable Market</p> <p style="text-align: center;">Nutrition</p>

<i>Entrepreneurship</i>	<i>Imagining the future</i>	
Eat It, Don't Skip It!	Visions of future food	

With the same considerations in mind, the modules have also been clustered according to the Food 2030 they tackle, and further subdivided according to whether the priority is considered a main aspect (**bold**), or secondary, as table 5 outlines.

Table 5. Clustering of the modules according to the priorities of the Food 2030 strategy. Bolded arrows indicate that the respective priority is considered to be central to the module, as opposed to secondary.

Module/FOOD 2030 priority	Nutrition & Health	Climate & Sustainability	Circularity & Resource Efficiency	Innovation & Communities
Applications in Food and Nutrition Security Analysis	✓	✓	✓	✓
Beeswax food wrap	✓	✓	✓	✓
Eat It, Don't Skip It!	✓	✓	✓	✓
Food and Vacuum	✓		✓	✓
Food waste	✓	✓	✓	✓
Fostering Change I	✓	✓	✓	✓
Fostering Change II	✓	✓	✓	✓
I <3 Food	✓			
Nutrition	✓			
Our Food System and Us	✓	✓	✓	✓
System Thinking for Food System Sustainability	✓	✓	✓	✓
Specific Features of the Food System	✓	✓	✓	✓
Taste Alternative Protein!	✓	✓		
Valuable Market	✓	✓	✓	✓
Visions of Future Food	✓	✓	✓	✓

5. Next steps

Deliverable 6.3, Toolkit for use of the educational modules and its annexes are expected to support the access of future users to the educational modules produced by the project: be it the City and Food Labs that will be further implementing these activities until October 2020, or the wider community interested in competences for food system transformation.

Further module development is expected to take place in the year ahead, with citizen science modules, and master classes for professionals currently being considered for development. Where new development takes place, modules will be processed and made accessible to users in line with the work carried out in this Deliverable.

6. Educational modules in full

Download the educational modules as individual files via: <http://gofile.me/3dZRD/HuQXDOhcv>.

Navigate to the educational modules by clicking on their name below. Where other key documents were developed to support the delivery of educational modules, they have been included as separate annexes. Some extra resources are available from some City Labs.

[City Lab Amsterdam – Applications in Food and Nutrition Security Analysis – general template](#)

[City Lab Amsterdam – Applications in Food and Nutrition Security Analysis – annex](#)

[City Lab Athens – EatIt, Don't Waste It! – general template](#)

[City Lab Athens – Food Waste – general template](#)

[City Lab Barcelona: Fostering change I \(Validating a system map and identifying areas where change is needed\) – general template](#)

[City Lab Barcelona: Fostering change II \(Building visions for concrete areas of the system and action plans for change\) – general template](#)

[City Lab Budapest: System Thinking for Food System Sustainability – general template](#)

[City Lab Budapest: System Thinking for Food System Sustainability –annexes](#)

[City Lab Budapest: Our Food System and Us – general template](#)

[City Lab Budapest: Our Food System and Us –annexes](#)

[City Lab Milan: Valuable Market – general template](#)

[City Lab Milan: Visions of Future Food – general template](#)

[City Lab Sofia: I <3 Food – general template](#)

[City Lab Sofia: I <3 Food – annex](#)

[City Lab Sofia: Nutrition – general template](#)

[City Lab Sofia: Nutrition – annex](#)

[City Lab Sofia: Specific Features of the Food System – general template](#)

[City Lab Sofia: Specific Features of the Food System – annex](#)

[City Lab Tartu: Beeswax food wrap – general template](#)

[City Lab Tartu: Food and Vacuum – general template](#)

[City Lab Tartu: Food and Vacuum – extra resource – Activity Guide and Teacher Guide](#)

[City Lab Tartu: Taste Alternative Protein! – general template](#)

[City Lab Tartu: Taste Alternative Protein! – extra resource – Activity Guide and Teacher Guide](#)

Applications in Food and Nutrition Security Analysis (AFNSA)

This module was created by Alanya den Boer together with Marjoleine van der Meij, Renee de Wildt-Liesveld, Barbara Regeer (Athena Institute, VU Amsterdam), with input from the Food Council of the Metropolitan Region Amsterdam, an independent consultant with expertise on systems thinking and food systems, and several informal conversations with food system related stakeholders from the Metropolitan Region Amsterdam. It was based on the University course Applications in Food and Nutrition Security Analysis (part of the minor Global Food Security at VU Amsterdam). A check for scientific accuracy was done by Marjoleine van der Meij and Renee de Wildt-Liesveld.



Thematic Area	Food and Nutrition Security (FNS) and food systems in the broad sense
Format	University course (Bachelor)
Duration	Four-week fulltime course (so a total of ± 160 hours)
Type of audience	Bachelor students (no specific study background required) who are interested in inter- and transdisciplinary approaches towards Food and Nutrition Security (FNS). Part of minor Global Food Security Analysis.
Age group	Adolescents
Number of participants	Between 10 and 25
Prerequisites for participation	If any, e.g. student background (specific, general); familiarity with or awareness of certain concepts etc.
Number of facilitators	2 to 3 facilitators or ‘coaches’ (depending on the number of students)
Overall difficulty	<p>Topic: Beginner; students are introduced to FNS as complex problem and the need for inter- and transdisciplinary research approaches.</p> <p>Preparation: Intermediate; relatively intense course with several reading materials in advance of the lectures and workgroups.</p>

	<p>Facilitation: Beginner; need to have a good understanding of inter- and transdisciplinary research and why this is important for FNS studies and food system transformation.</p>
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OVERVIEW

Lectures: Introduction (lecture 1), Systems approach and transdisciplinarity (lecture 2), In-depth interviewing (lecture 3), Qualitative data analysis (lecture 4), Spatial context of food and health (guest lecture)

Workgroups: which build on these lectures with in-depth assignments.

Project work: students work on a real-life world problem - commissioned by an external institution (from the city or community) - and write a policy advice report. Topic depends on the commissioning institution. See the draft educational module for an example topic which was used within the course at the VU in Amsterdam.

OVERALL AIM

Resolving the complex problem of FNS requires an inter- and transdisciplinary approach, in which actors from different disciplines and with different backgrounds cooperate. This module focusses on the analytical and practical skills necessary to conduct such a inter/transdisciplinary approach in formulating an evidence-informed policy advice. To this end, this module introduces students into the current theories on transdisciplinary research in general and the need for a transdisciplinary approach in FNS Studies more specifically.

SPECIFIC (LEARNING) OBJECTIVES

After the successful completion of this module participants are expected to be able to...

- has an understanding of the term **'food systems'** and the complexity around food systems (transformation)
- can **explain the need for inter/transdisciplinary research** in Food and Nutrition Security (FNS) Studies
- is able to **critically reflect on choices of design in inter/transdisciplinary research** (in the field of FNS Studies)
- is able to conduct an inter/transdisciplinary project in relation to FNS. The student:
 - is able to **find and integrate different relevant literature sources**
 - is able to contribute at an academic level to the execution of the project **related to his/her own disciplinary background**
 - is able to **conduct transformative interviews** that contribute to the research project
 - can **analyse qualitative data** in such a way that it contributes to the research project
 - is able to **integrate qualitative data** with data from literature review and/or analysis of secondary quantitative data
 - is able to set up **valid lines of argumentation**
 - is able to **translate research findings into evidence informed policy advice**
- The student has improved his/her capacity as a professional. The student:
 - can **work effectively together** with other students in a project team

- is able to **coordinate and plan an inter/transdisciplinary project** in such a way that deadlines are kept and the quality of the products are in relation with time invested
- is able to **highlight the results of and defend the recommendations** proposed in the inter/transdisciplinary research in a video-based presentation
- is able to **write a policy advisory report** that is coherent and covers the research project.
- is able to **critically reflect on his/her own capacities and role within the group** and his/her learning process during the research project

SUGGESTED SCENARIO FOR IMPLEMENTATION

This module is intended to be implemented in a formal educational context – University.

TOPICS & COMPETENCES COVERED BY THE ACTIVITY

Thematic area(s)	Food systems in a broad sense. However, within the project work student teams will most probably focus on a more specific topic within FNS (e.g. sustainable agriculture, or approaches on how to facilitate collaboration between food system actors)
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FOOD2030 Research & Innovation priorities

Priority	Indicate whether main or secondary	Addressed through
Circularity & Resource Efficiency	Main, since this course focuses on food systems more in general	Lecture on food systems and transdisciplinarity and related workgroup(s)
Innovation & Empowerment of Communities	Main, since this course focuses on food systems more in general	Lecture on food systems and transdisciplinarity and related workgroup(s)
Nutrition & Health	Main, since this course focuses on food systems more in general	Lecture on food systems and transdisciplinarity and related workgroup(s)
Climate & Sustainability	Main, since this course focuses on food systems more in general	Lecture on food systems and transdisciplinarity and related workgroup(s)

Responsible Research and Innovation (RRI)

Related concept	Addressed through
RRI will not be introduced to students in an explicit way. However, inter- and transdisciplinarity and inter- and	Lecture on food systems and transdisciplinarity, related work group(s) and project work.

transdisciplinary research approaches are chore within this module.	
Research & Innovation (R&I)	
Related concept	Addressed through
This module does not zoom in on the role of R&I in food system transformation. However, since it is a module for university students, research is chore. Students are taught about the need for inter- and transdisciplinary research approaches for solving complex problems.	Lecture on food systems and transdisciplinarity, related work group(s) and project work.
(Food) Systems thinking	
<p>The lecture on food systems and transdisciplinarity explicitly addresses the need for system thinking. It also shows some movies to students in this respect. During the workgroups there are several assignments which aim to stimulate system thinking, for instance the:</p> <ul style="list-style-type: none"> ○ ‘Newspaper and system understanding assignment’: This assignment is meant to help students acquire the competence of systems thinking. Students collect food system related articles during four weeks, from at least three different newspapers, including a ‘left-wing’ and a ‘right-wing’ newspaper. Two students will give a 5-minute presentation about their collection of articles at the end of each week. This presentation will be the start of a discussion with the entire group. The following questions are addressed in the presentations: What part of the food system are the articles about? Which part(s) of the food value chain (e.g. production, processing, distribution, consumption, disposal of waste)? What kind of challenges are being addressed (e.g. environmental challenges, health challenges, etc.)? What kind of actors are being mentioned (e.g. different stakeholder categories or not)? Is there a particular framing present within these articles? ○ ‘Stakeholders’ perspectives on a systems approach’: This assignment is aimed to show students that different stakeholders might have different perspectives on food systems and food system transformation, as well as on the meaning an application of a ‘systems approach’. Students are provided with different ‘mini-interviews’ with food system related actors (from the community). A plenary conversation will address the following questions: How do the answers about a ‘systems approach’ relate to what you read in the literature so far (any new aspects, or aspects that are missing)? In what way(s) do the answers about the meaning of and need for a ‘systems approach’ differ between the different stakeholders? 	
Other competences	
Competence	Addressed through
Food systems approach competences: Analytical thinking	Integrated within the lecture on food systems and transdisciplinarity and the design and analysis phase of the project work.
Multi-stakeholder approach/network building competences: Social intelligence, self-	Integrated within the assignment of ‘team role in relation to educational background: personal development and Belbin’ assignment and the

awareness, multi-perspective, communication ability	‘stakeholders’ perspectives on a systems approach’ assignment. Furthermore, the competences of social intelligence, self-awareness and communication ability are integrated within the project work, especially through the interactions with the commissioner as well as the engagement (transformative interviewing) with food system related stakeholders.
Responsible Research and Innovation competences: involving stakeholders in research data collection/analysis, participatory ability	Integrated via the ‘extended member check’ which means that stakeholders are asked to critically reflect on the data (from their own interview), and are invited to be involved in the data analysis phase.
Potential of bringing the arts, socio-economic science and humanities creatively or trans-disciplinarily with the module?	
Elements from the arts, socio-economic science and/or humanities are currently not integrated in the module. Since the module is in draft form, and will be piloted in another context it would be possible to upgrade the module to integrate some of these elements. This could be done by inviting people from these fields to critically reflect on the design and learning objectives of the course. It would also be a possibility to invite people from this fields to see if and how they (would) address the issue of food (systems) and systems thinking to come up with creative assignments for the work groups.	

TARGET AUDIENCE	
Audience category	<i>University-level students (Bachelor)</i>
Recommended number of participants	Between 10 and 25
Recommended age	Between 19 and 29
Prerequisites	<i>No specific educational background is required. An interest in food systems and transdisciplinary research is important.</i>

OPTIONS FOR MULTI-STAKEHOLDER ENGAGEMENT	
Stakeholder	Role envisaged in the activity
Academic person with expertise in spatial dimensions of food systems, and/or ‘foodscapes’ (links between food systems, infrastructure, spatial planning, architecture, etc.)	To provide a guest lecture

Academic person with expertise in the field of transition studies, social practice theory, etc.	
Academic person with substantial experience in doing inter- and transdisciplinary research (could be in any field)	
Citizen(s)	During the data collection phase of the project work (to interview them, but also to invite them to reflect on the problem statement/main research question for instance)
Local business	During the data collection phase of the project work (to interview them, but also to invite them to reflect on the problem statement/main research question for instance)
Prominent food system related actor, such as a Food Policy Council (if possible)	To provide a guest lecture on their work, followed by an interactive discussion

SETTING UP THE MODULE

FACILITATION/DELIVERY



This module needs one or two persons who can coordinate the entire module. This person needs to be able to invite (guest)lecturers, and is main responsible person for the communication to students.

Besides, the module needs two or three facilitators or ‘coaches’ (depending on the number of students). These coaches need to have some knowledge or experience with FNS studies and inter- and transdisciplinary research to be able to guide the students. This is important since students need to be stimulated to critically think about the meaning and need for inter- and transdisciplinary research approaches to be able to upgrade the ‘transdisciplinary level’ of their own project work. It is also important that coaches have some experience with guiding a project that is commissioned by an external institution, since this can lead to certain tensions during the execution of the project (e.g. tension between expectations of commissioner and academic objectives of the course).

RESOURCES

Physical materials

Resource name	Picture	Number
PowerPoint presentations for the lectures	-	-
Printed picture of Overview of four types of listening of Theory U (on A3) (Training 1)	<p>The diagram shows four types of listening in Theory U, each with a corresponding 'SPEAK' mode:</p> <ul style="list-style-type: none"> Downloading (SPEAK: HEAD) - Focuses on 'HANDLING INFORMATION' and 'RECOGNIZING AND APPLYING KNOWLEDGE'. Practical (SPEAK: HEART) - Focuses on 'PRACTICAL INTERAC EXPERIENCES' and 'EXPERIENCING NEW DATA'. Relational (SPEAK: BELLY) - Focuses on 'RELATIONAL CONNECTION' and 'SEEKING HUMAN/ARTIFICIAL PERSON & OBJECT'. Generative (SPEAK: WILL) - Focuses on 'GENERATING OR INVOLVING WANTING TO BE/DO' and 'CONNECTING TO AN EMERGING FUTURE WORLD (GIFT = IDENTITY & SELF)'. 	One for each workgroup (so 2 to 3)

<p>Listening self-observation template (Training 1)</p>		<p>For each student one (so between 10 and 25)</p>
<p>Printed mini-interviews (on A4) (assignment workgroup 2)</p>	<p>-</p>	<p>For each student one copy of each mini-interview</p>
<p>Printed picture of the Donut Economy (on A3) (assignment workgroup 2)</p>		<p>One for each workgroup (so 2 or 3)</p>
<p>Useful links, videos, articles</p>		
<p>See Annex 1. 'Food systems library'</p>		
<p>PREPARING THE SETTING</p>		
<p>Workgroups need to have an interactive setting, i.e. a setting in which students can work together in their team.</p>		

<p>DETAILED DESCRIPTION OF THE MODULE SCRIPT</p>	
<p>Step</p>	<p>Competences</p>
<p>Please refer to the Annex.</p>	

<p>REFERENCES</p>
<p>Competences from competence cards (D1.4 Tools and Training Guidelines for guiding lab activities), based on Tassone, Valentina and Hansje Eppick. 2016. "The EnRRICH tool for educators: (Re-) Designing curricula in higher education from a "Responsible Research and Innovation" perspective". EnRRICH project. 30 June.</p>
<p>Self-observation-sheet: D1.4 Tools and Training Guidelines for guiding lab activities</p>

Picture on the Donut Economy: Raworth, K. (2018). Doughnut economics. Seven ways to think like a 21st century Economist. Random House UK.

Overview of four types of listening of Theory U: U-Lab: Transforming business, society, and self. Source book (2015).

Educational Module

Amsterdam City Lab

Applications in Food and Nutrition Security
Analysis (AFNSA)



Table of Contents

1. Introduction to the document and process.....	39
2. Introduction and design module.....	39
3. Competences and learning objectives.....	40
Competences.....	40
Learning objectives.....	41
4. Lectures.....	42
5. Working on a real-world problem.....	44
6. Workgroups and trainings.....	45
7. The (research & innovation) food systems library.....	59
8. Assessment.....	62
9. Appendices.....	63
Appendix 1. Content of the policy advice report.....	63
Appendix 2. Example of a real-life project proposal.....	65
Appendix 3. Giving feedback.....	66
Appendix 4. Inspiring questions for transformative interviewing (Training 1).....	67
Appendix 5. Learning Self Observation Template (Training 1).....	69
Appendix 6. Assessment criteria.....	70

1. Introduction to the document and process

This module was developed as part of the EU-project FIT4FOOD2030. To stimulate the transformation towards a future-proof food system it is crucial to develop competences (knowledge, attitude and skills). This module is targeted at undergraduate students who are interested to learn more about food systems and food system transformation. This module is the result of a transformation of the existing undergraduate course called 'Applications in Food and Nutrition Security Analysis'. This course was transformed in co-creation with stakeholders from the Metropolitan Region Amsterdam (MRA), such as people working within local food production initiatives and policy makers working on food system transformation. During conversations with those different stakeholders, it was investigated what kind of competences they think are crucial in order to contribute to food system transformation. Moreover, academic experts working in fields related to (food) system transformation were consulted with regard to (didactic) strategies to stimulate the acquisition of key competences such as systems thinking. The module will be piloted and feedback from participants will be incorporated to further improve the module.

2. Introduction and design module

Food and nutrition security (FNS) is a key priority in development cooperation and central to broader debates on environmental and social sustainability. FNS not only focuses on building resilience to food crises and ensuring that no one is left hungry, it also battles the alarming increase in obesity in the developed world. Malnutrition (referring to both under- and over-nutrition in the same population) is increasingly problematic and the result of a complex system of factors, including economic, agro-ecological, technical, health and cultural aspects. Furthermore, food systems are linked to severe and persistent environmental problems, such as biodiversity loss, greenhouse gas emissions and resource scarcity. **Resolving the complex problem of FNS therefore requires an inter- and transdisciplinary approach**, in which actors from different disciplines and with different backgrounds, including the people who are malnourished, cooperate.

Inter/transdisciplinarity is an emerging discipline in which qualitative research approaches and analytical methods are developed to connect relevant parts of different disciplines and integrate different types of knowledge (e.g. knowledge from academics, policy makers, citizens, etc.) to solve complex problems such as food and nutrition security. A transdisciplinary approach is often taken in formulating an evidence-informed policy advice to address specific problems. Based on the analysis and integration of the positions, perspectives and experiences of different actors, sometimes combined with quantitative data, advice is given on what intervention would be most effective in resolving the problem under study.

This module will focus on the competences (knowledge, attitude and skills) necessary to conduct such a inter/transdisciplinary approach in formulating an evidence-informed policy advice. To this end, this module introduces students into the current theories on transdisciplinary research in general and the need for a transdisciplinary approach in FNS Studies in specific. It also highlights main challenges around inter/transdisciplinary research. Moreover, this module offers an introduction to semi-structured transformative interviews as a research method to study complex problems and opportunities for intervention. During several lectures and workgroups, designing, conducting and analysing interviews will be discussed and practiced with.

Students will further train other professional skills such as managing projects and collaborative team work. From the very first day, students are part of a project team that will work on a project to develop an evidence informed policy advice to address a specific problem in FNS. **Students are confronted with a real policy problem from an external commissioning institution.** Within four weeks they will

collect data by literature review and (transformative) interviews (and analysis of databases) to conduct an inter/transdisciplinary analysis on the basis of which they provide an advice. Results of the research are presented in an advisory report and a (video) presentation.

Target group, structure and work forms

AFNSA is part of the minor Global Food Security Analysis and is open for Bachelor students with an interest in food systems, policy and learning and practicing with inter- and transdisciplinary research. The module is designed as a four-week course and consists of lectures, project work with workgroups, training sessions and a video-presentation. In addition, students will practice with discussing and summarizing relevant scientific articles using the CARQ-method (see Chapter 5). The total study time is ± 160 hours. The different elements have approximately the following study time:

Module element	Hours	Total hours
Lectures	4 x 2 h	8
Training sessions	3 + 2 h	5
Workgroups	7 x 2 h	14
Project work	-	120
Video-presentation	1 x 2 h	2
CARQ assignment	6 x 45 min	4-5

3. Competences and learning objectives

The aim of this module is to stimulate the acquisition of several key competences for sustainability, in this case related to FNS. This section starts with an overview of competences linked to this module. Competence acquisition requires operationalization of competences into specific learning objectives⁸.

Competences

The above-mentioned learning objectives are linked to several competences⁹ that were identified as important based on stakeholder consultations and (grey) literature, including:

- Food systems approach competences: *analytical thinking, systems thinking*
- Multi-stakeholder approach/network building competences: *social intelligence, self-awareness, multi-perspective, communication ability*
- Research and Innovation system competences: *navigating complexity or wickedness, openness and transparency, pro-active, critical thinking, transdisciplinary collaboration*
- Responsible Research and Innovation competences: *involving stakeholders in research data collection/analysis, participatory ability*

⁸ Wiek, A., Bernstein, M.J., Foley, W., Cohen, M., Forrest, N., et al. (2015). *Operationalising competencies in higher education for sustainable development. Handbook of Higher Education for Sustainable Development*. Routledge, London, 241-260.

⁹ *Competences from competence cards (D1.4 Tools and Training Guidelines for guiding lab activities of the FIT4FOOD2030 project)*, based on Tassone, Valentina and Hansje Eppick. 2016. "The EnRRICH tool for educators: (Re-) Designing curricula in higher education from a "Responsible Research and Innovation" perspective". EnRRICH project. 30 June.

These competences are primarily linked to the module outputs: the policy advice report and the video-presentation. However, they are also linked to the different assignments during the workgroups. Chapter 5 include references to which competences are related to the specific assignments.

Learning objectives

After the successful completion of this educational module, the student...

- has an understanding of the term **'food systems'** and the complexity around food systems (transformation)
- can **explain the need for inter/transdisciplinary research** in Food and Nutrition Security (FNS) Studies
- is able to **critically reflect on choices of design in inter/transdisciplinary research** (in the field of FNS Studies)
- is able to conduct an inter/transdisciplinary project in relation to FNS. The student:
 - is able to **find and integrate different relevant literature sources**
 - is able to contribute at an academic level to the execution of the project **related to his/her own disciplinary background**
 - is able to **conduct transformative interviews** that contribute to the research project
 - can **analyse qualitative data** in such a way that it contributes to the research project
 - is able to **integrate qualitative data** with data from literature review and/or analysis of secondary quantitative data
 - is able to set up **valid lines of argumentation**
 - is able to **translate research findings into evidence informed policy advice**
- The student has improved his/her capacity as a professional. The student:
 - can **work effectively together** with other students in a project team
 - is able to **coordinate and plan an inter/transdisciplinary project** in such a way that deadlines are kept and the quality of the products are in relation with time invested
 - is able to **highlight the results of and defend the recommendations** proposed in the inter/transdisciplinary research in a video-based presentation
 - is able to **write a policy advisory report** that is coherent and covers the research project.
 - is able to **critically reflect on his/her own capacities and role within the group** and his/her learning process during the research project

4. Lectures

The module consists of five lectures (all compulsory) in which different models and theories regarding inter/transdisciplinarity in FNS are discussed. Below is a brief overview of the purpose and content per lecture.

Introduction lecture (week 1)

In this lecture students are briefly introduced to the topic of FNS and FNS as a complex problem, as well as to the term 'food system' and 'inter-and transdisciplinary research'. After this, learning objectives, work forms and deadlines of the module are showed to the students. Finally, students are introduced to the real-life projects that are chosen for this module. At the end of the lecture students will choose which real-life project they wish to work on for the coming four weeks.

PowerPoint slides as inspiration for this lecture can be found separately.

Lecture systems approach & transdisciplinarity (week 1)

This lecture zooms in on a systems approach and transdisciplinarity for food system transformation, meaning an introduction to systems thinking (and how it relates to their own project), different types of research and the need for transdisciplinary research processes to stimulate transformation. PowerPoint slides as inspiration for this lecture can be found separately.

In advance of this lecture students are supposed to (at least) read the following:

- Bunders J.F., Broerse J.E., Keil F., Pohl C., Scholz R.W., Zweekhorst M.B. (2010) How can transdisciplinary research contribute to knowledge democracy? In: in 't Veld R. (eds) Knowledge Democracy. Springer, Berlin, Heidelberg. https://link.springer.com/chapter/10.1007%2F978-3-642-11381-9_11?LI=true
- Hammond, R.A. & Dubé, L. (2012). A systems science perspective and transdisciplinary models for food and nutrition security. *PNAS*, 109 (31); 12356-12363
- Gill et al. (2018). A Systems Approach to Research and Innovation for Food System Transformation. Policy Brief 1, published by FIT4FOOD2030.
- Parsons, K., Hawkes, C., Wells, R. (2019). What is the food system? A Food policy perspective. In: Rethinking Food Policy: A Fresh Approach to Policy and Practice. London: Centre for Food Policy.
- Ruben, R., Verhagen, J., & Plaisier, C. (2019). The Challenge of Food Systems Research: What Difference Does it Make? *Sustainability*, 11(1), 171.

Lecture in-depth interviewing and qualitative data analysis (week 2)

This lecture introduces students to qualitative research methods, in particular in-depth interviewing. While this lecture will primarily focus on interviewing as a research method in general, the workgroup related to this lecture zooms in on **transformative** interviewing in particular.

This lecture also introduces students to the basics of qualitative data analysis, including an explanation of deductive and inductive research, different types of data analysis (e.g. content, thematic, grounded) and coding (e.g. axial, open, selective coding), and approaches to increase research validity. PowerPoint slides as inspiration for this lecture can be found separately.

In advance of this lecture students are supposed to (at least) read the following:

- Gray, D.E. (2013). *Doing Research in the Real World*. SAGE.
Chapter 7. Research design qualitative methods
Chapter 8. Research design: Mixed Methods
Chapter 15. Interviewing
- Gray, D.E. (2013). *Doing Research in the Real World*. SAGE.
Chapter 23. Analysing and Presenting Qualitative Data

(guest) Lecture spatial context of food and health (week 2)

The spatial context of food and health is a highly relevant topic within FNS studies, since the food system has several spatial dimensions. This lecture aims to stimulate the geographical imagination of students. Furthermore, it aims to inspire students to integrate quantitative aspects in their own research project (to make it mixed methods), by briefly introducing students to the importance of spatial analysis and the different research approaches related to such an analysis.

In advance of the guest lecture students formulate two to three questions in duos. To be able to formulate these questions, students are provided with an abstract of the presentation in advance and/or specific literature (see the box below). Students also need to do some desk research, focusing on the organization the guest lecturer works at, the function and role of this guest lecturer and the issues he or she is going to cover. Students will send these questions to their coach no later than 1 hour before the guest lecture.

In advance of this lecture students are supposed to (at least) read the following:

- Verburg, P.H., Mertz, O., Karl-Heinz, E., Haberl, H., & Wu, W. (2013). Land system change and food security: towards multi-scale land system solutions. *Environmental Sustainability*. 5(5), 494-502. <https://doi.org/10.1016/j.cosust.2013.07.003>

Alternatives

There are of course several alternative subjects for this guest lecture on the spatial context of food and health. For instance, a guest lecture on **sustainable (urban) food systems planning** would be highly interesting and suitable within this module. Such a lecture could focus on **foodscapes**, defined as places and spaces where food is produced, processed, acquired, distributed, consumed and the waste processed¹⁰. The term 'foodscape' is increasingly being used within several disciplines, such as spatial design and planning, health promotion (ref.), and food studies. It is used to describe our food environments and assess the impact of food choices and behaviour. Since our food systems could be seen as **complex systems**, a lecture on **transition theory, system innovation and/or social practice theory** would be highly relevant as well¹¹.

Another possibility would be to prepare a guest lecture about the EU-project FIT4FOOD2030 itself. This will be inspiring, because it gives the possibility to provide real-life examples of how food system transformation is tried to stimulate in practice. It would also be possible to ask one of the **community**

¹⁰ Wiskerke, H. & Verhoeven, S. (2018). *Flourishing foodscapes. Design for city-region food systems*. Valiz.

¹¹ Spaargaren, G., Oosterveer, P. & Loeber, A. (2012). *Food Practices in Transition. Changing Food Consumption, Retail and Production in the Age of Reflexive Modernity*. Routledge.

partners to give a guest lecture, for instance a representative from the Food Policy Council (in case this party is not the commissioner).

5. Working on a real-world problem

The added value of working on a real-world problem

Working on a real-world problem which is commissioned by an external institution has added value on academic, professional and personal level¹². An important aspect is that students deepen their understanding of scientific theories by linking theory and practice. This of course requires an appropriate link between the theories that are central within the module and the real-world project. Since the project needs to meet the expectations of the commissioner as well as the academic objectives of the module, students learn to formulate a problem statement and main research question in consultation with their commissioner. On professional and personal level students learn to improve their communication skills and might discover new interests. Furthermore, working on a real-world problem might be inspiring for students and/or increase their motivation, since they could immediately experience the value of their work.

Focus and commissioning institution

AFNSA could either have a European and/or city focus, an international focus, or a combination of those. However, working with a commissioner from the city or community is advantageous since this makes it possible for students to directly engage with the commissioner and their relevant stakeholders. Especially in the context of transdisciplinary research direct engagement with stakeholders is beneficial. This is also in line with the idea of Community Service Learning, which is a form of education in which students work on existing societal issues by using their academic skills which is not only beneficial for students and the academic institution itself but also for the specific (international) community³.

Transdisciplinarity of the real-world problem

Within this module, teams of 5 to 10 students collect data by literature review and semi-structured (transformative) interviews (and analysis of databases) to conduct an inter/transdisciplinary analysis on the basis of which they provide a policy advice to their external commissioner (see *Appendix 1* for an overview of the content of the report). This means that students need to reach an interdisciplinary synthesis of the collected information in consultation with their external commissioner. Since AFNSA is designed as a four-week course it is unlikely that the research project has a 'high' level of transdisciplinarity, characterized by e.g. co-creation of knowledge, a mutual learning process, an emergent design and an explicit integration of different types of knowledge. However, attention is paid to these transdisciplinary features in several ways via:

- Engagement with at least three **different types of stakeholders** relevant to their project to be able to get a deeper understanding of the existence of different perspectives regarding the real-world problem;
- A **reflection on problem statement and research question** together with these stakeholders;
- A training on **transformative interviewing** (rather than basic interviewing only) (see chapter 5);
- An **extended member check** to increase stakeholder participation during this phase (data analysis phase) of the project (see chapter 5, workgroup X) and;

¹² Community Service Learning: <https://www.vu.nl/en/about-vu-amsterdam/mission-and-profile/csl/index.aspx>

- A focus on **transdisciplinary research methods and knowledge co-creation** during one of the workgroups (see chapter 5, workgroup X).

Example case: The Food Council Metropolitan Region Amsterdam as Commissioner

One of the external commissioning institutions within AFNSA at the VU University Amsterdam is the Food Council Metropolitan Region Amsterdam (FC MRA). It is increasingly recognised that cities play important roles with regard to food system transformation. Food policy councils (FPCs) are a relatively new phenomenon and are now being set up in several cities around the world. Generally, FPCs aim to engage public, private and academic parties to strengthen the structure of the regional food system and aim to advise local authorities¹³. Since the FC MRA was recently launched it would like to gain a better understanding of the perspectives of different food system related stakeholders on the role of the FC MRA. *Appendix 2* presents the real-world problem description of the FC MRA as how it was presented to the students.

FPCs form an interesting party for this module. However, if this is not applicable because there is no FPC in the region where this module will be tried out, there are several other options. Below is a general overview of what kind of parties might be interesting to invite as external commissioning institution within the course:

- **Municipality** – department working on food system related issues
- **Province** – department working on food system related issues
- **Non-governmental organisation** working on food system related issues
- **Research or academic institution** working on food system related issues

Be aware:

In some communities or cities (like Amsterdam) it might be possible that certain stakeholders (especially entrepreneurs or start-ups) are contacted by students for different projects (too) frequently. Therefore, it is important to be aware of the situation in your specific community or city before students start to engage with stakeholders. Discuss this with the commissioning institution as well. 'Sensing the field' would be a good alternative. This means that visit a number of food related events (discussion evenings, debates, conferences, etc.) and interview people on the spot (which requires different skills and techniques).

6. Workgroups and trainings

Workgroups of this module are guided by a 'coach' and are all scheduled for three hours. This coach could be a junior researcher, PhD student or post-doc. The coach is not the one making the decisions concerning the research project but will rather advice and support the students in making those decisions. This chapter includes an overview of the content of the workgroups. Each sub-chapter below starts with an overview of workgroup elements (assignments and/or activities), duration of these elements and related competences.

Workgroup 1 (week 1)

The objective of this first workgroup is to let students get to know each other, to discuss the importance of effective team meetings and to give a more detailed explanation of the real-life case

¹³ Gill et al. (2018). *A Systems Approach to Research and Innovation for Food System Transformation*. Policy Brief 1, published by FIT4FOOD2030.

they are going to work on for the coming weeks. Two-third of this workgroup is dedicated to personal development and competence building, which is important to start with at the beginning of this module.

Workgroup element	Duration	Competences (if applicable)
Getting to know each other	15 – 20 min	-
In-depth introduction to the real-life project	10 min	-
Effective team meetings	10 min	-
Introduction newspaper assignment	10 min	-
Team role in relation to educational background: personal development and Belbin	115 min	<i>Critical thinking, Self-reflection</i>
Introduction CARQ seminars	20 min	-

Getting to know each other

This introduction round is meant to let student get to know each other in a fun way. It is not necessary to already ask for their experiences regarding inter- and transdisciplinary research approaches (this will be part of the last assignment of the workgroup; *‘Team role in relation to educational background: personal development and Belbin’*). Ask students to talk to their neighbours. After 5 minutes each student will introduce the person left to his/her (name, educational background, hobbies, etc.). There are of course several other ways to let student get to know each other.

In-depth introduction to the real-life project

This session is meant to give a more elaborate explanation of the real-life project. This can be done with a PowerPoint presentation, a movie, and/or other materials. Make sure that students understand the project/problem description correctly. Let them brainstorm on the problem statement and research question.

Effective team meetings

Since this is in intensive module it is important to tell students about the need for a strict planning during the first workgroup.

Your project team embodies a working force of about 7 x 1 months. However, you will also lose time in project meetings to discuss results, analysis, interview design, etc. Your main challenge is to gain time by efficiently organized project team meetings. This teamwork has to be learned, and is one of the objectives of the module. Therefore, specific attention is paid to working in a project team and team building. The roles of chairman and secretary of the meeting will for example rotate, so that you all get the opportunity to train the necessary skills. All project teams have a coach that guides and monitors the project work. You will have a meeting with your coach each week on a fixed moment in time. However, to train your skills in project management and taking ownership, you as a group will be responsible for organizing extra meetings with your coach if necessary/needed. Some flexibility is therefore required. Overall, you will meet up with your coach two-three times a week.

The project resembles a “real-world” policy job. This implies working hours from 9.00 - 17.00. You are requested not to come late to the lectures and workshops. The remainder of the time you as a team

are responsible for your activities. During the first project meeting, you will plan your time management and roles. If you have an important appointment that has been planned by an external organisation (e.g. exam for driver license, hospital visit) or is by definition not your responsibility of planning (e.g. funeral, wedding, etc.) discuss with your colleagues in the team how you will compensate that time. Remember, you are jointly responsible for the end product. Inform your coach about the arrangement you agreed on, and in case of illness or other unplanned absences, please inform your project team members, your coach and the module coordinator.

Introduction to newspapers and system understanding

Introduce students to the ‘newspaper and system understanding’ assignment. This assignment is meant to help students acquire the competence of systems thinking. Ask two students to collect all food system related articles they can find from this moment on. Ask them to collect articles from at least three different newspapers, including a ‘left-wing’ and a ‘right-wing’ newspaper. Two students will give a 5-minute presentation about their collection of articles at the end of each week. This presentation will be the start of a discussion with the entire group. Ask students to include the following in their pitch:

- *What part of the food system are the articles about? Which part(s) of the food value chain (e.g. production, processing, distribution, consumption, disposal of waste)?*
- *What kind of challenges are being addressed (e.g. environmental challenges, health challenges, etc.)?*
- *What kind of actors are being mentioned (e.g. different stakeholder categories or not)?*
- *Is there a particular framing present within these articles?*

Team role in relation to educational background: personal development and Belbin

In this session, students extensively explore their default or most preferred role in team work through the (well-known) Belbin test. In an additional reflection exercise, students explore how their background education (Bachelor/Major) may have contributed to their Belbin outcome in addition to their personal traits. In this way insight is generated into whether students already have experience with inter- and/or transdisciplinary research and what kind of ontological and epistemological perspective they have. Also, students learn to analyse their own strengths and weaknesses and based on that create a personal development plan for expanding their team work role repertoire in line with the Belbin typology.

Preparation

Ask students to do the Belbin test before this session (e.g. via <https://www.123test.com/team-roles-test/>) and bring their result to the session.

Outline of the session

1. (15 min) Engage in a plenary conversation with the group:
 - Try to unravel which students discovered that they are e.g. ‘plants’; what commonalities can they identify e.g. in working on a (new) project?
 - Walk through all the roles (see the list below in Figure 1).
 - Try to emphasize that each role has strengths and weaknesses. In case students are unhappy with their outcome, emphasize that the outcome may differ in each project/context/setting, and may change over lifetime. The outcome only says something about your most preferred role. Multiple roles may apply to one person, and of course people are not to be put in boxes, but sometimes a box-like division does help in pin pointing important strengths, weaknesses and personal traits.

2. (20 min) Reflect with the students on the following questions:
 - What was taught to you about the purpose of science?
Probing questions: 'In how far were you educated to discover 'the truth'?' and 'Is there a ONE AND THE ONLY truth?'
 - How did teachers in your Bachelor (Major) frame the relationship between science and society?
Probing questions: 'In how far were you educated to be 'objective'?', 'Is it possible to be objective?', 'Where does subjectivity come in when you perform scientific research?', 'Is it possible to be a 'neutral' scientist?', 'In how far were you taught to stay away from values, emotions and (stakeholder) interests when doing research?'
 - In how far was it common in your educational background to interact with societal actors during the research process?'
 - If you would not limit science-society interaction to communication by the end of a project (e.g. a public presentation about your findings), when in the scientific research process do you see opportunities to interact with society (including citizens, but also public and/or private parties)? For example, in order to align or anticipate with your research to societal interests?'
 - In what skills were you taught to excel as a scientist?
Probing questions: 'Was there attention for (developing) social skills?'

3. (15 min) Ask students (e.g. in pairs/duos or in bigger groups) to relate the answers of the discussion/dialogue held in part 2 to their Belbin outcomes. In how far do they see a particular relationship between their background education and their Belbin outcome? In other words, in how far do they consider themselves as being framed in performing team work by their background education?

Possible examples:

- Some educational tracks teach students to completely ignore or exclude values, emotions, and societal viewpoints in doing research. Students of these tracks may be more likely (but not surely) to discover that their Belbin outcome is 'monitor' or 'specialist', being focused on facts and outcomes. Or in the contrary, students with such 'value-free science' being taught during their Bachelor that have the plant as Belbin outcome, may discover why they always felt an outlier.
- Some educational tracks teach students to collaborate with various other disciplines and/or professionals from 'practice'. In such projects, the insights of these collaborators are taught to be valuable to the research process and/or outcomes. Students of these tracks may be more likely (but not surely) to discover that their Belbin outcome is 'team worker', or maybe a specialist, to operate as a specific actor in the project.

Exchange the relationships that the duo-students identified in a plenary conversation. Unravel similarities and differences. Note that to our best knowledge, little is known about these relationships. Students and teachers will therefore need to explore the identification of these links themselves.










Team Role	Contribution	Allowable Weaknesses
Plant 	Creative, imaginative, free-thinking. Generates ideas and solves difficult problems.	Ignores incidentals. Too preoccupied to communicate effectively.
Resource Investigator 	Outgoing, enthusiastic, communicative. Explores opportunities and develops contacts.	Over-optimistic. Loses interest once initial enthusiasm has passed.
Co-ordinator 	Mature, confident, identifies talent. Clarifies goals. Delegates effectively.	Can be seen as manipulative. Offloads own share of the work.
Shaper 	Challenging, dynamic, thrives on pressure. Has the drive and courage to overcome obstacles.	Prone to provocation. Offends peoples feelings.
Monitor Evaluator 	Sober, strategic and discerning. Sees all options and judges accurately.	Lacks drive and ability to inspire others. Can be overly critical.
Teamworker 	Co-operative, perceptive and diplomatic. Listens and averts friction.	Indecisive in crunch situations. Avoids confrontation.
Implementer 	Practical, reliable, efficient. Turns ideas into actions and organises work that needs to be done.	Somewhat inflexible. Slow to respond to new possibilities.
Completer Finisher 	Painstaking, conscientious, anxious. Searches out errors. Polishes and perfects.	Inclined to worry unduly. Reluctant to delegate.
Specialist 	Single-minded, self-starting, dedicated. Provides knowledge and skills in rare supply.	Contributes only on a narrow front. Dwells on technicalities.

Figure 1. Overview of the Belbin roles.

- (20 min) Place students in their team/group and ask them to discuss the meaning of the outcome for their group composition and teamwork to be done. Ideally a team composition is based on complementary roles. However, this is not always the case, which raises possible risks (and sometimes opportunities). E.g. in case there are multiple plants in one team, there is a chance that the team aims for generating a multitude of super-creative ideas. On the other hand, there is a chance as well that the team keeps exploring new ideas, and forgets to take decisions.

With the Belbin outcome in mind, how should they divide traditional team roles among the members? Think about the chairman, secretary (minute maker), planner, information manager, (internal and/or external) communication responsible, etc.

Also give them the task to make a team work contract. Who does what and when during the project? How to deal with malfunctioning team members, etc. See an example [here](#) or Google 'team work contract template' (web or images).

- (20 min) With the Belin outcomes in mind, ask students to make a personal top 5 core quality list. Skills, knowledge or attitudes that are useful in teamwork in which they (think that they) excel. Let students discuss their lists within their group.

Ask one student to share her/his list in a plenary conversation. Choose one core quality and draw a 'core quadrant' on the board, see Figure 2. Fill in the core quadrant with the students in class. The principles: if a core quality is exaggerated, it becomes a pitfall. Think about core quality

‘creativity’; too much creativity can make one’s work directionless (not always the case), which is then a pitfall of creativity. A pitfall, however, has a positive opposite, which results in a challenge (for the person with the identified core quality). For example, from directionless to direction-oriented. An exaggerated form of this challenge is an allergy to the person with the initial core quality. For example, extremely direction-oriented people can allow little space for creativity, which is a disaster to work with for creative people.

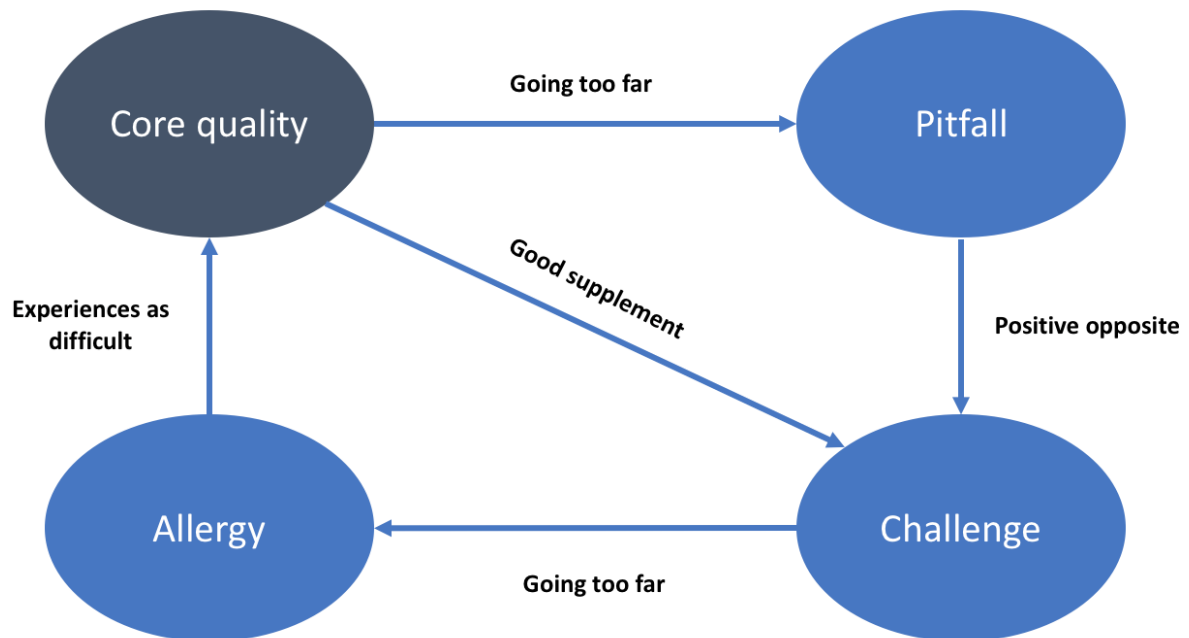


Figure 2. The core quadrant (in principle).

- (15 min) Let students individually make the core quadrant for their full top-5 list of core qualities. Once the challenges of their core qualities are discovered, instruct them to seek a connection between their challenges and the Belbin role(s) that they were not associated with in their test outcome. Based on this, ask students to explore whether group members have a Belbin role that includes these challenges as core quality, so that these students could regularly check in to give each other feedback during the course of the project. Instruct students to make a personal development plan based on these ‘challenges’ and under-explored Belbin roles. Their challenges are their personal ‘points for improvement’ to be practices during the (team work) project.

Introduction CARQ seminars

To work collectively towards a better understanding of the (scientific) literature pertinent to the topic of FNS and inter-and transdisciplinarity, the CARQ-method is used within this module, which stands for:

- Core quotation (a phrase or sentence of the article that according to you presents the key message of the whole article), accompanied with the
- Argumentative structure of the article or chapter to illumine this quotation; a discussion of
- Relations the article has (with what you know from other contexts, with other texts discussed in the module, with non-central issues dealt with in the text, with assignments you are currently working on, with your focus group project, *et cetera*). Finally, present fellow students with
- Questions that are formulated in such fashion as to *stimulate discussion*.

During each workgroup 2 students will discuss two selected articles which are preceded by a brief presentation by one of the students (i.e., no longer than 15 minutes), following the CARQ-method.

Students are not allowed to use powerpoint slides, but they can use handouts and/or use the black-or whiteboard during the discussion. After the presentation of the article a discussion with peers will follow, based on the questions that presentations end with. The presenter needs to make sure that that attention is paid to:

1. *What the content of the article means for students following Applications in Food and Nutrition Security Analysis;*
2. *What the content of the article means for the assignment the students are working on.*

The persons who are in charge of the CARQ presentation act as chair for the CARQ-part of the seminar, including facilitation of the discussion following the presentation. Only if necessary, the seminar coach will intervene to highlight important issues, or to deepen or structure the discussion.

The goal of discussion questions is to train students in arguing in favour and/or against a certain position they have encountered in the text at issue, such that they deepen their understanding of the text, the theories it puts forwards and the concepts it mobilizes. This can be done in many different ways. For instance, one can ask questions of the following structure:

- *“Based on the argumentation that we have just presented, how would [the author of the text at issue] think about the following situation /theory/ counter argument [...elaboration...].” Or*
- *“In contemporary public discourse, I have recently encountered that someone took position x; what would [the author of the text at issue] think about that?”*

Questions like these concerns applications of theories or concepts encountered in their readings. Ideally, students would add their own hypothesis to questions such as these, based on their reading of the text. Specifying what makes them uncertain about this interpretation makes their contribution even stronger, as this invites an open exchange of ideas.

- *“[Author of the text at issue] argues x, but [other author] argues the exact opposite. Which position is most plausible/ convincing/ relevant for our purposes/ consistent/...?”*

This type of questions has much to do with *relationships*. Make sure students explain why they think this is an important question to answer.

Planning

CARQ seminars are planned for work groups 2, 3, 4, 5 and 6. During workgroup 1 the CARQ method will be explained. During the last workgroup students do not have to present two articles and can focus on their end product. The schedule is as follows:

Workgroup	Resources
2 (week 1)	<ul style="list-style-type: none"> ○ Ruben, R., Verhagen, J., & Plaisier, C. (2019). The Challenge of Food Systems Research: What Difference Does it Make? <i>Sustainability</i>, 11(1), 171. ○ Gill, M. et al. (2018). A Systems Approach to Research and Innovation for Food System Transformation
3 (week 2)	<ul style="list-style-type: none"> ○ Bunders J.F., Broerse J.E., Keil F., Pohl C., Scholz R.W., Zweekhorst M.B. (2010) How can transdisciplinary research contribute to knowledge democracy? In: in 't Veld R. (eds)

	<p>Knowledge Democracy. Springer, Berlin, Heidelberg. https://link.springer.com/chapter/10.1007%2F978-3-642-11381-9_11?LI=true</p> <ul style="list-style-type: none"> Ivanov et al. (2016). CASI: Strategic Outline of Public Engagement in the Development of Sustainability Research Policies and Programmes . Findings of the CASI Project.
4 (week 3)	<ul style="list-style-type: none"> Krom, de, M.P.M.M. & Muilwijk, H. Multiplicity of Perspectives on Sustainable Food: Moving Beyond Discursive Path Dependency in Food Policy. <i>Sustainability</i>, 11(10), 2773. Parsons, K., Hawkes, C., Wells, R. What is the food system? A Food policy perspective. In: Rethinking Food Policy: A Fresh Approach to Policy and Practice. London: Centre for Food Policy.
5 (week 3)	<ul style="list-style-type: none"> Fazey, I., Schöpke, N., Caniglia, G., Patterson, J., Hultman, J. et al. (2018). Ten essentials for action-oriented and second order energy transitions, transformations and climate change research. <i>Energy Research & Social Science</i>, 40: 54-70. Sonnino, R., Tegoni, C.L.S. & de Cunto, A. (2018). The challenge of systemic food change: Insights from cities. <i>Cities</i>.
6 (week 3)	<ul style="list-style-type: none"> Moragues-Faus, A., Sonnino, R. and Marsden, T. (2017). Exploring European food system vulnerabilities: Towards integrated food security governance. <i>Environmental Science and Policy</i>, 75: 184-215. http://dx.doi.org/10.1016/j.envsci.2017.05.015 Caron, P., Ferrero y de Loma-Osorio, G., Nabarro, D., Hainzelin, E. Guillou, M., ... Verburg, G. (2018). Food systems for sustainable development: proposals for a profound four-part transformation. <i>Agronomy for Sustainable Development</i>, 38(14). https://doi.org/10.1007/s13593-018-0519-1

Workgroup 2 (week 1)

This workgroup builds on lecture 2 (food systems and transdisciplinarity).

Workgroup element	Duration	Competences (if applicable)
CARQ seminar	45 min	<i>Critical thinking</i>
Research question, problem statement and the commissioners' interview	30 min	<i>Critical thinking</i>
Newspapers and system understanding	30 min	<i>Systems thinking</i>
Project work	60 min	<i>Collaboration, interpersonal competences</i>

CARQ seminar

See description of this assignment on page 14.

Research question, problem statement and the commissioners' interview

First part of this session is meant to reflect on the problem description and research question of the students.

After this the importance of an interview with the commissioner needs to be explained. Although students received materials about the real-life societal issue, they will need additional and more in-depth information from the commissioner to be able to do the research and write the policy advice report. The interview with the commissioner will be conducted by the entire project team or two

representatives of the group. The interview will be more like an informal conversation with the aim to unravel the needs and expectations of the commissioner regarding the project.

Have the students think about what questions to ask: what information do they need from the commissioner? Stress that it is also important to think about the answers the commissioner will give: with what answers are they satisfied?

Students will invite the commissioner themselves and will write a summary of the conversation afterwards. Make sure the interview is scheduled between workgroup 2 and workgroup 3.

Newspapers and system understanding

See the description of this assignment on page 10.

Project work

Give students time to work on their project. Walk around and answer any questions.

Workgroup 3 (week 2)

Workgroup element	Duration	Competences (if applicable)
CARQ seminar	45 min	<i>Critical thinking</i>
Newspapers and system understanding	30 min	<i>Systems thinking</i>
Transdisciplinary research approaches	30 min	<i>Transdisciplinary competences</i>
Developing the (transformative) interview design	60 min	<i>Critical thinking, systems thinking</i>

CARQ seminar

See description of this assignment on page 14.

Newspapers and system understanding

See the description of this assignment on page 10.

Transdisciplinary research approaches

This session is meant to zoom in on transdisciplinarity and features of transdisciplinarity such as knowledge co-creation. Lecture 2 does focus on different types of research and transdisciplinarity. However, approaches and methodologies linked to transdisciplinary research are not covered in the lecture. To be able to increase the level of transdisciplinarity of their project work it is important to zoom in on the features of this type of research during the workgroup.

Let students watch the following movies on transdisciplinarity:

- The Transdisciplinary approach - <https://youtu.be/x5xGi9EFCSY> (4 min)
- Why Transdisciplinarity? - <https://youtu.be/8iMov3PuMk4> (3 min)

Engage in a plenary conversation. Start with asking students to reflect on these movies. After this ask them to think about their own project: How could they increase the transdisciplinarity of their project? Which approaches or research methods do spark their interest and which of them would be appropriate for their own project (also if they would not really use these methods)? During which phases of the project? etc.

Developing the (transformative) interview design

Start with a reflection on the interview with the commissioner: what does the outcomes mean for the project?

After this let students brainstorm about who to interview: what types of stakeholders (at least three different types) are they planning to engage with and why? Also, let them work on their interview design based on lecture 2 (in-depth interviewing) (training 1 on *transformative interviewing* will be on the next day).

Workgroup 4 (week 2)

Workgroup element	Duration	Competences (if applicable)
CARQ seminar	45 min	<i>Critical thinking</i>
Newspapers and system understanding	30 min	<i>Systems thinking</i>
Project work	90 min	<i>Collaboration, interpersonal competences</i>

CARQ seminar

See description of this assignment on page 14.

Newspapers and system understanding

See the description of this assignment on page 10.

Project work

Give students time to work on their project. Walk around and answer any questions.

Workgroup 5 (week 3)

Workgroup element	Duration	Competences (if applicable)
CARQ seminar	45 min	<i>Critical thinking</i>
Newspapers and system understanding	30 min	<i>Systems thinking</i>
Project work	1,5 hours	

CARQ seminar

See description of this assignment on page 14.

Newspapers and system understanding

See the description of this assignment on page 10.

Project work

Give students time to work on their project. Walk around and answer any questions.

Workgroup 6 (week 3)

Workgroup element	Duration	Competences (if applicable)
CARQ seminar	45 min	
Newspapers and system understanding	30 min	<i>Systems thinking</i>
Giving feedback	30 min	Social intelligence, self-awareness, communication ability
Checking in with the commissioner	45 min	Social intelligence, self-awareness, communication ability
Project work	30 min	<i>Collaboration, interpersonal competences</i>

CARQ seminar

See description of this assignment on page 14.

Newspapers and system understanding

See the description of this assignment on page 10.

Giving feedback

Provide students with information on how to give feedback (Appendix 3) in advance of this workgroup¹⁴, and ask students to give each other feedback based on these guidelines. Also link to the personal development assignment of week 1 by asking students to read each other's' personal development plan in advance. After the feedback round ask students to update their personal development plans.

Checking in with the commissioner

Reserve part of this workgroup to let student check in with their commissioner to investigate whether the research project is still in line with the needs and expectations of the commissioner. This can be done face-to-face or via a (teleconference) call.

¹⁴ Boud, D. (1991) *Implementing Student Self-Assessment*, HERDSA Green Guide 5, Campbelltown: Higher Education Research and Development Society of Australasia
 McGill and Beatty (in "Action learning: A practitioner's guide", London: Kogan Page, 1994, p. 159-163) provide useful suggestions about giving effective feedback.

Project work

Give students time to work on their project. Walk around and answer any questions.

Workgroup 7 (week 4)

Workgroup element	Duration	Competences (if applicable)
CARQ seminar	45 min	Critical thinking
Newspapers and system understanding	30 min	<i>Systems thinking</i>
Explanation of extended member check and project work	45 min	<i>Participatory ability</i>
Coming back to Belbin and the personal development plan	30 min	-
Project work	30 min	<i>Collaboration, interpersonal competences</i>

CARQ seminar

See description of this assignment on page 14.

Newspapers and system understanding

See the description on page 10.

Explanation of extended member check and project work

Explain the added value of an extended member check in order to increase the transdisciplinarity of the project. An extended member check means that students send their transformative interview transcripts as well as their interpretation of the transcript to the stakeholders. In this way stakeholder have the opportunity to change or add aspects to the transcript. If stakeholders are interested they could also be invited to be engaged during the analysis phase (with e.g. developing a coding scheme).

Coming back to Belbin and personal development plan

During work group 1 everyone made the Belbin test and created a personal development plan. This session is meant to come back to this personal development plan. Ask students to look at their personal plans again and ask them to write down what they think they learned so far and what they would like to develop further.

Project work

Let students work on their project. Walk around and answer any questions.

Training 1. Transformative Interviewing (week 1)

Workgroup element	Duration	Competences (if applicable)
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Exercising transformative interviewing	80 min	Social intelligence, self-awareness, communication ability,
Project work	40 min	<i>Collaboration, interpersonal competences</i>

Since the module is scheduled to last only four weeks, it is important to zoom in on interview skills relatively early on. Therefore, try to schedule this 2-hour training in the first part of the module.

Exercising transformative interviewing

In this training session, students learn to act as a (temporal) change agent in a (food) system by means of conducting (transdisciplinary) research. While doing research, one can shape interactions with stakeholders in such a way that they incite (transformative) change within, among or between stakeholders in the system, including the self (alias the student as a researcher).

Various types of research have transformative capacities, for example action research, participatory observation and reflexive monitoring¹⁵. In such research, researchers become part of a particular community or network and can organize ‘interventions’ that shape or transform (practices in) the community or network.

One tangible tool for such a change agent-like researcher is ‘transformative interviewing’. The term does not exist as such in scholarly literature, but we can deduce it from the RMA kind-of interviewing techniques⁷, and Theory U principles for transformative change¹⁶. In the former, interviewers ask interviewees to reflect on performed tasks, identify key learning points in relation to originally set objectives, and set goals for the next steps in performing a particular task (see an example in, e.g., Van der Meij et al., 2016). The latter, Theory U, pleads for a specific form of communication (in particular ‘generative listening’) to support transformative change. In the exercises below, students explore transformative interviewing by discovering communication principles in line with Theory U.

1. (20 min) Ask students to watch two YouTube videos before the session:
 - Otto Scharmer on four levels of listening: <https://youtu.be/elfXpRkVZal> (8 min)
 - Otto Scharmer on generative listening: <https://youtu.be/dlAYK6zaKDg> (13 min)

Reflect with the students on the four levels of listening as explained in the videos. The major differences are as follows (also see Figure 1 for an overview):

- Downloading: Listening from your own habits and to what you already know, in order to reconfirm this. We usually notice ourselves saying or thinking ‘of course’, ‘right’, and ‘ahuh’ in this level of listening.
- Factual listening: Noting new information that differs from what you already know/expect. This can be noticed when you think ‘oh?’, or ‘really?’.
- Empathizing: Listening from the other person’s perspective and feeling an emotional connection. Key reactions on this level are ‘ahhww, poor you!’, or ‘yeah, super nice!’.
- Generative listening: Connecting to an emerging future and possibilities that link to who you really are. On this level, excitement in terms of ‘wow!’ or new visions of the person you are talking with, or new visions of yourself, may arise. Most importantly, generative listening covers a way of listening that is closer to ‘sensing’ what your conversation partner aspires, and helping this person

¹⁵ Mierlo, van, B., Regeer, B. J., Amstel, van, M., Arkesteijn, M., Beekman, V., Bunders - Aelen, J. G. F., ... Leeuwis, C. (2010). *Reflexive monitoring in action. A guide for monitoring system innovation projects*. oosterwijk: BOXPress.

¹⁶ U.Lab: Transforming business, society, and self. Source Book (2015).

through questioning, listening and/or acting in such a way that the person can further shape these aspirations. Like the conductor of the orchestra senses what his solo-singer is capable of (even without the singer himself being aware of it), and shapes further conditions for the singer to further realize his capability.

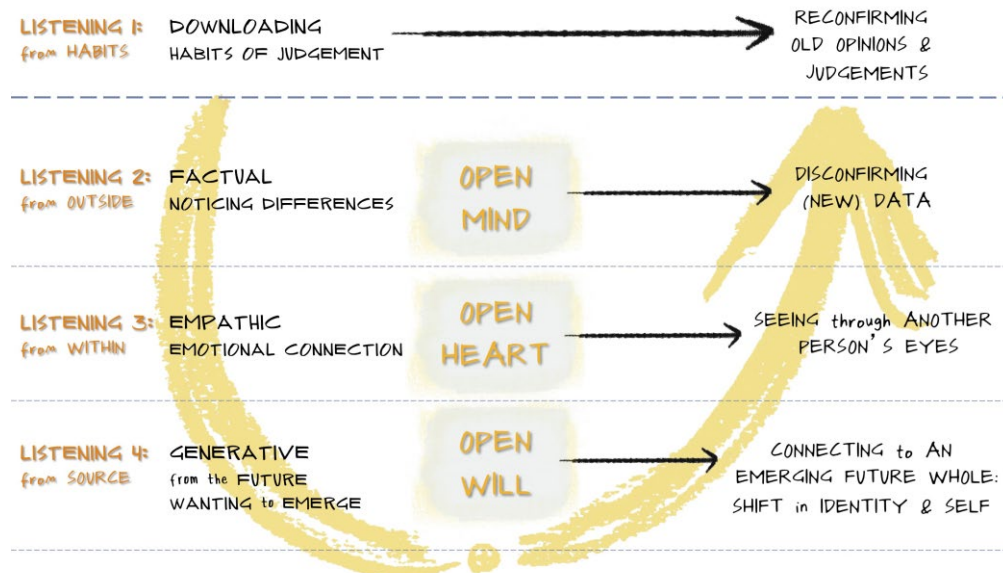


Figure 3: Overview of four types of listening of Theory U

In the next steps we further explore two concrete ‘generative listening’ exercises that can be used as a tool in transformative interviewing. Reflection on one’s own listening skills is the focal asset in the first exercise, creating a connection between personal drives and transformation, is central in the second.

2. (20 min) The following exercise embraces the listening principles of Theory U and helps people to train in generative listening. Ask students to pair with somebody they have not or hardly spoken with so far. The task is:
 - Engage in a conversation on ideas about your personal role in changing R&I on food systems. One student takes the lead in speaking; the other is not responding but just listening. After ±5-10 min the other person takes a turn to speak. Best is to look at a point on the horizon (not at each other).
 - After finishing this, use the listening self-observation template to monitor your listening skills (see below).

Facilitate a plenary dialogue with the students to reflect on the exercise (‘How did the students experience the exercise?’). Motivate students to repeat this exercise with a stakeholder with who(m) a connection is desirable, e.g. for doing research or for network expansion.

3. (30 min) Instruct students to pair with a (new) person. Take this person for a walk, e.g. outside in a green area. Either interview this person or engage in a dialogue about the following three questions:
 - Who am I/why are you?
 - Why am I doing my work/why are you doing your work? (work motivation)
 - What would I/you need to fully realize my/your work motivation?

It is advisable to let one person speak at a time; the listener does not necessarily have to ask questions within one answering round (see previous exercise). This allows more openness for what is actually being said (and little worries about which deepening questions to pose). Furthermore, it is advisable to both look in the same direction/in front of you (and not in each other's eyes), to literally look at 'the future'. In case of rain, place two chairs in front of a window with a good view, and look outside (so you do not look in each other's eyes). This exercise can also be done as a self-reflection exercise, e.g. by journaling about your answers to the three questions for yourself. Such reflection can help change makers to keep their transformative network activities/actions connected to themselves.

After the students returned, facilitate a plenary conversation about the exercise ('How did the students experience the exercise?'). Motivate students to repeat this exercise with a stakeholder with who(m) a connection is desirable, e.g. for doing research or for network expansion.

4. (10 min) The exercises performed so far during this session form the key to transformative interviewing.

Transformative interviewing: what does it mean for your own case?

The mode that students got into while performing the exercises is the mode one would like when interacting with stakeholders too. In addition to such listening, and holding simple conversations about questions such as 'Who am I/why are you? Why am I doing my work/why are you doing your work? What would I/you need to fully realize my/your work motivation?', the questions listed in Appendix 4 can be a suitable database to delve from for the set-up of transformative interviewing guides (derived from the Theory U MOOC Source Book¹⁷). In addition to covering (several of) such questions, generative listening will convert the interview into a transformative interview. See Appendix 5 for an example of a 'Learning Self Observation Template'

After students have learnt about transformative interviewing ask them to link these lessons to their own project. Let them revise their interview design (of workgroup 3) based on this training.

Training 2. Data Analysis (week 3)

This training is meant to focus on quantitative data analysis methods. Description can be found elsewhere.

7. The (research & innovation) food systems library

Below is an overview of articles, books and documents that are chore and recommended within this module.

Qualitative data collection and analysis

Chore

- Gray, D.E. (2013). *Doing Research in the Real World*. SAGE.
 - Chapter 7. Research design qualitative methods
 - Chapter 8. Research design: Mixed Methods
 - Chapter 15. Interviewing
 - Chapter 23. Analysing and Presenting Qualitative Data

¹⁷ U.Lab: Transforming business, society, and self. Source Book (2015).

Further reading

- Gray, D.E. (2013). *Doing Research in the Real World*. SAGE.
Chapter 3. Selecting and Planning Research proposals
Chapter 22. Analysing and Presenting Quantitative Data
Chapter 24. Writing up the Research

Complex problems, systems thinking and transdisciplinarity:

Chore

- Bunders J.F., Broerse J.E., Keil F., Pohl C., Scholz R.W., Zweekhorst M.B. (2010) How can transdisciplinary research contribute to knowledge democracy? In: in 't Veld R. (eds) *Knowledge Democracy*. Springer, Berlin, Heidelberg. https://link.springer.com/chapter/10.1007%2F978-3-642-11381-9_11?LI=true

Further reading

- Booth Sweeney, L. & Meadows, D. (2013). *The Systems Thinking Playbook. Exercises to stretch and build learning and systems thinking capabilities*. Chelsea Green Publishing Co.
- Meadows, D. (2015). *Thinking in Systems. A Primer*. Chelsea Green Publishing Co.
- Schuitmaker (2012). *Identifying and unravelling persistent problems*. Technological Forecasting and Social Change Volume 79, Issue 6, July 2012, Pages 1021–1031
<http://www.sciencedirect.com/science/article/pii/S0040162512000224>
- Regeer, B. & Bunders, J.F.G. (2009). Knowledge co-creation: Interaction between science and society. *A transdisciplinary approach to complex societal issues*. A Preliminary study of the RMNO (Advisory Council for Spatial Planning, Nature and the Environment).
- Pohl, C. & Hadorn G.H. (2008) Methodological challenges of transdisciplinary research. *Natures Sciences Sociétés*. 16:111-121.
<http://www.nssjournal.org/articles/nss/pdf/2008/02/nss8204.pdf>
- Stock, P. and Burton, R.J.F. (2011) Defining Terms for Integrated (Multi-Inter-Trans-Disciplinary) Sustainability Research. *Sustainability*. 3 (8), 1090-113.
<http://www.mdpi.com/20711050/3/8/1090>
- Pohl, C. (2001). How to bridge between natural and social sciences? An analysis of three approaches to transdisciplinary from the Swiss and German field of environmental research. *Natures Sciences Societes*, 9(3), 37-46.
- Jahn, T., Bergmann, M., & Keil, F. (2012). Transdisciplinarity: Between mainstreaming and marginalization. *Ecological Economics*, 79, 1-1
- Sarkki, S., Heikkinen, H. I., & Karjalainen, T. P. (2013). Sensitivity in transdisciplinary projects: A case of reindeer management in Finland. *Land use policy*, 34, 183-192.

Systems thinking and/or transdisciplinarity in relation to food systems (transformation)

Chore

- Ruben, R., Verhagen, J., & Plaisier, C. (2019). The Challenge of Food Systems Research: What Difference Does it Make? *Sustainability*, 11(1), 171.
- Hammond, R.A. & Dubé, L. (2012). A systems science perspective and transdisciplinary models for food and nutrition security. *PNAS*, 109 (31); 12356-12363
- Gill et al. (2018). *A Systems Approach to Research and Innovation for Food System Transformation*. Policy Brief 1, published by FIT4FOOD2030.

- Ingram, J. (2011). A food systems approach to researching food security and its interactions with global environmental change. *Food Security*. 3: 417–431. DOI 10.1007/s12571-011-0149-9

Further reading

- Metabolic (n.d.). Using systems thinking to transform society. The European Food System as a Case Study. Commissioned by WWF.nl.
- Ericksen, P. J. (2008). Conceptualizing food systems for global environmental change research. *Global Environmental Change*, 18 234-245.
- Meynard et al. (2017). Designing coupled innovations for the sustainability transition of agrifood systems. *Agricultural Systems* 157: 330-339. <http://dx.doi.org/10.1016/j.agsy.2016.08.002>
- Rayner, G., Barling, D. & Lang, T. (2008). Sustainable Food Systems in Europe: Policies, Realities and Futures. *Journal of Hunger & Environmental Nutrition*, 3:2-3, 145-168, DOI: 10.1080/19320240802243209
- Burchi, F., Fanzo, J. & Frison, E. The Role of Food and Nutrition Systems Approaches in Tackling Hidden Hunger (2011). *International Journal of Environmental Research and Public Health*. 8, 358-373; doi:10.3390/ijerph8020358
- Food Ethics Council (2018). *For whom? Questioning the food and farming research agenda*. A special edition magazine from the Food Ethics Council.
- Simons, L. (2014). *Changing the food game. Market Transformation Strategies for Sustainable agriculture*. Taylor & Francis Ltd.
- Gaitán-Cremaschi, D., Klerkx, L., Duncan, J., Trienekens, J., Huenchuleo, C. (2019). Characterizing diversity of food systems in view of sustainability transitions: A review. *Agronomy for Sustainable Development*, 39:1.

Food systems and policy

Chore

- IPES FOOD (2019). Towards a Common Food Policy for the European Union. The policy reform and realignment that is required to build sustainable food systems in Europe.
- Parsons, K., Hawkes, C., Wells, R. What is the food system? A Food policy perspective. In: *Rethinking Food Policy: A Fresh Approach to Policy and Practice*. London: Centre for Food Policy.

Further reading

- Barling, D., Lang, T. & Caraher, M. (2002). Joined-up Food Policy? The Trials of Governance, Public Policy and the Food System. *Social Policy & Administration*. 36 (6), 556-574.

Food Policy Councils and food system transformation (in case the real-life case is commissioned by a Food Policy Council)

Chore

- Schiff, R. (2008) The Role of Food Policy Councils in Developing Sustainable Food Systems. *Journal of Hunger & Environmental Nutrition*, 3:2-3, 206-228, DOI: 10.1080/19320240802244017

Further reading

- American Planning Association (2011). *Food Policy Councils. Helping local, regional, and state governments address food system challenges*. Food Systems Planning Briefing paper, American Planning Association's Planning and Community Health Research Center.

- Clayton ML, Frattaroli S, Palmer A, Pollack KM (2015) The Role of Partnerships in U.S. Food Policy Council Policy Activities. PLoS ONE 10(4): e0122870. doi: 10.1371/journal.pone.0122870

Additional materials to get a better understanding of how food systems are related to several disciplines and sectors

- Wiskerke, H. & Verhoeven, S. (2018). *Flourishing foodscapes. Design for city-region food systems*. Valiz.

Dutch materials related to food systems and policy

- Krom, de, M. & Muilwijk, H. (2018). *Perspectieven op duurzaam voedsel. Pluriformiteit in debat en beleid*, Den Haag: PBL.
- Muilwijk, H. et al. (2018), *Voedsel in Nederland: verduurzaming bewerkstelligen in een veelvormig systeem*, Den Haag: PBL.
- Nederland Verbeeld. Een andere blik op vraagstukken rond de leefomgeving. Voedsel, energie en mobiliteit: <https://www.pbl.nl/publicaties/2012/nederland-verbeeld>
- Candel, J. (2018). De opkomst van voedselbeleid: voorbij de tekentafel. *Beleid en Maatschappij*, 45 (4). doi: 10.5553/BenM/138900692018045004002

8. Assessment

This chapter gives an example overview of what the grade could be based on if this module is part of the curriculum of a Bachelor student.

The grade is based on the group grades for the report and the video presentation and an individual assessment of the performance in the project. To pass, all parts have to be concluded with the grade of 5.5 or higher. The student's final mark is built up as follows:

Percentage of total grade	Part of the module	Team or individual grade
35%	Report that reflects the research (problem, methods, results, advice) conducted by the project team	Team grade
25%	Video presentation on the results of the research	Team grade
40%	Personal performance in the project based on: <ol style="list-style-type: none"> 1. the assessment of the students' contribution to the team by the coach, based on: <ol style="list-style-type: none"> a) the students' contribution to the project team through peer assessment b) participation during project meetings c) portfolio of activities per student 	Individual grade

	2. the assessment of the CARQ assignment (50% of grade)	
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The assessment criteria for the policy advisory report, the video-presentation, personal performance and CARQ assignment are presented in appendix 6.

9. Appendices

Appendix 1. Content of the policy advice report

Object	Content
Cover page	Title, subtitle (optional), name of the author(s), picture/graphics/illustration (optional, yet recommended)
Title page	Title, subtitle (optional), name of the author(s) AND place and date of publication, name of organization/institute/university you work for, 'assignment board' and document identification number (optional)
Preface	Information about the reasons for writing the report, the intended audience, the authors and acknowledgement of people who were of assistance in completing the report. The acknowledgements can, however, also be placed in a separate chapter at the end of the report (as is more customary in the UK and US). About 1-2 pages.
Executive summary	The summary comprises around 1000 words. It gives a brief overview of the problem, the main research question, the sub-research questions and the approach, but focuses mainly on the conclusions and recommendations of the report.
Table of contents	<p>Chapters, paragraphs and numbering of pages. N.B there are a number of rules concerning how certain chapters are placed in the table of contents:</p> <ul style="list-style-type: none"> ○ Table of contents: The preface, summary, list of abbreviations, explanatory list of words, list of symbols. The appendices are not considered to be chapters and therefore receive no chapter-numbering in the table of contents, but are all listed in order of appearance in the report. ○ Pages: The cover page, title page, preface and the table of contents are not numbered. The executive summary is, in the case of policy and advisory reports, numbered in a different way than the rest of the report e.g. with roman numbering or characters (a, b, c, ...).
List of abbreviations	List of abbreviations and the full description of the term that is abbreviated. Using a list of abbreviations saves you the time and effort to write every abbreviation in full the first time you use it in your report.
First part	<p>This part includes the following elements:</p> <p>An introduction, including</p> <ul style="list-style-type: none"> ○ A problem definition

	<ul style="list-style-type: none"> ○ A short problem statement ○ A research objective (what you promise to produce) ○ The main research question ○ Contextual background, including an actor map <p>A theoretical background and a conceptual framework; including a part on food systems as complex problem</p> <p>Sub questions derived from your conceptual model</p> <p>Methodology (in past tense)</p> <ul style="list-style-type: none"> ○ Justify the choice for your methods with an emphasis on inter- and or transdisciplinary aspects of your research ○ Design of (transformative) interviews in general and the (transformative) interview questions in specific (and include: operationalization of concepts, interview procedures). ○ The used analysis of the qualitative results (detailed analytical approach) and how you performed the extended member check. ○ Structure of the report <p>Note: these elements need to be structured in multiple chapters (the exact structure is up to you)</p>
<p>Middle part</p>	<p>Core-chapter(s) on the results of your research. You usually end with a comparison or analysis of the research findings. That is a rearrangement of your data (both from the literature and (transformative) interviews) according the conceptual framework. In these chapters, generally 1 sub-research question is analysed per 1 (sub)chapter. You might end with a chapter on analysis in which you rearrange your data according to the conceptual framework, taking all results together → answering the main research question. Analysis is not a condensed summary of you results.</p>
<p>Conclusion and discussion</p>	<p>What insights are gained? Answering of your research sub-questions and the main research question. No new ideas/results are introduced in the conclusion. Also, a conclusion needs to be delivered in crisp and clear rational language; understandable for everyone without reading the entire report (often policymakers tend to read the introduction, conclusion and recommendations when scanning a report).</p> <p>Discussion: Place your conclusions within current relevant scientific literature; see also your contextual background in the beginning (how do your conclusion deviate/strengthen/ weaken this literature). Anticipate to critical remarks from an outsider reading your report (e.g., too less interviews) and argue why that critic is not that important for your conclusions (e.g., see actor chart, those are the main actors). Conclusion is not a condensed summary of you results. Discussion is 20% methodological and 80% contextual (might be speculative).</p>
<p>Recommendations</p>	<p>Formulate around 3 alternatives (i.e. policy advice). Listing the pro-contras of each alternative. This is based on the future steps that can be taken which emerge from the</p>

	results/conclusion - with each recommendation try to answer the questions: why? who? how? The gold is in the details.
List of references	<p>In text: between brackets (author, year). If two authors, list both. If more than two authors then first author et al.</p> <p>In reference list:</p> <p>Book: authors, year, title, place of publisher, publisher</p> <ul style="list-style-type: none"> • Example: Stake, R.E. (2004) <i>Standards-Based and Responsive Evaluation</i>. Thousand Oaks, CA: Sage. <p>Book chapter: authors, year, book chapter, editors, book title, place of publisher, publisher, pages</p> <ul style="list-style-type: none"> • Example: Mitcham, C. (1999) "Why the public should participate in technical decision making". In: R. von Schomberg (ed.) <i>Democratizing technology: theory and practice of a deliberative technology policy</i>. Hengelo: International centre for human and public affairs: 39-50. <p>Article: authors, year, title, journal (volume, number), pages</p> <ul style="list-style-type: none"> • Example: Paterson, M. and Higgs, J. (2005) Using hermeneutics as a qualitative research approach in professional practice. <i>The Qualitative Report</i> 10(2): 339-357

Appendix 2. Example of a real-life project proposal

Commissioner: Food Council Metropolitan Region Amsterdam

Initiator and mission

Food Council MRA is the meeting point of citizens' initiatives in the food chain. **FC MRA wants to promote mutual contacts and exchanges between these initiatives.** In addition, **FC MRA wants to promote that the citizens' initiatives in politics are well-understood and that the bottom-up and top-down efforts will therefore reinforce each other.** In short, opportunities are used more quickly and, above all, more effectively. The Food Council organizes meetings where issues in the food chain are put on the agenda. This is done in collaboration with the food network of the MRA-in-the-making. The food network is a joint venture between governments, companies, research and educational institutions (triple helix) that have signed a regional food manifesto (will be provided). This manifesto has been prepared by the Food Council MRA. The Food Council functions as a do-platform and advice board for the food network MRA. **It bundles citizens' initiatives (quadruple helix) and bridges the world of governments, large companies and educational institutions.** The **FC MRA also promotes professionalisation of these citizens' initiatives**, for example, initiators are encouraged to substantiate their story with figures.

Project goal

With this project, **FC MRA aims to map out civil initiatives in the form of an online atlas.** It maps out citizens' initiatives committed to making the food chain more sustainable in the MRA. **This makes it easier for these parties to come into contact with each other**, so that the food initiatives can grow in size, quantity and quality. The atlas covers all sectors in the food chain, all themes of food preservation and all areas of MRA up to neighbourhood level. **FC MRA aims to forge regional and urban coalitions thus inciting reflexive learning and political action on provincial, metropolitan, municipal and**

neighbourhood level. Ultimately, students are challenged to conceive **recommendations for collaborative food governance on provincial, metropolitan and municipal policy levels.**

Method

For the construction of the atlas, the project "Veldtest Tafelatlas" of the central government programme *Duurzaam Door*, in which representative networks are referred to as tables, is connected. In the (still experimental) table atlas, each network has a list of members, a top list of the (food) issues that members want to put on the agenda, an up-to-date overview of their projects and ideas to tackle those issues and a set of indicators that they use to urgency or progress. The atlas also presents total overviews and statistics for each area. For the initial filling of the atlas, existing networks are invited for self-notification. In addition, inventory interviews are conducted with the use of students. In addition, the project group can also report on initiatives and networks editorially. The maintenance of the atlas is divided over existing and new networks in the food chain in the MRA, each of which can map their part of the chain. For this purpose, the networks, for example a knowledge network, an industry organization or a chain consultation, are given the management of their card or sub-card in the atlas.

Assignment

The FC MRA would like to know which civil initiatives aiming to change the current unsustainable food system into a more sustainable, healthy and transparent one can currently be identified in the MRA. The FC MRA also aims to acquire more insight into the most promising agents of change.

The FC MRA would like the students to investigate the following questions:

- Which civil initiatives committed to make the food chain more sustainable do exist in the MRA? Specify by geographical level of scale: regional, municipal, neighbourhood. Basic characteristics to be identified: website, mission statement, contact.
- Which coalitions (clusters) do exist? To what extent are the initiatives linked to each other (e.g. mutual exchange of information and experiences, collaborations, etc.)?
- What kind of role do these initiatives envisage for the FC MRA, regarding alignment and stimulation of mutual exchange between these initiatives?
- What is the perceived role of regional and/or municipal government in the emerging field of food policy?

Appendix 3. Giving feedback

Feedback can be given two ways: through **constructive feedback** or through **praise and criticism**. Don't fall into the trap of giving praise and criticism on team members' performance. Constructive feedback is information-specific, issue-focused, and based on observations. It comes in two varieties:

- Positive feedback is news or input to a team member about an effort well done.
- Negative feedback is news to a team member about an effort that needs improvement. Negative feedback doesn't mean a terrible performance, but rather a performance in which the outcomes delivered should be better. So negative is not a negative word in this case.

Praise and criticism are both personal judgments about a performance effort or outcome, with praise being a favourable judgment and criticism, an unfavourable judgment. Information given is general and vague, focused on the person, and based on opinions or feelings. The guidelines for giving constructive feedback fall into four categories: content, manner, timing, and frequency.

Content is what you say in the constructive feedback.

- In your first sentence, identify the topic or issue that the feedback will be about.
- Provide the specifics of what occurred. Avoid general comments and clarify pronouns such as “it,” “that,” etc. Be descriptive rather than evaluative. Focus feedback on observations, rather than inferences.
- Without the specifics, you only have praise or criticism. Start each key point with an “I” message, such as, “I have noticed,” “I have observed,” “I have seen,” or when the need exists to pass on feedback from others, “I have had reported to me.” “I” messages help you be issue-focused and get into the specifics. Notice “all,” “never,” “always,” etc., and ask to get more specificity. Often these words are arbitrary limits on behaviour.

Manner is how you say the constructive feedback. As you may know, how you say something often carries more weight than what you have to say — manner is an important element when giving feedback.

- Be direct when delivering your message and be clear about what you want to say. Get to the point and avoid beating around the bush. Both negative and positive feedback should be given in a straightforward manner.
- Emphasize the positive. This isn’t being collusive in the person’s dilemma.
- Refer to behaviour that can be changed.
- Avoid “need to” phrases, which send implied messages that something didn’t go well. For example, “Jane, you need to get your reports turned in on time, and you need to spell check them.” This message is not really performance feedback. It implies that Jane did not do something well with her reports, but it doesn’t report exactly what happened. Providing clarity on what occurred is the aim of feedback.
- Be sincere and avoid giving mixed messages. Sincerity says that you mean what you say with care and respect. Mixed messages are referred to as “yes, but” messages. For example, “John, you have worked hard on this project, but...” What follows is something the person is not doing well and is the real point of the message. The word “but,” along with its cousins “however” and “although,” when said in the middle of a thought, creates contradictions or mixed messages. In essence, putting “but” in the middle tells the other person, “Don’t believe a thing I said before.”
- In positive feedback situations, express appreciation. Appreciation alone is praise. Yet when you add it to the specifics of constructive feedback, your message carries an extra oomph of sincerity. For example: “Sue, your handling of all the processing work while John did the call-backs made for an efficient effort and showed good teamwork. Everything you did was accurate, as well. Thanks so much for helping out. Such initiative is a real value to the team.”

Appendix 4. Inspiring questions for transformative interviewing (Training 1)

1. Over the past days and weeks, what did you notice about your (emerging) self?
2. Who have been your “Guardian Angels” (helpers) in your life’s journey so far?
3. Crack: Where do you feel the future in your life and work right now?
4. Frustration: What about your current work and/or personal life frustrates you the most?
5. Happiness: What are your most important sources of energy and happiness in your life and work?
6. Helicopter: Watch yourself from above (as if in a helicopter). What are you doing? What are you trying to do in this stage of your professional and personal journey? Helicopter II: Watch your collective journey from above: what are you trying to do collectively in the present stage of your collective journey?
7. Listen to your young self: Look at your current situation from the viewpoint of you as a young person, at the beginning of your journey: What does that young person have to say to you?
8. Footprint: Imagine you could fast-forward to the very last moments of your life, when it is time for you to pass on. Now look back on your life’s journey as a whole. What would you want to see at that moment? What footprint do you want to leave behind on the planet?

9. From that future point of view: What advice have you given to your current self?
10. Now return again to the present and crystallize what it is that you want to create: your vision and intention for the next 3-5 years. What vision and intention do you have for yourself and your work? What are some essential core elements of the future that you want to create in your personal, professional, and social life? Describe or draw as concretely as possible the images and elements that occur to you.
11. Letting-go: What would you have to let go of in order to bring your vision into reality? What is the old stuff that must die? What is the old skin (behaviours, assumptions, etc.) that you need to shed?
12. People: Who can help you make your highest future possibilities a reality? Who might be your core helpers and partners?
13. Action: If you were to take on the project of bringing your intention into reality, what practical first steps would you take over the next 3 days?

SELF OBSERVATION SHEET

In your LISTENING, How MUCH (%) did you APPLY...

DOWNLOADING

LISTENING FROM YOUR OWN HABITS
 " " " " WHAT YOU ALREADY KNOW
 TO (RE-)CONFIRM " " " "

FACTUAL LISTENING

NOTING NEW STUFF COMPARED TO WHAT
 YOU KNEW/EXPECTED

EMPATHIZING

LISTENING FROM THE OTHER PERSON'S PERSPECTIVE
 FEELING AN EMOTIONAL CONNECTION

GENERATIVE LISTENING

CONNECTING TO AN EMERGING FUTURE/
 POSSIBILITIES THAT LINK TO WHO YOU REALLY ARE

[DERIVED FROM U-LAB, MIT]

Appendix 6. Assessment criteria

Policy advisory report

Unsatisfactory (u)	Satisfactory (s)	Good (g)	Excellent (e)
Summary (approx. 2 pages) / abstract (200-300 words)			
Not fulfilling the criteria of 'Satisfactory'	<ul style="list-style-type: none"> - The choice for summary or abstract is appropriate to report/article size - The context, problem statement, research question, methodology used, results, conclusion and discussion are clearly summarized 	As 'Satisfactory' and additionally: <ul style="list-style-type: none"> - To the point - Coherent and logically sound 	As 'Good' and additionally: <ul style="list-style-type: none"> - Ready for scientific - publication - Can be read independently of source - Conveys the purpose of the research in relation to the field
Introduction: Dublin descriptors			
<i>Problem description, context analysis, scientific background</i>			
Not fulfilling the criteria of 'Satisfactory'	Is able to: <ul style="list-style-type: none"> - Select, order and summarize information; focus on essential elements; and recognize connections. - Demonstrate knowledge and understanding of the societal problem - Formulate a clear and relevant research question 	As 'Satisfactory' and additionally: <ul style="list-style-type: none"> -The analysis of the problem is clear and relevant - Appropriate use of the relevant scientific literature - Describe the interdisciplinary context to support the relevance of the research problem- - Placement within field of research 	As 'Good' and additionally: <ul style="list-style-type: none"> - Demonstrates a good insight and understanding of the societal problem. - Demonstrates mastery of the topic - Thorough analysis of the context and problem - Extensive use of the relevant scientific literature. - Contributes to field of research
Concepts and theory: Dublin descriptors and literature search			
<i>Relevant theoretical concepts and models, study questions</i>			
Not fulfilling the criteria of 'Satisfactory'	Is able to: <ul style="list-style-type: none"> - Select and explain relevant theoretical 	As 'Satisfactory' and additionally: <ul style="list-style-type: none"> - Demonstrates understanding and 	As 'Good' and additionally: <ul style="list-style-type: none"> - Can integrate, expand on, or modify and justify the

	<p>models and concepts in the field of specialization</p> <ul style="list-style-type: none"> - On the basis of relevant theoretical models and concepts formulate relevant study questions. - The study questions satisfactorily cover the main question 	<p>explanation of the (theoretical) model/concept</p> <ul style="list-style-type: none"> - Justify the choice of and relate the theoretical models and concepts 	<p>(theoretical) models and concepts</p>
<p>Methods (2d)</p> <p><i>Design, choice of variables, expressing and justifying methodology, description and justification of data processing</i></p>			
<p>Not fulfilling the criteria of 'Satisfactory'</p>	<p>Is able to:</p> <ul style="list-style-type: none"> - Justify the methodology of research - describe the effects of the chosen methods in the field of research - Understand the effect on the quality of data - Apply these understandings to his/her own project 	<p>As 'Satisfactory' and additionally:</p> <ul style="list-style-type: none"> - Student is capable of a critical and thorough description and justification of the methods used including issues related to the ethical conduct of research - discusses the effects of different (chosen) methods 	<p>As 'Good' and additionally:</p> <ul style="list-style-type: none"> - Student masters the link between the used methodology and data quality and acknowledges and remedies any limitations herein
<p>Results and execution</p> <p><i>Data processing (qualitative and quantitative), logical and complete presentation of data</i></p>			
<p>Not fulfilling the criteria of 'Satisfactory'</p>	<p>Is able to</p> <ul style="list-style-type: none"> - Present the results in a complete and adequate manner. - Select and order information, distinguish essentials from trivialities and recognize connections, while justifying your choices. 	<p>As 'Satisfactory' and additionally:</p> <ul style="list-style-type: none"> - Resulting data are well presented and can be useful as a starting-point for publication, if additional data are collected - Data is validated 	<p>As 'Good' and additionally:</p> <ul style="list-style-type: none"> - Student shows an independent, complete and thorough analysis of data, with an excellent presentation thereof
<p>Discussion and conclusions and ability to critically evaluate</p> <p><i>Structure of arguments, conclusions, link to research problem, comparison with other studies, strength and limitations of the study</i></p>			

<p>Not fulfilling the criteria of 'Satisfactory'</p>	<p>Is able to:</p> <ul style="list-style-type: none"> - Answer your research question in a clear and univocal way. <p>Connect the findings to the theoretical background in order to answer the research question</p> <ul style="list-style-type: none"> - Show satisfactory knowledge of the field of research to discuss the results - Discuss the findings using additional relevant literature - Formulate strengths and limitations of the study - Formulate recommendations - Draw a sound conclusion 	<p>As 'Satisfactory' and additionally:</p> <ul style="list-style-type: none"> - Deal with all the different aspects in a critical manner - Discuss the findings, taking into account the relevance of the research in science and society using a wide variety of scientific literature - Discuss limitations and their implications - Make recommendations and make these explicit for the target group(s) - Draw convincing conclusions 	<p>As 'Good' and additionally:</p> <ul style="list-style-type: none"> - Present a concise (but complete) evaluation of the findings in the light of the theoretical background - Reflect critically on the effect of the limitations on the findings of the study
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Structure and organisation

General structure, clarity of organization, coherence in line of thought

<p>Not fulfilling the criteria of 'Satisfactory'</p>	<p>Is able to:</p> <ul style="list-style-type: none"> - Show coherence in line of thought: the problem definition, the theoretical background, the methods, the analysis and the conclusion and discussion are logical connected (but may be superficial at some points) - Provide structure, division in chapters, headings and subheadings - Organize content clearly - Treat references correctly - Provide a clear layout 	<p>As 'Satisfactory' and additionally:</p> <ul style="list-style-type: none"> - Show coherence in line of thought with scientific quality: the problem definition, the theoretical background, the methods, the analysis and the conclusion and discussion are logically connected. - Well-chosen references - Layout adds to understanding of the text 	<p>As 'Good' and additionally:</p> <ul style="list-style-type: none"> - Show coherence in line of thought with in-depth scientific quality: the problem definition, the theoretical background, the methods, the analysis and the conclusion and discussion are logically connected
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Scientific and English writing skills			
Not fulfilling the criteria for 'Satisfactory'	<p>Is able to:</p> <ul style="list-style-type: none"> - Produce a text that might contain some language errors and ambiguous sentences - Presents the figures, tables and references in a clear way - Write acceptable English - Write in a readable and understandable way 	<p>As 'Satisfactory' and additionally:</p> <ul style="list-style-type: none"> - Demonstrate good use of language, including grammar and spelling 	<p>As 'Good' and additionally:</p> <ul style="list-style-type: none"> - Demonstrate ability to write a text that is ready for publication

Video-presentation

Unsatisfactory (u)	Satisfactory (s)	Good (g)	Excellent (e)
Summary (approx. 2 pages) / abstract (200-300 words)			
Not fulfilling the criteria of 'Satisfactory'	<p>Is able to</p> <ul style="list-style-type: none"> - Make a video from which the viewer mostly understands the topic and might remember the video. Some introduced themes/topics may distract from message. - Use Images/ Graphics and information used within the video has little or no relevance to the points discussed and/ or the topic 	<p>As 'Satisfactory' and additionally:</p> <ul style="list-style-type: none"> - Make a video from which the viewer is left with general understanding and will remember the video. - Show a fair amount of creativity displayed, but lacks "oomph!" - Images/ Graphics and information used within the video has moderate relevance to the points discussed and/ or the topic. 	<p>As 'Good' and additionally:</p> <ul style="list-style-type: none"> - Make a video from which the viewer is left with a strong understanding of the topic, will remember the video, and feels like they want to learn more. - Shows excellent creativity, has appropriate levels of "oomph" within the video. - Images/ Graphics and information used within the video are highly relevant to the points discussed and/ or the topic.
Scientific content			
Structure and thread of arguments, clarity of conclusion			

<p>Not fulfilling the criteria of 'Satisfactory'</p>	<p>Is able to:</p> <ul style="list-style-type: none"> - Produce a video presentation with a clear structure with question, methods, results, conclusion and discussion nicely summarized and a logical thread of argument - Place the research in a broader scientific context 	<p>As 'Satisfactory' and additionally:</p> <ul style="list-style-type: none"> - Content of presentation is well structured and content is well chosen; (suits the results of research and fits the audience) - Conclusions are clear and appropriate - Gives direction to future research 	<p>As 'Good' and additionally:</p> <ul style="list-style-type: none"> - Demonstrate strong line of argumentation - Provide convincing conclusions which stimulate further debate
<p>Ability to hold a discussion based on the presentation</p>			
<p>Not fulfilling the criteria of 'Satisfactory'</p>	<p>Is able to</p> <ul style="list-style-type: none"> - Responds to questions - Provide answers based on the research conducted 	<p>As 'Satisfactory' and additionally:</p> <ul style="list-style-type: none"> - Provide answers which are to the point and show a broad view of the subject - Reflect on own research - Demonstrate good interaction with the audience 	<p>As 'Good' and additionally:</p> <ul style="list-style-type: none"> - Respond to questions in convincing way - Demonstrate and show a deep and thorough knowledge and insight of the research field - Demonstrate excellence in the discussion

Personal performance

<p>Attitude</p>	
<p>Social skills and responsiveness to feedback</p>	
<p>Not fulfilling the criteria for 'pass'</p>	<p>Is able to:</p> <ul style="list-style-type: none"> - Collaborate - Openly and respectfully communicate internally and externally - Ask for advice, and feedback, - Reflect on feedback - Incorporate feedback

Self-reflection	
Not fulfilling the criteria for 'pass'	<ul style="list-style-type: none"> - Formulates personal learning objectives (personal development plan) and assess own progress - Critically evaluates own performance, both introspectively and in discussion with others (during peer feedback round). - Shows ability to revise own judgments, views and behaviour
Motivation and scientific curiosity	
Not fulfilling the criteria for 'pass'	<ul style="list-style-type: none"> - Is clearly interested in scientific inter- and transdisciplinary research and sees this as an essential component of complex societal issues - Is committed to the subject - Works no less than 8 hrs. a day - Demonstrates enthusiasm and involvement in the research topic and area - Participates in formal/informal placement activities - Shows a desire to contribute to the field of research
Ownership of project during placement	
Not fulfilling the criteria for 'pass'	<ul style="list-style-type: none"> - Works independently, and reflects on his/her own activities, work processes and skills - Takes action and initiative to overcome problems and to achieve the best results
Initiative	
Not fulfilling the criteria for 'pass'	<ul style="list-style-type: none"> - Independently acquires and critically assesses information during the research - Takes action to perform the research and is able to change plans when necessary, in cooperation with the coach - Is looking for opportunities to learn and to develop
Code of conduct	
Not fulfilling the criteria for 'pass'	<ul style="list-style-type: none"> - No plagiarism - Unbiased use of and presentation of data - Critical

Execution			
Unsatisfactory (U)	Satisfactory (S)	Good (G)	Excellent (E)
Work pace and planning			
Not fulfilling the criteria for 'satisfactory'	<p>Is able to</p> <ul style="list-style-type: none"> - Keep up with the planning and is flexible enough to make new plans when necessary - Produce satisfactory products and quality in relation to time invested 	<p>As 'Satisfactory' and additionally:</p> <ul style="list-style-type: none"> - Is a good planner and well able to combine and plan different tasks - Produce more than expected products in terms of quantity <i>or</i> quality in relation to time invested 	<p>As 'Good' and additionally:</p> <ul style="list-style-type: none"> - Able to anticipate on unforeseen and longer-term tasks - Produce more than expected products in terms of quantity <i>and</i> quality in relation to time invested
Practical research skills and execution			
Not fulfilling the criteria for 'satisfactory'	<p>Is able to (with some guidance):</p> <ul style="list-style-type: none"> - Review scientific literature - Develop an adequate research plan (problem statement, objectives, research questions, research approach, research methods, and planning) - Collect the data using appropriate (transdisciplinary) methods adequately. - Analyse data (in collaboration with stakeholders via extended member check) and, if needed, employ appropriate computer software - Exhibit learning and reflection on the limitations of the study - Exhibit learning and reflection on the level of transdisciplinarity of the project and how the 	<p>As 'Satisfactory' and additionally:</p> <ul style="list-style-type: none"> - Has the competence and initiative to conduct the methods and review more independently. - Exhibits in-depth learning and reflection - Good analytical skills 	<p>As 'Good' and additionally:</p> <ul style="list-style-type: none"> - Employs thorough data analysis. - Able to iterate between the meta and in-depth level

	<p>transdisciplinarity could be increased</p> <ul style="list-style-type: none"> - Demonstrate accuracy in data collection, storage and processing 		
Communication and collaboration			
Not fulfilling the criteria for 'satisfactory'	<p>Is able to (with guidance):</p> <ul style="list-style-type: none"> - Communicate research conclusions, knowledge and rationales underpinning them, to specialist and non-specialist audiences, clearly and unambiguously - Collaborate with researchers from various scientific disciplines as well professionals and policy makers related to the food system, policymakers and the general public (if applicable) 	A 'Satisfactory' but with minimal guidance	As 'Good' and additionally expand and/or develop a (new) network
Developing insights			
Not fulfilling the criteria for 'satisfactory'	<p>Is able to (with guidance):</p> <ul style="list-style-type: none"> - Apply scientific knowledge to formulate solutions/advice for a complex societal problem in the context of food systems 	<p>As satisfactory:</p> <ul style="list-style-type: none"> - Can make essential contributions to scientific discussion about plans, results and consequences of research 	<p>As 'Good'</p> <p>but with minimal guidance</p>

CARQ assignment

Content			
<p>Student shows that he/she understands the matter discussed within the article</p> <p>I/S/G</p>	<p>Student answers all questions (CARQ) formulated in the assignment</p> <p>I/S/G</p>	<p>Student clearly builds on and links to module material</p> <p>I/S/G</p>	<p>Student clearly build on his/her experience in doing inter/transdisciplinary research</p> <p>I/S/G</p>

Form		
Structure and argumentation	English	Length
I/S/G	I/S/G	I/S/G

City Lab Athens – Eat It, Don't Skip It!



Don't skip it!

This module was created internally in Ellinogermaniki Agogi, host of the City Lab Athens, through internal meetings among teachers from the general curriculum who facilitate student projects, the Research and Development Department, Physical Education Department, and informed by meetings and interactions of students and their facilitators with external experts who acted as consultants during the student projects (e.g., Prolepsis Institute, Boroume, SEVT).



ELLINOGERMANIKI AGOGI

AT A GLANCE

Thematic Area	food waste, food systems, student enterprise, social entrepreneurship, business plan,
Format	student interdisciplinary project
Duration	25 sessions of 2h per week, and additional external meetings and interactions with stakeholders
Type of audience	high school students
Age group	16-17 years
Number of participants	~20 students
Prerequisites for participation	None
Number of facilitators	2 min.
Overall difficulty	Intermediate Topic: food systems Preparation: brainstorming Facilitation: advising/guiding

OVERVIEW

The project is an interdisciplinary student project combining elements from the food nutrition systems and setting up a (social) enterprise addressing grand societal challenges (food malnutrition, resource scarcity, etc.)

OVERALL AIM

The mission of the student virtual enterprise (after being defined during the brainstorming session among students) is to be set up in a responsible way; thus “Nothing to go wasted” This has been addressed in multiple ways from the recycled paper of the food package to the contents.

SPECIFIC (LEARNING) OBJECTIVES

Learning outcomes as well as the final products/outcomes of the student enterprise are co-developed with the students with the support of external experts by setting meetings (face to face or online ones are taking place in different stages of the project in order to get feedback).

- Knowledge/concepts: FNS, food waste, recycling, obesity, healthy food choices, *Resource efficiency, sustainability, package materials*, advertising, apprentice, auction, auctioneer, be creative and innovative, business, business plan, civic responsibility, customer, entrepreneur, entrepreneur profile, fill a need, know your customer and product, market, marketing, profit, self-taught, social entrepreneur.
- Skills: active listening, analyzing information, brainstorming, creative thinking, critical thinking, decision-making, deductive reasoning, following directions, group work, interpreting information, oral and written communication, problem-solving, self-assessment, taking responsibility, digital skills, self-confidence, spot resources and opportunities.
- Attitudes: resilience and adaptability, participatory ability, self-regulation and other self-oriented competences

SUGGESTED SCENARIO FOR IMPLEMENTATION

Implementation can be quite flexible; a transdisciplinary project in a classroom context up to an activity club including classroom and out of classroom activities (e.g. interactions with experts, open presentations/participation in exhibitions/contests)

TOPICS & COMPETENCES COVERED BY THE ACTIVITY

Thematic area(s)	food health, food waste, sustainability, recycling, social entrepreneurship
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FOOD2030 Research & Innovation priorities

Priority	Indicate whether main or secondary	Addressed through
Circularity & Resource Efficiency	Main	Goal of the enterprise/mission statement: "Nothing gets wasted"
Innovation & Empowerment of Communities	Secondary	<p>Innovative pedagogical approach, students working on grand societal challenges with an innovative approach.</p> <p>The empowerment and well-being of communities is considered since the final product offers a direct solution:</p> <ul style="list-style-type: none"> • To parents, that don't have the time to prepare a healthy snack for their children at school. • Adults that don't have the necessary time to prepare a healthy snack for getting at work. • People that are out of house many hours and need a healthy snack in a low price. • People who exercise in outdoor facilities and in between need a healthy snack.
Nutrition & Health	Main	Goal of the enterprise/ Mission statement; The final product is made

		taking under consideration these issues
Climate & Sustainability	Main	Goal of the enterprise/Mission statement: “Nothing gets wasted”/Food producing school
Responsible Research and Innovation (RRI)		
Related concept		Addressed through
The module adopts a deep learning approach addressing the 3 RRI principles: - Education for society (principle 1) - Education with society (principle 2) - Education to whole persons (principle 3)		Project Interdisciplinarity
shared responsibility among diverse stakeholders and enterprise members		Enterprise mission statement (addressing societal challenges and working following an RRI approach)
students empowered and responsible for outcomes that meet societal challenges (ethically acceptable, sustainable and socially desirable outcomes)		The goal is that customers is that customers will be bigger institutions such as schools, companies and states that could cover the needs of vulnerable groups (such as under emergency or immigrants).
RRI competence framework <ul style="list-style-type: none"> • Anticipation • Reflexivity • Responsiveness • Inclusiveness 		Students are guided to work on the project following such an approach that addresses these competences. More specifically (the following cluster of competences are addressed): <ul style="list-style-type: none"> • Anticipation and future-oriented competency inherent in setting the enterprise vision/mission statement, revisiting it, and setting the business plan. • Communication: for the presentation of final outcomes and participation in European contests and exhibitions openness to dialogue as well as multi-perspective, inter-cultural communication is needed. • Collaboration: 'collaboration' and 'collaborative learning skills' needed among students as well as with the external 'multi-stakeholder engagement'.
Creativity		Inherent to the inter-disciplinary project as students are asked to devise innovative ways of addressing grand societal challenges
Critical thinking		Needed in order to implement the project
Empowerment for transformation and acting as change agents		Students become empowered to act towards societal changes and challenges is also one of

	the elements that can be elicited from the reports.
Transdisciplinarity (of the project itself)	Complex challenges; facilitating inputs from across scientific and non-scientific stakeholder communities and facilitating a systemic way of addressing the challenges
Reflexivity and awareness	Students are asked to work on societal challenges and to reflect on how they can support addressing them with their final outcomes
Responsibility	Sense of individual responsibility (enabled by self-regulation via self-control, self-efficacy, problem solving and adaptability) and shared responsibility among students/enterprise members towards making trade-offs to advance towards R&I that addresses grand challenges

(Food) Systems thinking

System thinking is inherent in the project, since seen as a whole the project is about how to tackle a complex and ill-defined problem. The project is about working in a systemic way and addressing two fields: FNS and enterprise (both being systems). Activities such as recognising and understanding relationships; analysing complex systems, different domains; dealing with uncertainty and ambiguity are integrated in the project.

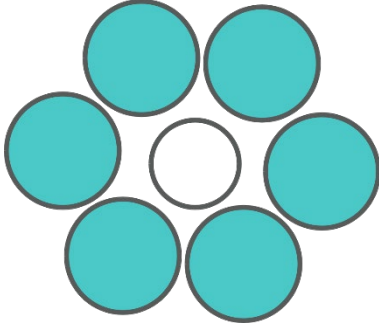
Other competences

Competence	Addressed through
Entrepreneurial skills	Inherent to the nature of the project

TARGET AUDIENCE

Audience category	Students of secondary & upper secondary school
Recommended number of participants	10-15
Recommended age	14-17
Prerequisites	e.g. student background (specific, general); attendance of previous activities; visit of exhibition; awareness of certain concepts etc. None; learning goals and competences can be achieved during the course of the project

OPTIONS FOR MULTI-STAKEHOLDER ENGAGEMENT

Stakeholder	Role envisaged in the activity
<p>There is room for all types of stakeholders to be included for the successful implementation of the project. Actually, one of the steps of the project is to record all possible contacts with different roles that could support the formation and running of the student enterprise (e.g. Steps:</p> <ul style="list-style-type: none"> Record the contacts and make a diagram as the below. Write your name in the center. Write down the names of your contacts as well as their field in the external circle. Compare the graphs Formulate teams and select the ones to collaborate with (that could support you) 	


SETTING UP THE MODULE

FACILITATION/DELIVERY

- Teachers/facilitators aware of how to facilitate interdisciplinary projects
- Teachers/facilitators aware of the basics of FNS & forming a student enterprise

RESOURCES

Physical materials

<i>Resource name</i>	<i>Picture</i>	<i>Number</i>
Sticky notes in 3 different colours for the brainstorming sessions		30
Laptops		
Students need to find the necessary resources e.g. via sponsorships (part of the learning process) in order to get hold of the items needed in order to run their enterprise		

Useful links, videos, articles

- Saving Food resources e.g. https://boroume.savingfood.eu/intro_new/gr/default.asp
- FoodBank, Redirect Project
- FNS resources
- Prolepsis Institute resources
- Federation of Hellenic Food Industries

PREPARING THE SETTING

- Flexible arrangements that allow collaboration among students & facilitators

- Use of laptops

DETAILED DESCRIPTION OF THE MODULE SCRIPT

Step

Feel

Students are presented initial resources (as a trigger for further discussion) regarding raising international societal concerns such as sustainable healthy eating, food waste and resource efficiency.

Then they are asked to investigate further and find their own references in order to get familiarised with these challenges.

Imagine

Provided the raising international concerns regarding sustainable healthy eating, food waste and resource efficiency students are advised to contribute to these challenges and find solutions via the operation of a virtual enterprise, e.g. students might follow the approach where schools are transformed in food producing ones. Opening up schools and with use of innovative approaches can help communities and municipalities in finding solutions to these problems.

Students are encouraged to think about the societal challenges (e.g. scarcity of resources, obesity and malnutrition, the factors that might lead to these and to think about possible solutions. At first students get familiarised with nutrition and diet, healthy and unhealthy food, different nutrients, nutritional value and they discuss their personal views and everyday dietary habits, resource efficiency and circularity. Then they need to think about entrepreneurial opportunities and challenges in order to address the above challenges.

Create

1. Familiarisation of students with societal challenges (e.g. healthy nutrition and diet)

The teacher uses a variety of educational resources (online, videos, newspaper articles etc.) in order to provoke a discussion about nutrition and modern nutrition habits. Issues such as healthy and unhealthy food, different nutrients and nutritional value are tackled. Students share their personal views and everyday dietary and lifestyle habits.

2. Visit of experts to our school and organizing meetings out of school (e.g. Dietitian-Nutritionist and stakeholders from industry/business)

3. Setting the enterprise vision/mission statement (initial idea and market research)

- Brainstorming sessions, where members of the enterprise participate
- Question to be answered: what's the vision?
- Member need to define the products, services, markets competition, target audience/customers etc. as well as define the enterprise strategy
- Mission needs to be revisited in order to confirm it's short, concise and clear

In the specific case the entrepreneurial idea is the creation of a cost-effective package, a snack box, that contains healthy food products produced in the school. The food products selected fulfill

the following criteria: seasonality, low percentages of natrium and sugar, whole meal flour, Greek originality and local production.

The package will be available in 3 different versions that will fulfill the needs of people who follow a healthy diet, vegan diet and for children (junior version). on the package via a QR code the consumer will be directed to an online platform where he could find useful information for the caloric uptake and nutritional value of food, as well as suggested ways for a healthy way of living and physical activity.

4. Roles and tasks

The key to success in setting up an enterprise is the collaboration among people with different skills. All members of the student enterprise have at least 3 roles:

- Shareholder,
- Clerk,
- Member of the Board of Directors.

Students need to allocate roles and tasks and ensure smooth collaboration among them.

5. Setting up a business plan

6. Innovation

- The production can be done in schools themselves aspiring to become an active community component
- Schools producing products, packages and looking for collaborations and sponsorships prevents waste in all levels by sending leftovers in initiatives such as social cooking promoting recycling
- The package is designed so as to facilitate transfer (small recyclable materials)
- Low cost.

Share

- Participate in exhibitions and Competitions in order to present the outcomes and final products
- Present the results and outcomes of the project to our parents and the school community in an event specifically organised for this purpose at the end of the school year.

ANNEXES

The milestones of the Virtual Enterprise (school year: 2018-2019)

Kick-off	October 2018
Naming the virtual Enterprise & application of product approval- Application for participating in the Athens Exhibition	Mid-January 2019
Student Virtual Enterprise Exhibitions (Trade Fair 2018) in Athens	March 2019



Greek contest «Best Virtual Enterprise 2019»	May 2019
European Contest «Best Company of the Year 2019»	July 2019 (France)



City Lab Athens: Food Waste

Food Waste

This module was created internally in Ellinogermaniki Agogi, host of the City Lab Athens, through internal meetings among teachers from the general curriculum who facilitate student projects, the Research and Development Department, Physical Education Department, and was informed by meetings with external experts active in the field (e.g., Boroume, Attica FoodBank, Redirect).



AT A GLANCE

Thematic Area	food waste, food systems
Format	Classroom lecture
Duration	1 class period
Type of audience	Secondary school students
Age group	12-15-year olds
Number of participants	25-30; suitable for the whole class
Prerequisites for participation	None
Number of facilitators	1 minimum
Overall difficulty	<p>Beginner</p> <p>Topic: an introduction to food waste</p> <p>Preparation: video watching by students</p> <p>Facilitation: consists of advising or guiding</p>

OVERVIEW

The module has the goal to raise awareness about the issue of food waste. Introduction materials acting as trigger for discussion and presentation of cases (local/European ones) in order to collect students' feedback.

OVERALL AIM

The module has the goal to raise awareness (content knowledge) about the issue of food waste and to develop students' critical thinking. The module could be further enhanced to a deep-learning module with students taking actions and actually implementing/piloting their solutions for reduction of food waste.

SUGGESTED SCENARIO FOR IMPLEMENTATION

The module could be implemented:

- in class (face to face) with printed cards and a projector presenting the resources and/or
- purely online as a module in the Open Schools for Open Societies (OSOS) repository (<https://portal.opendiscoveryspace.eu/>)

TARGET AUDIENCE

Audience category	Secondary school students
Recommended number of participants	25-30
Recommended age	12-15-year-old students
Prerequisites	None

DETAILED DESCRIPTION OF THE MODULE SCRIPT

Step

Feel

Teacher/Facilitator introduces:

- Presents pictures of selected FNS challenges to the students' which step by step introduce /problematize students around the issue of food waste,
- Pictures of positive local trends are also presented and discussed
- With guiding questions teacher problematizes students
- FNS concept is introduced and in discussion the systemic nature of FNS is highlighted. Systemic reflection was introduced by guiding the discussion on the fact that food waste can take place in all of the processes/steps of the food system

Resources:

- (FNS, Chapter 1) <https://foodsource.org.uk/chapter/1-overview-food-system-challenges>

Teacher:

- presents showcases around food waste (national and local ones if applicable) to students.

Resources (videos):

Local cases

- Boroume/SavingFood, https://www.youtube.com/watch?time_continue=6&v=VErZcyxzHGE&feature=emb_logo
- Redirect, <https://www.youtube.com/watch?v=KtowT0qpeFA>

Guiding questions:

- What caught your eye in the video we just watched?
- What is this initiative about? How does the specific initiative handle the issue of food waste?
- What is the difference in the approach between the cases in the way that they handle food waste?

Guiding the discussion for students to realise:

- the extent of environmental resources (e.g. water) that go wasted as well /need to be consumed for the production of e.g. 1 loaf of bread
- that implications can be apart from financial (obvious), societal/ethical and environmental
- on the levels of food wasted at various points from farm to fork to gut and back.
- The terms of carbon food footprint and food insecurity are introduced (students are not aware of these terms)

International cases (suggested)

- Feeding the 5000 (FIT4FOOD2030 Showcase)
- FareShare
- GrowUpUrban Farms (FIT4FOOD2030 Showcase)
- Winnow (FIT4FOOD2030 Showcase)
- KromKommer (FIT4FOOD2030 Showcase)
- FoodWINproject

Imagine

Students in small groups plan their own solution /project/action plan/breakthrough in order to address food waste;

- Potential field of application: their home, their school canteen, the school garden; the students were able to take different roles, e.g. restaurant owner

Possible extension/alternatively (to make it a deep learning module; min 1 teaching period and out of class activities)

Students

- make a survey (with a paper-based questionnaire or the myBigO app) to record their peers' daily practices at their homes, school canteens policy, local restaurants or other institutions' policies (e.g., hospitals)

have meetings with external stakeholders in order to get mentoring/feedback for devising their solution in order to address food waste.

Create (from this phase and on expansion to a deep learning module)

Students develop and pilot/implement their own solutions/projects/action plans for food waste prevention;

Potential field of application: their school canteen, their home

Students:

- make a survey to record their peers' daily practices (at their homes, or the school canteen policy),
- have meetings with externals in order to get mentoring for implementing a solution in order to address food waste.

Students are guided/suggested to collaborate in this effort, with CSOs, NGOs, e.g. in Greece: <https://boroume.savingfood.eu/en-us/Donor-Registration> or the local municipality (social store) e.g. in Greece: <http://www.pallini.gr/pages/koinoniko-pantopoleio>.

If more than one teaching periods are available, the Teacher could:

- Ask students to make their own research (e.g. literature review, via web or contacting experts) in order to spot other interesting showcases (focusing on local ones)
- Make reference also to the 17 UN Sustainable goals; focusing particularly on Goal 12: Responsible consumption and productions and Goal 2: Zero Hunger
- Present the concept of Responsible Research and Innovation
- Present more showcases around food waste (international, national and local ones if applicable) to students.
- Ask students to pick up one of the showcases to discuss in groups of 3-4 students then critically assess them and write down possible enablers and barriers for their wide implementation
- Provide some examples of criteria (e.g. how successful, adaptable, applicable the showcases could be in other contexts, effective) and invites students in groups to think about the criteria that matter to them and rank them. Then, the discussion is done in the plenary; each team delegate presenting and finally reaching to a consensus.
- Ask students to write down mottos for preventing food waste and finally students vote for the most successful ones.

Share

Students:

- write an article to the blog of their school, in the school newspaper
- organise a thematic evening in the end of the school year where they present the outcomes of their project to their families and local stakeholders, as well as recommendations for citizen conscience (mottos)
- publish their projects to the Open School Journal for Open Society (describing the systemic approach they followed)

ANNEXES

Powerpoint presentation, available separately

City Lab Barcelona/FIT4FOOD2030 Catalonia: Fostering change I (Validating a system map and identifying areas where changes are needed)

Fostering change in your system for the promotion of healthy and sustainable diets

Part 1: Validating a system map and identifying areas where changes are needed

This module and the system map that it uses were developed by the Living Lab for Health at IrsiCaixa (Rosina Malagrida, Marina Pino) based on the results obtained within the FIT4FOOD2030 Catalonia’s network during two series of workshops that took place in Barcelona during September 2018 and March 2019 with the involvement of more than 55 actors from the region of Catalonia. This activity is based on the previous work developed in this region with a high investment in human resources. Our hypothesis is that it could be used in other regions in order to make it more cost-effective. However, we have not tested if the map can be useful for other regions. With this activity we invite you to test its effectiveness in other contexts.

**Living Lab
for Health**

IrsiCaixa
Institut de Recerca de la Sida

AT A GLANCE

Thematic Area	Food systems, healthy and sustainable food, health promotion, Responsible Research and Innovation (RRI), system approach
Format	Workshop with a problem-based learning approach. It is also recommended to conduct previous interviews with local key stakeholders identified among the target audience to validate the map and the format of the workshop
Duration	4-5h (plus extra time for coffee breaks)
Type of audience	Stakeholders representing different sectors and disciplines related to food systems: research and innovation communities, industry representatives, policy makers, civil society organisations and the education community. Some examples are: policy makers in charge of food innovation, public health experts, health care providers, patients’ associations, consumers’ organisations, food and agriculture producers and industry, researchers working in a wide variety of disciplines, innovators, research and innovation funding organisations,

	<p>educators, communicators and journalists and environmental organisations.</p> <p>However, it can also be adapted to other audiences such as students in Higher Education (as the activity covers a wide range of disciplines, it can be appropriate for different degrees and subjects)</p>
Age group	18-99
Number of participants	Recommended maximum 20-30 people divided in groups depending on the number of facilitators
Prerequisites for participation	<p>None</p> <p>However, the level of knowledge needed will differ depending on the expected results.</p>
Number of facilitators	1 facilitator per group (we recommend groups no larger than 8 to 10 participants)
Overall difficulty	<p>Topic: Intermediate. The participants work on the complexity of the food system and the need to move towards collective action and collective research & innovation using a system and transdisciplinarity approach and following the process requirements described within the Responsible Research and Innovation (RRI) framework.</p> <p>Preparation: Intermediate</p> <p>Facilitation: Expert. Need to have some knowledge on food systems, systems approach, RRI and transdisciplinarity.</p>

OVERVIEW

This activity aims to:

- 1) Facilitate reflection and learning around the system of promotion of healthy and sustainable diets by building consensus on a shared vision and adapting a pre-designed system map to a local context
- 2) Identify areas of the system where changes are needed

OVERALL AIM

This activity is focused on the challenge of promotion of healthy and sustainable diets. It facilitates the necessary learning to open meaningful conversations around the present complexity of the system and the needs to change.

The participants are invited to exchange their perspectives and experiences around the challenge and to check if its main problems and behaviours are represented in a system map facilitated by the organisers. They adapt it with their inputs to their local context and then they identify areas where change is needed. They gain a sense of urgency to think and work in a more systemic and transdisciplinary manner to change the system starting during a follow up activity (part 2).

Through this activity, each participant becomes a “systemic change agent” and gains knowledge and competencies to reflect and better understand its local system, exploring the interconnections happening between different subsystems and variables.

SPECIFIC (LEARNING) OBJECTIVES

A list of the learning objectives that students must reach by working through this module is detailed below. The aims are normally broken down into three categories (conceptual, procedural and behavioural).

Conceptual objectives

- Understand the complexity of the system and the need to address its problems taking into account different variables identified within academic disciplines or by stakeholders’ perspectives.
- Examine the dynamics among food, health, society and the environment and how they relate to each other.
- Contribute to build knowledge about the key variables that play a key role in the current dynamics in the food system in regard to the system of promotion of healthy and sustainable diets.
- Describe and speculate about system changes and areas where each participant would like to see change.

Procedural objectives

- Participate in debates on the system of promotion of healthy and sustainable diets and its related variables.
- Facilitate mutual learning among different stakeholders and academic disciplines
- Take decisions taking into account the complexity with the different perspectives and disciplines.
- Apply system approach methodologies.
- Reflect on the importance of system approach as a problem-solving method.

Behavioural objectives

- Align participants with a shared purpose or vision for the system.
- Gain awareness of the importance to promote individual, organizational and systemic changes towards a more healthy and sustainable food system.
- Self-reflection on individual’s, organizational’s and systemic roles in the system and its potential to contribute towards change.

- Form an opinion and be able to participate in an informed debate around the promotion of healthy and sustainable diets with a systemic vision.

SUGGESTED SCENARIO FOR IMPLEMENTATION

This activity has been specifically designed to be implemented in a non-formal education context with professionals that aim to work collectively on a strategy for changing the system of promotion of healthy and sustainable diets in their local context. However, we believe it can be adapted to different circumstances or scenarios. For example, it could take place:

- Within projects aiming to transform the local system of promotion of healthy and sustainable diets
- Within a classroom aiming to build knowledge around the promotion of healthy and sustainable diets
- During a congress for participants to build knowledge around the promotion of healthy and sustainable diets and for organisers to adapt and improve the map with new perspectives

TOPICS & COMPETENCES COVERED BY THE ACTIVITY

Thematic area(s)	Food systems integrating a wide diversity of disciplines (see “type of audience” above), healthy and sustainable food, Responsible Research and Innovation (RRI), system approach
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FOOD2030 Research & Innovation priorities

<i>Priority</i>	<i>Indicate whether main or secondary</i>	<i>Addressed through</i>
Circularity & Resource Efficiency	Secondary (for environmental resources)	Not covered
	Main (resource efficiency for human and economic resources)	The activity aims to build a collective strategy with the aim to improve resource efficiency in the system.
Innovation & Empowerment of Communities	Main	Through a system approach, participants are encouraged to understand differently the food system, seeing not just parts but the whole system itself. This process helps to change current innovation processes by avoiding linear thinking, and promoting solutions developed, prototyped and tested using

		multistakeholder and iterative experiments to gain feedback and make sure that the solutions are more adapted to the different stakeholders' needs. The final aim is to develop solutions that have a higher impact.
Nutrition & Health	Main	The overall aim of activity, which is to promote food and nutrition security within the participants' local context, among other objectives.
Climate & Sustainability	Secondary	The inclusion of one variable in the map (e.g. sustainability), although this aspect is not covered in depth as it was not a priority of this activity.
Responsible Research and Innovation (RRI)		
<i>Related concept</i>		<i>Addressed through</i>
"Responsible research and innovation is an approach that anticipates and assesses potential implications ...		Collective deliberations among different stakeholders that analyse and carry out future oriented reflection on the potential implications of the current dynamics and on how to change them.
...and societal expectations with regard to research and innovation, ...		The process involved a wide variety of perspectives to make sure that their needs and expectations are taken into account.
...with the aim to foster the design of inclusive and sustainable research and innovation."		The stakeholders identify areas where change is needed, which in the follow up activity (part 2) will be translated into a plan with research and innovation lines and actions. Therefore, the plan will be defined with the inclusion of stakeholders who will collectively prioritize them taking into account sustainability criteria.
Research & Innovation (R&I)		
<i>Related concept</i>		<i>Addressed through</i>
Research and Innovation lines		Validation and adaptation of the system map: the map serves as a tool to identify relevant areas of the food system where either actions

	or research and innovation lines can lead to desired changes.
(Food) Systems thinking	
Through the systemic map, participants better understand the complexity of the system with its interconnections between variables and stakeholders involved in the promotion of a healthy and sustainable food system. It leads participants to develop critical thinking skills and to become aware of how changes in one part of the system affect other parts. It also fosters participants to build self-awareness and self-agency to understand and address the complex problems in their local context with an RRI and systems approach.	
Potential of bringing the arts, socio-economic science and humanities creatively or trans-disciplinarily with the module?	
This module includes socio-economic and humanities expertise, as the map was developed taking into account some experts in these fields. The participants to be invited (see “type of audience”) also include these disciplines.	

TARGET AUDIENCE	
Audience category	Professionals representing different stakeholders and academic disciplines, but it can be also adapted to general public or other audiences such as students in Higher Education
Recommended number of participants	Between 20- 30 participants. If the workshop happens to have low profile attendees, we recommend to organise further workshops to assure diversity of expertise until data saturation.
Recommended age	From 18
Prerequisites	Advanced knowledge is not needed but if the aim is to build a robust system map, the more knowledge participants have, the richer the result will be.

OPTIONS FOR MULTI-STAKEHOLDER ENGAGEMENT	
<i>Stakeholder</i>	<i>Role envisaged in the activity</i>
Other stakeholder such as students, families, local businesses or citizens can be involved in the educational module.	Participants

SETTING UP THE MODULE


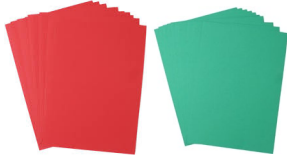


FACILITATION/DELIVERY

The facilitator should:

- Create a comfortable environment
- Develop a structure that allows participation from all the members that makes their ideas heard
- Support all the ideas that have been said
- Make a good management of the time spent
- Send a summary of the results to all participants after the workshop and invite them to validate the resulting map online. If more workshops are organised, the results of all of them can be shared and all participants can give feedback until online consensus is reached.

RESOURCES

Physical materials

<i>Resource name</i>	<i>Picture</i>	<i>Number</i>
Sticky notes in 2 different colours		50
Green and red cards		50 of each colour
System map and evaluation form		1 system map for each workgroup, one to be displayed on the wall (bigger copy) and one evaluation form per participant
Flipchart or blackboard		One to display the map where different areas will be highlighted.

Office supplies (pencils, pens, marker pens, blank sheets, etc.).		Minimum 1 set per participant
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Useful links, videos, articles

- Food2030 [strategy](#)
- [Play decide](#) around food systems
- Methodologies for visioning Food Systems from [Deliverable 1.1](#) of FIT4FOOD2030
- [Video on food system](#)'s complexity developed by The Lancet

PREPARING THE SETTING

- Room with several tables and chairs for working in groups of 5-7 people
- Flipchart to display the system map
- Tables for keeping the materials
- Tables for the facilitators
- Computer

DETAILED DESCRIPTION OF THE MODULE SCRIPT

Steps

1. Welcome and presentation of the objectives and the program. Presentation of the attendees. Signature of an informed consent (previously approved by an Ethical Committee).

Recommended duration: 30 min

2. Exploration and analysis of the current food system. Recommended duration: 1h and 15 min

Ask participants to reflect about the problems and opportunities of the current food system. Distribute marker pens, green and red cards among the tables (6-10 of each). Explain that they will need to write down the opportunities in green cards, whereas the obstacles will be written down in the red cards (maximum of 8-10 words per card). Participants are invited to reflect individually, and then to share their perspectives with the rest of the group and agree on cards to present.

After that, the results of each group are presented and the facilitator clusters them. After each participant presents one card, the other groups also add cards in case they belong to the same cluster. Once all the information is clustered, she reflects on the results and explains participants that in the following session on visioning, the exploration of the current food system is important when defining an achievable vision.

3. Development of a shared vision Recommended duration: 60 min.

Visioning is a methodology used to create a shared strategy that aims to achieve a desired future. Stakeholders reflect on what they would like to see or happen in the Food System and its interconnected subsystems.

Within the FIT4FOOD2030 Project several methodologies for vision development have been described. Find below a possible methodology adapted from the project:

- Divided in several groups, ask participants to think about an upcoming year (e.g. 2030) and envisage what changes have happened within the Food System that have allowed to promote healthy and sustainable food.
- Ask them to write down their thoughts on at least 2 posts it or A5 papers (only one idea per post it or paper) and then to share with the work group.
- Once there is consensus within the work group, ask participants to share their vision with the rest of the groups. Each group shares its post it's while they present them to the rest of participants.
- The facilitator, clusters them and, once all the information is clustered, she reflects on the results and possible different perspectives among actors.

Ask participants for a final consensus of the **vision**: ask them to reflect if anything is missing and if they agree on it.

Note: if the organisers have previously organised workshops with the participants where they already defined a vision, they can alternatively ask participants to validate the existing vision.

Optional supporting materials can be found in the Food2030 [strategy](#) of the EC: the FOOD2030 cyclic figure, FOOD2030 definition of a future-proof food system and FOOD2030 four priority areas, and the video presenting the strategy.

Before starting with the visioning exercise, if the participants are not experts in the field, other optional activities can be offered such as: the card game around food issues called [play decide](#), one methodology that uses photos as a starting point for analysing the food system, its opportunities and obstacles and the transformation needed that can be founded in [Deliverable 1.1](#), or display a [video on food system](#)'s complexity developed by The Lancet.

3. Reflection around the areas of the system where participants would like to see changes

3.1 Reflection around the current food system and adaptation and validation of the map to participants' local context *Recommended duration: 1h and 30min*

On the basis of the system map facilitated by The Living Lab for Health at IrsiCaixa, participants split up in different groups. If they are experts, they will split among common interests, such as: social, economic, education, communication...

They are handed out a paper copy of the system map. They start to observe its different variables and their interconnections by starting to focus on one particular group of interconnected variables. They are asked to analyse the dynamics and reflect on the following questions:

- *Is the map useful for understanding the current dynamics and their causes and consequences?*
- *Do you agree with the dynamics described?*
- *Would you recommend improvements?*

- *Are variables and/or, interconnections missing?*

Participants edit the map by adding comments, variables, and new connections drawing on the map with pens.

3.2 Identification of areas where changes should happen *Recommended duration: 20min*

In groups, participants reflect on the edited system map:

Where would you like to see changes?

Indicate with a marker pen areas including some variables which they think are the most interesting to provoke change, i.e. which are the leverage areas, taking into account aspects such as urgency and feasibility.

Presentation of the results to the other work groups. As the participants present, all the areas are marked on one single map which is displayed on the wall.

4. Wrap up and evaluation. *Recommended duration: 15 min*

The facilitator leads a reflection on the different areas where participants think there should be change. She invites them to come to the follow up activity (part 2) to design a strategy to implement changes in these areas.

She thanks all the participants for their contribution. Finally, she asks participants to fill in the evaluation form.

Before leaving the room, the facilitator takes notes of the vision obtained and also pictures of the post its and the map with the areas where change is needed marked with a pen, to make sure they will be available during the follow up activity (part 2).

DEVELOPERS

This module was developed by The Living Lab for Health at IrsiCaixa (Rosina Malagrida, Marina Pino) based on the results obtained within the FIT4FOOD2030 Catalonia's network during two series of workshops that took place in Barcelona during September 2018 and March 2019 with the following participants:

Elena Gayán (Centre for Pedagogical Resources to Support Research and Innovation in Education); Mariona Chavarria (Biblioteca del Fondo); Pol Llonch (Animal welfare, Autonomous University of Barcelona); Anna Castellví (Food and Agriculture Transfer and Innovation Department, Government of Catalonia); Clara Solé (Food Control Department, Government of Catalonia); Francesc Puiggròs (Eurecat), Jaume Sió (Food and Agriculture Transfer and Innovation, Government of Catalonia); Josep Brosa (Celiac Association); Josep Pascual (Business Development & Innovation at XaRTA); Laia Badal (Alicia Foundation); Laura Casado (Health Department, Government of Catalonia); Lluïsa Valls (Can Rac - production of cured meat products); Tatiana Fernández (Economy Promotion at Economics Department, Government of Catalonia); Anna Bach (Food Lab, Open University of Catalonia); Carla Estany (Fight Aids Foundation); Carles Ariza (Public health agency in Barcelona); M. Carme Verdaguer (Bosch i Gimpera Foundation); Cristina Andrés-Lacueva (Food Metabolomics Research Group, University of Barcelona); Elisabetta Broglio (Citizen Science Office); Fàtima Crispi (Fetal Medicine Barcelona); Gonzalo Casino (Scientific

Communication Observatory UPF); José Manuel Fernández-Real (University of Girona); Maria José Miranda (Escola Virolai); Sergi Gallardo (Education Department of the Government of Catalonia). Glòria Cugat (Food Control, Government of Catalonia); Mireia Espallargues (AQuAS), Sònia Chavero (Diputació de Barcelona); Ignasi López (La Caixa Foundation); Maria José Plana (Bioethics and Law Observatory); Núria Martí (BioCat); Montserrat Cruz (EIT Health, University of Barcelona); Agustí Fonts (IRTA); Màrius Rubiralta (Food and Nutrition Torribera Campus, University of Barcelona); Imma Palma (Ramon Llull University), Olga Castañer (Hospital del Mar Medical Research Institute); Tomàs Miralles (higher education); Jesús Contreras (ODELA, University of Barcelona); Antoni Gual (Hospital Clínic); Hugo López (Hospital Clínic); Juan M. Viejo (Food+i); Yvonne Colomer (Triptolemos Foundation); Elena Roura (Alicia Foundation); Toni Massanés (Alicia Foundation); Álvaro Cristóbal (Leitat); Carlos Chetrit (ADreamUP); Juan Carlos Moreno (Corporación Tecnológica Andalucía); Amaya Prat (Ametller Origen); Diana Roig (Unilever); Pilar García (ESCOOL); Eulàlia Hernández (eHealth Open University of Catalonia); Magalí Palau (Food Metabolomics Research Group, University of Barcelona), Diana Escobar (ICUB); Sara Bujalance (ACAB); Marco Inzitari (Parc Sanitari Pere Virgili); Cristina Sáez (freelance journalist); Josep Carreras (Living Lab for Health); Marta Castells (writer); Miriam Sánchez (ITA Salud Mental), Alba Oms (Sant Andreu Salut). This module has been developed also with the assessment of Christoph Hinske.

A check for scientific accuracy was done in a previous version of the map, which was later simplified into a new version with a smaller number of variables. This new version will be checked in future workshops. The English language translation will be checked at the end of this process.

REFERENCES

http://educators.brainpop.com/wp-content/uploads/2014/07/IOP_QDesignPack_SystemsThinking_1.0.pdf

ANNEXES

“FIT4FOOD2030_Catalonia_evaluation_forms”

“FIT4FOOD2030_Catalonia_system_map”

City Lab Barcelona/FIT4FOOD2030 Catalonia: Fostering change II (Building visions for concrete areas of the system and action plans for change)

Fostering change in your healthy and sustainable food system with a system approach and strategic conversations

Part 2: Building visions for concrete areas of the system and action plans for change

This module and the system map that it uses were developed by the Living Lab for Health at IrsiCaixa (Rosina Malagrida, Marina Pino) based on the results obtained within the FIT4FOOD2030 Catalonia’s network during two series of workshops that took place in Barcelona during September 2018 and March 2019 with the involvement of more than 55 actors from the region of Catalonia. This activity is based on the previous work developed in this region with a high investment in human resources. Our hypothesis is that it could be used in other regions in order to make it more cost-effective. However, we have not tested if the map can be useful for other regions. With this activity we invite you to test its effectiveness in other contexts.

**Living Lab
for Health**

IrsiCaixa
Institut de Recerca de la Sida

AT A GLANCE

Thematic Area	Food systems, healthy and sustainable food, health promotion, Responsible Research and Innovation (RRI)
Format	Workshop with a problem based learning approach + previous interviews with local key stakeholders identified among the target audience to validate the format of the workshop
Duration	2h 30min (add extra time for coffee breaks)
Type of audience	<p>Stakeholders representing different sectors and disciplines related to food systems: research and innovation communities, industry, policy makers, civil society organisations and the education community.</p> <p>Some examples are: policy makers in charge of food innovation, public health experts, health care providers, patients’ associations, consumers’ organisations, food and agriculture producers and industry, researchers working in a wide variety of disciplines, innovators, research and innovation funding organisations,</p>

	<p>educators, communicators and journalists and environmental organisations.</p> <p>However, it can also be adapted to general public or other audiences such as students in Higher Education (as the activity covers a wide range of disciplines, it can be appropriate for different degrees and subjects)</p>
Age group	18-99
Number of participants	Recommended 20-30 people divided in groups depending on the number of facilitators (
Prerequisites for participation	<p>None</p> <p>However, the level of knowledge needed will differ depending on the expected results</p>
Number of facilitators	1 facilitator per group (we recommend groups no larger than 8 to 10 participants)
Overall difficulty	<p>Topic: Intermediate. The participants work on the complexity of the food system and the need to move towards collective action and collective research & innovation using a system and transdisciplinarity approach and Responsible Research and Innovation (RRI).</p> <p>Preparation: Intermediate</p> <p>Facilitation: Expert. Need to have some knowledge on food systems, systems thinking, RRI and transdisciplinarity.</p>

OVERVIEW

This activity aims to:

- 1) Identify leverage points (i.e. the areas to intervene more effectively in the food system) where participants want to see change and an intervention is needed.
- 2) Co-define a vision for the specific area of the system map
- 3) Define an action plan with R&I lines and actions

OVERALL AIM

This activity facilitates the development of action plans to move towards the desired system of promotion of healthy and sustainable diets envisaged during the first workshop by working in different challenges and identifying leverage points.

The learning is facilitated by the identification of key variables that could help to move the system towards change.

SPECIFIC (LEARNING) OBJECTIVES

A list of the learning objectives that students must reach by working through this module is detailed below. The aims are normally broken down into three categories (conceptual, procedural and behavioural).

Conceptual objectives:

- Understand the complexity of the system and the need to address its problems taking into account different factors, academic disciplines and actors
- Understand the need to work in a transdisciplinary manner when defining possible solutions

Procedural objectives

- Apply system approach methodologies
- Apply visioning methodologies
- Facilitate mutual learning among different stakeholders and academic disciplines
- Participate in debates on the system of promotion of healthy and sustainable diets and its related variables
- Take decisions taking into account the complexity with the different perspectives and disciplines
- Design roadmaps for change through the development of action plans
- Reflect if better solutions are achieved through collective actions

Behavioural objectives

- Align participants with a shared purpose or vision for concrete areas of the system
- Gain awareness of the importance to promote changes towards a more healthy and sustainable food system
- Self-reflection on individual's roles in the system and its potential to contribute towards change
- Form an opinion and be able to debate different aspects regarding the promotion of healthy and sustainable diets

This activity has been specifically designed to be implemented in a non-formal education context with professionals that aim to work collectively on a strategy for change in their local context. However, we believe it can be adapted to different circumstances or scenarios. For example, it could take place:

- Within projects aiming to transform the local food system
- Within a classroom aiming to build knowledge around the food system
- During a science festival to build knowledge around the food system





TOPICS & COMPETENCES COVERED BY THE ACTIVITY		
Thematic area(s)	Food systems, healthy and sustainable food, health promotion, RRI, system approach	
<u>FOOD2030 Research & Innovation priorities</u>		
<i>Priority</i>	<i>Indicate whether main or secondary</i>	<i>Addressed through</i>
Circularity & Resource Efficiency	Secondary (for environmental resources)	Not covered
	Main (resource efficiency for human and economic resources)	The activity aims to build a collective strategy with the aim to improve resource efficiency in the system.
Innovation & Empowerment of Communities	Main	Through a system approach, participants are encouraged to understand differently the food system, seeing not just parts but the whole system itself. This process helps to change current innovation processes by avoiding linear thinking, and promoting solutions developed, prototyped and tested using multistakeholder and iterative experiments to gain feedback and make sure that the solutions are more adapted to the different stakeholders' needs. The final aim is to develop solutions that have a higher impact.
Nutrition & Health	Main	The overall aim of activity, which is to promote food and nutrition security within the participants' local context, among other objectives.
Climate & Sustainability	Secondary	The inclusion of one variable in the map (e.g. sustainability), although this aspect is not covered in depth as it was not a priority of this activity.

Responsible Research and Innovation (RRI)	
<i>Related concept</i>	<i>Addressed through</i>
“Responsible research and innovation is an approach that anticipates and assesses potential implications ...	Collective deliberations among different stakeholders that analyse and carry out future oriented reflection on the potential implications of the current dynamics and on how to change them
...and societal expectations with regard to research and innovation, ...	The process involved a wide variety of perspectives to make sure that their needs and expectations are taken into account
...with the aim to foster the design of inclusive and sustainable research and innovation.”	The stakeholders identify areas where change is needed, which in the follow up activity (part 2) will be translated into a plan with research and innovation lines and actions. Therefore, the plan will be defined with the inclusion of stakeholders who will collectively prioritize them taking into account sustainability criteria.
Research & Innovation (R&I)	
<i>Related concept</i>	<i>Addressed through</i>
Research and Innovation lines	Validation and adaptation of the system map: the map serves as a tool to identify relevant areas of the food system where either actions or research and innovation lines can lead to changes. Based on this reflection, participants design an action plan targeted to the areas identified.
(Food) Systems thinking	
Through the development of action plans, participants realize that the potential solutions outlined in the action plans need to take into account in which part of the system they are located and which connections might have with other parts of the system. It leads participants to reflect on potential non- compartmentalized solutions that embrace complexity.	
Potential of bringing the arts, socio-economic science and humanities creatively or trans-disciplinarily with the module?	
This module includes socio-economic and humanities expertise, as the map was developed taking into account some experts in these fields. The participants to be invited (see “type of audience”) also include these disciplines.	

TARGET AUDIENCE	
Audience category	Professionals representing different stakeholders and academic disciplines, but it can be also adapted to general public or other audiences such as students in Higher Education
Recommended number of participants	Between 20-30 participants. If the workshop happens to have low profile attendees, we recommend to organise further workshops to assure diversity of expertise until data saturation.
Recommended age	From 18
Prerequisites	Advanced knowledge is not needed but if the aim is to build a robust system map, the more knowledge participants have, the richer the result will be.

OPTIONS FOR MULTI-STAKEHOLDER ENGAGEMENT	
<i>Stakeholder</i>	<i>Role envisaged in the activity</i>
Other stakeholder such as students, families, local businesses or citizens can be involved in the educational module.	Participants

SETTING UP THE MODULE
FACILITATION/DELIVERY
<p>The facilitator should:</p> <ul style="list-style-type: none"> ○ Create a comfortable environment ○ Develop a structure that allows participation from all the members that makes their ideas heard ○ Support all the ideas that have been said ○ Make a good management of the time spent ○ Send a summary of the results to all participants after the workshop and invite them to validate the resulting R&I action plans. If more workshops are organised, the results of all of them can be shared and all participants can give feedback until online consensus is reached.

RESOURCES		
<i>Physical materials</i>		
<i>Resource name</i>	<i>Picture</i>	<i>Number</i>
Sticky notes in 2 different colours		50
System map		1 for each workgroup and the map that was displayed on the wall during part 1 where the areas where change is needed were highlighted
Flipchart		1 per workgroup and one to display the map with the areas highlighted.
Office supplies (pencils, pens, marker pens, blank sheets, etc.).		Minimum 1 material per participant
Vision obtained during part 1 and picture of the map with the areas where change is needed highlighted	Copies of a document written by the facilitator	1 per each participant
Scenario and R&I action plans template	See document "FIT4FOOD2030 Catalonia_scenario&action plan"	1 per each group of participants
PREPARING THE SETTING		
<ul style="list-style-type: none"> • Room with several tables and chairs for working in groups of 5-7 people. • Flipchart to display the system map and other flipcharts to design the action plans. • Tables for keeping the materials • Tables for the facilitators 		

- Computer

DETAILED DESCRIPTION OF THE MODULE SCRIPT

Step

1. Welcome and presentation of the objectives and the program. Presentation of the attendees. Signature of an informed consent (previously approved by an Ethical Committee).

Recommended duration: 15 min

2. Design of the prototypes of scenarios and roadmaps *Recommended duration: 1h*

Prior to the activity, facilitators replicate on each flipchart the document “*Fit4Food Catalonia scenario & action plan*” in order to adapt it to a bigger size. The systems map are distributed for each table, as well as the other materials: paper describing the vision and a picture of the map with the areas where change is needed marked (obtained in part 1), sticky notes, pencils, pens, etc...

2.1 Participants individually read the **vision** defined during part 1 and revise the system map on the wall where the areas where change is needed are highlighted. As a group, participants **identify key variables/factors** where they would like to focus their strategic plan for change:

Imagine you are now in 2030 and you have been successful. Which factors from the map have been key to achieve the vision defined during part 1, and have enabled us to be more successful in improving the subsystem?

They mark a total of 3-5 factors on their map and they are also written on the “*Fit4Food Catalonia_scenario&action plan*” document.

2.2 Individually, they reflect on the specific variables on which they would like to see changes for 2030 and write elements for a **new vision** focused on those. The elements are written by each participant on a post it. Then they share the post its and arrive to a consensus on a **shared vision for their strategic plan for 2030**. They write it on the “*FIT4FOOD2030 Catalonia_scenario&action plan*” document.

2.3 As a group, participants decide on the **boundaries of the strategic plan** where they want to see this vision achieved (international, national, local, specific context...).

3. Development of action plans *Recommended duration: 1h*

Using the flipchart, participants identify **R&I lines** and **actions** targeted at different key variables or factors (at individual, organizational and systemic levels). They also identify the **stakeholders** that should collaborate and the **part of the process** where they will be engaged.

Finally, each group explains the results to the other group(s).

4. Wrap up and evaluation *Recommended duration: 15 min*

The facilitator leads a reflection on the different variables where participants think there should be change and thanks all the input for R&I lines and actions.

She explains that she will distribute the final visions and R&I lines and actions with an online tool where participants will be able to put them in order of priority and to express their commitment to contribute in future workshops.

She invites them to think if future meetings would be interesting for their implementation and whether they think that it would be worth starting to constitute a transformative network.

She thanks all the participants for their contribution. Finally, she asks participants to fill in the evaluation form.

DEVELOPERS

This module was developed by The Living Lab for Health at IrsiCaixa (Rosina Malagrida, Marina Pino) based on the results obtained within the FIT4FOOD2030 Catalonia's network during two series of workshops that took place in Barcelona during September 2018 and March 2019 with the following participants:

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A check for scientific accuracy was done in a previous version of the map, which was later simplified into a new version with a smaller number of variables. This new version will be checked in future workshops. The English language translation will be checked at the end of this process.

REFERENCES

Helen P. N. Hughes, Chris W. Clegg, Lucy E. Bolton & Lauren C. Machon (2017) Systems scenarios: a tool for facilitating the socio-technical design of work systems, *Ergonomics*, 60:10, 1319-1335, DOI: [10.1080/00140139.2017.1288272](https://doi.org/10.1080/00140139.2017.1288272)

ANNEXES

“FIT4FOOD2030 Catalonia_scenario&action plan”

“FIT4FOOD2030 Catalonia_evaluation_forms”

“FIT4FOOD2030_Catalonia_system_map”

City Lab Budapest: System Thinking for Food System Sustainability – template

Systems Thinking for Food System Sustainability

This module was created by Diana Szakál (ESSRG) incorporating insights from discussions with Bálint Balázs (ESSRG) and results and insights derived from individual stakeholder consultations and workshops. Parts of the module were inspired by and/or incorporate elements of the following materials developed by FIT4FOOD2030 project partners: trend cards, showcases, and the food systems diagram.


AT A GLANCE

Thematic Area	Food systems, system thinking, systems practice
Format	<ul style="list-style-type: none"> - 4 x 3hr co-creative, experiential workshops (spread across 5-8 weeks) - Online learning platform with 7.5 hours' worth of content available to participants simultaneously - Local stakeholder engagement via individual sessions
Duration	<ul style="list-style-type: none"> - 12 hours of facilitated workshop time - 7.5 hours individual work using the online component - 3 hours dedicated to preparation and stakeholder meeting - Optional: additional 3x2hrs for group practice
Type of audience	Open (university students, professionals, etc.)
Age group	Open, but recommended for 16+
Number of participants	12 - 20
Prerequisites for participation	There are no prerequisites
Number of facilitators	Minimum 1
Overall difficulty	<p>Topic: <i>intermediate</i></p> <p>Preparation: <i>intermediate</i></p> <p>Facilitation: <i>intermediate/advanced</i></p>

OVERVIEW

The current module offers a blended approach incorporating offline facilitated sessions, stakeholder consultations, individual and group home study, as well as, an online learning platform.

During the offline component of the course, participants are guided through a co-creative, experiential learning based process towards deeper system understanding. They form teams of 3-4 people and choose a real challenge from their local food system that they would like to work on. Course members are introduced to various systems thinking and systems practice methodologies that target developing their ability to organize their thinking, manage complexity and instead of being overwhelmed by it, use it as a fertile soil for spotting new opportunities. The activities and reflections of the course aim to support participants in first recognizing, and then increasing their sphere of influence and finding their own ways to create positive impact in the food system, let it be via their individual behaviour, small communities or respective organizations.

The online component encourages participants to think critically about various ways food impacts the health of the population, society at large and our natural environment currently and in the future. It supports users in developing a deeper understanding of how the different aspects of a system influence each other and how a system itself is affected by its context. Participants are guided through four prevalent perspectives of our food system (mainstream, sociology, ecology and health), reflecting on the main trends that supported the development of the paradigm, the key challenges, approaches and tools, as well as, the blind spots of the perspective. The learning management system of the course includes weekly readings and a database of additional resources, articles, videos and stories from the field for students who wish to explore further about the topics on their own.

The module supports participants on their own learning journey regarding their role and responsibilities within our global food system, increasing self-awareness, by reflection and (co-)creation exercises. By the end of the course participants will have created and reflected on their own map of the food system in an iterative process, as well as, have taken part in several individual experiments and self-reflection exercises with regards to their food system related habits.

OVERALL AIM

The course aims to spread food system thinking and encourage participants to approach the food system holistically and critically and with multiple perspectives in mind, while taking responsibility for their own actions as a member of the system.

SPECIFIC (LEARNING) OBJECTIVES

After the successful completion of this module participants are expected to be able to...

- Identifying the main elements of the food system
- Describe the most prevalent paradigms that exist with regards to the food system
- Examine the food system from a critical perspective

- Explain how diet, food production, the environment, equity, population and resources inter-relate to impact each other
- Reflect on their own role and responsibility as a food system actor more clearly and consciously
- Point out the main challenges and controversies that exist within the food system
- Apply a systemic approach to a given problem or challenge
- Use various system thinking tools and methods that can support navigating complexity
- Contribute to (inter/transdisciplinary) collaborative projects more effectively

SUGGESTED SCENARIO FOR IMPLEMENTATION

The module has already been tested with the participation of **university students** and **young professionals with diverse backgrounds** and is suitable to be offered as an **open course for adult learners**.

It is designed to be implemented as an evening course over the course of several weeks. However, it is also suitable to be implemented in a university setting or in a modified format, can be rolled out with the participation of high school students.

The online and offline components are designed to support each other; however, they can also be implemented separately. The offline sessions are centred around experimentation and experiential learning that all target the development of the competency of systems thinking. The online learning management system provides the necessary background information and lexical content that participants can build on during the offline sessions.

The material is also appropriate for learning communities or small groups wishing to create a Community of Practice. In this case, the readings can be processed at home and then discussed in a group setting even without an experienced facilitator.

TOPICS & COMPETENCES COVERED BY THE ACTIVITY

Thematic area(s)

General food system approach

FOOD2030 Research & Innovation priorities

All four main priorities are given focus during the course. The extent to which each of them is dealt with in detail during the offline component depends on what specific food system challenge participants decide to work on.

<i>Priority</i>	<i>Indicate whether main or secondary</i>	<i>Addressed through</i>
Circularity & Resource Efficiency	Secondary	The importance of circularity and reducing environmental footprint is mentioned various times in the online component
Innovation & Empowerment of Communities	Main	Addressed in Chapter 5 of the online component

Nutrition & Health	Main	Addressed in Chapter 4 of the online component
Climate & Sustainability	Main	Addressed in Chapter 3 of the online component
Responsible Research and Innovation (RRI)		
<i>Related concept</i>		<i>Addressed through</i>
Self-awareness		Reflective exercises both in the online and offline component
Responsible long-term thinking		Future trends, challenges
(Transdisciplinary) collaboration		Participants need to collaborate in creating and reviewing their conceptual maps of the food system
Future-oriented ethical abilities		Considering ethical aspects in the environmental, health and social equity realms
Research & Innovation (R&I)		
<i>Related concept</i>		<i>Addressed through</i>
Analytical thinking		Practicing breaking down complex information
Critical thinking		Specific learning objective
Navigating complexity or wickedness		Going through an iterative system understanding process, conscious reflection on divergent and convergent phases of the process, creating a systems map
Pro-activity		Choosing a challenge, finding a stakeholder to discuss their map with
(Food) Systems thinking		
<p>The whole module is focused on and designed around the development of food system thinking. The offline component contains various exercises that target the development of this competency, such as, specific reflection questions, tools for system analyses understanding, as well as, the creation of shared conceptual maps of the food system. It is further supported by the content and the theoretical component of the online course: each chapter is dedicated to a different perspective of the food system, highlighting how the given perspective influences other systems.</p>		
Other competences		
<i>Competence</i>		<i>Addressed through</i>

Sense making	Addressed through the process of iterative concept map creation
Social intelligence	Collaborative group work, stakeholder meeting
Communication ability	Group work, presentations, stakeholder meeting and interview
Potential of bringing the arts, socio-economic science and humanities creatively or trans-disciplinarily with the module?	
The socio-economic perspective is integrated in the course. Visualization and drawing-based methods are also integrated into the course. In addition to this, self-reflection exercises can be altered to bring in components from arts and/or humanities.	

TARGET AUDIENCE	
Audience category	Open (university students, professionals, etc.)
Recommended number of participants	12 - 20
Recommended age	Open, but recommended for 16+
Prerequisites	There are no prerequisites – it is possible to join from any disciplines and fields – as the course builds on the principles of transdisciplinarity and leverages the power in bringing together different perspectives.

OPTIONS FOR MULTI-STAKEHOLDER ENGAGEMENT

<i>Stakeholder</i>	<i>Role envisaged in the activity</i>
Stakeholders from different parts of the food system that represent the different perspectives that the module incorporates (agronomist, economist, sociologist, health specialist/nutritionist and someone who works in environmental conservation)	Each stakeholder will be asked to participate in an interview from which an approximately 5 minutes long video will be prepared and incorporated in the module
Various members of the FIT4FOOD2030 Budapest community, mostly from the private and the civil sector	Besides sharing their experience and knowledge in the framework of individual meetings with participants, stakeholders are envisaged to play a crucial role in the activity in the following ways: 1) guest lecturers during the facilitated session, 2) partners in organizing field trips and visit their organizations, 3) by providing cases for participants to work on.

SETTING UP THE MODULE

FACILITATION/DELIVERY

See Annex 1 – Separate document

RESOURCES

Physical materials

See Annex 1 – Separate document

Useful links, videos, articles

See Annex 1 – Separate document

PREPARING THE SETTING

See Annex 1 – Separate document

DETAILED DESCRIPTION OF THE MODULE SCRIPT

Please see Annexes 1, 2 and 3.

DEVELOPERS

This module was created by Diana Szakál (ESSRG) incorporating insights from discussions with Bálint Balázs (ESSRG) and results and insights derived from individual stakeholder consultations and workshops. Parts of the module were inspired by and/or incorporate elements of the following materials developed by FIT4FOOD2030 project partners: trend cards, showcases, and the food systems diagram.

REFERENCES

References are detailed in the Annexes.

ANNEXES

1. ANNEX 1: details the structure and content of the course
2. ANNEX 2: Power Point slides that accompany the offline, facilitated sessions
3. ANNEX 3: Script for guided visualization exercise used in the first session



System Thinking for Food System Sustainability

A Blended learning course on
Food System Thinking & Practice developed by
the Budapest City Lab



TABLE OF CONTENTS

TABLE OF CONTENTS	120
LEARNING OBJECTIVES AND COMPETENCES	121
Course objectives.....	121
Competencies	121
Course Architecture.....	123
PART I OFFLINE LEARNING WORKSHOPS.....	0
Introduction.....	0
WORKSHOP 1: SETTING THE STAGE	1
WORKSHOP 2: EXPLORATION	5
WORKSHOP 3: VISUALIZATION & DEVELOPING THE STORY OF THE SYSTEM	8
WORKSHOP 4: SPICING IT UP.....	10
WORKSHOP 5: ACTIVATION & INTEGRATION.....	10
Questions and facilitation guide for post-course feedback	12
Additional resources about Systems Thinking and Practice.....	13
Example of flyer for student recruitment.....	14
PART II Online Learning Support System	15
INTRODUCTION	15
KEY MESSAGES OF THE COURSE.....	15
REFERENCES	16

LEARNING OBJECTIVES AND COMPETENCES

Course objectives

- support participants on their own learning journey regarding their role and responsibilities within our global food system (self-awareness)
- encourage participants to think deeply about many of the different ways food impacts the health of the population, society at large and our natural environment currently and in the future (develop critical, responsible and long-term thinking)
- introduce participants to the basics of systems thinking, how the different aspects of a system influence one another and how a system itself is affected by its context
- provide practical tools and methods for system analyses and understanding
- guide participants through a process of understanding the systemic forces connected to a challenge present in the local food system in teams ((transdisciplinary) collaboration, navigating complexity, agency, proactivity)
- saw the seeds of a Community of Practice and create opportunities for network development

“Transformative learning involves experiencing a deep, structural shift in the basic premises of thought, feelings, and actions. It is a shift of consciousness that dramatically and irreversibly alters our way of being in the world” (O’Sullivan, 1999, p 237).

After the successful completion of this educational module, the participant will be able to...

- demonstrate a general understanding of the term ‘food systems’ and how diet, food production, the environment inter-relate and impact each other
- identify the main elements of the food system
- point out some of the key challenges and controversies that exist within the food system
- describe the most prevalent paradigms that exist with regards to the food system
- reflect on his/her own role and responsibility as a food system actor more clearly and consciously
- apply a systemic approach to a given problem or challenge
- use various system thinking tools and methods that can support navigating complexity
- contribute to (inter/transdisciplinary) collaborative projects more effectively

Competencies

Competencies are highly context dependent and therefore, the development of any course need to reflect the specific needs of the local environment. In the case of this educational module, the identification of the necessary competencies came from combining the general needs from literature and international assessment carried out in several European cities with the competence needs defined by local stakeholders of the Budapest City lab (members of CSOs, businesses, policy makers, educational and research institutions who are active in the local food system). The online component of the course aims to serve a broader audience, while the offline component can be specifically targeted, adapted to the needs of the local community. This supports the adaptation and implementation of the module in various contexts.

The successful completion of the course contributes to the development of various competences:

- *Food systems thinking*
- **Multi-stakeholder approach/network building competences:** *social intelligence, self-awareness, multi-perspective, communication ability*
- **Research and Innovation system competences:** Analytical thinking, Critical thinking, *navigating complexity or wickedness, pro-activity*
- **Responsible Research and Innovation competences:** Responsible long-term thinking, (Transdisciplinary) collaboration, Future-oriented ethical abilities
- *Sense making*

Course Architecture





PART I

OFFLINE LEARNING WORKSHOPS

Introduction

Our food system is a primary example of complex, adaptive systems, thus in order to successfully intervene and initiate changes that could potentially support the system in evolving and transforming into a healthier and more sustainable state a systemic approach is necessary. Gaining a deeper understanding of system thinking and system practice methodologies will guide participants in developing their ability to organize their thinking, manage complexity and instead of being overwhelmed by it, use it as a fertile soil for spotting new opportunities as well as avoiding potential risks and threats. The activities and reflections of the course aim to support participants in first recognizing and then increasing their sphere of influence and finding their own ways to creating positive impact in the food system, let it be via their individual behaviour, small communities or respective organizations.

Methodology, Format and Target Group

The offline part of the module integrates various methods used in system thinking, system practice, human centred design, system oriented and disruptive design.

All the offline sessions are designed to be highly interactive, with most of the learning exercises centred around co-creation and collaboration. All sessions are based on the principles and methodology of experiential learning, including activities that support participants in each stage of the learning cycle, and paying special attention to both active experimentation and conscious reflection.

The module is divided into *3-hour-long learning workshops* with at least a week in between the offline sessions to allow participants ample time to not only process the supporting materials available via the [online Learning Management System](#), but to also carry out additional research about their chosen challenge in the local environment.

The course has already been tested with the participation of *university students* and *young professionals with diverse backgrounds* and is suitable to be offered as an *open course for adult learners*. In addition, its modified format is planned to be tested in a secondary school setting.

TIPS FOR FACILITATION

The timing of the workshop as it is now, **presents the minimum time requirements to be able to carry out the tasks**. This requires the facilitator to be highly skilled in managing the group, paying attention to which teams need more support and being rather strict at times.



As a rule of thumb, allow 30% more time for the workshops than the planned time requirement. So, for example, in the case of not adding additional material and/or aims to the sessions detailed below, in order

In addition, if possible, it is advisable to lengthen the course, e.g. from 5 weeks to 8 weeks, and including offline sessions where participants are not shown any new material but are simply given the space and time to deepen their understanding of the tools and the local food system.

to have a more relaxed working atmosphere it is **advisable to add an extra hour of working time**.

In order to keep the focus and also help the participants feel relaxed, it is important to discuss the **framework of the course and the expectations** of the participants in the beginning. In addition to dedicating time for this during the first session, it is advisable to include a brief recap in each workshop during the check-in process that details the aims, the planned timeline (including breaks, etc.) and the guidelines of cooperation. This is an **iterative, organic and co-creative process**, so for instance, guidelines can be adapted (e.g. asking participants to stop talking when somebody puts their hand in the air and follow the example, until the whole room is silent – it is an easy and relaxed way to get back the focus after team work – was introduced during the first pilot of the course by one of the participants), or participants can be reminded of the agreement that the group collectively made during the first session.

WORKSHOP 1: SETTING THE STAGE

During the first learning workshop participants are introduced to the system thinking and system practice approach of food systems. They learn about the general characteristics of complex, adaptive systems and discuss why and how the food system can be considered as a complex and dynamic system, as well as, the advantages and disadvantages of a systemic approach.

During this introductory session, course members take part in exercises that facilitate getting to know each other, forming teams, as well as, defining the challenge in the local food system that they would like to focus on during the course. In this process they are also encouraged to reflect on their individual motivations that lead them to choose the specific challenge they would like to tackle.

Outline of the workshop:

<i>Name of Session</i>	<i>Aim of session</i>	<i>Stage of the Double Dimond</i>
Setting the stage	<ul style="list-style-type: none"> *team formation *support participants in getting to know each other *initiate the group development process *understand why system thinking is useful and necessary for food system sustainability *general introduction about systems & the food system *channel the previous knowledge and experience of participants *each team chooses a challenge *support participants in getting comfortable 	BRIEF, understanding and choosing a challenge

	with the process *create an environment conducive to learning	
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<i>Duration</i>	<i>Activity</i>	<i>Brief description of activity</i>	<i>Materials needed</i>
00:10:00	Introduction	<ul style="list-style-type: none"> *Introduce the general aims of the course and the community of practice workshops. *Introduction of the facilitator and the context of the course *Share personal story about my connection to the course and why System Thinking and FSS are important. *Talk about the practical framework (food & drinks, bathroom, limited time - policy about being late - mutual respect) 	Intro presentation slides ¹⁸
00:10:00	Check-in & Icebreaker	<p>Version A) Participants stand in a circle. Each of them introduces themselves together with a “signature movement”. The name together with the movement is repeated by the whole group.</p> <p>Version B) Gift Circle Exercise: Participants stand in a circle; one person says their name and gives an imagined gift to the one on the left of her/him. The receiving person thanks the giver (saying also their name and what they imagine they received. E.g. "Thank you, Carla, for this beautiful apple". Then say her/his name and gives a gift to the next person. (It is not important to name what the giver imagined giving.)</p>	
00:10:00	Understanding Expectations	<p>Give participants around 3 – 5 minutes to write down their answers individually to the following questions and put them up on a wall:</p> <ul style="list-style-type: none"> *"When will I feel that it was worth for me to participate in this course?" *"What am I willing to give/contribute in order for the course to be successful?" (What can you bring for your team?) *"What will help me to learn and in bringing in my talents and gifts"? (What do you ask from others?) <p>Group the post-its and reflect on them in</p>	Post-its in 3 different colours for each question. 3 big sheets on the wall with the questions written on them.

¹⁸ Please See ANNEX 2 for all the slides that accompany the offline facilitated sessions.

		the plenary. Highlight all the resources that participants mentioned that they are bringing to the course. If appropriate, mention the unique possibility to network with all other participants. Finally, reflect on their expectations: what are the aspects that can be realistically covered by the course and what are the aspects that fall out of its scope.	
00:10:00	Setting Guidelines	Ask participants to reflect on what guidelines they would think could help the cooperation and mutual learning in the coming 5 weeks. Create a common document based on expectations, participant reflections, and own suggestions (punctuality, telephone use, being present, giving feedback, etc.) Bring this sheet for each consecutive session and place it in a visible area.	Big sheet with "Guidelines of Cooperation" written on it.
00:05:00	Introduction of the journey	Introducing participants to the process and the journey they are going to take together and how the online and offline parts support each other.	Presentation slide that details the course architecture and main concepts
00:20:00	The Systems Game	Commonly used systems practice exercise that supports participants gaining embodied experience about the common mechanisms of systems. A version developed by REOS can be found here: https://reospartners.com/publications/the-systems-game-module/	Large empty space.
00:20:00	Introduction to system thinking and the food system	General introduction about System Thinking, Design Thinking, the double diamond model. What do we mean by the food system? Collect associations from the participants. The global food system - local food system.	Intro presentation slides
00:10:00	BREAK		
00:05:00	Guided visualization	The facilitator asks participants to find a comfortable seat and reads the script of the guided visualization.	Text of the visualization printed. For detailed script see ANNEX 3
00:30:00	Individual Reflection &	To get to the vision that you imagined, what needs to change in the current food	post-its for each person

	Team formation	<p>system? Ask participants to write down their answer to this question (3 minutes). What is a challenge that you personally feel motivated to solve? What part of the food system you feel personally called to change/work on? (5 min) Each person comes up and briefly explain their personal motivation (their relationship to the food system) and the challenge that they feel called to work on and puts up their post it on the wall. The next person comes up, explains motivation and decides whether wants to join a previously defined challenge or start a new one. (<i>Can you connect to any of the previous challenges or would you like to start a new group?</i>) [possible variation: prepare various pictures of the FS, place them out on the floor as inspiration - ask participants to choose one or draw something that represents the challenge that they want to work on]</p>	[food system picture cards – prepared set in the light learning Annex 1]
00:40:00	Refining the challenge	<p>Newly formed teams come together and agree on the challenge that they want to tackle. Support them in choosing a challenge that is complex enough that it requires a systems approach, but not too complex so that it could not be addressed in the short timeframe of the course. Example questions: How well does the team understand the nature of the challenge? Does it target a short-term fix or long term, sustainable change? They also set a long-term shared vision that they aim towards. (If time allows, they also define a closer milestone that can help the system move towards the desired change.) Ask teams to also agree on the communication channels they want to use (the LMS of the course allows for group communication as well).</p>	Sheets for writing out their vision and milestone.
00:10:00	Check out	<p>Ask participants to place up their "guiding stars" on the wall. Ask them if anybody has any questions or comments that they would like to share in plenary and offer the possibility to write down their feedback and/questions on post-its and leave them</p>	Prepared feedback wall, post its, blue tech.

		on a designated area ("Feedback wall"). Ask everyone to stand in a circle and say 1 word that sums up for the experience of the first offline session for them.	
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Our food system as a complex, adaptive system:

- It is a system of subsystems.
- It is characterized by non-linear system dynamics.
- It is full of unpredictable, emergent properties.
- The magnitude of the intervention does not necessarily correlate with the magnitude of the results/outcomes.
- Complex interplay and interwovenness of system components.
- Cause and effect can be temporally and spatially distant. (“The system has a memory”¹⁹, present behaviour at one location of the system can have consequences on other locations, subsystems both in the present and in the future).
- The notion of tipping points.
- Systemic boundaries are unclear.
- Feedback loops are present in the system. (The concept of viscous and virtuous cycles).

WORKSHOP 2: EXPLORATION

During the second workshop, participants start to explore the dynamics and basic causal relationships present in local food system via the method of *connection circle diagram*. They identify the main elements, actors, institutions of the system first individually then collectively and make connections among the elements. At this stage of the process they are encouraged to think broadly, explore without zooming in on any focal point in order to understand the main forces that drive the food system. While they define system boundaries at a local level, they are encouraged to look at the broader context and how the local food system they are analysing connects into our global food system. This is also supported by the online materials that they can access in between sessions.

In the second half of the workshop, participants start to examine the system from the perspective of the desired change they defined in the first workshop and work toward identifying elements and processes that either hinder or support the transformation of the system towards the desired direction.

Outline of the workshop:

<i>Name of Session</i>	<i>Aim of session</i>	<i>Stage of the Double Dimond</i>
Exploration	*provide specific tools for system understanding *develop system thinking, divergent thinking, collaboration *support participants in gaining a deeper understanding of the local food system and	Research phase, divergent

¹⁹ Hueston W & McLeod A. (2012)

	prepare for the mapping phase by: *understanding the main elements, parts and agents of the FS *identifying connections among them *identifying the main driving forces within the system	
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<i>Duration</i>	<i>Activity</i>	<i>Brief description of activity</i>	<i>Materials needed</i>
00:10:00	Alternative use game	Participants gather in their small teams. They receive one reusable drinking bottle (empty)/ or a glass jar. They pass it around, while each person says a different thing that the bottle/jar could be used for. The aim is to make the round as quick as possible and go for the numbers. After 4-5 minutes stop the game and ask each team to share in plenary some of the most creative, unusual or weird ideas that came up.	Bottle/jar for each team.
00:10:00	Starting presentation check in	Share where you are in the process. Introduce participants to the aims and goals of the session: exploration, experimenting with different system thinking tools. Highlight that the aim of this workshop is not to find a solution yet! Introduce the cluster mapping exercise.	Intro presentation slides.
00:25:00	Free association Mapping	Based on their chosen challenge, participants decide on the boundaries of the system that they are working with. Engage in free brainwriting process and placing down all their associations about the system on post its. They start to connect and cluster the ideas that are related.	Large sheets, pens, post - its.
00:15:00	Stakeholder map <i>Optional: can be left out if the group needs more time</i>	Brainwriting all the stakeholders that are connected to their challenge on post its.	Large sheets, pens, post - its.
00:30:00	Connected Circles map	Here participants place the main themes and clusters and stakeholders identified in the	Large sheets with pre-drawn circles.

		<p>previous exercises along a circle. Then they start to connect the nodes on the circle. Present various possibilities for using this exercise, depending on what the team considers important.</p> <ol style="list-style-type: none"> 1. Connecting various actors 2. Focusing on variables of the system 3. Examining the flows of e.g. information, material, etc. 	
00:15:00	Designing the guiding question for further exploration	<p>At this phase teams need to create a specific question about: "Why their chosen system works a certain way?" Explain the importance of neither being too broad nor too narrow. They can reframe the question after learning more about the system.</p>	<p>Examples of framing questions on ppt.</p>
00:15:00	Driving forces	<p>At this phase teams start to look at the driving forces within the system. What are the forces that support transformation towards a healthier system and what are the forces that inhibit change? Team members brainstorm enablers and inhibitors on two different coloured post-its. Encourage them to write as many as they can.</p>	<p>Pink and blue post-its.</p>
00:15:00		<p>Then cluster them into themes.</p>	<p>Two big sheets/team with Enablers and Inhibitors written on them.</p>
00:20:00		<p>Teams choose the most important clusters to continue to work with. For these 2-3 clusters or main themes they start to list various causes that lead to a certain system variable to manifest. Then they also list what kind of consequences it has for the overall functioning of the system.</p>	<p>prepared sheets for causes and effects</p>

00:15:00	"Research plan"	Each team decides what kind of information would be the most useful for deepening their understanding of the local system and chooses the relevant research methods. Realistically, these methods should be not too time consuming so they would be able to carry out their research until the following week.	ppt slide with potential research methods
00:10:00	Check out	Each person sums up the experience in two words. 1: How do you feel now? 2: What was the most important learning point from today? /What are you taking home? Mention the wall of feedback again.	

WORKSHOP 3: VISUALIZATION & DEVELOPING THE STORY OF THE SYSTEM

Based on the exploratory work of the previous weeks, participants create a visual representation of the local food system that captures important actors, activities and the dynamics of various pressures and responses. Building on the previously identified elements and processes of the system, the aim is to identify and make the underlying dynamics of the system visible.

This map will constitute as the base of further exploration, and a tool for identifying potential leverage points for intervening in the system for increasing its overall health and sustainability.

Outline of the workshop:

<i>Name of Session</i>	<i>Aim of session</i>	<i>Stage of the Double Dimond</i>
Visualization	<ul style="list-style-type: none"> *putting it all together and creating a complex system map * provide space for feedback and reflection * support participants in their preparation for the stakeholder visit 	Divergent and Convergent, Re-Brief

<i>Duration</i>	<i>Activity</i>	<i>Brief description of activity</i>	<i>Materials needed</i>
00:10:00	Systems thinking embodied	Ask participants to share some concepts and abstract ideas about systems. Put them all up on a board/flipchart. Examples: interconnectedness,	Prepared concepts written down

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		emergence, dynamic, flexibility, circular, shared responsibility, complexity, curiosity, etc. Then ask them to create statues or moving constellations as a group that represent one concept. (Can be repeated a couple times.	
00:05:00	<i>Introduction to the session</i>	Briefly explain the framework and agenda for the day.	Agenda prepared on flipchart.
00:30:00	<i>Feedback Loops</i>	Each group traces back where they left off with their system analyses at the previous workshop, paying special attention to their main question. Then they are presented with a short introduction on vicious, virtuous, stabilizing and stagnating cycles.	Powerpoint slides about feedback loops. Arrows and cards that support feedback loop creation.
00:30:00	<i>The relationships of loops</i>	The teams are asked to rearrange their developed loops, looking at how they might connect and intend to understand the underlying dynamics that drive their chosen system.	
00:30:00	<i>Putting it all together</i>	Bringing together the results of all their previous exploration, teams create a visual representation of their chosen system.	Large space, post its, tape, pens.
00:15:00	<i>Preparation for short presentation</i>		

00:20:00	Mini presentations and feedback	Each group has two minutes to present their key insights and then 3 minutes to receive questions, as well as, comments and feedback from the other teams.	Timer, cards to signal how much time they have left.
00:30:00	Preparation for the study visit	Present the guidelines for the stakeholder meetings.	Short presentation. Linking to materials available at the online platform.
00:10:00	Check out	Ask participant how they are feeling and if there is anything that they would like to focus on during the last session. Ask if anybody has further questions, feedback that concerns the whole group.	

WORKSHOP 4: SPICING IT UP

Based on the themes and challenges that the participants identify during the first workshop as the focus of their work and learning, they will need to organize a stakeholder meeting for the 4th week of the course. The aim of the meeting is to re-iterate their prepared systems maps and ask for the feedback of the relevant local food system actor.

In order for these meetings to go successfully, make it clear for participant during the first session that it is their task to find an interviewee. Keep close communication with them and remind them often that local actors are busy and need to be contacted in advance.

In addition, offer them your help in connecting with actors from your network. A great way to ensure that each team will find a relevant actor to talk with is to already connect with a diverse set of actors from the local food system and agree with them about their potential involvement in the course.

WORKSHOP 5: ACTIVATION & INTEGRATION

During the last facilitated session, participants finalize their system's map and define a strategy for intervention and the next steps they want to take.

Each team presents their narrative to the group and receives feedback and questions from other teams.

<i>Name of Session</i>	<i>Aim of session</i>	<i>Stage of the Double Dimond</i>
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Activation	*integration * updating their systems map based on the stakeholder visit experiences	Divergent and Convergent,
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<i>Duration</i>	<i>Activity</i>	<i>Brief description of activity</i>	<i>Materials needed</i>
00:15:00	Check in	Opening Circle where each person shares how they are and what was the most significant learning point for them from the field visit.	
00:05:00	Narrative of a system & agenda	Short presentation	Agenda on flipchart
00:80:00	Integration and updating the maps.	The teams update their maps and integrate the new information that they have learned during their field visits, as well as, from reading the last two chapters of the online course. They focus on deriving the key insights from the process and develop the story or narrative of their system and prepare for the final presentation of their map. Make sure to check in with each team regularly and support them in their process. This time is available for them to go deeper into exercises that they need more time for and also transfer their map into KUMU if they had not done so	All materials that teams have created in the previous session.

		before their stakeholder visit.	
00:10:00	BREAK		
00:52:00	Presentation of maps and narratives	Each team has 5 minutes to present and then 6 minutes for feedback and questions.	
00:18:00	Closing circle	Taking a bowl of yarn, we go around in a circle where each person shares how was the course experience for them and what they are taking with them.	Yarn

Questions and facilitation guide for post-course feedback

- Has the way you think about the food system or its sub-systems changed and in what way?
- Has the way you see your role within the food system changed and in what way?
- How will you take your food systems practice forward?
- What is the biggest practical thing you will do differently as a result of this course?

Evaluation and Feedback Session *System Thinking for Food System Sustainability Course*

INTRODUCTION - 5 min.

Facilitator introduces himself + intro to the session objective, timeframe, expected norms of behaviour
*The main aim of the discussion is to receive honest feedback about both the online and the offline component of the **System Thinking for Food System Sustainability Course**, focusing on what went well, what aspects they enjoyed, as well as, what could have been better/done differently in order to make the course even better for next time.*

Timeframe: 1.5 hours

Guidelines to be shared with participants before the session: *there is no need to agree; listen to each other - one person talks at a time; it is going to be recorded (recording will be handled carefully, data gathered will be only used for the development of the course and stored in an anonymised format)*

GENERAL FEEDBACK - 25 min.

1. Please create a schematic drawing (e.g. timeline) about your learning experience over the past five weeks. Indicate the best parts/highlight, as well as, low points if you experienced any.
2. What are the three most important things that you have **learnt** by participating in the course? (First writing down, then sharing)

The OFFLINE Workshops - 30 min.

1. Please tell about your experience regarding the **facilitation** of the sessions.
 - Was the facilitator able to effectively support you on your learning journey?
 - What could she have done differently?
 - How easy was to understand, follow directions?
2. Did you find the **structure and the methodology** used conducive to your learning?

The ONLINE Component - 20 min

1. **What would you have needed to increase your engagement in the platform?**
2. ***Please share any bugs/difficulties that you might have encountered when using the system.***

Closing - 10 min

1. **What could have made the course (both online and offline components considered) even better?**

Additional resources about Systems Thinking and Practice

- Articles on [systemsthinker](#)
- [Toward Principles for Enhancing the Resilience of Ecosystem Services](#) by Kimberly Bowman et. Al
- [Systems Archetypes at a Glance](#) by Daniel Kim and Colleen Lannon
- [The art and science of systems change](#) by Joe Hsueh
- [The art of systems thinking in driving sustainable transformation](#) by Jo Confino
- [Systems Grantmaking Resource Guide – Causal Loop Mapping](#)
- [Open Source your Analysis: Participatory Approaches to Systems Mapping](#) by Adapt Research and Consulting
- [Three Keys to Unlocking Systems-Level Change](#) by Susan Misra and Jamaica Maxwell



Example of flyer for student recruitment

In cooperation with Impact HUB BP

TAMING THE ELEPHANT: SYSTEM THINKING FOR FOOD SYSTEM SUSTAINABILITY

Develop your system thinking ability &
increase your sphere of influence for
positive social & environmental change

● ESSRG

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PART II

Online Learning Support System

The online learning platform can be accessed
via:

www.courses.essrg.hu

INTRODUCTION

The online learning platform is created with the following guiding principles in mind:

- Provide content and background information for students who are taking part in the offline, facilitated sessions of the course
- Go beyond sharing information by facilitating student engagement, interaction, social learning
- Include exercises and activities that leverage the power of experiential learning and active student engagement

Students are encouraged to complete all exercises, reflection and activity modules for best results. However, facilitators can pick and choose what parts of the online course they deem relevant for the local context.

KEY MESSAGES OF THE COURSE

- Our Food System is highly complex.
- The system is already broken in many ways and is under pressure.
- Several of the identified global trends are likely to increase the existing pressures and create intense challenges in the future unless the food system undergoes radical transformation.
- The food system can be approached from various perspectives. The current course focuses on the following perspectives: environmentalist, agronomist, sociologist, economist and health.
- The dynamics of the food system is highly interwoven with the dynamics present in several other systems and sub-systems, such as, ecological system of our planet, the economic sub-system and our society. There are often trade-offs between the aims and goals of these systems and sub-systems.
- We have underlying assumptions (paradigm, perspective) that shape how we think, speak, act and interact.
- These underlying assumptions, world views, interests can be/are in conflict with each other.
- The fact that we have been doing things in a certain way, does not mean that we should keep doing them the same way or that that is the only way to do things. Underlying assumptions also need to be questioned and revised in order to create sustainable transformation on a systemic level.
- System thinking and a holistic perspective is necessary for finding solutions for the pressing challenges, since creating “the best solution” from one aspect can have hazardous consequences for another.
- Personal and collective responsibility are both key for positive transformation.
- It is idealistic to think that we can change the situation on our own. Therefore, it is essential to understand our role and place within the system in order to know how we can contribute and take responsibility.

“Agriculture and food systems must evolve if we are to survive as a planet” (TEEB, 2018, p. IV)

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UN (2019). About the Sustainable Development goals. Accessible at:
<https://www.un.org/sustainabledevelopment/sustainable-development-goals/>

Additional Resources

CHAPTER 1

- Food System – an overview. History and power structures. Accessible at:
<https://www.youtube.com/watch?v=1xvIP5vW2BU>

CHAPTER 2

- Feeding 9 billion video series. Accessible at
<https://www.youtube.com/watch?v=raSHAqV8K9c&list=PLr2L6TB8fh8Gbpb-K1ioZlwJ2il1yDhF7>
- Agriculture: The Basics of Our Industrial Food System in 5 minutes. Accessible at:
<https://www.youtube.com/watch?v=04T23houM4s>

CHAPTER 3

- BBC – Climate Change the Facts. Accessible at:
<https://www.youtube.com/watch?v=0ypaUH57MO4>
- Global calculator: A tool to model the world's energy, land and food systems. Accessible at:
<http://tool.globalcalculator.org>
- Change the goal – 1/7 Doughnut Economics: <https://youtu.be/Mkg2XMTWV4g>
- Why it's time for Doughnut Economics: <https://youtu.be/1BHOflzxPjl>
- Introducing the Doughnut 1.0: <https://youtu.be/CqJL-cM8gb4>

CHAPTER 4

- Sustainable diets and public health - Tim Lang. Accessible at:
https://www.youtube.com/watch?time_continue=1&v=ANKWQWwObH4

CHAPTER 5

- Cultivating equality in the food system | Danielle Nierenberg | TEDxManhattan. Accessible at:
<https://www.youtube.com/watch?v=zqSrobaD5sA>

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“Our food system and us”

“Develop your System Thinking - "Where does your breakfast come from?"

This module was created by Diana Szakál (ESSRG) incorporating the results and insights derived from individual stakeholder consultations and workshops with the members of the Budapest Food City Lab. Special acknowledgement for Janka Horváth, Márta Fekete, the students of Semmelweis University, Valeriano Donzelli and the members of the Inspiral Club for their support and cooperation in the two-stage piloting process. The workshop also incorporates the trend cards developed by the FIT4FOOD2030 project.



AT A GLANCE

Thematic Area	food systems, reflection on individual roles and responsibilities within the food system
Format	workshop
Duration	Approx. 90 - 150 minutes (Depends on the number of participants and their willingness to share)
Type of audience	A: University students, B: General Public
Age group	A: 18 – 25 B: 16 ⁺
Number of participants	10 - 20
Prerequisites for participation	There are no prerequisites
Number of facilitators	1
Overall difficulty	Topic: intermediate (the facilitator needs to have general knowledge of the food system)

	<p>in order to be able to ask the adequate guiding questions)</p> <p>Preparation: beginner</p> <p>Facilitation: intermediate</p>
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OVERVIEW

The educational module uses various reflective and co-creational exercises in order to increase self-awareness and generate discussion about the food system and the role and responsibility of each individual in it. It is organized in a workshop format, where the facilitator guides participants through the creative process of developing shared conceptual maps of the food system. The learning journey of participants starts from establishing a relationship with the abstract concept of food systems via association and open discussion. Then they are guided through a process of self-reflection regarding where the food that they eat comes from and what journey it needs to take in order to land on their plate. The facilitator aids the process of exploration by guiding questions and plenary reflection. All this preparatory work enables participants to visualize their mental representations of the food system in small groups and develop various competences.

OVERALL AIM

The overall aims of the module are to introduce food system thinking, increase participants' awareness of important issues and trends within the food system and encourage reflection regarding individual roles and responsibilities.

SPECIFIC (LEARNING) OBJECTIVES

After the successful completion of this module participants are expected to be able to...

- Reflect on their own role and responsibility as a food system actor more clearly and consciously
- Demonstrate a basic understanding of the complexity and interwovenness of the food system
- Understand how the journey of a specific food item can influence the natural environment, human health and communities
- Identify opportunities for behavioral change in their own life

SUGGESTED SCENARIO FOR IMPLEMENTATION

This activity could take place at a university level setting as an introductory lesson in a longer course on food systems or incorporated into courses where gaining basic understanding of the complexity and the interconnectedness of food systems is desired. It might also be adapted to a secondary school context and offer it as a workshop or open lesson. In addition, it could also be offered as an

open workshop in a setting where it is ensured that participants stay for the whole duration of the workshop.




TOPICS & COMPETENCES COVERED BY THE ACTIVITY		
Thematic area(s)	food system more broadly	
FOOD2030 Research & Innovation priorities		
<i>Priority</i>	<i>Indicate whether main or secondary</i>	<i>Addressed through</i>
Circularity & Resource Efficiency	secondary	The guiding questions of the facilitator during exercises
Innovation & Empowerment of Communities	secondary	The guiding questions of the facilitator during exercises
Nutrition & Health	secondary	The guiding questions of the facilitator during exercises, reflection on own role and food choices
Climate & Sustainability	Main/secondary	The guiding questions of the facilitator, the introduction of the model of “Doughnut economics” ²⁰ , reflection on own role and the “ <i>Journey of my breakfast</i> ” exercise
Responsible Research and Innovation (RRI)		
<i>Related concept</i>	<i>Addressed through</i>	
Self-awareness	Associative and self-reflective exercises. The role of the facilitator in asking adequate guiding questions is key here.	
(Transdisciplinary) collaboration	Participants need to collaborate in creating their conceptual maps of the food system	

²⁰ Raworth, K. (2017). *Kate Raworth exploring doughnut economics. What on Earth is the Doughnut?...* Accessible at <https://www.kateraworth.com/doughnut/>

Ethical thinking	Considering ethical aspects in the environmental, health and social equity realms
Responsible long-term thinking	Doughnut, future trends, reflecting on the impact
Participatory ability	Exercises throughout the workshop
Research & Innovation (R&I)	
<i>Related concept</i>	<i>Addressed through</i>
Analytical thinking	The inclusion of trend cards in the process of concept map creation, “ <i>Journey of my breakfast</i> ”
Critical thinking	Critical reflection questions by the facilitator – placing emphasis at each step on the interconnections between food system – natural environment – human health etc.
(Food) Systems thinking	
Developing food system thinking is a core element of this module. All the exercises, such as, the “ <i>Journey of my breakfast</i> ” and preparing shared conceptual maps of the food system target the development of this competence.	
Other competences	
<i>Competence</i>	<i>Addressed through</i>
Sense making	Addressed through each step that leads up to the concept map creation, as well as, the reflection questions
Oral presentation	Each team needs to present their concept map to the whole class
Potential of bringing the arts, socio-economic science and humanities creatively or trans-disciplinarily with the module?	
It is possible to make the co-creation of conceptual maps into an even more open and artistic process by introducing other materials, such as, clay, paint and material that they can use to create the collage.	

TARGET AUDIENCE	
Audience category	university-level students general public could also be used with secondary school students
Recommended number of participants	10-20
Recommended age	16+
Prerequisites	There are no prerequisites – it is possible to join from any disciplines and fields. The quality of the workshop is enhanced by bringing together different perspectives.

OPTIONS FOR MULTI-STAKEHOLDER ENGAGEMENT	
<i>Stakeholder</i>	<i>Role envisaged in the activity</i>
Local business owners or CSOs - preferably active in food system transformation	<ul style="list-style-type: none"> • After the workshop, stakeholders can present their activity to students, opening up the space for discussion and inquiry • As an optional second round, students can be asked to reflect upon and revise their original map/drawing of the food system based on what they have learned from the short presentation and the following discussion
Various stakeholders from the supply chain	If the conditions allow, students can be asked – either in preparation for the lesson or after the workshop as a take home assignment – to go out and trace back where certain foods that they eat come from and reconstruct the journey that these food items have done in order to land on their plate by interacting with various stakeholders from the supply chain.

SETTING UP THE MODULE		
FACILITATION/DELIVERY		
<p>The module requires one main facilitator, her/his role is crucial in guiding the process and continuously encouraging participants to go deeper in self-reflection by using the adequate guiding questions. Besides facilitation skills and group management, the facilitator also needs to have at least a general knowledge of the main dynamics, challenges and opportunities of the food system.</p>		
RESOURCES		
<i>Physical materials</i>		
<i>Resource name</i>	<i>Picture</i>	<i>Number</i>
Sticky notes		4 per participant + additional ones to allow participants to use them during concept map creation if they wish to
Pens, pencils – preferably in different colors		15 (3 per group minimum)
Flipchart paper		3-5 (1 per group)
Pictures of the food system printed out. The more varied the better, including various parts, relationships and challenges/opportunities of the system		At least 30 different ones, you can find a prepared picture set in <i>Annex1 (separate document)</i> , but feel free to customize and adapt this.
Trend cards printed out		The whole series (if the group is around 25 two series). You can find the prepared set in <i>Annex2 (separate document)</i> .
<i>Useful links, videos, articles</i>		
<p>For a holistic overview on food systems and systems thinking: the online part of the System Thinking for Food System Sustainability blended learning course developed by the Environmental Social Science Research Group, in the framework of the FIT4FOOD2030 project.</p>		

PREPARING THE SETTING


If possible, the best is to have a flexible setting. Starting the workshop with the chairs in a circle to encourage sharing and dialogue and then creating separate workspaces for each team, as well as, a space for the additional material, such as, pictures and trend cards, etc. that they can use for concept map creation.


DETAILED DESCRIPTION OF THE MODULE SCRIPT

<i>Activity step</i>	<i>Time requirement</i>	<i>Description of activity</i>	<i>Competences</i>
Bridge – in	5 min	The facilitator introduces her/himself and briefly introduces the aim of the session.	
Setting Expectations Optional part, recommended when the participants are not familiar with each other/with general audience/outside of a formal institutional context	25 – 30 min	Participants are sitting in a circle. The facilitator asks them to briefly share about: <ul style="list-style-type: none"> • Why did they choose to attend the workshop? • What is their connection to the topic of the workshop? If there are more than 12 participants -choose one of the questions for being able to stay in the timeframe.	
Pre-assessment	5 min	Associations about the food system The participants receive 3 post-its each. Facilitator asks them to write down one association per post-it that they have when they hear the phrase “food system”.	Self-awareness
	10 – 15 min	Start to create shared understanding about what associations participants have about the food system by asking several students to share. After each sharing put up post its on the board/flipchart already starting to cluster them. Ask whether anybody has a same or similar idea that was mentioned before.	Participatory ability Sense making

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		<p>Potential ways to group based on the incoming answers: various actors, elements of the system, creating a visual of the processes & making up the value chain, values, etc.</p> 	
<p>The Doughnut</p> <p>Can be left out/substituted depending on the needs of the target group</p>	5 min	<p>Introduce the Doughnut model for creating context and establishing the base for how the food system is connected to the ecosystem and the need for change.</p>	Responsible long-term thinking
<p>“The journey of my breakfast”</p>	10 min	<p>Each participant writes down what they ate for their most recent meal (e.g.: breakfast), detailing the components.</p> <p>Then the facilitator asks them to choose one component of their meal. This can be a relatively simple ingredient, such as, lettuce, milk, an egg, an apple, etc. However, it can become more complex in the case of processed foods (e.g.: fish sticks, candy bar...)</p> <p>Participants are asked to track back the steps that the food item needed to go through from its source.</p>	<p>Self - awareness</p> <p>Food system thinking</p> <p>Analytical thinking</p>
	10 – 15 min	<p>Initiate plenary discussion by asking some of the participants to share their journey. This step of the workshop is really important for establishing links: ask participants to explain how each step of the previously mentioned journey might have impacted the environment and communities.</p> <p>You can ask in plenary how many steps each person has in their journey. (E.g. Who has more than 10? Who has less than 3? Etc.)</p> <p>Here you can introduce the concept of short supply chains and reflect together with</p>	<p>Participatory ability</p> <p>Critical thinking</p> <p>Ethical thinking</p> <p>Food systems thinking</p>

		<p>participants on how short chains might impact: communities, human health, environment. E.g: What can be the benefit of buying food from these sources?</p>	
<p>Creating shared concept map</p>	<p>35 min</p>	<ol style="list-style-type: none"> 1. In advance prepare the trend cards and pictures, additional materials. 2. Divide participants into small groups of 3 – 5 people 3. Ask participants to draw/create a representation of the food system on the flipchart before them. Tell them that they are free to draw, write, use the post-its, trend cards and pictures and any additional material that they would like. 4. Tell them how much time they have. 5. During the exercise, go around. When  <p>you see that participants are getting close to finishing their maps present them with the following two tasks (Besides telling them, also write them out on the flipchart/board):</p> <ol style="list-style-type: none"> a. What they think is the most import to be changed in the system? (crucial leverage point for positive change) Each participant writes this down individually. Then the group needs to agree on what they think is the most important. b. Ask them to draw themselves (individually) on the map after thinking about their own role within the system. 	<p>Food systems thinking</p> <p>Sense making</p> <p>Analytical thinking</p> <p>(Transdisciplinary) collaboration</p> <p>Communication</p>
<p>Presenting Concept maps</p>	<p>20 min</p>	<ol style="list-style-type: none"> 1. After the concept maps are ready ask each group to present their maps to the whole class. 	<p>Oral presentation</p>

		<ol style="list-style-type: none"> 2. After the presentation ask participants from other groups to pose their questions, comments. 3. Pose questions to the group that presented. While they are presenting their concepts, most important aspect to change and individual role and place within the system think about guiding questions that can support participants in discovering new relationships and system dynamics, as well as, increase the depth of their reflection. 4. Go to the next group and repeat. (It worked well to ask participants to come and gather around the table of the presenting group – movement increased attention and facilitates discussion if participants are not so confident in speaking up) 	<p>Food system thinking</p> <p>Sense making</p> <p>Ethical and long-term thinking</p>
Closing circle	10 min	<p>If possible, bring back participants into a circle.</p> <ol style="list-style-type: none"> 1. Ask them to share what they learnt and what they are bringing with them from the workshop. 2. Name one action that they would like to do differently based on the workshop. 	<p>Reinforcing learning points</p> <p>Self-awareness</p> <p>Opportunities for behavioral change</p>

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ShiftN (2011). Global Food Systems Map. Accessible at <https://www.aaccnet.org/publications/cfw/2019/jan-feb/Pages/CFW-64-1-0010.aspx>

ANNEXES

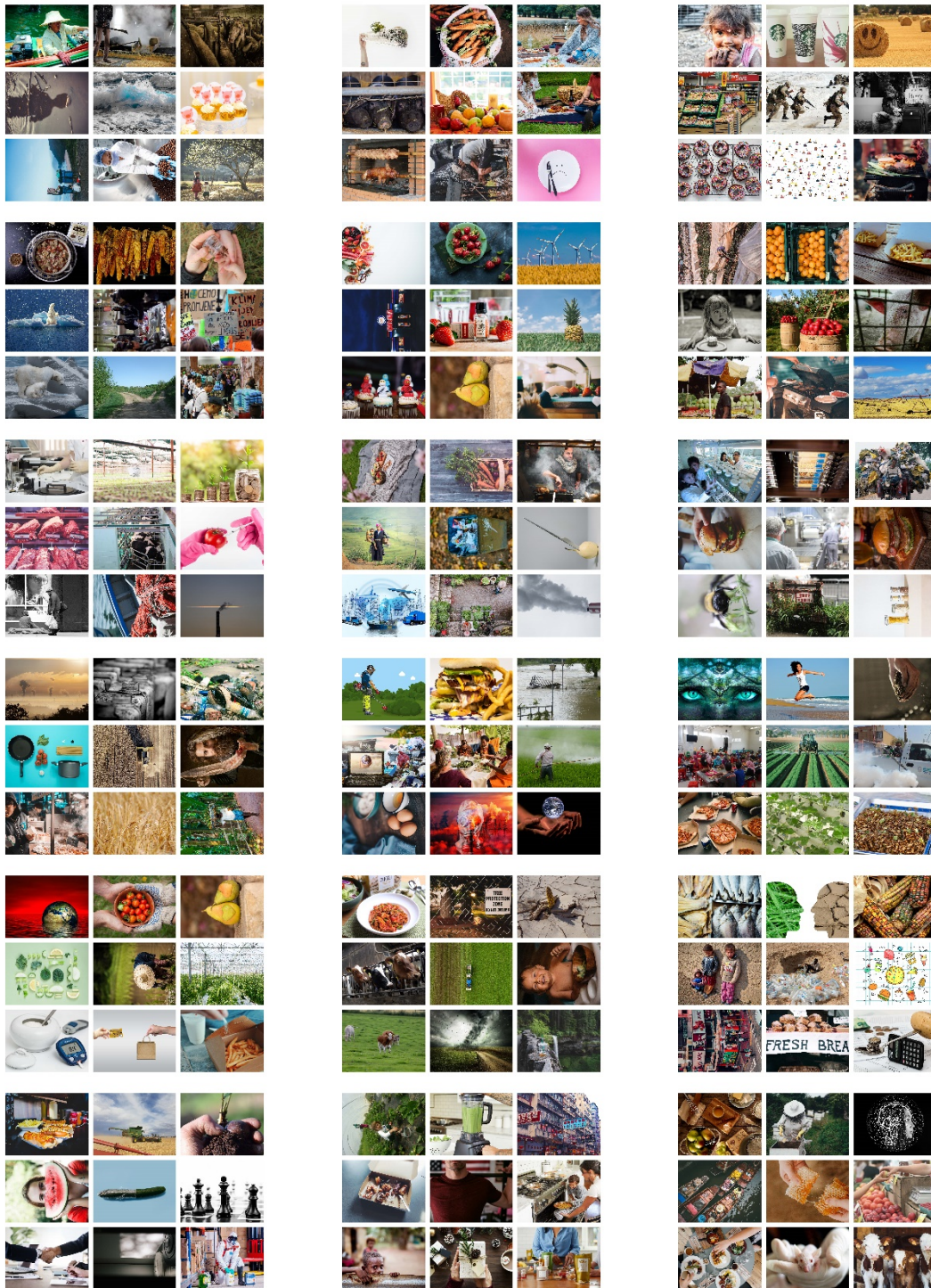
ANNEX 1 Pictures of the food system (available online in higher resolution)

ANNEX 2 [FIT4FOOD2030 TREND CARDS](#) (landscape orientation)

ANNEX 3 Pictures illustrating the workshop

City Lab Budapest: Our Food System – annexes

ANNEX 1 Pictures of the food system (available online in higher resolution)



fit4food2030.eu - #FOOD2030EU



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No774088

ANNEX 3 Pictures illustrating the workshop

Pictures from the piloting session with a general audience:



Examples of concept maps made by participants during the piloting session with university students:



“The two worlds”



fit4food2030.eu - #FOOD2030EU



Valuable Market

*The activity has been developed by the educational staff of the **National Museum of Science and Technology Leonardo da Vinci in Milan, Italy**. It is based on the experimental and interactive methodologies applied in the educational activities of the Food and Nutrition Interactive Lab of the Museum, which rely on the principles of non-formal learning. The Museum collaborated with the association Recup (which fights food waste with volunteer work to recover surpluses in public markets, donating it to persons in need) to embed in the activity an outreach part in public markets, that provides the starting point for the involvement and for the open reflection which is then further explored with the experimental activity.*

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AT A GLANCE

Thematic Areas	<ul style="list-style-type: none"> - Food waste; - Ethic and social value of food; - Social inclusion; - Food education; - Active participation of different citizens groups.
Format	<p>Interactive activities:</p> <ul style="list-style-type: none"> - Activity 1: activity of food surpluses recovered in a neighborhood market, with the support of the volunteer association (A1) - Activity 2: experimental activity on collected food in the museum lab (A2)
Duration	<ul style="list-style-type: none"> - A1: 2 hours - A2: 1 hour
Type of audience	Citizens/General Public
Age group	<ul style="list-style-type: none"> - A1: Adults, students (+16 years old) - A2: Families with children (+8 years old)
Number of participants	<ul style="list-style-type: none"> - A1: 10

	- A2: 10-20
Prerequisites for participation	No prerequisite is needed for both the activities.
Number of facilitators	<ul style="list-style-type: none"> - A1: 2 facilitators needed + 1 volunteer - A2: 1 facilitator needed
Overall difficulty	<p>Topic: Basic</p> <p>Preparation: Intermediate</p> <p>Facilitation: Intermediate</p>

OVERVIEW

The module engages groups of citizens in two different activities: the first one concerns collection and recovery of fruit and vegetables remained unsold or that risk to be thrown away at the end of the day in a neighbourhood market; then, an experimental activity with the recovered food aims to increase the knowledge about the nutritional values still present in the recovered food (presence of vitamins).

OVERALL AIM

Citizens become an active community in the recovering and redistributing process and, through the experimental activity in lab, they become aware on the still-present nutritional value in recovered food and how to concretize an action to combat food wastage.

SPECIFIC (LEARNING) OBJECTIVES

After the successful completion of this module, participants are expected to be able to:

- Understand the process of food wastage in a neighbourhood market and possible solutions
- Value and prioritise the ethical, social and cultural features of food
- Become aware of the concrete actions they can undertake in order to contribute to social needs (such as self-organized groups against food waste)
- Recognize the nutritional properties of food which risks to be wasted

SUGGESTED SCENARIO FOR IMPLEMENTATION

- A1: Neighbourhood market with fruits and vegetables stands;
- A2: Museum lab, classroom or any other space that can be arranged with tables, chairs and kitchen utensils.

TOPICS & COMPETENCES COVERED BY THE ACTIVITY		
Thematic area(s)	<ul style="list-style-type: none"> - Food waste; - Ethic and social value of food; - Social inclusion; - Food education; - Active participation of different citizens groups. 	
FOOD2030 Research & Innovation priorities		
<i>Priority</i>	<i>Indicate whether main or secondary</i>	<i>Addressed through</i>
Circularity & Resource Efficiency	Main	<ul style="list-style-type: none"> - Collection of food surpluses (A1)
Innovation & Empowerment of Communities	Main	<ul style="list-style-type: none"> - Engagement of different social groups of citizens (A1); - Redistribution of food to disadvantaged categories.
Nutrition & Health	Secondary	<ul style="list-style-type: none"> - Demonstration of the still-present nutritional values in food surpluses (A2)
Climate & Sustainability	Main	<ul style="list-style-type: none"> - Limitation of the food wastage (A1)
Responsible Research and Innovation (RRI)		
<i>Related concept</i>	<i>Addressed through</i>	
Scientific Education	<ul style="list-style-type: none"> - Experimental activity on properties and nutritional value of recovered food, through an inquiry-based approach for learning - Reflection on food origin 	
Public Engagement	<ul style="list-style-type: none"> - Engagement of different social groups of citizens to reflect on food waste (A1); 	

Ethics	- Improvement of the awareness of the importance of a responsible and sustainable consumption (A1; A2)
Research & Innovation (R&I)	
<i>Related concept</i>	<i>Addressed through</i>
Food analysis and food nutritional properties	Experimental activity on properties and nutritional value of recovered food
(Food) Systems thinking	
<p>The module aims to integrate and potentiate the Food System-declined RRI competences, through some specific actions:</p> <p>ANTICIPATION</p> <ul style="list-style-type: none"> - <i>Food-related abilities</i>: knowledge on food properties - <i>Future-oriented ethical abilities</i>: giving importance to the sustainability implications of preventing and avoiding food waste <p>REFLEXIVITY</p> <ul style="list-style-type: none"> - <i>Social awareness and empathy</i>: understanding the dynamics of food wastage <p>RESPONSIVENESS</p> <ul style="list-style-type: none"> - <i>Navigating Complexity</i>: approaching the food system in a systemic way <p>INCLUSIVENESS</p> <ul style="list-style-type: none"> - <i>Multi-perspective and intercultural communication</i>: embracing the comprehension of the system through social collaboration - <i>Participatory ability</i>: collaborating in groups 	
Potential of bringing the arts, socio-economic science and humanities creatively or trans-disciplinarily with the module?	
<p>Social sciences approaches:</p> <p>Part of the module is settled in a public market, and address a social innovation practice, involving the participants in a multicultural space and in a possible way to improve the local food supply chain through volunteering.</p>	

TARGET AUDIENCE	
Audience category	Citizens/General Public
Recommended number of participants	From 10 to 20
Recommended age	Adult
Prerequisites	No prerequisite is needed for either activity.







OPTIONS FOR MULTI-STAKEHOLDER ENGAGEMENT	
<i>Stakeholder</i>	<i>Role envisaged in the activity</i>
Ethical purchasing groups (GASes)	Possible participants of the activities.
Supermarket chains	Possible alternative to the market, as a setting of the A1.

SETTING UP THE MODULE
FACILITATION/DELIVERY
<p>For A1: 2 facilitators</p> <p>For A2: 1 facilitator</p> <p>Suggestions for the facilitator in the different phases:</p> <ul style="list-style-type: none"> - PREPARATION First, the preparation of the setting and the context of the activities is crucial to create a positive habit in which participants can work. It can be referred to the physical space where the activity takes places or to a proper and efficient stakeholder engagement. - EXPERIMENTAL ACTIVITY It's important to stimulate the direct participation of each participant, trying to avoid demonstrations. For a succeeding activity, the facilitator encourages hypothesis, descriptions of the phenomena or any other comment before and during the practice. Trying to engage the participants, it is suggested to alternate moment of practical activity with a dynamic interaction using questions and debates. As regards the scientific aspects of the experimental activity (A2) proposed, it can be useful for the facilitator to take in account the content of <i>Annex 1</i> and <i>Annex 2</i>. - DISCUSSION

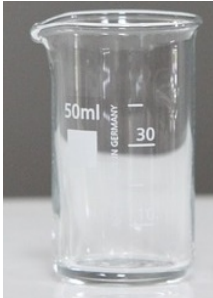






During the collective moment it is better to stimulate and boost the horizontal interaction, asking a lot of questions and enhancing the debate among participants. For a successful debate, it is better to let the participants start the discussion in small group first: the facilitator limits their intervention, just checking up on each group. Then, the facilitator invites the participants to share in plenary their thoughts about the theme.



RESOURCES		
<i>Physical materials</i>		
<i>Resource name</i>	<i>Picture</i>	<i>Number/quantity</i>
Activity 1 – Collection at the market		
Recovered boxes or containers		From 10 to 20 (one for each participant)
Weight Scale		1
Activity 2 – Experimental activity		
Little pot or any other containers to heat the water		1
Microwaves oven or hotplate		1
Water		850 ml
1lt bottles with stoppers		2

Dropper		1
Corn-starch or wheat powder		2 tablespoons
Iodine tincture		5 drops
Mortars with pestles		4
Juicers		4
Knives		4
Cutting boards		4
Plastic dishes		20 circa

Small glasses or 50 ml/100ml beaker		20 circa
Droppers		4
Recovered fruit and vegetables		8
Effervescent vitamin C tablets		2
Water		100 ml
Lugol's iodine		60 drops
Reagent (starch in solution)		300 ml

PREPARING THE SETTING

A1- Collection of food at the market:

Before the activity starts, it is suggested to create *an easy-identifiable area* (a welcome station, table or stand) as the meeting point for the participants. The station is arranged with boxes or recovered containers, available for the collection.

Note: it is better than no more than two days pass between the two activities, to prevent fruit and vegetables from rotting.

A2 – Experimental activity

The activity can take place in a room, in a classroom or in the school science lab; tables and chairs are gathered to create 4 workstations, in each of which 5 people work together. A table for each workstation is needed to place the material for the activity.

DETAILED DESCRIPTION OF THE MODULE SCRIPT		
	Step	Competences of participants
Activity 1: <i>Collection at the market</i>	Preliminary preparation Before the activity it is suggested to visit the chosen market, in order to sensitize and engage the vendors about the aims and the different phases of the collection. It is better to set the beginning of the activity at least 1 hour before the market closes, when vendors start to count the products unsold and dispose of the waste.	//
	Group management: 10 minutes Welcome the participants in a predefined area, identifiable with a station (table or stand) arranged with boxes or recovered containers and provide them with some explanation about the activity and the materials needed.	- Participatory ability
	Introduction: 10 minutes Agree with participants: <ul style="list-style-type: none"> - The organisation of the collection (in groups or pairs) - Where each group or pair is going to do the activity (which stand?) - Some questions to address to the vendors, to know why some types of fruit and vegetables remain unsold (How much fruit is left? Why? What do people prefer to buy? How many products do you buy from your wholesaler? Where does this type of vegetable come from? Have you any recipe to suggest?) 	
	Development: 40 minutes <i>Collection of the food</i> The participants, in groups or pairs, collect fruit and vegetables donated by the vendors and bring the food at the welcome station where the redistribution will	- Future-oriented ethical abilities

	<p>take place. It is better to throw away fruit and vegetables which are clearly rotten and no more edible. Then, the participants proceed in weighing the food, in order to know the quantity of what has been collected.</p> <p>Conclusion: 1 hour</p> <p><i>Redistribution</i> Place the food in boxes or other containers.</p> <p>Organise the distribution to:</p> <ul style="list-style-type: none"> - Associations which operate and help in matter of food poverty. - People who spontaneously show up at the distribution point, until all fruit and vegetables are used up. <p>Save about 20 products, among fruit and vegetables for the experimental activity.</p>	
		- Social awareness and empathy
Activity 2:	Preliminary preparation	//
Experimental Activity	<p>Before the activity starts, the facilitator prepares the Lugol's iodine, following the instructions below:</p> <ul style="list-style-type: none"> - Prepare the reagent: pour 500 ml of water in a pot and add 2 tablespoons of corn-starch. - Bring the mixture to the boil for few minutes (it's possible to use microwave oven) and let it cool. In this way the quantity of the reagent prepared is greater than the one needed for the activity. Anyway, it is better to have a stock available. Store the liquid in 1 l bottle and close it with a stopper. - Prepare Lugol's iodine: pour 250 ml of water in a bottle with stopper and add with the dropper 5 drops of iodine tincture. Close the bottle and shake. In this way the quantity of Lugol's iodine prepared is greater than the one needed for the activity (about 60 drops); anyway, it's difficult to foresee the exact quantity to be use. It's better to have a stock available. 	//
	Group Management	//
	The facilitator welcomes the participants (20), divides them in groups (4), clarifies the aims of the activity.	
	Introduction: 15 minutes	- Multi-perspective communication

	<p>The facilitator clarifies to the participants the aims of the activity:</p> <ul style="list-style-type: none"> - to share, to discuss and to compare the information given them by the vendors. - to investigate the nutritional properties (presence of vitamins) of the collected food. <p>Then, the participants are asked to report the results of the inquiry done with vendors They share the answers given by the vendors regarding the reasons of food surplus. Comparison and discussion about the answers are helpful to identify the crucial factors involved.</p>	
	<p>Development: 30 minutes</p> <p><i>Searching for vitamins in recovered fruit and vegetables</i></p> <p>To introduce the experimental activity, the facilitator can ask some questions to the participants, such as:</p> <ul style="list-style-type: none"> - Where do you think that this food comes from? - Would you eat it? Why? - Do you already know these fruits/vegetables? <p>And once the participants are ready to manipulate the food with the tools:</p> <ul style="list-style-type: none"> - What do you think these fruits/vegetables contains? - Why do we eat fruits and vegetables? - Can the food about to be wasted still be good? <p>Each group works with two fruits or vegetables, following the instructions below:</p> <ul style="list-style-type: none"> - Cut, squeeze, crush with mortar and pestle fruit and vegetables to extract the juices. Extract 25 ml of juice for every fruit and pour it in a glass or in a beaker. - Add 25 ml of reagent in each beaker with extracted juice. - Add 4 or 5 drops of Lugol's iodine and observe the reaction (if the colour of the reagent changes once it touches the liquid). - Prepare the comparison: dissolve half a tablet of vitamin C in a beaker with 25 ml of water. 	<ul style="list-style-type: none"> - Participatory ability

	<ul style="list-style-type: none"> - Add 25 ml of reagent and 4 or 5 drops of Lugol's iodine and observe if the colour of the reagent (purple) changes once it touches the juice. <p>Results: the purple colour disappears = the juice contains vitamin C the purple colour doesn't disappear = the juice doesn't contain vitamin C</p> <p>In most cases, if it hasn't been too long since the collection, vitamins are still present in the products. The solution with vitamin C (the purple colour of the reagent disappears) helps to understand how to interpret the result. Share the experimental results of each group and discuss about the quality of the recovered food.</p>	
	<p>Conclusion: 15 minutes</p> <p>In the final part of the activity, the facilitator focuses on what comes out from the activity, in order to point the attention on:</p> <ul style="list-style-type: none"> - the reason why we waste food; - nutritional properties, which are still present in the food we waste; <p>which are the key messages of the educational module.</p> <p>Some guiding questions could be:</p> <ul style="list-style-type: none"> - Which kind of food do you waste at your home? - Where does the wasted food go? - Do you know any food waste recover practice? <p>In this process, the facilitator doesn't give an explanation directly to the participants but engages them with questions on their perception of waste and on what emerges from the experimentation.</p>	<ul style="list-style-type: none"> - Navigating complexity

DEVELOPERS

The module is designed and implemented by the educational staff of the National Museum of Science and Technology Leonardo da Vinci in Milan, Italy, together with RECUP, an association of social promotion which operates on a local scale, in social inclusion through the recovery of food. From several years, RECUP has strengthened a mutual relationship with

street vendors and has experimented recovering activities in different neighbourhood markets.

Recup association: <https://assoziazionerecup.org/>

A check for scientific accuracy was done by Valeria Chiodini, Responsible for Food and Nutrition Interactive Lab of the National Museum of Science and Technology

IMAGES ILLUSTRATING THE ACTIVITY



At the market



Experimental activity

ANNEXES

- Annex 1: Preparation of the Lugol's iodine
- Annex 2: Explanation of the reaction

Annex 1

PREPARATION OF THE LUGOL'S IODINE

MATERIALS

1 bottle of amber glass with stopper or a beaker (600 ml capacity)
15 ml test tubes with stoppers
1 graduated pipette
1 funnel
iodine tincture (available in pharmacy)

HOW TO

Bring the iodine tincture, the plastic pipette, the bottle or the beaker.

Aspire with a pipette some iodine tincture.

Pour 5 drops of iodine tincture in the bottle or in the beaker and add water up to reach 250 ml. Mix the solution.

At the end of the procedure, the Lugol's iodine appears limpid and brownish.

SAFETY AND DISPOSAL

Read the iodine tincture safety sheet carefully to use it safely and dispose of it properly.



Annex 2

EXPLANATION OF THE REACTION

(This information can be useful to the facilitator while he addresses to the participants, to stimulate the reflection on the key items of the experience)

The reagent (water and corn-starch, as known as starch solution) is a turbid liquid which assumes an intense purple colour when in contact with Lugol's iodine.

Lugol's iodine (or Lugol solution) is an hydroalcoholic yellow-brown iodine solution.

Starch consists in a long molecule formed by numerous glucose units. Its helical shape is responsible for the intense purple colouring assumed by Lugol's solution. The molecule of iodine can fit perfectly into the starch helix and this interaction causes an immediate change in colour, from yellow-brown to dark purple.

The reaction described is reversible in presence of vitamin C. The foods containing vitamin C break up the starch-iodine complex and bring the reagents back to their initial colour. The greater the amount of vitamin C present, the greater the change.

In the absence of vitamin C the reagent maintains its dark purple colour.



Visions of Future Food

The activity has been developed by the educational staff of the National Museum of Science and Technology Leonardo da Vinci in Milan, Italy. It is based on the experimental and interactive methodologies applied in the educational activities of the Food and Nutrition Interactive Lab of the Museum, which rely on the principles of non-formal learning.

The activity also incorporates approaches deriving from social research (concept mapping) and from the system understanding methodologies adopted in FIT4FOOD2030 (visioning).

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AT A GLANCE

Thematic Area	<ul style="list-style-type: none"> - Systemic approach - Scientific citizenship - Innovation and transformation of the systems - Future studies - Food and research
Format	Visioning process developed through an experimental activity with the optional intervention of an expert/researcher, and a creative expression of a future scenario with artistic tools.
Duration	1 hour and a half
Type of audience	<ul style="list-style-type: none"> - High school students - University-level students
Age group	From 16 years old students to 20 years old students
Number of participants	20
Prerequisites for participation	No prerequisite is needed for the activity
Number of facilitators	1 facilitator + 1 researcher (optional)
Overall difficulty	<p>Topic: Intermediate</p> <p>Preparation: Intermediate</p>

	Facilitation: Intermediate
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OVERVIEW

The activity is structured into different phases, interconnected:

- The creation of a concept map
- An experimental activity
- An activity of visioning

The visioning exercise starts from a crucial question, concerning one of the main aspects of the food system: “what will be the future of food?”, explored in three possible contexts: food consumption, food production and food purchase.

The experimental activity (about proteins in insects-based food) and the participation of an external expert can help in the exploration of these themes with alternative tools and help students in formulating hypothesis and drawing a vision of the future.

OVERALL AIM

The module purpose is to reflect about the links among different areas of the food system, to involve students’ abilities and competences in reading and interpreting the systemic dimension of food and its development in the future.

SPECIFIC (LEARNING) OBJECTIVES

After the participation to this module the participants should be able to:

- Understand the concept of “systemic perspective” referring to the food supply chain, in order to read and interpret the food system as:
 - A complex of relations and connections between parts, in order to improve an interdisciplinary approach to the comprehension of researches and developments in this field.
 - A dynamic and growing network, as the comprehension of the development process can foster a responsible and sustainable transformation
- Visualize future scenarios with novel foods
- Experiment a stronger emotional engagement linked to the topic of food system

SUGGESTED SCENARIO FOR IMPLEMENTATION

The activity can be proposed during school hours, in events of orientation to STEM careers, during university and research centres open days.

TOPICS & COMPETENCES COVERED BY THE ACTIVITY

Thematic area(s)	- Systemic approach for the understanding of the elements of the food system;
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	<ul style="list-style-type: none"> - Interdisciplinary vision of research and development process in the agri-food field; - Scientific citizenship and innovative competences; - Connections between research and civil society.
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FOOD2030 Research & Innovation priorities

<i>Priority</i>	<i>Indicate whether main or secondary</i>	<i>Addressed through</i>
Circularity & Resource Efficiency	Secondary	<ul style="list-style-type: none"> - Experimental activity, to increase awareness on novel food properties and possibilities
Innovation & Empowerment of Communities	Main	<ul style="list-style-type: none"> - Activity of visioning to foster the reflections on hypothesis and visions for future food scenarios
Nutrition & Health	Main	<ul style="list-style-type: none"> - Experimental activity, to explore novel foods properties and nutritional value.
Climate & Sustainability	Main	<ul style="list-style-type: none"> - Experimental activity, to increase awareness on novel food properties and possibilities

Responsible Research and Innovation (RRI)

<i>Related concept</i>	<i>Addressed through</i>
Public Engagement	<p>Exploring research aspects of the food system</p> <p>Active involvement of the students as citizens and stakeholder of the food system</p>

<p>Scientific Education</p>	<p>Experimental activity on properties and nutritional value of novel food, through an inquiry-based approach for learning</p> <p>Multidisciplinary approach to science</p> <p>(Interaction with an expert in an informal setting)</p>
<p>Research & Innovation (R&I)</p>	
<p><i>Related concept</i></p>	<p><i>Addressed through</i></p>
<p>Food analysis and food nutritional properties</p> <p>Awareness that R&I address different aspects of the food system</p>	<p>Experimental activity</p>
<p>(Food) Systems thinking</p>	
<p>The module aims to integrate and potentiate the Food System-declined RRI competences, through some specific actions:</p> <p>ANTICIPATION</p> <ul style="list-style-type: none"> - <i>Food-related future studies abilities</i>: inquiry on novel food, visioning the possible development of food systems <p>REFLEXIVITY</p> <ul style="list-style-type: none"> - <i>Situational awareness</i>: understanding the complexity of Food System and reflecting on its several implications in different fields. <p>RESPONSIVENESS</p> <ul style="list-style-type: none"> - <i>Navigating Complexity</i>: reflecting on an articulated vision of the Food System and the ability to explore it. <p>INCLUSIVENESS</p> <ul style="list-style-type: none"> - <i>Multi-perspective communication</i>: understanding the system through dialogue embracing others' opinions. - <i>Participatory ability</i>: collaborating in groups and comparing different standpoints. - <i>Transdisciplinary collaboration</i>: mixing different competences and field of actions, avoiding sectorial separations. 	

Potential of bringing the arts, socio-economic science and humanities creatively or trans-disciplinarily with the module?

Social sciences approaches:
 The module includes a methodology for concept mapping that comes from social research, and serves to explore people’s conceptions about a topic.
 Creative and artistic approaches:
 The module exploits artistic tools, such as drawing tools and mouldable paste, in order to foster imagination in the process of visioning of future scenarios about food.

TARGET AUDIENCE

Audience category	<ul style="list-style-type: none"> - High school students - University-level students
Recommended number of participants	20
Recommended age	From 16 years old to 20 years old
Prerequisites	No prerequisite is needed for the activity

OPTIONS FOR MULTI-STAKEHOLDER ENGAGEMENT

<i>Stakeholder</i>	<i>Role envisaged in the activity</i>
Food system experts	Dialogue with participants moderated by the facilitator, on the Personal Meaning Map and on the Food System scenarios, to reflect on future perspectives of research, and on challenges and opportunities of the science of food.

SETTING UP THE MODULE

FACILITATION/DELIVERY

Needed for the implementation of the activity:
 1 facilitator (optional: 1 researcher or expert of the food system)

Suggestions for the facilitators in the different phases:

- PREPARATION

First, the preparation of the setting and the context of the activities is crucial to create a positive habit in which participants can work. It can be referred to the physical space where the activity takes places or to a proper and efficient stakeholder engagement.

- CREATION OF A PERSONAL MEANING MAP (part 1 and 2)
See the link in Resources:

Personal Meaning Map:

<https://www.raeng.org.uk/publications/other/ingenious-personal-meaning-mapping>

- OPTIONAL CONTRIBUTION OF AN EXTERNAL EXPERT
(RESEARCHER OR FOOD SYSTEM PROFESSIONAL)







It might be useful to suggest to the expert to alternate his intervention with some questions, to stimulate the participation of the public.

Before the facilitator introduces the expert, ask the participants about their perception on his profession can be interesting and can stimulate the debate with the expert himself.

When students have the possibility to spontaneously ask questions, they are often interested to personal aspect of the researcher's life, on his professional career and his academic experience. These elements can stimulate students' attention during the dialogue.

- EXPERIMENTAL ACTIVITY

It's important to stimulate the direct participation of each participant, trying to avoid demonstrations. For a succeeding activity, the facilitator has to encourage hypothesis, descriptions of the phenomena or any other comment before and during the practice. Trying to engage the participants, it is suggested to alternate moment of practical activity with a dynamic interaction using questions and debates. The facilitator has to avoid unveiling the results of the experiment before all the participants have made their considerations and comments. Referring the main scientific features of the experimental activity proposed, it can be useful for the facilitator to take in account the content of *Annex 2* and *Annex 3*.

RESOURCES		
<i>Physical materials</i>		
<i>Resource name</i>	<i>Picture</i>	<i>Number</i>
Chopped meat (bovine, swine or poultry)		10 gr
Dried insects (i.g. flour worms)		10 gr
Fruit (or any other food without proteins)		10 gr
Pipettes		2
Copper sulphate solution (see attachment for the preparation of the solution)		1 test tube with stopper (minimum capacity 10 ml)
Sodium hydroxide solution (see attachment for the preparation of the solution)		1 test tube with stopper (minimum capacity 25 ml)

Becher (100 ml capacity each)		12
Post-it of 2 different colours		60 post-it for each colour
A3 sheets		25
Moldable paste (or clay)		100 g for person
Felt pens of different colours		At least 20

Useful links, videos, articles

Personal Meaning Map:

<https://www.raeng.org.uk/publications/other/ingenious-personal-meaning-mapping>

Food Systems

<https://foodsource.org.uk/building-blocks/what-are-food-systems>

PREPARING THE SETTING

The activity can take place in a room, in a classroom or in the school science lab; tables and chairs are grouped to create 4 workstations, in each of which 5 people work together. A table for each workstation is needed to place the material for the activity.

A free wall might be useful to hang the conceptual map to make it visible to everyone. The activity alternates individual work to group work and plenary sessions with the mediation of a facilitator.

Before the activity starts:

- Place the materials for the experimental activity
- Prepare the copper sulphate solution and the sodium hydroxide solution.

DETAILED DESCRIPTION OF THE MODULE SCRIPT

Step	Competences of the participants
<p>Preliminary preparation</p> <p>The facilitator prepares the copper sulphate solution and the sodium hydroxide solution following the instruction in Annex 2 and Annex 3.</p>	//
<p>Group management</p> <p>Divide the participants in 4 groups and let them take sit around the workstations.</p>	
<p>Introduction: 10 minutes</p> <p><i>Creation of a map - Personal Meaning Map on the theme: “Food System” – part 1</i></p> <p>The first part of the activity is focused on exploring all the key areas of the complexity of the food network, starting from participants’ experiences and knowledge. The Personal Meaning Map is the tool used to create the very first scenario of participants’ ideas on food system (to deepen the methodology of the map, see the link in Resources).</p> <p>To introduce the theme “Food System”, the facilitator prepares a poster-dimension sheet writing on it: “FOOD SYSTEM”. He explains the purpose of the activity that is the creation of a cognitive map to stimulate the discussion. He asks the participants to write on a post-it a key word (associated with a certain experience) which is related to the idea of food system. It’s important to use post-it of all the same colour in this first phase. Each participant individually writes 2 or 3 key words then, starting from a volunteer, participants share and shortly explain the chosen words and, at the same time, attach the post-it on the map. In case of similar words or experiences, participants can join other explanations.</p>	<ul style="list-style-type: none"> - Situational awareness

<p>It's possible to gather and to cluster words and concepts, naming each group of words after a short plenary negotiation on the possible choices. The next phase is dedicated to expanding and deepening the knowledge about the elements which the map is composed by, through the experimental activity. The map is now left in the background and will be reconsidered after the hands-on phase.</p>	
<p>Development part 1: 15 minutes</p> <p><i>Experimental activity</i> The facilitator introduces the activity as a tool to stimulate new ideas or new questions on the food system. He starts making questions such as: "What do insects contain? Why, in your opinion, insects are considered as one of the novel foods of the future?" Meanwhile, he takes note of the hypothesis and proposes to find the answer through experimentation. He proceeds giving each group the following instructions to work with:</p> <p><i>Experimental protocols for groups</i></p> <p>Put the chopped meat, the insects and the fruit in three different bechers (one for each substance). Add the reagents to each becher, in the following ways: 3 parts of sodium hydroxide and 1 part of copper sulphate. i.g.: 7,5 ml of sodium hydroxide and 2,5 ml of copper sulphate. Leave for few minutes and observe the change in the colour of the reagent when in contact with foods and insects.</p> <p>Results: Meat: the reagent turns purple Insects: the reagent turns purple Fruit: the reagent doesn't turn purple (it remains light blue) The explanation of the phenomena is the following: In presence of proteins the reagent turns purple. In absence of proteins the reagent maintains its original colour (light blue). Copper ions (copper sulphate) react with the protein peptide bond, giving an intense purple colour in a basic solution (sodium hydroxide). Insects and meat, therefore, contain proteins. Fruit does not contain proteins (negative control).</p> <p>Once the experiment is finished, the facilitator stimulates the reflection on protein content of foods, without directly giving explanation but making questions to the participants. He shares in plenary the observations of the public, going back to the initial issue (What do insects contain? Why they are considered as one of the foods of the future?)</p>	<p>- Future studies abilities</p>

<p>Questions help the reflection and the comparison between usual foods (meat, fruit) and novel foods (insects). They can be, e.g.:</p> <ul style="list-style-type: none"> - Which colour do you observe? - Why did the food change its colour? - What these foods have in common? 	
<p>Development part 2: 15 minutes</p> <p><i>Expansion of a map - Personal Meaning Map on the theme: “Food System” – part 2</i></p> <p><i>Contribution of the researcher</i> The researcher asks the participants if the experimental context has aroused some other impression or reflection and if they need to enrich the map, by adding other words;</p> <p>To do that, participants use the second-colour post-it. The researcher comments and discusses about the map together with students, aiming to:</p> <ul style="list-style-type: none"> - Establish connections between the emerged themes and the world of the Research (present scenarios, boundaries, critical issues); - Let the interdisciplinarity of themes and interconnections emerges; - Expand the map, if needed, by adding the missing themes. <p>In order to facilitate the discussion, the researcher can propose to cluster the words and to associate to each cluster a different key word. He can also present to the students an object related to his research, to stimulate their imagination and project them in a new scenario.</p>	
<p>Development part 3: 30 minutes</p> <p><i>Creation of a vision</i> The arrangement of each workstation changes: on each table, students have now clay or mouldable paste, felt pens and sheets. To present the next step, the facilitator and the researcher briefly introduce these key aspects:</p> <ul style="list-style-type: none"> - System are dynamic networks, rather than static ones, so they continuously evolve and change. The upcoming challenges have to consider the best ways in which the system should grow: in a regular and harmonic way. In this way the system could remain sustainable. - Beside analysis and comprehension of the themes, “visioning” can be considered as one of the main tools that helps the positive change and the design of future scenarios. The visioning exercise is 	<ul style="list-style-type: none"> - transdisciplinary collaboration

<p>a form of free-imagination practice.</p> <p>The facilitator should prompt the discussion by asking: what will the food of the future look like? What will contain your typical meal in the future?</p> <p>In order to answer these questions, students have to:</p> <ul style="list-style-type: none"> - Imaging situations that reflect expectations, ideals, values connected to the questions. - Representing the vision using different materials (colours, paper, written words, mouldable paste), choosing the medium that suits the most their expressive style, in order to unlock any creative input. <p>To answer the questions, participants have the possibility to represent their vision.</p> <p>Once the concept of “vision” is clear to the students, they are invited to use the time left (30 minutes) to sum up their ideas, to imaging a future scenario and concretely represent it using the materials available.</p>	<ul style="list-style-type: none"> - multi-perspective communication
<p>Conclusion: 20 minutes</p> <p>The facilitator invites each participant to present and to share his personal vision.</p> <p>Together with the researcher and the public, he discusses the emerged inputs, to identify the coherent elements part of the systemic vision of the food system.</p>	<ul style="list-style-type: none"> - participatory ability - navigating complexity

DEVELOPERS

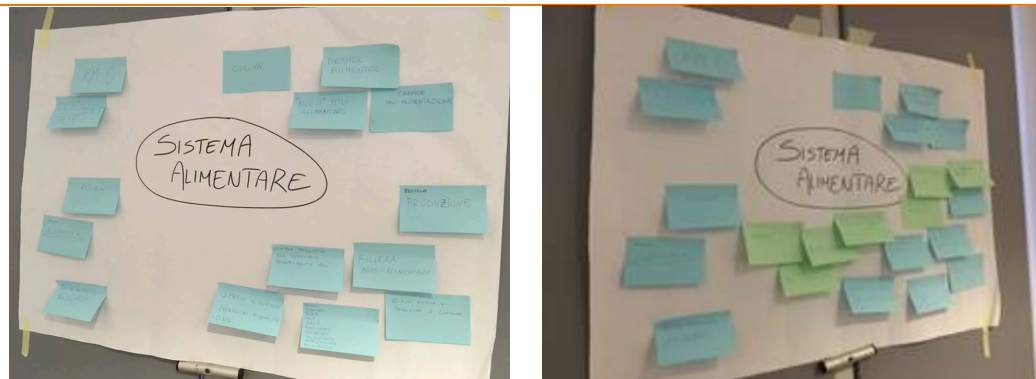
This module was created by the National Museum of Science and Technology Leonardo da Vinci. The perspectives of other stakeholders from the Milan City Lab were considered, namely those of:

- Milano Urban Food Policy Pact Office (Municipality of Milan);
- AGER (Network of foundation for the development of Agrifood Research)
- High school teachers whom participated to the Open Day for teachers held at the Museum on October 2018, 6th.
- Dott. Cristiano Sandels Navarro, founder of Food Education Italy and General Secretary of the foundation since 2011. He is counsellor and trainer in organizing development, management and communication in projects and multidisciplinary innovative activities. He was professor of Environmental and Economic Sustainability of Agrifood Systems at Università Statale di Milano. Sandels significantly contributed to the candidacy of Milan for Expo 2015 and actively collaborates with MIUR (Italian Ministry of Education, University and Research) to the drafting of Guidelines for Food Education in Italian School.

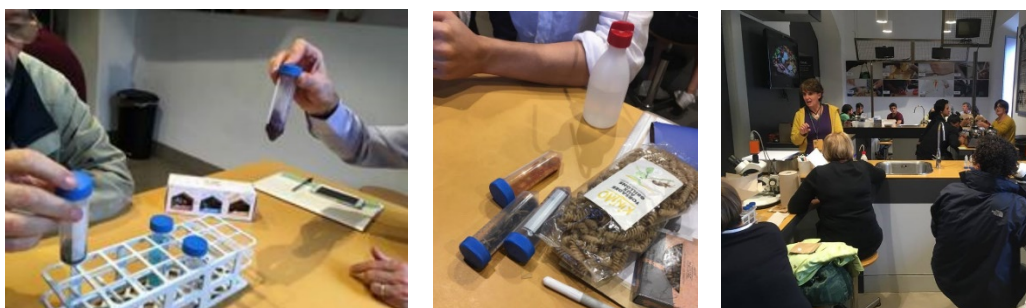
The module was partially based on: Facilitation script visioning City Labs- Extension to module 4 of 'Deliverable 1.1 Tools and training for setting up a transformative network'

A check for scientific accuracy was done by Valeria Chiodini, Responsible for the Nutrition and Food Interactive Lab of the Museum and Cristiano Sandels Navarro, founder of FEI in Italian.

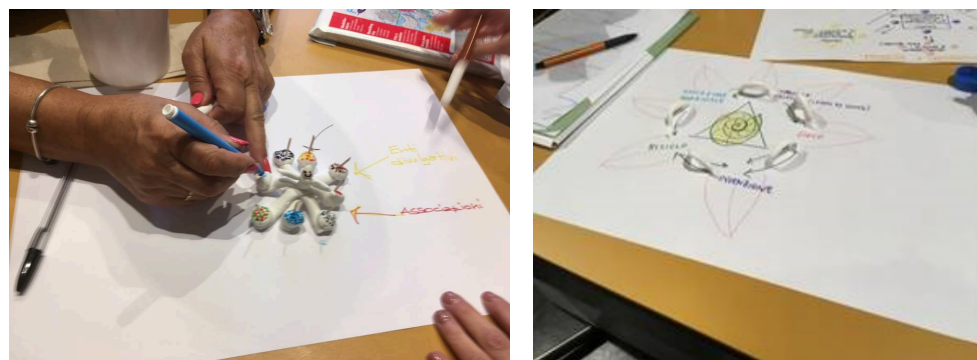
IMAGES ILLUSTRATING THE ACTIVITY

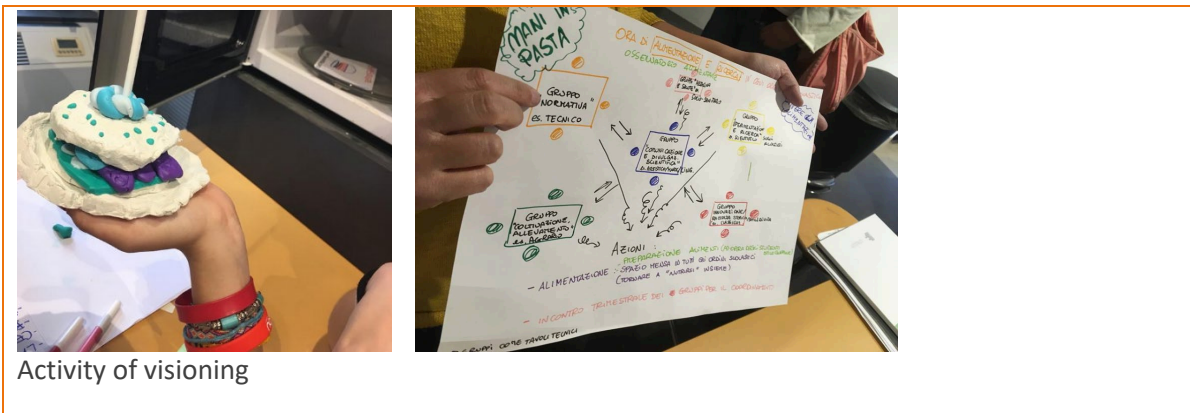


Examples of a Personal Meaning Map



Experimental activity





Activity of visioning

ANNEXES

- Annex 1: In-depth sheet: Visioning
- Annex 2: Preparation of the copper sulphate solution
- Annex 3: Preparation of the sodium hydroxide solution

Annex 1: Visioning

Visioning about a desired future can be an important stimulus for change. It can be the first step in creating a powerful strategy to achieve a desirable future or a particular purpose. In a visioning process, various stakeholders are brought together, that are involved in the environment of the addressed topic, thus visioning is a participatory tool to develop a shared vision of the future. Two central questions in a visioning process include: “Where are you now”? and “Where do you want to be in the future”? The aim of a visioning process is to develop written and visualized statements of long-term goals and strategic objectives in the interested field.

Regarding outputs, visioning is a method for generating a compelling vision of a preferred future. Thus, the outcome of a visioning process includes some pictures that communicate in a very powerful way the preferred future and benefits of the future. A visioning process can also help to show the interdependencies between different factors that shape the future. Ultimately, visioning can lead to recommendations and even transformations of for instance policies, priorities, strategies, investments, socio-economic and research and innovation systems, behaviours and attitudes, education, products and services.

Visioning is typically used after a problem and situation analysis has been completed (although this is not a necessity for your workshop) and before the detailed planning and decision-making process with the involved stakeholders has started. Whereas the results of the problem and situation analysis serve as the definition of State A (Where are we now?), the outcomes of a visioning workshop describe a future State B (Where do we want to be?). Visioning is a process and visioning activities can be organized at any stage of the pathway. In any case, the visioning process should be implemented before decisions on e.g. Lab activities are made. It can last one or several days, even months, depending on the complexity of issues faced.

[from: Facilitation script visioning City Labs- Extension to module 4 of ‘Deliverable 1.1 Tools and training for setting up a transformative network’]

Annex 2

Preparation of copper sulphate solution

Materials:

- 1 one glass bottle with stopper or becher (600 ml capacity)
- 15 ml capacity test tubes with stoppers
- 1 funnel
- 1 spatula
- anhydrous copper sulphate
- distilled water

Copper sulphate is a light blue coloured crystal powder.

Take the container with copper sulphate and a plastic test tube with a stopper.

On the test tubes there's a scale, from 1 to 15 units. In case of powdered substances, 1 unity corresponds to 1 cm³.

With a funnel, introduce the anhydrous copper sulphate in the test tubes, up to reach 5 cm³.

Pour the content in the bottle or in the becher and add distilled water up to reach 250 ml.

Vividly and continuously mix the solution in order to let the salt completely melt.

Copper sulphate has a low solubility; for the complete dissolution of the salt is required a waiting time of at least 30 minutes. At the end of the process, the copper sulphate solution appears limpid and light blue.

For the experimental activity, pour the solutions in the test tubes as needed.

SAFETY AND DISPOSAL

Read the anhydrous copper sulphate safety sheet carefully to use it safely and dispose of it properly.

Annex 3

Preparation of the sodium hydroxide solution

Material:

- 1 one glass bottle with stopper or becher (600 ml capacity)
- 15 ml capacity test tubes with stoppers
- 1 funnel
- 1 spatula
- sodium hydroxide
- distilled water

Sodium hydroxide is in form of solid, white and odorless pellets.

Take the sodium hydroxide and a test tube with stopper.

On the tube there's a scale, from 1 to 15 units. In case of solid substances, 1 unity corresponds to 1 cm³.

With a funnel, put the pellets in the tubes up to reach 10 cm³.

Pour the content in the bottle or in the becher and add distilled water up to reach 250 ml.

Vividly and continuously mix the solution in order to let the pellet melt.

Sodium hydroxide presents a high solubility and is an exothermic substance: an increase of temperature of the solution may happen during the process.

At the end of the process, the sodium hydroxide solution appears limpid and colourless.

For the experimental activity, pour the solutions in the test tubes as needed.

SAFETY AND DISPOSAL

Read the sodium hydroxide safety sheet carefully to use it safely and dispose of it properly.

I ♥ FOOD

This module was created by secondary school biology teachers together with school director, parents and end users. A check for scientific accuracy was done by a biology teacher in Bulgarian.



AT A GLANCE

Thematic Area	nutrition, food production
Format	short school course
Duration	4-5 sessions of 35-40 minutes
Type of audience	primary school children
Age group	9 years old
Number of participants	10-15, the group could be bigger if there are more facilitators to support the activity.
Prerequisites for participation	None
Number of facilitators	1-3
Overall difficulty	<p>Topic: Beginner</p> <p>Preparation: Beginner</p> <p>Facilitation: Beginner</p>

OVERVIEW

The sessions would be organized as games, and students will learn about healthy food, food production, food origin through fun.

OVERALL AIM

Make the students more aware about healthy diets and food production. Create favorable environment for better understanding of healthy diet.

SPECIFIC (LEARNING) OBJECTIVES

After the successful completion of this module participants are expected to be able to...

- to understand which foods are good for their health;
- which foods should be avoided or consumed rarely;
- have knowledge how basic foods are prepared;
- what are some basic rules for a healthy diet;
- understand the importance of fruits and vegetables for a healthy diet;
- Understand meaning of proper and healthy eating habits.

SUGGESTED SCENARIO FOR IMPLEMENTATION

This activity could take place at schools as a short course, additional classes or as a part of educational activities, organised by a different institution. It could take the form of a non-formal education.

TOPICS & COMPETENCES COVERED BY THE ACTIVITY

Thematic area(s)	<i>food elements; food production; healthiness of food</i>
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FOOD2030 Research & Innovation priorities

<i>Priority</i>	<i>Indicate whether main or secondary</i>	<i>Addressed through</i>
Circularity & Resource Efficiency		
Innovation & Empowerment of Communities		
Nutrition & Health	main	Food and health connection, including basic rules for healthy diet, knowledge of the different types of food.
Climate & Sustainability		

(Food) Systems thinking

The modules show the how different foods are produced and prepared how they affect our health.

Other competences








<i>Competence</i>	<i>Addressed through</i>
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	<i>E.g. Explicitly integrated within the learning goals, or integrated in materials and assignments, etc.</i>
Basic nutrition knowledge, Learning about the importance of food and how it affects our health	Participating in „Traffic lights of foods“, learning about the fruits
Have knowledge of where food comes from	Participating in „APC of foods“, learning about how fruits grow
Have a healthy food relationship: Learning to have positive attitudes around food and eating, as well as understanding that all foods can have a positive role in our diets	Participating in „Traffic lights of foods“, learning about the fruits
Potential of bringing the arts, socio-economic science and humanities creatively or trans-disciplinarily with the module?	
The module includes learning through arts and students will draw and use visual materials. A short dramatization which could be developed as a performance is developed.	

TARGET AUDIENCE	
Audience category	primary-level students
Recommended number of participants	10-15
Recommended age	9 years old
Prerequisites	There are no specific prerequisites, students should have.

OPTIONS FOR MULTI-STAKEHOLDER ENGAGEMENT	
<i>Stakeholder</i>	<i>Role envisaged in the activity</i>
Teachers	Leading the activity
Demonstrators/animators	Supportive activities
A chef at the school or guest for a session	Supportive activities
A musician or older student who plays and instrument	Supportive activities

SETTING UP THE MODULE
FACILITATION/DELIVERY
The activity might be organized with one facilitator – a teacher (for example) or 2 or 3 facilitators e.g. involving older students/volunteers involved in the process of improving food literacy. Students do not need any specific background or competences.

RESOURCES		
<i>Physical materials</i>		
<i>Resource name</i>	<i>Picture</i>	<i>Number</i>
Cardboards (to be used as boards for collages)		10 -15
“Traffic light” made by colourful cardboards		3-5
Pictures of products related to milk, cereals, healthy and junk food		6-10 sets of 5-10 pictures
Adhesive tape		3-5 tapes
Painting materials		10-15
“Medals”, might be in the form of fruits/stars...		20-30
Pictures/Cards with different fruits to be used as “costumes” in a dramatization		5-15
PREPARING THE SETTING		
The activity could take place in the class room and few blocks of tables with chairs around them could be organized for each team. For the last part of the module, short dramatization, more free space is needed.		
DETAILED DESCRIPTION OF THE MODULE SCRIPT		

Step

The facilitator could choose one or several activities, which they could implement. The idea is that all sessions are game-like. Keeping this in mind the facilitator could modify or add a fun element in the session.

As a first step the students are introduced to food elements, using pictures and boards to visualise them.

After this they learn about the healthy foods and others which should be consumed rarely. The sessions include answering quizz, which could be made in two or three teams, using healthy rewards and/or medals.

Another approach is organizing a short dramatization, which could be accompanied by music. If the faciliator has possibility, they could make costumes together with the students or with the help of older students.

It is advisable that each session starts with a short revision of the previos one.

A good practice would be to show the students work – boards, posters, drwaings, etc. In the school as a result of their work.



Contents

APC of food?	72
„Traffic lights of foods“	74
Food and health. Fruits	76
Food and health. Fruits II	80

APC of food?

Hello!

We are here as your guests with the idea to get familiar with you and to play games together. Today's game is called "APC of food".

- "A" – Do you like to eat? (Here follow their answers. We ask which their favorite foods are).

- What do you think "P" stands for in our "APC of food" game?

* We wait for their answer and if they don't give any, we proceed with giving the answer with a relevant explanation*

- "P" is the initial letter of one of the three types of nutrient substances – proteins. Do you know what proteins are and why they are so useful for us?

We wait for an answer

- Proteins are the basic material of which the bodies of all living organisms on the planet Earth are made, they are the small "bricks" of which our bodies are built too.

Can you give examples of foods rich in proteins?

Some possible answers are meat, lentil, eggs, fish. Upon getting the reply "milk", we proceed with the subject of milk products

- Milk, or rather the food products containing milk, are exactly what we are going to talk about today. Milk is the food which mammals (such as us humans) begin to feed their offspring with. Milk and the dairy products are one of the basic food groups in children's nutrition. Their daily intake is very important at the age of children's growing up when the need of calcium is very high. Calcium is a mineral that is highly essential for having healthy and strong bones. If children don't take enough calcium in childhood, they will not be able to grow up healthy and strong enough. The dairy products supply one fourth of the proteins necessary for the growth, and three fourths of the minerals calcium and phosphorus that we



need in order to have healthy bones and teeth. Milk and the dairy products are very important for the proper development and functioning of the children's bodies, because the fats they contain are responsible for the supply and the assimilation of the vitamins A and D. The lactose (or milk sugar) and vitamin D are necessary so that calcium can go to the right places in our body – in the bones and the teeth – in order to make them strong and to protect us from diseases when we have grown up. Which are your favorite dairy products?

Some possible answers are: butter, cheese, yellow cheese, yoghurt

- Do you actually know where milk comes from?

We wait for their answer and if the children don't give any, we show them the picture with the origin of milk, followed by an explanation

- After milking the animal, the milk goes to the dairy products plant where it is processed, bottled or transformed into different milk products, then it goes to the shop. After we buy it, it reaches our table and we start eating it.

After the explanation, we introduce the game

- Now you will be divided into 3 teams, and each team will receive several pictures. You have to choose from them and arrange in a "Clover of health" all pictures related to milk. In its center you place the "source" of milk and dairy products. Time for the task – 5 minutes.

*Our teams take their places next to the children and help them, observing the decisions they make. We give out one cardboard cut in the shape of clover to each one / or they stick tapes with pictures as a hanging collage. After the time is up, each team shall present its clover / tape collage and explain its arrangement. The team having included the picture with "beating of butter" shall get an additional point. The team that was the quickest to solve the task shall get respectively 3, 2 or 1 point.

- The time has come for the next letter of our game – "C". What do you think "C" stands for in our "APC of food" game?

* We wait for their answer and if they don't give any, we proceed with the explanation*

- "C" like carbohydrates. Do you know what carbohydrates are?

* We wait for their answer and if they don't give any, we proceed with the explanation*

- Carbohydrates are the basic sources of energy for our bodies. Can you tell what do we need energy for?

Possible answers: to grow up, to study, to move, to play

* If they don't give the answers, we prompt them*

- And do you know which foods are rich in carbohydrates?

Possible answers: sweets, fruits and vegetables (upon getting the reply “cereals”, we proceed with the subject of cereals, or if not, we give that answer

- Do you know that the foods most rich in carbohydrates are the cereals and the cereal plants? These are also the foods providing the group B vitamins that are so important for our health and good mood? What examples of cereal plants can you give?

Possible answers: wheat, oats

- Do you know what this symbol means (wheat ear crossed out)? This is a symbol put on foods that should not be eaten by people with a special disease. The foods containing flour of wheat grains are harmful for such people and they have to keep a very special food diet. For all the rest people the cereals are a wonderful source of fibers, energy and vitamins.

- Now we are going to test your knowledge in still another game. You have to arrange consecutively the cereal plants and the foods we make of them in “The wheat road”. You shall get 1 point for each item arranged in the right order.

We give out a large cardboard with a road drawn on it to each team. At the beginning of the road they have to stick the cereal plants, then the wheat grains and after that the pictures of the foods. After the end of the game, if the items are not arranged in the right order, we shall explain what the order should be.

Finally, we account the points and award the teams with special medals

- Now, as an award for the wonderful job you did, everyone of you shall get one little star/fruit. We hope that you had a wonderful time learning something interesting in a slightly different way.

- And for a finish, we strongly hope that you have materials for drawing, because it is time for your creativity. Now color the collages that you made today in the two games and we shall be greatly pleased to see them when we come again soon.

„Traffic lights of foods“

1. We prepare the materials – traffic lights with sticks attached to them
2. Cut out pictures of different types of foods and examples of different impacts on the environment due to human activity
 - 1) Packaged – chips, snacks, lollipops, sweets
 - 2) Meat and meat products

- 3) Fruits, vegetables, bread, rice, potatoes, milk and dairy products
- 4) Pile of plastic bottles, pictures of chimneys polluting the air; people planting a tree, picture of innovative/alternative technologies as source of energy; people cleaning the ocean, people gathering garbage in the forest, recycling

3. Game realization:

- 1) At the beginning the children show the colored pictures from the previous games. Then follows a discussion for reassertion of the learned notions from the previous time. Focus again on the importance of proteins and carbohydrates as a part of good nutrition. We ask the children how often do they eat milk products and which are the most frequently used foods containing carbohydrates at home.
- 2) As a logical continuation to the subject of frequently used foods, we introduce the new subject. We ask questions so that that we can find out whether the children have the knowledge and skills to differentiate the foods' qualities according to their nutrition value.
 - 1) Do you know which foods you should eat every day?
 - 2) Do you like to eat various meals?
 - 3) What do you have for breakfast, lunch, supper most frequently?
 - 4) Do you compose a daily, weekly menu at home?

b) We proceed with the topic of city traffic:

- Today we shall play traffic cops – what does a man with this job do? Have you watched a traffic cop in operation? (Possible answers: he/she controls street traffic/puts on traffic lights in the streets).
- When there is no traffic cop, how do you cross the street correctly? (Possible answers: we wait for the green traffic light to switch on).
- What do you do at yellow and red traffic light? (We are careful and do not cross the street).
- Do you want us to play traffic cops today? Guess what we shall be learning to regulate? (Possible answers: the food, food products, nutrient substances).

4. We give out the prepared traffic lights and pictures to the teams. We ask them to view the pictures carefully and to try and guess the principle of foods sorting.
5. We hear the suggestions of each team before starting the sticking activity. We give directions:
 - To the green light (color) you must stick the pictures of foods that you should eat every day – fruits, vegetables, carbohydrates (such as bread, rice, pulses, legumes / milk and dairy products).

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We explain that these are the foods that give us the necessary daily energy and material for building our bodies. We recall the items from the previous game.

- To the yellow light (color) you must stick the pictures of foods that you should eat several times a week, but not every day – meat, eggs, fish. We explain that these foods are more difficult to digest and our bodies assimilate them more slowly and when taken in greater quantities, they create a sensation of heaviness in the stomach. We shouldn't eat too much of them.
- To the red light (color) we sort the foods that we must eat rarely – packaged foods, candy, sweets, cakes. We explain that these products don't give our bodies any useful substances, and the great quantity of sugar in them gives us a fast energy "bomb", which is manifested in restlessness, jumpiness and overexcitement. The unwanted carbohydrates are transformed into fats that our body stores up and our weight goes up without us noticing it. Again we should stress that these foods have zero nutrition value!
- And the other team – to the green light you should stick the pictures of different activities that help the environment; to the yellow light you could stick pictures of such activities which are good for the environment, but only trying to recover the damages done by people and to the red light – the negative consequences of human activities.

6. We announce start of the game. Our teams offer help in the activities accomplishment.
7. After the set time (10 minutes) is up, we announce end of the game and proceed with a short presentation of the elaborated traffic lights. The children give their arguments as to why they have sorted out the pictures of food products in that specific way.
The team which prepares the traffic light of human activities according to their effect on the environment do the same. In this way they reassert what they have learned on that topic.
8. The evaluation is based on the correct elaboration and explanation of the activity.
9. Follows the teams awarding.
10. We say good-bye to the children and promise to come again and play games together.

Food and health. Plants and Fruits

The session begins with comments on how plants grow and then the basic rules of healthy and balanced nutrition. Then the students answer questions in an entertaining quiz.

Where do plants come from?

We show pictures of the different stages of a growing plant.

A life cycle shows how a living thing grows and changes. While plants life cycles keep going, a plant's life begins with the seed. With water, right temperature and right location, the seed grows. It becomes a seedling. Roots push down into the ground to get water and minerals. The stem reaches for the sun, and leaves begin to unfold. A bud appears. The plants then produce flowers. The flowers are then pollinated in many ways – by bees, moths, butterflies, insects, moths, bats, butterflies and even by the wind. The pollinated flower turns into fruit. The new seeds are inside the fruit. The ripe fruit drops to the ground and the cycle begins again.

Some seeds have an outer layer called a seed coat, which provides protection and food for the seed. When a seed grows, a small root begins to grow downward and a shoot grows upward. When the shoot hits the surface, the plant is called a sprout. The sprout uses water and nutrients from the soil along with sunlight and air to grow and change into a seedling.

A seedling is a small plant with few leaves. Later the seedling changes into a young adult plant.

At this stage, the plant is bigger and may have more leaves. Thin branches will develop on young adult trees. Over time, the young adult plant will grow into an adult plant.

The adult plant is now mature and has the ability to reproduce through spores or flowers. After flowers are pollinated, they get bigger and turn into fruit with seeds inside. The fruit protects the seeds and after it ripens, the seeds can start the life cycle all over again. Because there are so many threats to both seeds and seedlings, sometimes a plant will make a lot of seeds so it will survive.

Important!

All plants need plenty of water and light to grow into healthy plants! But don't over water or give too much light to plants as well!

That is how fruits and vegetables grow!

Then we ask: "Where do you get fruits and vegetables from?"

Does your mom or dad (or aunt or grandma) buy them at the grocery store?"

Give each child a chance to answer. We continue by saying: "There are a lot of places to get healthy fruits and vegetables. Have you ever picked an apple off a tree or picked strawberries off vines on the ground?"

After giving each child a chance to answer, we say: "There are a lot of places to get fruits and vegetables. We can buy them at the grocery store, at a fruit or vegetable stand, at a farmers' market, or we can pick them from a garden. Has anybody ever gone to a farmers' market?"

The group discusses what the children have shared.

The next step is to explain to the children the ten rules of healthy nutrition as the key to a long life and healthy lifestyle. The healthy nutrition determines not only the normal growth and development of the students, but also their work capacity and good results in the studies. Healthy means varied, balanced and regular nutrition.

1. Rule: Variety in the choice of food products. In order to stay healthy and fit, a person needs nutrition substances – proteins, fats, carbohydrates, vitamins, mineral salts and water.
2. Rule: Neither too much, nor too little. Food provides energy in the form of fats, carbohydrates and proteins, and it is measured in calories and joules. It is the source from which our bodies draw strength in order to think, to support the muscles in fit condition, to regulate the body temperature, to keep up the heart activity and breathing – in other words – in order to live.
3. Rule: Smaller food quantities, but more frequently. Everybody has to find the right solution for oneself – corresponding to one’s work habits and free time. Don’t forget: a man has to take time for feeding!
4. Rule: Enough proteins. Life is unthinkable without proteins. They are necessary for the growth, for replacement of the used-up substances that are necessary for the body, and for the normal course of the life processes.
5. Rule: Fats should be maintained within specified limits. The excessive use of fats results in accumulation of body fats. You should prefer vegetable fats to animal fats. And as always – choose variety!
6. Rule: Restrict sugar and sugar products. The excessive sugar is transformed into fats that accumulate in the body.
7. Rule: Eat fresh fruits and vegetables, as well as whole grain products every day. These products are your best guarantee that your body is supplied with enough vitamins, minerals and nutritive fibers. The more various, the healthier!
8. Rule: Correct food processing (cooking). If the food is cooked incorrectly, it not only smells and tastes worse, but it also loses a great deal of its vitamins and mineral substances.
9. Rule: Be thrifty for the salt. Remember the following rule for the salt: the less, the healthier.

10. Rule: Be physically active – get moving, engage in sports you like and maintain your fitness.

After discussion of the rules, the students answer the questions in the quiz:

Quiz:

1. Its color is pink-red, it tastes and smells divinely. Children love it in a jam and juice. What is it?
- a) Melon
 - b) Raspberry
 - c) Fig
2. It looks like the peach, but its taste is not the same. A lovely fruit with orange color.
- a) Plum
 - b) Pear
 - c) Apricot
3. They usually call me southern fruit and I look like huge egg or fir-cone. Guess who I am?
- a) Fir-cone
 - b) Pineapple
 - c) Pear
4. Water melons are my sisters, my color is yellow and I smell wonderfully, because I bathe in sun all day long!
- a) Lemon
 - b) Melon
 - c) Banana
5. I live far away from here, in warm countries in the south. There everyone can feast on something long and yellow!
- a) Bananas
 - b) Pears
 - c) Lemons
6. I look like little red, juicy, fragrant heart! And I am loved by everyone! My name is...
- a) Strawberry

- b) Cherry
- c) Peach

7. You look at me and see a ball, but green. I sunbathe on the melon beach to grow up big and sweet.

- a) Melon
- b) Quince
- c) Water melon

8. I have a little heart of stone, my color is dark blue, and I am sweet and tasty.

- a) Olive
- b) Plum
- c) Cherry

9. They import us from countries far away, but we can also grow in the south of Bulgaria. They sometimes pick us yet little and green and sell us in jars of jam.

- a) Olives
- b) Water melons
- c) Figs

10. I am the bigger and sweeter cousin of the lemon, with juice as sweet as honey.

- a) Orange
- b) Grapefruit
- c) Tangerine

At the end of the game we sum up the points and award the winners.

Food and health. Fruits II

The children are given the text of the dramatization “The speaking fruits”. The roles are distributed among the students so that all of them are included; the part of the presenter may be divided between more children, or the groups of the different fruits may also include more students.

Dramatization

“The speaking fruits”

Presenter: One evening Vanya did not eat her dessert that consisted of a large red apple. She preferred something sweeter and softer because her front teeth were getting loose and very soon were to be replaced by new ones.

Her mom told her crossly that she didn't buy any sweets today. Vanya was displeased. She got up from the table and flung herself angrily on the bed in the children's room. As she lay face down on the pillow, she heard a sudden ringing. She peeped and saw a tiny princess sitting next to her on the bed.

V: Who are you?

F: The fairy of the fruits.

V: What do you want from me?

F: Nothing. I just want you to meet several good friends.

Presenter: Vanya became interested at once. She loved making friends, but it was the first time a fairy offered her friendship.

V: What are their names?

F: You know them, but you just keep avoiding them. In fact they are very kind and knowing them can be very healthful.

V: This is the first time I hear that a new acquaintance can be healthful.

F: You can judge for yourself.

The fairy swings the magic wand and the fruits appear on the stage:

Cherries:

We are cherries,
Dressed in red
Here we come to you
With some very tasty news:
„If you want to grow up,
Eat fruits, don't wait!"

Strawberry:

I am their pretty sister
Strawberry is my name.
I sit on the top of cakes
Over their glossy cream.

Peach, apricots:

We are friends and neighbors,
Tasty beauties dressed in velvet.
And to have rosy cheeks like ours,
Eat some peaches and some apricots.

Plums:

If you eat me with my heart of stone,
You will have a plum tree
growing in your stomach.
Every little child must read
This rule important:
Never eat the fruits with dirty hands!!!
Wash with water every fruit you eat!!!

Grapes:

When the autumn comes to us,

The old vine gets heavy
with its fruits.
It fills the grapes with honey
And the baskets fills with grapes.

Pear:

I am the sweet wild pear,
Hurry, snatch a bag,
Loose no time and pick me up.

Quince:

You can eat the whole of me
This is known since ages past.
Now you learn at once
How useful I can be!

Blueberries, raspberries, blackberries:

We are tiny blueberries, raspberries, blackberries
If you want to get sound and strong
Eat our berries, don't wait long!

Pumpkin, melon, water melon:

We are cheerful and noisy
And we tell sweet tales
Everybody loves us
And they call us pumpkin, melon, water melon!!!

Walnut:

If you want to be as smart as me,
Break my shell
And eat my heart,
Remember not to try
To break my shell
With your teeth!

The fruits sit around Vanya and every fruit draws a picture of itself.

F: One fruit is missing! Can you guess which one?

V: The apple.

F: You guessed right! I shall introduce it last because it is very important.

V: What is so important about it?!

The fairy swings the magic wand and the apple appears on the stage.

Apple:

Here I am! You should eat me every day!

V: You wish!!! /she shakes her head disapprovingly/

F: Just listen to her story.

The apple begins to tell her story:

APPLE:

The apple is a wonderful fruit – it has no fats, it has very few calories, it is poor in sodium chloride and has no cholesterol.

The pectin hairs in the apple clean like a brush the inside of our intestines and thus not only help our stomach to work well, but they also remove the harmful deposits that are inside our bodies.

F: Here is one excellent ripe apple for you, dear, eat it!

V: I can't. My teeth are loose!

F: Don't worry, you will have new ones, even better and stronger, grown in their place, but you must take care of them! My sister, the Tooth Fairy, will tell you how to do this.

The fairy goes out and the Tooth Fairy dressed in white enters the stage.

TF: Hello! I am the Tooth Fairy. In order to have healthy teeth, you must take care of them.

V: I know! I brush my teeth regularly after every meal, I eat sugar free candy and bubble gum.

TF: And do you drink milk in the morning?

V: I hate milk! And what does milk have to do with my teeth?!

TF: But you should not hate it... Now listen to the story of one cup of milk.

A cup of milk appears on the stage.

Cup:

Milk is the basic food of all newborn babies and young animals - mammals, as well as of the man. You can find almost all vitamins in milk, and it contains also calcium and phosphorus which are very important for your teeth. Milk is not a durable product, which is why man has found ways to make it more stable and resistant to spoiling. One of the ways is by curdling it, as a result of which you get yoghurt. The most popular sour milk product is the Bulgarian yoghurt. It is widely spread in the whole world and the basic bacteria from which it is prepared is *Lactobacillus Bulgaricus*. Curd is made by using other bacteria. Other countries have other popular sour milk products, such as clabber, mazzoni, kefir, kumis, and others. The lactic acid (or milk acid) that is obtained under the action of sour milk bacteria, suppresses the development of harmful microorganisms not only in milk, but in human intestines too. The sour milk products contain a great number of living sour milk bacteria. They can suppress and even stop the development of the harmful microorganisms in the intestines that may cause diseases. The nutrition value of yoghurt is greater than that of fresh milk.

There is a huge variety of cheeses manufactured around the world. For instance, in France considered as the cheese paradise, you can find about 150 kinds of cheese. In Bulgaria there are 2 basic types of cheese manufactured out of the different milks – white brined cheese and yellow cheese. The cheeses are a concentrated source of proteins and calcium. They contain 3-6 times more vitamin A compared to milks, 2 times more vitamin B2 and 2-8 times more of the folic acid vitamin. Milk sugar is almost completely decomposed and there are only traces of it in the cheese. In most yellow cheeses the contents of fats is high, which is why we recommend you to restrict their consumption. But the Bulgarian cow's white brined cheese is much more dietary – it contains about 19 g fats in 100 g.



V: I am surprised that a simple cup of milk knows so much!!!

TF: Yes! So never miss your daily cup of milk if you want to be healthy and to have strong white teeth ...
Bye-bye ...

Here goes the sound of the alarm clock.

Vanya's mother enters the room and wakes her up for school ...

V: Mom, where is my cup of milk? Please put an apple in my school backpack, and I want a pot of yoghurt for dessert tonight. BYE!!!

Presenter: Vanya went to school and she was lively and vital all day long because the milk and the fruits gave her strength.

The fruits hang their pictures on a string after which they dance merrily.

After finishing the dramatization, we review the usefulness of fruits for the health.



Nutrition

This module was created by secondary school teachers together with the school director, parents and end users, with specific support of other stakeholders.



AT A GLANCE

Thematic Area	nutrition, eating habits
Format	short school course
Duration	6 sessions of 45 minutes
Type of audience	secondary school children
Age group	12 years old
Number of participants	10 - 20
Prerequisites for participation	None
Number of facilitators	1-2
Overall difficulty	<p>Topic: Beginner</p> <p>Preparation: Beginner</p> <p>Facilitation: Beginner</p>

OVERVIEW

The module foresees several lessons about nutrition, diet example and traditions related to food, each ending with example tasks, which could be further developed if the students are interested. The aim is to make young people realize the importance of nutrition and healthy diet as well as prevention of nutritional diseases.

OVERALL AIM

The main aim is to make young students more aware about healthier eating habits, cultural specificities related to food.

SPECIFIC (LEARNING) OBJECTIVES

After the successful completion of this module participants are expected to be able to...

- build healthier eating habits and diet;
- creating open conscious towards healthy life style;
- have practical knowledge of calorie balance and its considering;
- have knowledge about different cultures' eating habits and their consequents as well;
- have knowledge about traditional practices related to food.

SUGGESTED SCENARIO FOR IMPLEMENTATION

This activity could take place at schools as a short course, additional classes or as a part of educational activities, summer schools. It is considered non-formal education.

TOPICS & COMPETENCES COVERED BY THE ACTIVITY

Thematic area(s)	<i>healthy food, traditional food, healthy habits related to healthier lifestyle, food and communities</i>
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FOOD2030 Research & Innovation priorities

<i>Priority</i>	<i>Indicate whether main or secondary</i>	<i>Addressed through</i>
Circularity & Resource Efficiency		
Innovation & Empowerment of Communities		
Nutrition & Health	main	Principles of healthy diet and leading healthier lifestyle
Climate & Sustainability		

Research & Innovation (R&I)

<i>Related concept</i>	<i>Addressed through</i>
secondary	New productive methods and practices of responsible research

(Food) Systems thinking

The module combines knowledge about nutrition and healthier eating habits and practical tasks through which the students would gain deep understanding of the topic.

Potential of bringing the arts, socio-economic science and humanities creatively or trans-disciplinarily with the module?

The module includes some activities as making dashboards/posters, locating a corner – specially organized for the students to eat.

TARGET AUDIENCE

Audience category	Secondary level students
Recommended number of participants	10-20
Recommended age	12 years old
Prerequisites	There are not any specific prerequisites needed, students should have general background.




OPTIONS FOR MULTI-STAKEHOLDER ENGAGEMENT

<i>Stakeholder</i>	<i>Role envisaged in the activity</i>
Teachers	Leading the activity
Expert in health and nutrition or sport	Supporting activity

SETTING UP THE MODULE

FACILITATION/DELIVERY

The activity might be organized with a facilitator or/and demonstrator. Students do not need any specific background or competences.

RESOURCES		
<i>Physical materials</i>		
<i>Resource name</i>	<i>Picture</i>	<i>Number</i>
Cardboards (to be used for posters) <i>Optional, if such specific task is chosen</i>		10 -15
Painting materials <i>Optional, if such specific task is chosen</i>		10-15 sets
Equipment for printing materials <i>Optional, if such specific task is chosen</i>		20-30 <i>Depending on the number of students, who decide to prepare journals and/or booklets; menus.</i>
Food products for healthy meal <i>Optional, if such specific task is chosen</i>		Varies depending on the meal chosen, if the students take part in such activity.
PREPARING THE SETTING		
The activity could take place in the class room and the school canteen if students prefer to be engaged in a task related to food preparation.		

DETAILED DESCRIPTION OF THE MODULE SCRIPT
<i>Step</i>
The facilitator chooses the topics that they would like to include in the module. After each session it would be useful to ask the students to work on an individual task (there are suggestions for such after the different topics). In this way students would be more involved in the activities and the content could be delivered based on students' experience.
Explanation of balanced nutrition.
Several recommendations which should be followed in relation to balanced nutrition.



Theoretic formulation of the principles of a healthier lifestyle.

Students are introduced to norms for appropriate behaviour for different social groups.

Preparing healthy diet with practical examples.



Contents

For the facilitator	90
1. Discussion: Wholesome and balanced nutrition – what does it mean?.....	91
2. Discussion: How to eat usefully	94
2.1. Independent work of the students – Tasks:	99
3. Discussion: The inseparable relation between food, health and sport	99
3.1. PRACTICAL ACTIVITIES:	101
4. Discussion: “Traditional nutrition and health”	101
4.1 Practical activities:	103
5. Food traditions all over the word	104
5.1 Tasks for independent work:	106
6. Discussion: Daily diet	106
Example	107
Tasks for independent work:	109
7. Food safety along the food system.....	109
7.1 Tasks for independent work:	111

For the facilitator

Lessons objectives

After this lesson students should be able to:

- acquire knowledge and skills related to healthy eating as part of a healthy lifestyle;
- understand and realize its meaning and show a desire to observe it in its everyday life;
- to feel more responsive to their own health;
- realize that nutrition is subject to rules, compliance with which will improve the quality of their lives;
- to become acquainted with basic rules and norms for proper behavior as well as with some foreign traditions for healthy eating.
- to be aware about eating habits specificities - benefits and damages.
- to be able to build a proper attitude towards nutrition.

Modules aims at preventing and reducing the risk factors most common among students - low physical activity, unhealthy nutrition, etc. and thereby reduce the incidence of major chronic non-communicable diseases among students.

Suggestions for organizing a lesson

A technique that could be used is to intentionally structure topics to end three-fourths of the way through the time, leaving one quarter of the time to start the next module/topic. This would generate an automatic bridge between sessions.

As a start for every lesson, the facilitator could discuss the previous one in brief or comment on the materials that the students prepared. Otherwise they could directly ask several questions on what students know about the topic and discuss the answers with the group as middle schoolers usually do not share their opinions or thoughts as readily as younger students. One might give the children several minutes for brainstorming - interactive brainstorming is typically performed in group sessions, or they could give them a little time to think, then pair with the classmate/child next to them and share.

An alternative way to start a discussion is to show students an image with no explanation, and ask them to identify/explain it, and justify their answers.

Or the instructor might invite one volunteer to “take the microphone” at a time (even sitting on a different chair), then calls on the next volunteer. Each subsequent speaker must summarize the previous one’s points (or, if desired, all the speakers thus far) before adding original ideas.

Also, it is good for students to illustrate a concept or idea. In this way when comparing drawings around the room, one could clear up misconceptions as stations or displays are spread across the room, and students go around to each station individually or in groups.

Another option is to carry out questionnaires among the students and receive a feedback based on the results as a helpful tool for module evaluation.

To make the lesson more interactive the facilitator could select some students to travel the room, polling the others on a topic relevant to the course (for example how much water they drink daily, or what they have for breakfast, etc.), and then report back the results for everyone.

After the main information is presented, the facilitator could ask the students what they learned and which fact was most interesting for them, after this, children could choose word of the day or phrase to describe the lesson. The facilitator could ask true or false questions and instruct students either stand or sit to indicate their binary answers.

Additional materials: [How to Make Your Teaching More Engaging: Advice Guide, Sarah Rose Cavanagh](#)
[How Peer Instruction and Polling Have Changed My Teaching, James M. Lang](#)
[Ready-to-use teaching and learning resources which aims to raise awareness among Europeans aged 11-15 of the importance of food and farming for Europe, EC](#)

1. Discussion: Wholesome and balanced nutrition – what does it mean?

For the facilitator: [Learning About Nutrition in the Classroom: Tips for Teachers](#)

[Teaching with Discussions](#)

Wholesome nutrition is a hot topic, since the use of junk food affects greatly the energy at a person’s disposal and also one’s mood and weight. Overweight (obesity) is a confirmed problem of our time and it can cause serious diseases.

The growth, development and health of adolescents depend on nutrition. Nutrition is of great importance at school age. It is the most significant prerequisite for securing good health and harmonious physical and mental development. Good nutrition increases the body’s resistance against different diseases and some negative impacts of environment. At this age good nutrition is of vital importance also because then the

final building of the organism takes place – the physique, the individual metabolic stereotype, the intellect, the reactivity and the adaptability to life become shaped at this age. The role of good nutrition under the modern life conditions is also important with respect to acceleration – a process of premature physical and psychological development of the human organism at a pace that significantly exceeds that of previous generations. The basic task of rational nutrition at school age is to ensure a balanced nutrition corresponding to that specific age.

Quantitative insufficiency and qualitative incompleteness have equally unfavorable effects on the physical and neuropsychical development of the adolescent generation. Therefore rational nutrition is the basic means of maintaining a normal physiological condition of the body to ensure a high level of functionality and adaptability to the constantly changing conditions of the environment. The basic elements of rational nutrition are the balance of the nutrient substances in the daily menu and the correct eating regimen.

It is in the very early childhood that a child is taught to have an attitude and taste for certain foods (for example with less fats, salt and sugar), as well as to feel pleasure from the food: they can build nutrition habits that can improve the health.

1. Discussion – Balanced nutrition

Some basic recommendations about balanced nutrition are presented. They are followed by a discussion by the participants – what do they eat. It ends with an element of play – do we eat correctly based on the given examples.

Here are some basic rules of balanced nutrition:

- Nutrition that ensures the exact calories quantity depending on how much we move. This balances the consumed energy and the used up energy. Eating a wide range of foods is important because it guarantees intake of all the necessary nutrient substances.
- Eat meals that have starch carbohydrates. It is recommended that these foods should be a little more than one third of the food that we eat. The starch carbohydrates include potatoes, bread, rice, pastries and cereals.
- Choose wholegrain varieties (or eat unpeeled potatoes) whenever you can, because they contain more fibers that create a feeling of satiety for a longer time. We have often heard that carbohydrates lead to overweight, but they contain less than half the calories contained in the fats. This is one of the reasons to pay attention to how much fats you use as an addition to these foods, because often the dressings and the fats for the foods preparation contain a huge amount of calories.

- Eat lots of fruits and vegetables. It is recommended to eat at least five portions of different fruits and vegetables every day. This is easier than it sounds, as it is not difficult to replace the intermediate meals (snacks) with fruits or vegetables. A 100% fruit juice without additional sugar, a vegetable juice or smoothie can be considered as one of the 5 portions a day.
- Eat as much fish as you can. It is good to have at least two portions of fish a week, including at least one portion of fish that is rich in fats. Fish is a very good source of proteins and it contains many vitamins and minerals. Eat fish regularly.
- Everybody needs small quantities of fats in the food, but it is important to pay attention to the amount and type of fats. There are two basic types of fats: saturated and unsaturated. Too much saturated fats may increase the amount of cholesterol in the blood, which is harmful.
- The saturated fats are present in many foods such as solid cheeses, cakes, biscuits, cold cuts, cream, butter, lard, pies. Try to reduce the intake of saturated fats and choose foods containing unsaturated fats, such as vegetable oils, fish and avocado. When you eat meat, choose the one with less fats and remove the visible fats.
- The regular consumption of foods and beverages with high sugar content increases the risk of obesity and spoiling of the teeth. The sugar foods and beverages, including the alcohol drinks, usually have a high energy value and if consumed too often, they may lead to increase of weight. Avoid carbonated beverages with sugar, alcohol drinks, cereals with sugar, cakes, biscuits, sweets.
- Salt restriction.

Healthy nutrition is far from complete by the above recommendations, but they are a good start.

Also, in order to follow a healthy nutrition, we should be very careful about food quality.

So that students can grasp better the recommendations for balanced and healthy nutrition and use them in their daily life, we gave them **the following tasks:**

- 1) To compose an “ABC health book” in which to collect the most important recommendations for healthy nutrition as a condition for good health and successful studies.
- 2) The “ABC health book” could be presented to the parents, to younger students and to their schoolmates, share it with the other students at school. It may be represented as an open poster and other students and teachers could add their proposals.

- 3) To prepare balanced and healthy menu. An additional activity might be Design Challenge: The Ideal Meal - Teachers TryScience, Deliverable 6.1

2. Discussion: How to eat usefully

The basic recommendations on balanced nutrition shall be presented. They shall be followed by a discussion by the students – what do they eat. It ends with an element of play – do we eat correctly based on the given examples.

Healthy nutrition is a key to good health. In order to grow up healthy and strong, try to keep the following recommendations for healthy nutrition:

1. Eat a variety of foods. BUT take enough time for having meals in a friendly and restful atmosphere.

The nutrition is balanced when the foods we take are neither too much, nor too little, but as much as to give us the energy we need for the day. There is no such food product or group of foods that contain all nutrient substances in the necessary quantities. That is why it is good to eat varied foods. It is recommended that the foods we should take every day include foods from the following 4 groups:

- 1) Cereals (bread, rice, pasta, spaghetti, corn, oat flakes, cereal snacks) and potatoes;
- 2) Vegetables and fruits;
- 3) Milk, cheese, yellow cheese, curds;
- 4) Meat, fish, eggs, beans, lentil, nuts (walnut, almond, hazelnut, etc.).

These foods are very important for the individual's growth and health and that is why it is necessary to take at least one food of each group every day. The foods and the drinks that you have to take in smaller quantities are included in the remaining two groups:

5. Fats (butter, lard, sunflower oil, corn oil, olive oil);
6. Sugar products and sweets (candy, chocolate, wafers, pastries, cakes, baklava, syroped pastries, halva, Turkish delight, and many others), as well as beverages with sugar.

Having meals together with the family at home or with friends at school creates pleasant emotions and enjoyment. Eat without hurry – this is the time when you can enjoy both good food and company.

2. Don't miss breakfast in the morning, eat regularly

The morning breakfast is very important because after the night's sleep you need charging with energy and nutrients. Breakfast is a wonderful beginning of the day and it gives you energy for studying and sports. You can choose milk with cereals and a fruit for breakfast, or a sandwich with cheese or yellow

cheese, with ham or eggs and a cup of fresh milk or yoghurt, fruits or fresh fruit juice. Our body needs energy all the time and therefore it is important to eat regularly. Besides breakfast, don't miss the other principal meals – lunch and supper - in order to feel alive throughout the whole day. For snacks between the principal meals choose a fresh fruit or fruit juice, yoghurt with fruits, cereal or muesli bar, a sandwich with wholegrain bread, etc.

3. Eat cereal foods as an important source of energy, prefer wholegrain bread.

The cereal foods (bread, pasta, spaghetti, rice, corn, oat flakes, etc.) and the potatoes are basic plant foods for the man, they provide nutrient substances and the basic part of the energy for the day. The wholegrain foods are richer in nutrient substances – plant fibers, vitamins and many mineral substances that are useful for the health.

- Include bread, other cereal foods or potatoes in your daily menu;
- Choose more often wholegrain foods, it is recommended that at least half of the bread you eat should be wholegrain;
- Eat stewed or baked potatoes, avoid fried potatoes and chips;
- Restrict the consumption of pastries with high content of fats (batter fried in deep oil, donuts, banitza, tutmanik, milinki, etc.).

4. Eat more vegetables and fruits, possibly with each meal.

Fruits and vegetables are some of the most useful foods. They are rich in many vitamins, mineral substances, fibers and biologically active substances that are necessary for the functioning of the body, for its growth, development and resistance against diseases. You cannot put on weight from fruits and vegetables because they contain much water, have no fats and are poor in energy.

- Eat various vegetables and fruits – green, yellow, orange, red;
- Eat vegetables in salads, dishes, sandwiches;
- Choose fresh fruits instead of sweets for dessert and snacks.

5. Take milk and dairy products every day.

Yoghurt and fresh milk and the dairy products (cheese, yellow cheese, curds) are valuable foods for the children. Milk and the dairy products are the best source of easily assimilated calcium, they are also rich in proteins and vitamins that ensure the growth and the strength of the bones and the teeth. Yoghurt, the

traditional Bulgarian food, is a particularly good choice because it has a special importance for the health – it improves digestion and increases the immunity against diseases.

- Every day eat 3-4 times milk or dairy products;
- Choose yoghurt with low fats (1.5 - 2%);
- Prefer dairy products with low fats and salt content (curds with low fats, fresh cow's cheese, desalinated cow's cheese).

6. Choose meat without fat, replace meat by fish, beans and lentils more frequently.

Foods of animal origin (meat, fish, eggs) and some foods of plant origin (beans, lentil, soya, nuts) are rich in proteins and are very important for man's growth and health. Meat and fish contain easily assimilated iron – the element important for the formation of red blood cells and for the body's resistance against infections, and for improvement of the attention (focusing) and overall strength. Fish contains valuable fats useful for the function of the brain and the heart. At least one of these products should be eaten every day.

- Eat poultry meat (chicken, turkey, etc.) and red meats without fats (veal, beef, pork, lamb);
- Avoid and restrict eating sausages and cold cuts with a high content of fats and salt;
- Eat fish 1-2 times a week;
- Eat beans or lentil 1-2 times a week;
- Eat nuts (walnut, hazelnut, peanut) unsalted;
- Eat at least 5 eggs during the week (this quantity includes the eggs in different dishes and desserts).

7. Restrict the fats, especially animal fats, and avoid fried foods

Fats are necessary for the human organism, as are the other nutrient substances. They are the richest source of energy and help for the assimilation of important vitamins – A, D, E and K. However, the consumption of large quantities of fats leads to overweight and obesity. Animal fats and solid margarines are not recommended, since they contain substances which, if taken in large amount, may lead to disease of the blood vessels and the heart. Besides in butter, oil and the visible meat fats, some foods like chips, snacks, cakes, wafers, cold meat cuts, fried snacks, dressings, salads with mayonnaise, etc. contain "hidden" fats as well. In order to reduce fats consumption, it is useful to remember the following recommendations:

- Choose foods with low fats content – low-fat milk and dairy products, lean meats;
 - Restrict the consumption of cold cuts, sweets and pastries, cakes, donuts, milinki, etc.;
 - Restrict the consumption of products containing solid margarine – bisquits, wafers, dry cakes, etc.;
 - Avoid fried foods;
 - Prefer plant oils (sunflower, corn, olive oils, etc.) to animal fats (butter, lard, etc.).
8. Restrict the intake of sugar, sugar products and sweets, avoid consumption of sugar containing beverages.

Sugar gives a pleasant sensation of sweetness, it gives a fast supply of energy, which is why the foods and drinks containing sugar are commonly preferred. The frequent consumption of candy, wafers, chocolate, sweets and other sugar foods and beverages is harmful for the teeth and may lead to overweight. Honey contains useful substances and it should be preferred to sugar as a sweetener.

- Try not to sweeten the milk and tea with sugar. If you want to sweeten your food, prefer honey, but don't use it excessively;
- Avoid frequent use of beverages with sugar. Prefer tap water or mineral water;
- Prefer natural juices without added sugar to juices and nectars sweetened with sugar;
- Choose fruits for dessert instead of sweets and cakes;
- Avoid frequent intake of sugar foods and beverages between the separate meals.

9. Reduce the use of salt and consumption of salty foods

Salt contains sodium and chlorine that are important for a number of bodily functions, but the excessive use of salt and salty foods may lead to loss of calcium from the bones and to increase of blood pressure. Besides the salt added to cooked food, processed foods such as: chips, cold cuts, sausages, canned meat, canned fish, cheeses, pickles, dry soups, salty snacks, ketchup, dressings, etc., are with high content of salt. The taste preference for salty foods can be changed by a gradual decrease of salt consumption.

- Reduce the consumption of canned foods, sausages, saline fish;
- Avoid addition of salt to your food;
- Instead of salt, flavor your food with lemon juice, vinegar, plant spices.

10. Take enough water and liquids during the day. Don't use alcohol drinks.

Water is vitally necessary. Dehydration caused by insufficient intake of water and liquids leads to a decrease of mental and physical activity, attention disorder, fatigue and headache. Children are particularly sensitive to dehydration. The best thing to satisfy the thirst is common drinking water, as well as low mineralized mineral waters. Drinks such as tea, ayran and natural fruit juices without sugar, contain also useful nutrient substances.

- Drink at least 6-8 glasses of water and liquids (1.5 – 2 litres) every day, which includes water, milk, juice, tea, soups, etc.;
- Drink water regularly in small quantities throughout the whole day before you feel thirsty;
- Drink more water when the ambient temperature is high or at intensive physical effort;
- Prefer tap or mineral water to beverages and juices with sugar or other sweeteners;
- Drink water and liquids with moderate temperature, avoid very cold and very hot drinks.

The organism of children and adolescents is particularly sensitive to the effect of alcohol. Alcohol injures the brain, the liver and other essential organs. Even in small quantities, alcohol may cause intoxication in children. That is why don't use alcoholic drinks.

11. Keep the hygiene rules in eating, foods preparation (cooking) and storage.

Take part in choosing the menu, shopping and cooking the food at home. This is a wonderful way to choose and prepare wholesome foods that you prefer to eat. Besides wholesome, food also should be safe. The food may get contaminated at any stage of its preparation, storage and consumption. Keeping the hygiene rules in eating and foods preparation (cooking) is an important condition for good health. How should we protect foods from contamination?

- Wash your hands before eating;
- Use individual cutlery and dishes when eating;
- Don't eat foods after their expiry date;
- Wash well the fruits and the vegetables before eating them;
- Avoid contact between raw foods and foods ready for consumption when storing them;
- Store the foods in the fridge in their packages, closed boxes and covered.

13. In order to have healthy nutrition it is important to eat fresh food and as little processed food as possible. But where does our food come from? Home production? A grocery store? A restaurant? A farmer's market? A refrigerator? All of these answers are correct, but really, all food starts out in a farm!

Farmers all across the country produce different foods and products. There are vegetable farmers, dairy farmers, wheat farmers, corn farmers, cranberry growers, apple growers, hog farmers, chicken farmers, turkey farmers, and so on. Some farmers grow more than one thing, and other farmers may only produce one thing. Part of the home production is free from harmful additives during growth.

After farmers produce their food, they must find a way to market it so that it gets to the citizens. Some farmers sell it directly to consumers from their farms. Other farmers bring their fresh foods to the farmer's market in town. Some companies buy a farmer's food so they can process it, preserve it and send it longer distances to grocery stores all over the world. And some – sell their goods online.

Farmers depend on everyone in the community in order to have a successful farm, and everyone in the community depends on farmers for food. That's why cooperation and community are so important. And the more local food you eat the fresher it is.

In this way, choosing locally produced food, you can not only have fresher food, but also help the environment – the transportation would not take as much fuel and will be for much shorter distance compared to the transportation that is needed when importing goods.

2.1. Independent work of the students – Tasks:

- 1) To elaborate a pyramid of healthy nutrition and to put it in the assigned place at school so that it is visible for the onlookers.
- 2) To prepare presentations or pictures/comic strips with the basic rules of healthy and rational nutrition and to show them to the parents and to the other students at school. Ask other students (not part of the course) to participate with their pictures or presentations.

3. Discussion: The inseparable relation between food, health and sport

The balance between sport, nutrition and healthy habits is the key to a healthy body.

Nutrition is a basic biological necessity of man. Food is necessary for the correct growth and development of the body and for the constant renewal of the substances in the cells and tissues, for increasing the immunity, for preserving the health and the work capacity, for extending the years of creativity. The nutrition needs of children and adolescents are essentially different from those of the adults. The

metabolic processes in a growing organism are more intensive, which is why the nutrients are not only necessary for covering the energy needs, but for an intensive growth and development as well.

Our nutrition pattern very often is unbalanced. We take more than enough food in volume and calorie value, which, however, is poor in proteins, vitamins and minerals. This proves a lack of established nutrition habits.

As we already discussed, cereals are an important source of energy, and wholegrain cereals should be preferred. The physiological needs of vitamins and minerals of the adolescents are higher compared to those of the other age groups, and this relates to their indispensable role as activators of many metabolic processes taking place much more intensively during this period. Nutrition should not only be varied but also regular – 4-5 times in a day. The morning breakfast is particularly important for the students, but it is often omitted, which results in lack of focus, easy fatigue and reduced immunity. Consumption of refined sugar, sugar and chocolate products should be restricted. The consumed food should be processed by healthy culinary technologies: stewing, baking and boiling. Students should reduce the consumption of fried foods: fried potatoes, chips, snacks, etc. The use of iodized salt when cooking various dishes should be restricted. Instead of using salt for food flavoring, use plant spices as: savory, mint, parsley, dill, etc.

Water is vitally necessary for the young organism. Healthy nutrition not only determines the students' healthy growth and development, but also their capacity for work and their successful studies and sports. There is a lot of stress in our everyday life. The unhealthy nutrition can be one of the reasons for the great amount of stress. The accumulated stress can have a negative effect on our health and to contribute to increase of weight.

One of the best ways to control the stress is by regular physical activity. This, combined with rational nutrition, is an efficient means of keeping one's body healthy.

We are presenting herewith several basic principles that you must keep if you aspire to health and good fitness:

1. Breakfast is the most important meal of the day.

This is the most widely known rule for healthy nutrition, but also the most neglected one by most people. We recommend to you to create the habit of taking breakfast every day before you proceed with your daily tasks and activities. Include fresh or dried fruits, yoghurt, nuts or other favorite products of yours.

2. Take at least 1.5 - 2 of water a day.

For athletes water is the number one factor and it is critically important to maintain a high level of hydration of the organism.

3. Before intensive physical training, take carbohydrates with retarded action.

Potatoes, rice and nuts are examples of such foods. Thus, you will be provided with enough energy and stable levels of glucose in the blood that you will need for the sports.

4. If you are actively engaged in sports – add meat to your menu.

Don't forget that meat contains large amounts of zinc, iron, food fats, that are responsible for the cells growth.

5. Don't miss a meal after sporting.

The most suitable foods to take after active sporting are protein bars, tuna fish salad or other foods rich in proteins.

6. Eat at least 4 times a day.

Don't forget that frequent meals speed up metabolism and balance blood sugar. Moreover, there is less possibility to feel hunger throughout the day. The small food portions are recommended and completely sufficient if you take them at least 4 times a day.

3.1. PRACTICAL ACTIVITIES:

- 1) Elaboration of a poster “We practice active sports and healthy nutrition”.

For the facilitator: [Implementing Posters in the Classroom](#)

- 2) Organizing sport games in the open. (relevant for summer schools and ski week travels)

4. Discussion: “Traditional nutrition and health”

Knowing the wisdom of our forefathers is a wealth that gives meaning to our life and brings inner peace. The students might visit the ethnographic museum in the city. The museum team could familiarize them with folk traditions in the field of nutrition and some specific cooking habits during the holidays as well. Healthy nutrition is associated with regular daily meals at approximately equal time intervals. Healthy nutrition should include moderate, but varied in contents and amount food complied with the individual needs.

Determined historically, the different cultures keep different ideas, traditions and manner of cooking, serving and eating of food. These ideas build and shape the notion of different national cuisines, as well as of culinary traditions in a wider sense.

The basic group of foods is of plant origin. Fruits and vegetables are the most valuable ones. The dishes prepared only from vegetables in the traditional Bulgarian cuisine are known as lean and vegetarian.

The second group of foods is of animal origin – a source of proteins – eggs, milk and dairy products. In Bulgarian cuisine, the inclusion of proteins from animal origin (eggs, milk, dairy products) is acceptable for a vegetarian cuisine.

The third group of foods (as nutrients) is the fats. They are divided into fats from animal origin and fats from plant origin. There are animal fats (e.g. lard; and butter – from milk origin), and plant oils (e.g. sunflower oil). Not all plant oils are food products.

Throughout the ages, Bulgarian traditions have imposed periods (fixed short or longer seasonal periods) in which meat was excluded from the meals and that custom is known as “fasting”. These customs are the result of combined rituals - heathen and orthodox religious canons. Such a diet has a healthful effect on the organism.

In terms of the daily meals, the Bulgarians have accepted three types of meals – breakfast, lunch and supper. There can be several breakfasts, the basic one is considered to be the morning breakfast (early or morning breakfast). Lunch is composed of three dishes – entrée (usually something light – soup, salad), the principal dish and the dessert which comes last (usually some sweets, fruit or sweetened product- fruit yoghurt or sweet curds). The supper does not involve serving of soup, except in the cases when it is prepared as a basic dish (usually in winter).

All the great holidays are related with cooking of specific food and gathering of the whole family around the festive table. Here are some examples:

Shrovetide

The Bulgarian holiday Shrovetide also known as the first Sunday before Lent is one of the first spring holidays and its date is not fixed. It is seven weeks before Easter. After Shrovetide, the Great Fasting starts and lasts 49 days and it ends on the greatest Christian holiday – Easter. Shrovetide has its traditional rituals. They are connected first and foremost with the food that is strictly fixed. There should be banitsa (cheese pastry), boiled eggs, rice, beans, lentil, dried fruit compote on the table. In the center of the table is served halva – mostly white halva with walnuts or peanuts. The children also try to catch with their mouths a piece of halva hanging on a string without using their hands.

Enyov Day

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Enyov Day coincides with summer solstice. It is believed to be the distant beginning of winter – hence the expression: “Enyo slipped on his fur-coat, so there would be snow in winter”. There are many superstitions related to this day – by that day they try to foretell what will be the remaining part of the year.

What is most important about this holiday is that it is believed to be the day when the herbs acquire their healing power and it is the best time to collect and dry the herbs with which they will cure the people for a year ahead and will also be used as food spices. Basically this is the day for collecting herbs related to people’s everyday life.

St. Jordan’s Day (Epiphany)

The third (and last) Christmas Supper is prepared in the eve of St. Jordan’s Day. Only vegetable food dishes are served on the table: beans, stewed cabbage or stuffed cabbage leaves, walnuts, bread (but not of pure wheat flour, but mixed with millet – in honor of the millet – in some regions they also serve corn bread instead of millet). On the table they also light the candle from the second Christmas Supper that did not burn down.

St. George’s Day

St. George’s Day is associated with a traditionally rich table. For the festive table the housewife prepares special ritual bread (“bogovitsa”) on which she models dough figurines of the shepherd and the sheep. Every household slaughters a young lamb in honour of St. George. Before that they place on its head a wreath of flowers that they picked in the morning, and on its left horn they light a candle and read a prayer. They usually slaughter the lamb before the front door and pour the blood in the river or over an ant-hill – for the sheep to multiply like the ants. The lamb’s skin goes as a gift to the church temple. The traditional dish on the festive table is “lamb roasted on a spit” or “lamb’s drob-sarma”. They drink wine and sing songs round the table. After the meals people get up and start to dance a horo (Bulgarian folk dance).

Cooking can be a lot of fun, especially when family and friends are involved. In this way you enjoy cultural foods, while learning on family food traditions through celebrations, cultural foods, and family recipes. At the same time, you avoid highly processed food. This keeps you healthy and you help the environment, because less food of such type is consumed, therefore produced and distributed to your city.

4.1 Practical activities:

- 1) Presentation or video clip – My favorite traditional holiday. Each student or students in small groups prepare a short presentation or clip related to their traditional holiday with special focus on food.

5. Food traditions all over the world

One way to find joy and meaning through food is enjoy cultural foods, not only from Bulgaria, but from other countries as well. In this way you could experience new and varied foods, that is how you will be open to eating and enjoy cooking new and diverse foods.

All nations around the world have their eating etiquette and use specific products most often in their menus. This is related to their geographic location, as well as to the ages-long experience of the peoples in healthy nutrition. We shall now introduce you to some of them.

Traditions around the world helping healthy nutrition

1. India: Spices and large variety of tastes.

About 40% of India's population sticks to vegetarian cuisine and prefers a menu consisting of rice, cereals and legumes, vegetables and bread. Even those who don't give up meat don't forget to eat a lot of vegetable meals.

Of course, Indian nutrition is famous for its spices added to almost all the meals. But piquant food has its advantages too. The chilly pepper, for instance, with its low calorie value and strong taste quality, increases metabolism and helps for fats burning down.

The legume plants (like chick-peas and lentils) contain little fats and more carbohydrates, which makes us feel satiated for a longer time.

According to Ayurveda (a system of care for the health originating from India), the key to satiety is the food that includes the 6 principal flavors: sweet, sour, salty, bitter, piquant, and astringent.

2. France: Eat a little of everything you like!

The secret of the elegant figures of French women is that they enjoy food in small amounts. Although their menu is rich in fats and includes butter, cheeses and red meat, the size of the portions remains very small.

Moreover, the French are well organized with respect to nutrition – they stick to three meals a day and don't eat at the other time, and they turn every meal into a social event. For them lunch is the principal meal and they find time to enjoy the food they take. This helps them to control their weight because:

- The prolonged chewing of the food gives the stomach the possibility to understand that you are satiated;
- When the basic food intake is in the middle of the day, you have enough time to actively burn down the calories swallowed through it.

You should not forget that the French prefer home cooked food and not the semi-finished products.

3. Japan: Start with a soup!

Japan is the country with the lowest percent of obesity of its people on a global scale – less than 5%. The nutrition of the Japanese is natural – it consists of fresh products as rice, vegetables, fresh fish, soya and minimum amount of meat and sugar. They consume varied products (up to 30 types daily) and stick to the saying: “A dish without color is as good as going out naked in the street”. Enriching their dishes with colors (green, yellow and red vegetables) leaves little space for unhealthy products.

Another characteristic habit of the Japanese is that they start the meals with a light soup that satiates them while containing few calories. The studies have shown that those who eat soup take in 100 calories less.

And there is one more rule kept in Japan, which sounds like this: “Leave the table when you feel 80% satiated!”. If you overeat, the stomach extends by 20%, which undermines strongly the control of appetite.

4. Greece: Enjoy the Mediterranean diet!

The Greek or Mediterranean diet has long ago won its name as one of the healthiest worldwide, being especially beneficial for the heart.

The Greeks consume lots of vegetables, fish, chicken, legumes, as well as wholegrain products. This type of nutrition is low in calories and at the same time is rich in flavors. We should not forget the olive oil which is rich in unsaturated fats and is useful for the health.

Similar to the French, our Greek neighbours turn their meal into a real event, sharing their supper with their family and friends, so that they get maximum use of the Mediterranean diet and relax and enjoy their food.

5. Iceland: Don't be stingy with fish!

A man eats about 15 kg fish a year on average. If it seems like a lot to you, compare it with the amount of fish consumed by the real fish lovers – the Islanders – which is about 90 kg a year.

According to nutritionists, a menu containing large amounts of fish helps to control one's weight in different ways:

- fish is rich in eicosapentaenoic and docosahexaenoic acids – irreplaceable fats that block the formation of fats in the body, control appetite, and activate the genes instrumental for fats burn down.

6. Brazil: Eat legumes and rice!

The Brazilian secret for a slim figure lies in the favorite traditional dish of rice and beans. It is low in fats, rich in fibers and proteins; it helps to stabilize blood sugar level and controls appetite.

The dishes of rice and beans reduce the risk of obesity by 14% as compared to the traditional western nutrition.

5.1 Tasks for independent work:

- 1) Find examples for good practices in the food systems of other countries. They may be related to environment friendly production, waste management or any other part of the food system. Discuss whether and how these examples could be implemented in your city system.

6. Discussion: Daily diet

According to all experts in fitness, dietetics and healthy lifestyle, the correct nutrition is the key to good health. It is important to note that this includes not just restrictions as to what we eat and how we cook it, but also when and what amounts we should consume. Nutrition should take place in a nice and peaceful atmosphere, in good mood and without distracting factors.

For the facilitator: The session could start with exercise and presentation on the topic: „How does my day pass“. Students could fill template 6.1. This could be done as a preliminary task at home or as a short exercise in the beginning. After everyone has the templates filled out, the following advices are discussed.

[How to use the task-based learning approach](#)

Advices:

1. Eat something every 3-4 hours. This charges the metabolism, prevents overeating and blood sugar problems.

2. Combine proteins (meat, fish, eggs, beans, nuts, dairy products) with fibers (wholegrain foods, fruits, vegetables) at every meal. When consumed together, these foods take more time to digest than common carbohydrates and you will stay satiated for a longer time.

3. Move more often and drink water regularly. This daily nutrition plan has a wide calories range: (from about 1550 to 2100). If you are physically active, you may choose the upper limit.

And last: even the perfect regimen will not be perfect if you eat the same food over and over again. In order to avoid this problem, as well as many others related to the wrong choice of the type of food and the hour of eating, an hourly schedule for a day is proposed, in which the food is distributed correctly – according to amount and type of food:

For better understanding of the advices the following example is reviewed:

Example

6:30 - 7:00 a.m.: Wake with water

Before tea or any other food, drink a glass of water with lemon juice. While sleeping, the body restrains not only the food, but the water too. Since many vitamins are water-soluble, drinking a glass of water before eating will help the body to absorb better the nutrients of the food. The acidity of the lemon will help for the rebalance of the digestive tract making it alkaline – thus the “good” bacteria in the intestines will be activated for an optimal digestion of the nutrients.

7:00 a.m.: Short gymnastics – it is perfect for activating the energy reserves of the body.

7:30 a.m.: Breakfast

Many nutritionists recommend porridge (oatmeal) for breakfast. It is true that not everybody likes it, but its usefulness is undoubted - the body digests the fibers slowly, i.e. you will not feel hungry for several hours. Add a cup of milk or a hardboiled egg for proteins. Or mix the porridge with some nuts (walnut or almond). Eat also a cup of fruits – they will provide you with the necessary vitamins, antioxidants and more fibers (for instance, a cup of orange juice, rich in vitamin C, folic acid and potassium).

9:00 a.m.: Drink a glass of water

As you know, you must drink a lot of water, but better drink small amounts of water throughout the whole day, than drink a large amount when you suddenly feel great thirst.

10:00 a.m.: Physical activity

During the sport classes or in the schoolyard during the big break

10:30 - 11:00 a.m.: A little snack

Eat every 3 or 4 hours, in order to have energy and to avoid overeating. So as to get fibers and proteins, try an apple, some yellow cheese or a handful of nuts (especially if you haven't had nuts for breakfast) or some yoghurt with small fruits.

Additional advice: Sit while you eat. Eat small bites and try to prolong the snack as much as possible (10 to 15 minutes is perfect). The more you chew, the more nutrients will be assimilated by the body.

11:30 a.m. until noon: Water and movement.

Drink a glass of water, fill it again and drink it up.

13:00 - 13:30 p.m.: Lunch

Start with salad and fish, grilled chicken, turkey meat, beans or lentils.

Additional advice: Eat a slice of wholegrain bread if you want. It is hard to find someone who doesn't like bread.

14:00 p.m.: Water and a stroll

The clean air and sunlight will vitalize and protect you.

15:30 – 16:00 p.m.: Afternoon snack

Almost everybody feels a need of some snack between lunch and the evening meal. For a mixture of fibers and proteins, eat 200 g yoghurt and a handful of some cereal snack with a high content of fibers. Or eat a banana and a spoonful of peanut or almond butter.

Additional advice: Let your appetite lead you – you may need the same type of snack every day. If you have eaten more for lunch, you may need just something small for a snack.

17:00 – 18:00 p.m.: Walk or sports

If you have missed the stroll in the morning, now is the time to compensate. It is recommended to do some intensive physical activity regularly before supper – no matter if it is going for a walk in the garden or elsewhere or training in the fitness hall.

18:30 p.m.: Supper

Start this meal with a soup – in this way you won't eat too much food. It is a good choice to take soups low in fats – e.g. thick soups with vegetables and pasta. Choose a moderate portion for the basic dish, e.g. 100-120 g baked salmon – it provides a dose of the healthful omega-3 fatty acids. Add some stewed vegetables – broccoli or spinach with half a cup of brown rice.

A variant without fish is chicken meatballs (rolled in oat flakes and spices - for more fibers and antioxidants) over a portion of spaghetti. Add half a glass of tomato juice and sprinkle with a handful of nuts.

21:30 p.m.: Time for bed

Try to sleep 8 hours a night. Scientific research shows that insufficient sleep increases the risk of different health problems and leads to lack of focus and fatigue.

In the end of the session, students reflect on what they have learned and what would be a good change in their daily regime.

Tasks for independent work:

- 1) To ask their parents, grandmothers and grandfathers fill in template 6.1 and make suggestions on how their daily regimes might be improved.
- 2) To elaborate a poster on the topic „How do we eat at home and at school”. It might include an overview of the learning group and have parts before and after what they have learned at this course. Another option is to include and interview more students in the school. The poster might be displayed at a suitable space at the school in order to be visible for everyone.

For the facilitator: [Implementing Posters in the Classroom](#)

- 3) Design Challenge: The Ideal Meal - Teachers TryScience, Deliverable 6.1 exercise

7. Food safety along the food system

For the facilitator: [Additional materials An Educator's Guide to Food Safety Material](#)

[Kitchen & Food Safety Lesson Plans](#)

A thing to keep in mind that in order to be healthy we should eat good food and we should pay attention to food safety. Please, remember that everyone plays a role in reducing foodborne bacteria:

- FARM - use good agricultural practices
- PROCESSING - monitor at critical control points
- TRANSPORTATION - use clean vehicles and maintain the cold chain
- RETAIL - follow the food code guidelines
- TABLE - always follow the 4 cs of food safety
 - ✓ Clean
 - ✓ Cook

- ✓ Combat Cross-Contamination
- ✓ Chill

As you see literary everyone along the Farm-to-Table Chain plays a major role in keeping our food safe. If a link in this chain is broken, the safety and integrity of our nation's food supply can be threatened.

There are many places on a farm that can be contaminated by harmful bacteria, so farmers have to make sure that the areas where food is handled are kept clean and at the right temperature. There are many innovations on the farm that help prevent the growth of bacteria — like special areas for washing vegetables, refrigerated storage areas for milk and eggs, and portable sanitation in fields.

Keeping food safe and in good condition as it's shipped across the country or around the world is critical. There are many steps to shipping food safely and there's science behind each step. The cold chain has to be maintained throughout the loading process, in transit, and during receiving. The food is cleaned and precooled as it comes from the field or plant. The cooling extends product life by reducing field heat, rate of ripening, loss of moisture, rate of respiration, and the spread of decay. Proper packaging is selected for the product. The shipping container is cleaned and properly loaded, making sure that the boxes are stacked tightly to lock in the cold during transit. Proper temperature control can be tracked by satellites. Refrigerated containers usually have equipment that automatically records refrigeration system functions and the air temperature inside the container. This information provides a detailed record of refrigeration system performance throughout the trip.

Food is properly stored and cooled at the warehouse.

In any restaurant or place that serves food, cleaning, cooking, combating cross-contamination and chilling are critical. Humans are one of the biggest sources of food contamination in restaurants. So, proper handwashing is critical to keep food safe. For example, contamination can occur when someone doesn't wash his or her hands and then prepares or serves food.

Supermarkets. Receiving areas are maintained at cold temperatures of 5° C or below to maintain the cold chain that started way back in the field. Storage areas and display cases are kept clean and temperature controlled. Food preparation areas are also kept clean, and are set up to avoid cross-contamination. Foods are always separated to avoid cross-contamination. Red meats, fish, and poultry will never be mixed together or mixed with fruits and vegetables.

Even with all the great technology, food can still become contaminated, so it's important for YOU to always be careful about food safety. Once you purchase food and take it home, the responsibility for food safety is literally in your hands. This means to:

- Clean — Wash hands and surfaces often. Wash hands with warm, soapy water, and cutting boards, dishes, utensils, and surfaces with hot, soapy water before and after food preparation.
- Cook — Cook foods to proper temperatures.
- Chill — Refrigerate promptly. Refrigerate or freeze foods quickly because cold temperatures keep harmful bacteria from growing and multiplying. Follow the 2-Hour Rule: Refrigerate or freeze perishables, prepared foods, and leftovers within 2 hours or less.
- Combat Cross-Contamination (Separate) — Keep raw meats, poultry, and seafood — and the juices from raw foods — away from other foods in your shopping cart, on kitchen counters, and in your refrigerator.

After all these stops along the way food is finally at your table. But its journey hasn't ended, because there are always some waste. That is why it is important to know what waste management is. Waste management means the best practice for the waste handling: collection, transportation for re-use, recycling (for recyclable materials) and recovery the organic for energy production for fertilizer, finally the useless waste that cannot be re-used, recycled or recovered should go to a sanitary landfill. If there is poor waste management, that means poor handling, collection, transportation and dumping and this will result in negative impacts on human health and environment.

That is why it is important to know that the most environmentally friendly ways to dispose of trash are to reduce, reuse, recycle and compost. These are several steps in "integrated waste management". This means that you try to reduce the amount of garbage by the first step (reduce) and with what garbage is left, you venture onto the next step (recycle), and so on, until the garbage or waste is all gone. The key is to have barely any waste left when reaching the last step.

7.1 Tasks for independent work:

1. Fill in the steps on the food system template – Template 7.1
 - 1.2 How do you think each part of the food system could be improved in your city?
2. Implement and example CommNet project: Communicating the Bioeconomy, Deliverable 6.1
3. Food and food labels: From food to meals – making choices – SAILS project, Deliverable 6.1

Tempalte 6.1

My Day

1. I get up at...
2. I have breakfast around ... a.m. and usually I eat...
3. After this I ...
4. At school I would have for snack at ...
5. My lunch typically is ...
6. By this time of the day I have drunk ... liters of water.
7. In the afternoon I eat ...
8. Most of the times I have dinner at ... and my meal consists of...
9. Before bed I ...
10. Usually I go to sleep at ...

Template 7.1



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FOOD PRODUCTION

PROCESSING

PACKAGING

LOGISTICS

DISTRIBUTION

HEALTHY PEOPLE

WASTE STREAMS



Specific Features of the Food System

This module was created with the help of researchers in the University of Food Technologies, using materials such as European strategies and national policies. Presentations delivered at the piloting of the training were developed individually by the speakers.



Elaborated originally for the Bulgarian context (see Annexes 1 and 2), this module presents guidelines on how training of a similar nature could be conducted for and with journalists in other countries and settings.

AT A GLANCE

Thematic Area	Food quality, food control, new trends in the food system, e.g. urban farming
Format	One day training
Duration	4 sessions of approximately 1 hour, optional additional time for discussions in the end
Type of audience	Journalists, professionals in the food system
Age group	Adults (18+)
Number of participants	20 to 30
Prerequisites for participation	None
Number of facilitators	4-5
Overall difficulty	<p>Topic: Intermediate</p> <p>Preparation: Intermediate</p> <p>Facilitation: Intermediate</p>

OVERVIEW

The module foresees organizing training for journalists in several steps. First a survey among journalist is done in order to outline topics interesting for them as an audience. And based on them suitable speakers are invited. The training includes presentation of the project and food R&I, presentations, discussion, networking and hands-on exercises. Depending on the different context each City Lab could choose different or modify new exercise(s).

OVERALL AIM
The main aim is to make provide journalists with relevant information on topics they are interested in, communicating with the most suitable specialists, while in the same time support networking between specialists in the food system with journalists.
SPECIFIC (LEARNING) OBJECTIVES
<p>After the successful completion of this module participants are expected to be able to...</p> <ul style="list-style-type: none"> • gain knowledge on topical subjects • assess the reliability of sources of relevant information; • improve their system thinking • begin to conceptualise how their practices could improve the food system in their city • connect with specialists in the food system.
SUGGESTED SCENARIO FOR IMPLEMENTATION
This activity could take place in any conference room as it is in the form of standard training.

TOPICS & COMPETENCES COVERED BY THE ACTIVITY		
Thematic area(s)	<p>National/local food systems</p> <p>In the Bulgarian case, the issues of food quality and control, double standards, urban farming, children’s eating habits, health condition of children at national level, specific foods related to it, food provided to children in state institutions, dangerous lifestyle trends, concerning food.</p>	
FOOD2030 Research & Innovation priorities		
<i>Priority</i>	<i>Indicate whether main or secondary</i>	<i>Addressed through</i>
Circularity & Resource Efficiency		
Innovation & Empowerment of Communities	secondary	Giving opportunity to journalists/citizens to be better informed and more literate, making connections between them and trust worthy sources of information.

Nutrition & Health	main	Principles of food quality and control, better understanding of the “double standard” in foods, better understanding how food affect young people and what are the current trends among them.
Climate & Sustainability	secondary	Giving example how urban farming, which has a lot of traditions in Bulgaria, could actually change and add to a city food system.

(Food) Systems thinking

The module introduces system thinking, encourages the discussion of challenges from the points of view of different actors in the system (e.g. the citizens, policy makers, executive institutions, businesses, including producers) and increased awareness about connections between elements of the system. In this way the participants gain deep and systematic understanding of the topic.




Potential of bringing the arts, socio-economic science and humanities creatively or trans-disciplinarily with the module?


Discussing topical subjects of food system includes discussing socio-economic aspects – such as the factors in the society and economy which lead to the current situation, what socio-economic changes should be made, is empowering citizens enough or other actors should take active participation as well.

TARGET AUDIENCE

Audience category	Professionals/Journalists
Recommended number of participants	30
Recommended age	Adults
Prerequisites	None, though knowledge of and interest in issues concerning food systems is desirable.

OPTIONS FOR MULTI-STAKEHOLDER ENGAGEMENT	
<i>Stakeholder</i>	<i>Role envisaged in the activity</i>
Specialists/researchers/ representatives of a state authority	Leading the activity
Journalists/professionals in the food system	Audience

SETTING UP THE MODULE		
FACILITATION/DELIVERY		
Depending on the type of topics chosen and the presenters could be 3 or 4. It is advisable that one more facilitator opens the training, presents the specialists and moderates the discussions.		
RESOURCES		
<i>Physical materials</i>		
<i>Resource name</i>	<i>Picture</i>	<i>Number</i>
E.g. Sticky notes in 3 different colours		30
Flip Chart board		1
Multimedia equipment		1 set

Writing materials (pen and folders for the audience)		20-30 Depending on the number of journalists attending.
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PREPARING THE SETTING

The activity could take place in any conference room, big enough for the expected audience. The facilitator should make sure that the screen is visible from every seat in the room and all participants could hear well enough the speakers. Depending on the activities selected by each speaker (see detailed script), a flexible setting allowing group work will be necessary.

DETAILED DESCRIPTION OF THE MODULE SCRIPT

Step

Before the event

The first step is to send (short) questionnaires to various journalists and see which food system aspects are curious for them and/or need further explanation and clarification. The Coordinator could include in the survey few examples in order to direct the journalists – topics related to production of fruits and vegetables and what practices should be avoided; supplying more local food; waste management practices in the city. At the same time, organisers can use the opportunity to promote the training being organised.

Another or an additional option is to gather information on which topics are considered interesting and important, both by researchers and specialists and by journalists, through several focus groups meetings.

The next step is to enlist all recommendations, making sure that similar ones are combined into clusters and properly formulated. Having such a list prepared, the themes could be separated in sections in relation to key areas of the food system, for example:

- Production – this section might include different issues related to nitrates, heavy metals, pesticides, GMO, etc.
- Processing – in this category one might include – food preservatives, organic farming, innovative products, labelling.
- Market – themes related with unfair commercial practices, claims for healthy products, food supplements.
- Consumers – topics concerning informed choice (again labels might be discussed), packaging, resource recovery.

Alternatively, one could use a food system scheme to map which actors, sectors or dynamics are relevant for the training.

After identifying the themes of the training, organizers are encouraged to reflect at least two points of view on each issue, for example that of a researcher and of a policy maker or any other party’s opinion, which your Lab finds important.

After constructing the content in such a way, the training could be organized in one or two days depending on the number of topics and further discussions with specialists might be organized as well.

When preparing the presentations, ask the speakers to reflect on the topics from the perspective of the whole food system in the city (country), why this issue is important for the system, how it relates to other aspects of the system and how it affects them.

They might also include the following points in their presentations as well, considering the target audience of the training:

- What is the country situation compared to the European practices and context?
- What would be the “news” for the journalists/professionals?

The facilitator could ask the presenters to choose one of the following exercises or propose another, which they think would work best and modify it with the help of facilitator. Also, the facilitator could present an exercise before the beginning of the sessions or during the open discussion.

During the event

In the very beginning of training or during a networking part of the event specialists, presenters, journalists and guests could take part in “speed dating”. All participants make random couples and for one-minute exchange quick information on who they are, what they are interest and what they would like to learn, after one minute all swap and form different couples answering the same questions.

It is advisable to start the training with a presentation on the systemic approach to food systems Research and Innovation and information about the FOOD2030 policy framework and the FIT4FOOD 2030 project.

If an exercise has been foreseen to run throughout the event, it could be introduced by the facilitator at this point.

Each of the training sessions animated by the speaker and the facilitator would include:

- a presentation by a speaker
- a stand-alone exercise(s) chosen by the speaker and co-developed with the facilitator or the chance to work on part of an exercise if it is ongoing throughout the whole day
- time for discussion.

Each part could be approximatively 20 minutes.

Optional exercise 1: Visioning food systems (transformation)²¹ – stand-alone exercise

This exercise aims to develop participants’ understanding of the food system and its

²¹ FIT4FOOD2030 exercises: https://fit4food2030.eu/wp-content/uploads/2019/01/FIT4FOOD2030_D1.1_Toolstraining-for-Setting-Up-a-Transformative-Network.pdf)

elements and to guide them in creating collectively a vision of the desired transformation in order to set the scene for later discussions. Several steps could be foreseen:

- how would the city's food system need to change in the next 10 years to get closer to the Food 2030 priorities;
- what steps it would take to get there;
- how media practices could support those steps;
- what could be their role in future change

An additional step: The facilitator could combine all answers (if on a sticky notes) in clusters. Working backwards from the desired media practices in support of transformation, each group could draw a map or timeline based on them.

Optional exercise 2: The food system and new media practices – throughout the day

A possibility to stimulate deeper reflection on the speakers' contributions is to invite the audience to work on conveying the content using a familiar or a less-than-usual format, e.g. storytelling via a certain platform, or collective storytelling. Possible steps include:

- A media representative with experience in the field could be invited to share their knowledge and practices, needs and challenges regarding this format at the start of the session.
- Journalists attending the event are split in groups and choose a challenge related to food and nutrition security or the food system more generally to work on.
- Throughout the day, 15-20 minutes of each training session are allocated to develop content reflecting the contribution of the speakers to the challenge selected.
- Groups present their work in a plenary session. Depending on the group and outputs, these could be published following the training.
- Ask the speakers to give feedback on the way their topic was reflected upon by the group and what difference it would make for their own (research, policy making, consuming, etc.) practices.

Optional exercise 3: Greater mutual understanding - standalone exercise

Speakers could propose to the journalists an output (produced by one of the other stakeholders represented among the speakers) which is aimed to be used by, and useful to, media representatives. An example could be a press release (N.B. if using a real example, this should be edited so that it is not obvious from which organization it originates). Working in groups, journalists improve it during the training based on their needs. The researchers and professionals in the room could join the groups for this work and present their own perspectives on the document. Mutual understanding of the different positions can be encouraged through guided questions. Based on the changes suggested and participant discussions, recommendations can be drawn up and published.

Optional exercise 5: Building connections

Ask journalists and speakers to make a map how the themes discussed by the presenters connect and what could be done as one measure, which could support several aspects of the food system. Add it to the plan. This could be a continuous process taking place throughout the whole day. The facilitator could use the systemic map prepared by the City Lab Barcelona to map these out.

Optional exercise 4: **Connections revealed** – throughout the training

Ask journalists to take notes during the training and come up with notes on the food system connections that become clear during the presentations, that they were not previously aware of, as well as questions and angles for further investigation. Ask for comments from the speakers.

After the event

It would be useful for the journalists to receive any materials related to the event as soon as possible, including maps, plans and/or summarized future measures participants agreed upon.

It would be beneficial if the facilitator gathers feedback in order to improve the content or the format of the course.

DEVELOPERS

This module was created with the help of researchers in the University of Food Technologies, using materials such as European strategies and national policies. Presentations delivered at the piloting of the training were developed individually by the speakers.

A check for scientific accuracy was done by a professor in University of Food Technologies in Bulgarian and the English language translation was checked by a professional interpreter.

ANNEXES

ANNEX 1: An overview of the training delivered in Sofia City Lab as part of the piloting

I. Event program

- 1) 10.00 – 10.15 – Registration (ongoing coffee break)
- 2) 10.15 – 10.30 - Short welcoming presentation explaining the focus and aim of the project and presenting the speakers and topics
- 3) 10.35 – 11.30 - 1st presentation - Double standards, what are the facts
- 4) 10.30 – 11.30 - 2nd presentation – Eating habits of children, the latest statistics related to food and children’s health
- 5) 11.30 – 12.30 – Networking lunch
- 6) 12.30 – 13.30 - 3rd presentation – Urban farming
- 7) 13.30 – 14.30 - 4th presentation – Food quality and control
- 8) 14.30 – 15.00 Open discussion

II. Double standards, what are the facts

- 1) Political campaign
- 2) The meaning of the term – what citizens think it is and what is the definition
- 3) The three most common theses and the consumers desires
- 4) Scientific arguments
- 5) Quality function



6) Conclusions, results and Brussels official position

III. Healthy nutrition for children

- 1) Eating patterns and nutritional status
- 2) Obesity in children
- 3) Malnutrition
- 4) Relation between diseases and food as a factor in European context
- 5) Statistical information for trends in child's nutrition in Europe with a focus on Bulgaria
- 6) Regulations in Bulgaria and support for their implementation
- 7) Related actions and activities in Bulgaria
- 8) Prevention
- 9) Reliable information and recommendations
- 10) Future steps

IV. Urban farming

- 1) Milan Urban Food Policy Pact
- 2) Definitions for urban farming
- 3) Scheme of the food system
- 4) Business models in urban farming
- 5) Pros and cons
- 6) Examples, Almere case study

V. Food control. The Bulgarian case

- 1) How is it done?
- 2) Is it effective?
- 3) Participants in the food system
- 4) Control throughout the whole system
- 5) Basic terms and definitions
- 6) Competent authorities in EU and Bulgaria
- 7) Types and organization of the official control, methodology
- 8) How does it look in practice?
- 9) Evaluation and recommendations





ANNEX 2 Contents of the information pack prepared as a result of consultations with Bulgarian journalists and researchers

Contents

Food safety – European policies	3
What the European policy in the food safety area includes.....	3
Verification of the quality and food safety	3
Restrictions for safety of materials designated for contact with foods	4
Improvement of the hygiene of the foods.....	4
Reduction of the contamination of foods.....	5
Encouragement of better nourishment.....	5
Support for the innovations in the sphere of foods	5
Clear labeling.....	6
Foods for certain groups.....	6
Precise health pretensions.....	6
Encouragement of the production of foods of high quality and of traditional foods	6
Encouragement of animal welfare and reduction of diseases in animals	7
Guaranteeing high level of animal welfare.....	7
Efficient system for tracing down live animals and of food and feed of animal origin	9
Encouragement of international welfare standards.....	9
Suspension of the dissemination of pests	10
Protection of plant reproductive material.....	10
Strict system for permission and sale of genetically modified organisms.....	11
Guaranteeing the safe use of pesticides.....	11
Better training for safer food products.....	12
Responsible research and innovations	12
How and where is the quality of foods controlled?.....	13
Efficient rapid alert systems.....	13
Regular inspections in the EU for the observation of the standards.....	13
Official inspections along the borders of the EU	14
Cooperation in global scale.....	14
European Food Safety Authority (EFSA)	14
Bulgarian Food Safety Agency.....	16
How should we read and understand the labels?	16
Authenticity of foods and labeling.....	17
Concept “clean label”	18





Official control with regard to food labeling.....	21
Official control in food production units:	21
Official control in outlets for trade with foods:	21
Bioproducts – reality and fantasy	22
What does “bio” mean according to the language of law?	22
The label contains the following information of significance for the buyer:.....	22
What is the procedure for placement of a similar sign/certificate?.....	23
How much does the receipt of a certificate for manufacturer, processor or trader of production manufactured in a biological manner cost?	24
Designation of bio products.....	24
Significance of the short food supply chains	27
Traditional nourishment and health.....	29
Super foods – in favor and against, Bulgarian superfoods	30
Definition and examples	30
Further to these examples for high energy foods, which may be easily found by everyone, the subject- matter for superfoods also provokes a more different point of view.....	33
Are imported superfoods irreplaceable or may they be replaced by Bulgarian products?	34
Kinds of foods and the unknown?	36
Functional foods	36
Guidelines for organizing training for journalist.....	40
Harmful and useful E-s (preservatives).....	41
Sources of authentic information	41



Beeswax food wrap

This module was created by the employees of Science Centre AHHA: Kristel Schreiner with help from Pille Randjärv, Elisabeth Parman and Sander Kask. Members of City Lab Tartu were consulted in the development process. Checks for scientific accuracy and English language translation were done by Üllar Kivila.



AT A GLANCE

Thematic Area	Food packaging, food waste,
Format	Hands-on workshop
Duration	45-60 minutes
Type of audience	From primary school to high school
Age group	12-18
Number of participants	10-20
Prerequisites for participation	None
Number of facilitators	1
Overall difficulty	<p>Topic: beginner</p> <p>Preparation: beginner</p> <p>Facilitation: intermediate</p> <p>Handling a large number of kids and hot tools (oven and oven trays) in the room requires lots of attention.</p>

OVERVIEW

Children will make their own piece of beeswax food wrap, which sticks like plastic food wrap does, but is reusable. They will also learn and discuss about different food and general packaging methods and materials, why do we package it and how to prevent unnecessary packaging.

OVERALL AIM

Allow children to see how unnecessary food packaging is bad for our environment, a waste of material and give them a tactile example of how they themselves can make a difference.

SPECIFIC (LEARNING) OBJECTIVES

After the successful completion of this module participants are expected to be able to...

- Understand the extent of producing waste and how much of it is one-time packaging.
- Identify moments when packaging can be avoided.
- Know more about where different materials come from and their properties (plastic and beeswax for example).
- Repeat some simple kitchen cooking techniques that they might not have tried before.
- Make beeswax food wrap.
- Understand why we use food packaging and why plastic wrap is so successful in achieving this goal.

SUGGESTED SCENARIO FOR IMPLEMENTATION

This workshop is created as a science centre / science museum 1 hour workshop that requires participants to be present for the whole duration, from start to finish. Trained facilitators can carry out the workshop multiple times in one day, with different participants.

With the necessary kitchen equipment at hand (an oven), Beeswax Food Wrap workshop could also be facilitated, for example, in a classroom, as part of a science festival or some other science seminar, as a fun hands-on workshop to further engage and energize the participants.

The workshop is considered non-formal education. Connections with the school curriculum can be found and the workshop could be used to exemplify an environmental topic.

TOPICS & COMPETENCES COVERED BY THE ACTIVITY

Thematic area(s)	Food packaging, food waste, the environmental footprint of food systems, food preservation
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FOOD2030 Research & Innovation priorities

<i>Priority</i>	<i>Indicate whether main or secondary</i>	<i>Addressed through</i>
Circularity & Resource Efficiency	main	Presenting, evaluating and discussing different (and bad) methods of packaging. Making a reusable alternative to plastic wrap.
Innovation & Empowerment of Communities		
Nutrition & Health	secondary	Explanation on what happens with food when it is exposed to air and other elements.

Climate & Sustainability	secondary	Making a reusable alternative to plastic wrap.
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Responsible Research and Innovation (RRI)

Related concept

Addressed through

Innovation with and for society

Explanation and presentation of different innovative (and less innovative) materials and methods connected to food packaging and their sustainability.

Research & Innovation (R&I)

Related concept

Addressed through

Research about different packaging materials and how they affect food

Presentation of food preserving methods and their impact.

(Food) Systems thinking

The workshop focuses on an important component of the food system: packaging; and interlinks this component with production, transport, waste management, retail and consumer habits. This facilitates circular economy thinking.

Other competences

Competence

Addressed through

Using kitchen tools

Measuring and applying beeswax, heating beeswax to the right temperature, taking care with hot surfaces and items.

Potential of bringing the arts, socio-economic science and humanities creatively or trans-disciplinarily with the module?

Cutting out and designing (with non-toxic markers) your own reusable beeswax wrap is a form of creative expression.

TARGET AUDIENCE

Audience category

Children and youngster from primary school to high school.

Recommended number of participants

10-20

Recommended age

12-18

	Younger children will need help, because they need to work quickly with hot wax coming from a hot oven, which can be dangerous.
Prerequisites	No prerequisites required.

OPTIONS FOR MULTI-STAKEHOLDER ENGAGEMENT








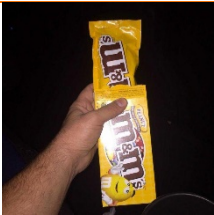

<i>Stakeholder</i>	<i>Role envisaged in the activity</i>
Shops and markets selling unpackaged food	This workshop could be carried out at an event at or near food shops or markets (often specializing in organic food) that sell unpackaged food, to draw attention to their more sustainable practices and waste management. This would work best during events that target the public. Regular shops are transitioning towards these practices as well (e.g. the ban on small plastic bags), so this workshop could be attractive for them as well.
Waste management, food preservation and materials experts	Scientists or specialists could be brought to the workshop to share their insights on packaging materials and methods and what happens with the waste.

SETTING UP THE MODULE

FACILITATION/DELIVERY

One facilitator is sufficient. It helps if the facilitator has a generally good grasp of different scientific topics and already understands the concepts of over packaging and sustainable packaging, but reading through the extra-information in the facilitation script should be enough to successfully carry out the workshop.

RESOURCES		
<i>Physical materials</i>		
<i>Resource name</i>	<i>Picture</i>	<i>Number</i>
Thin cotton cloth (recycled is the best)		1.5 m ²
Beeswax pellets		0.5 kg
Baking mats (reusable silicone mats are the best, cooking paper works also)		3
Kitchen scales		5
Small bowls		10
Sharp scissors		5
Ruler (at least 25 cm)		5
Pencil		5

Silicone spatula		5
Oven (can be fixed in the room or portable)		1
Oven trays		3
Drying rack		1
Clothes line (a substitute for a drying rack, to be tied between two chairs)		1
Floor cover underneath the drying rack or clothes line (for example a large plastic waste bag, meant to be reused)		1
Printed large pictures of topics and items mentioned in the workshop (such as wax plates being produced by bees, oceanic plastic pollution, growing cotton etc.)		10
Store-bought examples of over packaged products		3
Non-toxic fabric markers		10

Oven mitt		1-2
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Useful links, videos, articles

<http://www.foodsafetysite.com/educators/competencies/general/microbiology/mic6.html>

<https://www.weforum.org/agenda/2019/01/most-plastic-packaging-is-unrecycled-that-has-to-change/>

<https://www.dw.com/cda/en/plastic-waste-and-the-recycling-myth/a-45746469>

<https://www.un.org/sustainabledevelopment/blog/2017/04/feature-uns-mission-to-keep-plastics-out-of-oceans-and-marine-life/>

<https://ourworldindata.org/plastic-pollution>

https://en.wikipedia.org/wiki/Plastic_pollution

<https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/beeswax>

<https://superbee.me/beeswax/>

<https://www.beeswaxcandleco.com/wax-removal-tips/>

<https://en.m.wikipedia.org/wiki/Beeswax>

https://www.boredpanda.com/unnecessary-wasteful-packaging/?utm_source=google&utm_medium=organic&utm_campaign=organic

<https://www.youtube.com/watch?v=RS7IzU2VJIQ>

How plastic was seen as a wonder material:

<https://youtu.be/lesIsKMjB4Y?t=356>

Examples of novel materials to be used instead of plastic:

<https://www.cbc.ca/news/canada/montreal/mcgill-researchers-use-lobster-shells-to-make-biodegradable-plastic-1.4920820>

<https://www.lifegate.com/people/lifestyle/muskin-leather-mushrooms>

<https://biotrem.pl/en/>

PREPARING THE SETTING

Set up the room so that participants sit in tables of 4 each, set up chairs accordingly.

It is best if the room has a fixed oven, but if it doesn't then a portable oven has to be set up beforehand.

Set up the drying rack or tie a clothesline between chairs (multiple lines for bigger groups). Put the floor cover underneath the drying area, to protect the floor from potentially dripping beeswax. You will also need put a table near the drying rack, to minimize the length dripping pieces of cloth have to travel. Put spatulas on that table.

Since you will have multiple table groups, it is best if you have the cloth already cut into at least one piece per table. Also, dividing beeswax into smaller containers for each table is useful, but this can be done during the workshop.

It is best to keep the materials participants need during the workshop at a large table at the front of the room.

DETAILED SCRIPT FOR IMPLEMENTATION

Step

2 min

Introduction to the workshop, setting the agenda.

Tell participants that in this workshop participants will take a look at packaging, will get to know more about the concept of overpackaging, about different packaging materials and make their own piece of sustainable packaging – beeswax food wrap, that can be reused many times, unlike the single use plastic food wrap.

10 min

To have participants share their own ideas about food packaging, start with the following questions:

**What is the point of food packaging? For example, for store-bought products.
What kind of food is not packaged?**

Use the extra information to further explain key ideas behind packaging, as participants touch upon them:

Packaging protects food products (and other products) from going to waste and lets us store or use them for a longer time. Packaging depends on the product, but generally its principles are:

- **Lock nutrients** and ingredients in one place (for example, moisture and aroma compounds could easily leave an unsealed product);
- Control contact with **air** (e.g. meat would rot faster in contact with oxygen, because it enhances microbial growth);
- Regulate **moisture** (keep it in or keep it out);
- Block **organisms** from reaching the product and spoiling the product;
- Block **light** from affecting the food – photodeterioration, which causes chemical reactions in vitamins, pigments, amino acids and fats (for example, storing milk in transparent

bottles under bright supermarket lighting results in a distinct flavor change and loss of vitamins);

- Preserve the **shape** of brittle food items (e.g. chips and cookies);

Furthermore, packaging gives us **information** about the product, its nutrients, usage and safe storage methods and duration. Packaging can also be used to boost the attractiveness of a product (**marketing**).

Show participants store-bought or otherwise acquired real examples of overpackaging one by one and ask:

What is wrong with this example?

What is the reason behind this packaging?

What could be done differently in this example?

What are the downsides of food packaging?

What happens with packages after they are used?

Use the extra information to explain further:

In Estonia, there is an average of **311 kg of unrecycled waste generated each year by each person**. 30% of its mass and 60% of its volume is packaging waste. All of the packaging waste created by the small Estonian nation in one year takes up the space of a three-story building, two football fields in size. In the European Union, Estonia is among the top three plastic packaging waste producers, behind Ireland and Luxembourg (2016).

Waste thrown in the **general bin will not get recycled**. Instead it is put in a landfill or incinerated. These methods can be used for **generating energy** (by utilizing the landfill gas methane, created by microorganisms, or heat generated by incineration), but it is better to have the packaging materials recycled and thus reused (for example, bottles) or downcycled (made into flower pots, fleece cloth, packaging paper etc.).

29 European countries have established a system of **recyclable packaging bins**, where companies pay a fee to finance the collection, sorting and recovery of packaging waste. But of course consumers are the ones paying for this service, as a part of the product price. Recycling has its controversies, such as consumers fail to recycle correctly, packages with mixed materials might still not get recycled, humans still have to sort through the recycled waste and for this waste is sometimes shipped overseas etc.

Packaging is the dominant use of plastics in the world, **accounting to 42% of the plastic use** (second is construction with 19%). In 2016, the global population of 7 billion created more than 300 million tons of plastic in one year, while in 1950s the number was about 1.5 million tons. Much of it **ends up in the oceans**, also as microplastics. Reports show that if this trend would continue, by 2050 our oceans will contain more plastic than fish by weight.

Sustainable packaging, **minimizing single-use plastics** and avoiding unnecessary packaging in the first place is key here. An example is to use beeswax food wrap instead of plastic wrap or a single-use plastic bag.

5 min

Give the groups (or have them come to you and receive the following items):

- one scale each
- groups share of beeswax in a bowl (~100 g)
- measuring bowl
- groups share of cloth
- scissors
- pencils
- fabric markers

With a sample of beeswax on their tables, have the participants touch and smell pellets of beeswax, while you explain what it is.

Beeswax is an **antibacterial, waterproof, malleable** substance that young bees secrete on the bottom of their bodies. Bees eat honey in order to create beeswax, then scrape the beeswax platelets from the bottoms of their bodies, chew them up and build their hives using it. Beeswax has a melting point of 60-65°C and its autoignition temperature is 204°C.

Beeswax is **non-toxic** and safe if ingested, although it wouldn't provide you any nutrients, because our bodies cannot break it down. Beeswax is in fact so stable, that thousands of years old beeswax discovered in pyramids is still the same as beeswax produced today.

10 min

Instruct participants to measure and cut themselves 25 cm x 25 cm pieces of cloth, that they can design using fabric markers. They must add at least a minimal element of design, such as their name, in order to identify their wrap later.

Meanwhile, turn the oven on at 100 degrees Celsius, it will heat for about 8 minutes. Put the baking mats on the oven trays outside of the oven.

10 min

Give the oven trays to groups and instruct the group to measure 20 grams of beeswax per each person. Then they will need to fold their cloth in two, lay it on the tray and sandwich the beeswax between the two layers of their cloth. One group's 4 pieces of cloth should fit all on one tray. Then put the tray in the oven (or let the children do it) for 3-4 minutes. Task the children with measuring time.

As ovens don't have space for many trays, and usually there aren't many trays either, groups will use the trays and get oven-time taking turns.

2 min

Explain the next part, so it goes more smoothly and quickly: once the tray comes out of the oven, it will be placed on a table near the drying rack. Participants must take care with the hot tray and spread their beeswax on their cloth using the spatulas very quickly. The beeswax hardens very rapidly at room temperature within a couple of minutes.

15 min

After 4 minutes have passed (verify visually that the wax is totally molten) invite the corresponding table-group to the table that is set up near the drying rack. Take the tray out using

oven mitts. (The tray is actually not very hot, but it is a precaution.) Place the tray on that table and have them quickly spread the beeswax into the try parts of their cloth.

Then quickly separate the two layers of the folded cloth and hang the pieces on the drying rack. Older participants can hang the cloth by themselves.

Repeat this with each group.

2 min

After a couple of minutes of drying, participants can take their cloth. Allow people to test their food wrap on the bowls that were used in the workshop. Ask them:

What can you use this wrap for?

2 min

Thank the participants for taking part, the workshop is now over. You can let the participants leave now.

Collect the used materials and equipment (you can have participants help you with this), wash anything that became dirty.

Food and Vacuum

This module was created by the employees of Science Centre AHHAA: Kristel Schreiner with help from Pille Randjärv, Elisabeth Parman and Sander Kask. Members of City Lab Tartu were consulted in the development process. Checks for scientific accuracy and English language translation were done by Üllar Kivila.



AT A GLANCE

Thematic Area	Food packaging, food preservation
Format	Hands-on workshop
Duration	45-60 minutes
Type of audience	From primary school to high school
Age group	10-18
Number of participants	10-20
Prerequisites for participation	None
Number of facilitators	1
Overall difficulty	<p>Topic: beginner</p> <p>Preparation: beginner</p> <p>Facilitation: beginner</p>

OVERVIEW

Children will make their own vacuum chamber to exemplify vacuum packaging and freeze drying – two methods of food preservation.

OVERALL AIM

Participants will explore phenomena of vacuum first hand. This shows how science and research are an integral part of our food system, and the method of how food will be preserved more and more in the future – freeze drying.

SPECIFIC (LEARNING) OBJECTIVES

After the successful completion of this module participants are expected to be able to...

- Understand better how food is stored and what are the chemical and physical principles behind these methods.

- Make a vacuum chamber.

SUGGESTED SCENARIO FOR IMPLEMENTATION

This workshop is created as a science centre / science museum one-hour workshop that requires participants to be present for the whole duration, from start to finish. Trained facilitators can carry out the workshop multiple times in one day, with different participants.

Food and Vacuum workshop could also easily be facilitated, for example, in a classroom, as part of a science festival or some other science seminar, as a fun hands-on workshop to further engage and energize the participants.

The workshop is considered non-formal education. Connections with the school curriculum can be found and the workshop could be used to exemplify food and physics topics.

TOPICS & COMPETENCES COVERED BY THE ACTIVITY

Thematic area(s)	Food packaging, food preservation
-------------------------	-----------------------------------

FOOD2030 Research & Innovation priorities

<i>Priority</i>	<i>Indicate whether main or secondary</i>	<i>Addressed through</i>
Circularity & Resource Efficiency	main	Presentation and explanation of different food packaging methods, and trying them out.
Innovation & Empowerment of Communities	secondary	Explaining the science behind innovative food preservation methods.
Nutrition & Health	secondary	Discussion on why do we even need to preserve and package food – to keep it from becoming harmful to us.
Climate & Sustainability		

Responsible Research and Innovation (RRI)








<i>Related concept</i>	<i>Addressed through</i>
Innovation with and for society	Explanation and presentation of different innovative (and less innovative) methods of food preservation and how science, entrepreneurs and consumers can work together here.








Research & Innovation (R&I)	
<i>Related concept</i>	<i>Addressed through</i>
Science behind the chemistry and physics of food preservation	Presenting the principles of food preservation.
(Food) Systems thinking	
The workshop focuses on a component of the food system: food preservation; and interlinks this component with production, packaging, transport, waste management, retail and consumer habits. This facilitates circular economy thinking.	
Other competences	
<i>Competence</i>	<i>Addressed through</i>
Understanding schematic instructions, finding solutions accordingly	Participants have to make their own vacuum chamber, following a scheme, that doesn't list all of the steps required to produce the outcome, but they have to find the solutions on their own (or as a table-group).
Handcraft, tinkering	The activity involves measuring, cutting, gluing, fitting components together.
Potential of bringing the arts, socio-economic science and humanities creatively or trans-disciplinarily with the module?	
Building the vacuum chamber is partly a design process, but currently the creativity here is quite limited.	

TARGET AUDIENCE	
Audience category	Children and youngster from primary school to high school.
Recommended number of participants	10-20
Recommended age	7-18
Prerequisites	No prerequisites required. However, mixed-age groups can be tricky, because different ages need different explanations in order to understand vacuum. If one would go over it too quickly, young children will not understand vacuum and the experiments will not be interesting.

OPTIONS FOR MULTI-STAKEHOLDER ENGAGEMENT	
<i>Stakeholder</i>	<i>Role envisaged in the activity</i>
Nutrition and food preservation experts	Scientists or specialists could be brought to the workshop to share their insights on food preservation methods.
Physics educators	Teachers, educators, tutors etc. can use this activity to tie together physics topics and food topics. Vacuum chamber is useful to observe space-vacuum related phenomena as well.

SETTING UP THE MODULE
FACILITATION/DELIVERY
One facilitator is enough. Basic general background knowledge about physics and chemistry helps.

RESOURCES		
<i>Physical materials</i>		
<i>Resource name</i>	<i>Picture</i>	<i>Number</i>
Glass jars		20
Lids with 5 mm holes drilled into them		20
Pieces of transparent hose (40 cm each) (5 mm diameter) Link		20
Plastic syringe (5 mm diameter for the opening) Link		20
Small aquarium one-way valves (5 mm connection diameter) Link		40
T-connectors for hoses (5 mm connection diameter) Link		20
Ruler		5

Scissors		5
Tape		5
Adhesive putty		3 packs
Small balloons (water balloons work well)		10
Pack of freeze-dried products (such as strawberries)		1
A pack of marshmallows		1
Schematic for making a vacuum jar	See Annex 1	5
Mini grip bags		10
Useful links, videos, articles		
https://www.sciencedirect.com/topics/food-science/food-preservation		

<http://ecoursesonline.iasri.res.in/mod/page/view.php?id=1706>

<https://www.sciencedirect.com/topics/food-science/active-packaging>

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5868547/>

<https://www.foodqualityandsafety.com/article/containing-food-waste-food-storage/?singlepage=1>

<https://www.unenvironment.org/regions/north-america/regional-initiatives/minimizing-food-waste>

<http://www.fao.org/food-loss-and-food-waste/en/>

<http://www.euro.who.int/en/health-topics/disease-prevention/food-safety/news/news/2015/12/more-than-23-million-people-in-the-who-european-region-fall-ill-from-unsafe-food-every-year/presentation-the-global-burden-of-foodborne-diseases-results-for-action>

<http://www.euro.who.int/en/health-topics/disease-prevention/food-safety/news/news/2015/12/more-than-23-million-people-in-the-who-european-region-fall-ill-from-unsafe-food-every-year>

<https://foodinsight.org/the-benefits-of-preservatives-in-our-food/>

<https://www.triplepundit.com/story/2015/preservatives-good-bad-and-essential/57276>

<https://www.thekitchennyc.com/the-history-behind-the-modern-vacuum-sealer/>

https://en.wikipedia.org/wiki/Vacuum_packing

https://en.wikipedia.org/wiki/Modified_atmosphere

<https://www.newfoodmagazine.com/article/36664/vacuum-packaging-food-waste/>

<https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/vacuum-packaging>

<https://www.greenbiz.com/article/reducing-food-waste-could-dramatically-cut-ghg-emissions>

http://www.fao.org/fileadmin/templates/nr/sustainability_pathways/docs/FWF_and_climate_change.pdf

<https://en.wikipedia.org/wiki/Freeze-drying>

<http://www.madehow.com/Volume-2/Freeze-Dried-Food.html>

<https://harvestright.com/blog/2017/how-to-store-freeze-dried-food/>

<https://harvestright.com/>

PREPARING THE SETTING

Set the room so that all participants can be divided into groups of 4. Each group has their own table and chairs.

It is best to keep the materials participants need during the workshop at a large table at the front of the room.

DETAILED SCRIPT GUIDELINES

Step

1 min

Introduction and setting the agenda. Tell the people that in this workshop all of the participants will make their own vacuum pump, test it out and learn how it connects with food preservation.

10 min

Start with asking participants questions and let them express different opinions about:

How is food preserved?

How long can different food be preserved?

Why do we need to preserve food?

How would it be possible to store and preserve food for as short time as possible? What would be the benefits? What would be negative about it?

What are the causes of food deterioration? (i.e. the things you need to protect food from when preserving it.)

If possible, write down on the whiteboard (as people name the causes), what are the causes of food deterioration (and add the missing ones):

- Growth and activities of **microorganisms**, mainly bacteria, yeasts and moulds (this can lead to contamination or production of toxic compounds in food, which is dangerous for humans);
- **Temperature**, both heat and cold (low temperatures are used to slow down biological and chemical deterioration of food);
- **Moisture** and dryness (water is a good breeding ground for microbes);
- **Air** and in particular **oxygen** (oxygen helps microorganisms grow and facilitates chemical breakdown of nutrients, such as lipids);
- **Light** (photodeterioration, which causes chemical reactions in vitamins, pigments, amino acids and fats);
- **Time** (deterioration can generally be slowed down, but not stopped);
- Activities of **natural food enzymes** (for example peeled apples becoming brown quickly);

- Insects, **parasites** and rodents;

Use the extra information to add key facts to the answers participants give:

United Nations estimates that **one third of the food produced globally is lost** or wasted, either thrown away after a meal or the food gets bad and inedible during transport or preservation. Also, 23 million people in Europe annually fall ill from eating **contaminated food**. In United States that number is 48 million, one in six people, every year. World Health Organization notes that malnourished people are more vulnerable to foodborne diseases and households suffering from famine rarely discard contaminated food.

It is evident that although **sourcing our fresh food locally** is the best way to minimize our ecological footprint (less packaging, transport, cooling etc.), preserving food correctly while it reaches the hungry millions is very important. Packaging and different food preservation methods help here.

Use of **preservative ingredients** helps fight off microbes, but preservatives have their own effects on health, taste and other properties of food. For example sugar and salt are known natural preservatives often added to food as well (jams and beef jerky), but they are not healthy in their own right. However, modern packaging and other methods can alleviate the need of using any preservatives and food processing.

Intelligent packaging (IP) helps to monitor the safety of food. A simple widespread example of IP is the use of barcodes to identify food and its properties. A more futuristic example is the use of **time-temperature indicators** or oxygen indicators in packaging. Time-temperature indicators show how long food has been stored and how long it has been in favorable or unfavorable conditions. The active ingredients in the indicators change color slowly in cold or frozen conditions, and more rapidly in warmer conditions, indicating (more precisely than best-before dates) if the food is safe to eat or not. These solutions have found commercial use in USA, Japan and Australia, but Europe is lagging behind because of strict regulations of food-contact materials that can't keep up with technological innovations.

Vacuum packaging – pumping out the air prior to sealing the food in plastic – helps to preserve food 3-5 times longer, because air and oxygen is removed from the product, which inhibits the growth of microorganisms and inhibits oxidation processes. It also locks components of food (aroma components, nutrients) in one place, prevents contamination, preserves the level of moisture, reduces packaging volume and fixes food in a certain position (good for displaying food in a retail store).

Examples of how long food can be preserved without and with vacuum packaging:

- Bread – 2 days in room temperature, 8 days vacuum packaged in room temperature;
- Coffee, nuts, pasta – 120 days in dry conditions in room temperature, 360 days vacuum packaged in room temperature;
- Raw meat – 2-3 days in a refrigerator, 6-9 days vacuum packaged in a refrigerator.

Modified Atmosphere Packaging (MAP) is a similar popular technique, where air is also evacuated from the package, but is then replaced with another air mixture, usually lacking in oxygen and containing high levels of CO₂ or inert nitrogen. The effects are basically the same as vacuum packaging, but the resulting package is larger.

The history of vacuum packaging goes back to World War II, when allied soldiers used evacuated latex bags were used to help preserve frozen food. Commercial use started in 1940s and plastic packaging became preferred.

The plastic used in vacuum packaging can be used only once. This is the controversial and **wasteful** aspect of this method, but it does prevent food loss. Developing world experiences food loss because of inadequate preservation and packaging techniques (before the food arrives at the market), while developed world does not have this problem, instead uneaten food is thrown away at supermarkets and at homes. **It is debatable, which is more harmful for the environment:** the production and waste management of single use plastics used in vacuum packaging or the production and waste management of un-vacuum-packaged food that is lost.

Greenhouse gas (GHG) footprint produced by food waste is calculated by adding up the footprints of all the steps in the production process of wasted food – growing, producing fertilizers, transport, refrigeration etc. Wasted food also usually ends up in landfills, where it produces a potent GHG methane. This adds up to **4.4 billion tons** of CO₂ equivalent GHG emissions annually in the world, caused by food waste. If food waste were a country, it would rank third in GHG emissions, behind China and USA. Food waste has almost the same GHG footprint as global road transportation.

As food is wasted in the final stages of the food cycle in the developed world (as opposed to production, storage and transportation in the developing world), **developed world is accountable** for a larger part of the GHG emissions of food waste, because more energy and resources are used up by the time our food is wasted.

2 min

Give each table (or have them come over and pick up) a schematic for building a vacuum pump, tape, half a pack of adhesive putty, scissors, ruler, and for each person:

- a jar
- a lid
- a syringe
- 40 cm hose
- a T-connector
- 2 one-way valves

15 min

Instruct everybody to make their own vacuum chamber by reading the schematic and using their available tools. Have group members help each other and walk around and help them, as necessary.

The common mistake that people might make is putting valves on the wrong way. Adhesive putty and tape are necessary to seal the hole in the jar lid.

10 min

When participants are nearing completion, hand two balloons per group. Instruct them to blow the balloons a little and close them (water balloons have a suitably limited size) and see what happens.

Let them try to explain (and fill in the blanks): **Why the balloon increases in size when air is pumped out of the vacuum chamber?**

Vacuum is the absence of air and other materials inside a space. Air pressure is absent inside a perfect vacuum, however the vacuum in our chamber is not perfect, thus some air molecules and low air pressure remains.

Air balloon (and also marshmallows and for example shaving foam) has air trapped inside an elastic container. The large pressure inside the balloon gives a filled balloon its shape and size (by inducing more force upon the elastic material), but **atmospheric pressure still acts upon the balloon, limiting its size**. If we lower the pressure (inside our vacuum chamber) our balloon can take a larger form, because the pressure inside the balloon is not counteracted by the atmospheric pressure.

5 min

Hand participants marshmallows to try out in their vacuum pumps as well.

Hand each table a couple of mini grip bags and have them try to seal something of their own choice inside the bag, using the vacuum pump. It is a two-person job. They will have to remove the hose from the jar lid, but they will have to remove it in a next step anyway.

10 min

Coming back to freeze drying, explain how vacuum pumps are used for freeze drying. It is time to bring out the freeze-dried products and have participants taste them.

Ask participants, **how this fruit tastes like and how does it differ from fresh fruit?**

Freeze drying is a food preservation method that consists of the following steps:

- 1) Freeze all the water content inside the food;
- 2) Place the food in (near-)vacuum;
- 3) Heat the food (can be up to 38 °C);
- 4) Ice sublimates directly into water vapor, collect the vapor by letting it condense on a cold surface;
- 5) (For best possible storing conditions, break the vacuum with an inert gas and package your product.)

This method results in food that will have **empty space where ice crystals used to be**, thus

maintains its form and can be easily rehydrated. The nutritional content, flavors and smells generally **remain unchanged**, unlike canning or regular dehydration. Freeze dried products can be stored in **room temperature** and they are **very light**, as they are missing all of their original water content (for example, 90% of the mass of fruits can be water). The dehydration also prevents the growth of **microbes**.

Hermetically sealed freeze dried products can be stored **up to 25 years**. A simple container in room temperature, like a cookie jar, can safely store such products for a couple of months. Contact with air (and more precisely water vapor inside the air) will gradually rehydrate freeze dried food.

Because of its light weight and ease of storage, freeze dried food is **great for astronauts, military combatants, campers** and to stock **bomb shelters**. But all of freeze drying benefits are useful for regular food preservation as well and could see use in a wider extent in the future.

The main drawback currently is the **cost of freeze drying**, as it is a technologically difficult process. Home freeze dryers are available for 2000-3000 euros, but commercial freeze drying is done in special rooms and complexes. Nevertheless, proponents of freeze drying imagine that large supermarkets could all use freeze drying rooms, to prevent food loss by applying it on products nearing the end of their shelf life, effectively stopping the spoiling process.

2 min

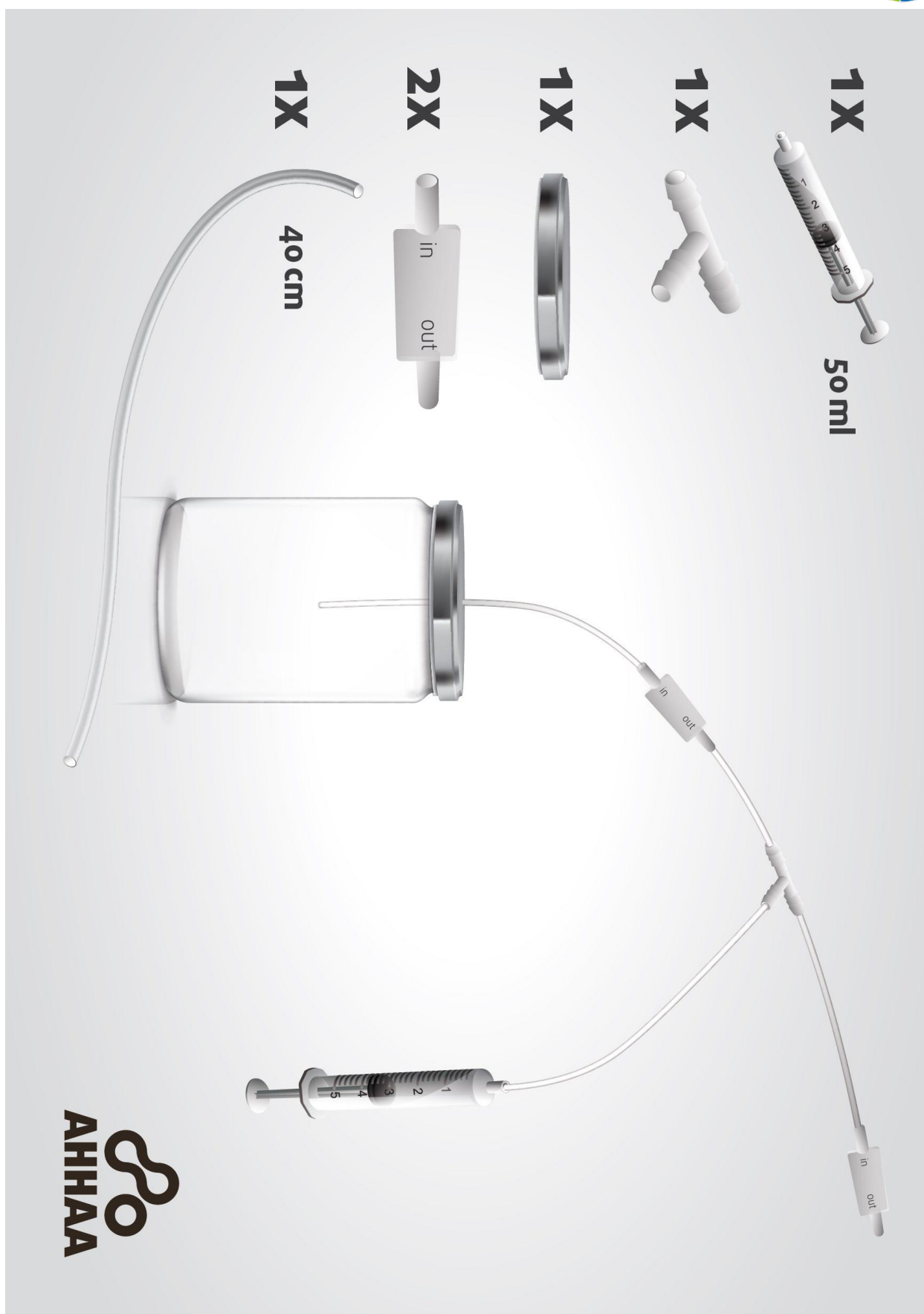
Thank the participants for attending! Let them keep their vacuum pump systems, if they desire, but the jars with lids will stay in the facilitator's possession, for future workshops.

Encourage participants to continue experimenting with their vacuum pump at home, by repurposing an old jar and making a hole in the lid (possibly with parents' help). Shaving cream gives out excellent results in a vacuum chamber as well.

Remove the adhesive materials from the vacuum pumps and take them apart to reuse in future workshops.

ANNEXES

ANNEX 1: Schematic for making a DIY vacuum chamber



City Lab Tartu: Food and Vacuum – extra – Activity Guide and Teacher Guide

VACUUM CHAMBER

The maximum length of a straw you can use to suck water from a well 3'4" is: Beyond that the vacuum in our mouth will not be enough. Theoretically, it is possible to pump water up to 10.3 m high using a vacuum, before the water column pressure overpowers the air pressure and even a full vacuum would not get further.

Mold and bacteria cannot reproduce in an oxygen-deprived environment, therefore vacuum packaging is a good option to preserve food. By placing frozen food in a special type of vacuum chamber, it is possible to transform ice crystals in food directly into gas. The result is water-free freeze-dried food, which has the original taste and texture. Since freeze-dried food can be stored for decades, it can also help prevent food waste and be used more widely in the future.

There is a partial vacuum between the two metal layers of a thermos. This allows to keep a constant temperature for a long time.

TASK
Build a vacuum chamber to explore the effect of pressure changes.

IDEAS
How does the placement of air valves affect air movement?
What can you do to prevent air leaks and air moving back to the jar?
What can you do to make your jar as airtight as possible?

BUILDING
Build a vacuum chamber and test the device with a small inflated balloon.

EXPERIMENT

EXPERIMENT I
Explore, how does the change of pressure affect shaving foam, marshmallows and sound.

EXPERIMENT II
During two weeks, observe, what happens to food placed in the vacuum chamber. Try this experiment for example with a piece of bread, fruit or a biscuit. As a control experiment observe the same food in regular air conditions.
Which data should you collect?
How should you collect the data?
Will you take photos?

DISCUSSION
Why does the volume of foam, balloons and marshmallows increase while pumping air out of the jar?
Very low atmospheric pressures can make sebata in the mouth, but not blood in other body liquids (as sometimes shown in sci-fi movies), because cells and body's internal environment can maintain the required pressure.

DISCUSSION
Why does the volume of foam, balloons and marshmallows increase while pumping air out of the jar?

TRY AGAIN
How can you remove the air from the syringe without disconnecting it?

DEVICE DOES NOT WORK

DISCUSSION
Are there any similarities between our lungs and the balloon placed in the vacuum chamber?

DISCUSSION
Are there any similarities between our lungs and the balloon placed in the vacuum chamber?

DISCUSSION
Are there any similarities between our lungs and the balloon placed in the vacuum chamber?

SUMMARY
Describe the effect of air pressure changes on shaving foam, marshmallows and sound. Did the decreased pressure effect food preservation?

ADDITIONAL INFORMATION

Pressure is the force applied perpendicular to a surface divided by its area.

$$P = \frac{F}{S}$$
 P = pressure, F = force, S = area.

A pressure gauge is used to measure pressure in liquids and gases.

Atmospheric pressure at sea level is: 1 atm (atmosphere) = 101325 Pa (Pascal) = 1,013 bar = 760 mmHg (millimetres of mercury).

Atmospheric pressure at sea level varies between 810-1085 mbar. Pressure decreases by half for every 5.54 km of height.

Sound cannot travel through a vacuum, because there is no air or other molecules to transfer sound vibrations. Air valve (in/out) allows air to move only in one direction.

ATTENTION!
Scissors are sharp. Be careful while removing the lid.

When pressure increases, for example while diving, dissolution of nitrogen and other gases in the blood improves. As pressure decreases, the solubility of gas is reduced and gas builds up in bubbles. If the pressure declines rapidly, lungs cannot remove bubbles fast enough and the diver gets decompression sickness.

This material was developed using co-funding by European Union's Horizon 2020 programme under grant agreement No 774088. Authors: Kristel Schreiner, Milla Rendjari, Sander Kask, Ulla Kivita, Heleen Jänepõld, Elisabeth Parman, Andes Kura.

VACUUM CHAMBER

During 2 weeks, on 6 different days, observe two sets of food, first one placed in the vacuum chamber and the second one under normal air conditions. Write down your observations.

Draw a sketch of your vacuum chamber design and modify it later if necessary.

What are the factors affecting the reliability and quality of a device? How can the device be improved?

Observe the effect of pressure changes on different objects. Write the results in a table below.

Object	Brief description of the test result, estimated measurement results
Shaving foam	
Marshmallow	
Slightly inflated balloon	
Buzzer	

What indicates that there is not a vacuum in the device, only a reduced pressure instead?

Vacuum packaging and shelf life
Based on your previous knowledge, explain whether you think the food is better preserved in the air or in the vacuum chamber you built.

Day	Normal air (control test)	Inside the vacuum chamber
Day ...		
Day ...		
Day ...		
Day ...		
Day ...		
Day ...		

Were the results expected? How can you explain the results?

You took a bottle of water with you on a mountain trip, drank all of the water at an altitude of 3000 meters and put a closed bottle back in the bag. What happens to the closed empty water bottle 60 m above the sea level and why?

Could a similar change occur even if the altitude would not change? Yes No

KEYWORDS FOR ONLINE SEARCH
Pressure, vacuum, pressure gauge, mold, vacuum packaging, barometer, manometer, phase diagram, freeze drying, mmHg to Pa, smart packaging, modified atmosphere packaging



Vacuum Chamber



Duration

45 min
+ 2 weeks observation



Related topics



What you need (for each group)

- 0,5 l Jar
- 40 cm Silicone tube
- 2 pcs Air valve
- 1pc 50 ml Syringe
- Shaving foam (or similar) (1 can per class)
- Piece of fruit or other food
- Ruler
- Optional:**
- Small disposable plastic cups for foam
- Freeze-dried berries/fruits for tasting
- Rubber gloves
- Pressure gauge
- T-connector
- Insulating tape or adhesive pads
- Scissors
- Marshmallow
- Balloon
- Buzzer and a suitable battery



Instructions

The task of the participants is to build a vacuum pump (one per each group).

There are several ways to build a working vacuum pump. One of them is shown on the additional page of this teacher guide. If the participants do not have any ideas how to start, they can be directed towards that solution.

The vacuum chamber can also be built simply by attaching the syringe to the lid of the jar using a silicone tube, but it does not allow all of the air to be removed from the jar. This would require a system that, on the one hand would remove air from the jar, but on the other hand, wouldn't let it go back to the system. A suitable tool for that purpose is a T-connector which has three branches. Air valves should be attached so that one of them prevents the air from going back into jar and the other allows the air to leave the system (diagram on the additional page). A well-sealed jar gives the best results. Insulating tape or adhesive pads are good for sealing.

The pressure gauge helps to determine the change in pressure. Place it in the jar while testing. It is more convenient to put shaving foam in a cup before you put it in the jar. The volume of materials filled with gas increases when the pressure in the jar is reduced as the gas inside them begins to expand. Sounds become quieter as air pressure decreases. No sound is transmitted in a full vacuum.

The devices built by our participants do not reach a full vacuum because the system will have some leaks and the pump itself is not powerful enough. The presence of air is indicated by the balloon not retaining its size (swells and pulls back), the sound of the buzzer and also the jar remaining intact. Vacuum chambers that are used in science laboratories are made of materials that withstand high pressure and temperature changes.

By looking at the water status diagram (figure 1), you can discuss with participants if their vacuum chamber could be improved so that it could also be used for freeze-drying.



Explanation

Pressure gauge is used to measure the pressure while pumping tires, barometer is a device that measures atmospheric pressure, meteorologists use the unit millibars in weather forecasts.

As liquids and gases are not structured as solid bodies, the pressure that is exerted on them is carried equally in every direction.

Breathing is possible due to pressure changes in our lungs. During inhaling, the diaphragm contracts, the thoracic cavity expands and the lungs expand. **Negative pressure** created in the lungs allows air from outside to enter the trachea and flow into lungs. As we exhale, the diaphragm relaxes, reduces space in the chest and pushes air out of the lungs.

A vacuum is a state when there is no substance (including air and other gases) in a space. An approximate vacuum fills the whole universe. Due to the lack of pressure in a vacuum, there is no resistance to moving bodies.

Astronauts wear pressurized suits in outer space. An unprotected living being can withstand a vacuum environment without losing consciousness for about 15 to 20 seconds, assuming they have exhaled deeply. The widely popular belief that the human body will explode in a vacuum is not true because the skin and cell walls are strong enough to prevent the bodily fluids from boiling and tissues from swelling. Studies and animal experiments have shown that even an unconscious human can endure vacuum for one minute without any damage to the body or the brain.

Freeze-drying technology was developed by NASA scientists to make bringing food into space easier. Freeze-dried food is first frozen, then it is placed in a vacuum chamber that has a heated bottom. The aim is to reach the pressure and temperature at which ice sublimates (goes directly from solid to gaseous state; see figure 1). The extracted water vapor is caught on pipes that are cooled down to -80°C .

This method allows preserves up to 98% of the nutritional value and the food tastes and smells as it did before. All food can be freeze-dried: berries, vegetables, fruits, mushrooms, herbs, meat, seafood etc. Although the volume of the food stays the same, 70 to 90 percent of its weight is lost. Depending on packaging, the shelf-life of freeze-dried food can be up to 25 years. Freeze-dried food is considered raw food because the process takes place at temperatures below 40°C . Freeze-drying is a great solution to prevent food from spoiling in grocery stores, although the best way to prevent food wasting is to consume locally produced food, because a considerable amount of food spoils during transportation.

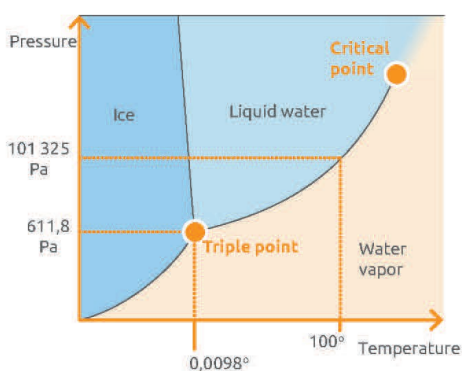


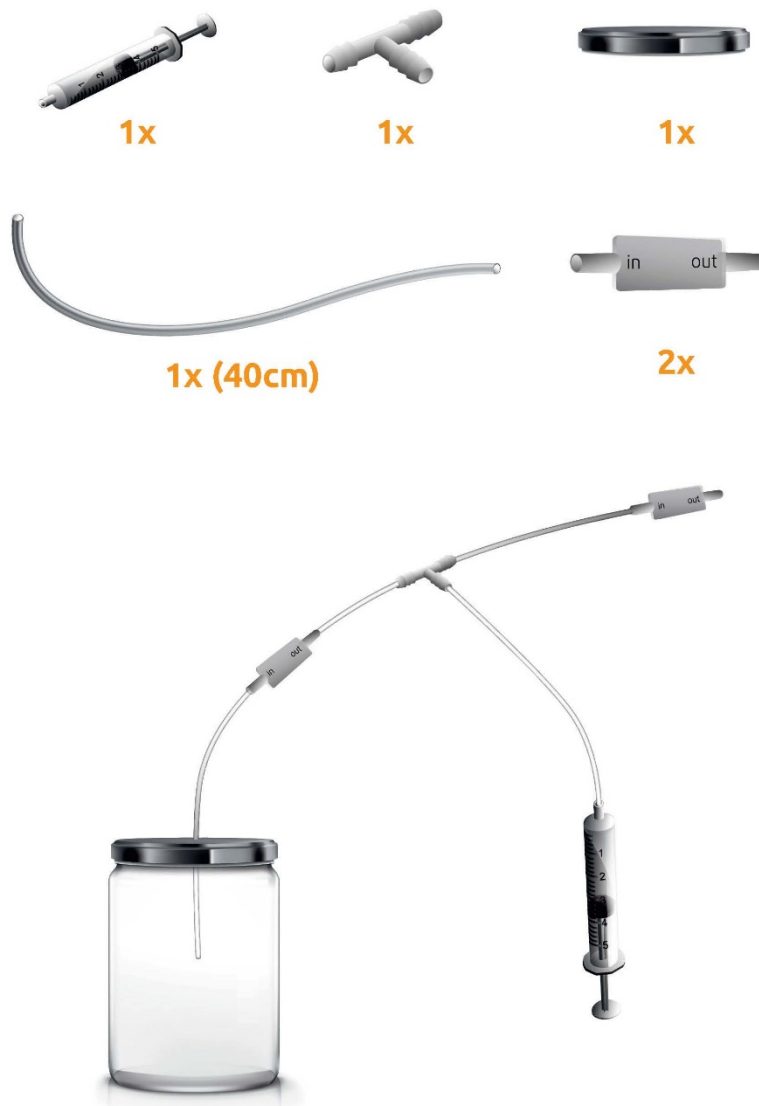
Figure 1. Water phase diagram

Freeze-dried food should be kept at a constant temperature, be protected from sunlight and the package should also keep moisture away. Package however does not always guarantee food freshness, because even packaged food can get spoiled when kept under wrong conditions. Therefore, scientists are working on "smart labels" that react to even small temperature or chemical compound changes. If any difference occurs, smart label changes its color.



Keywords for online search:

Pressure, vacuum, pressure gauge, mold, vacuum packaging, barometer, vacuum meter, phase diagram, freeze-drying, mmHg to Pa, smart packaging



This material was developed using co-funding by European Union's Horizon 2020 programme under grant agreement No 774088.



Taste Alternative Protein!

This module was created by the employees of Science Centre AHHAA: Kristel Schreiner with help from Pille Randjärv, Elisabeth Parman and Sander Kask. Members of City Lab Tartu were consulted in the development process. Checks for scientific accuracy and English language translation were done by Üllar Kivila.



AT A GLANCE

Thematic Area	Sustainable (and healthy) food and nutrition
Format	Hands-on workshop
Duration	75 minutes
Type of audience	From primary school to high school
Age group	7-18
Number of participants	Maximum 20 (divided into groups of 4), no lower limit
Prerequisites for participation	None (however, basic understanding of nutritional components helps)
Number of facilitators	1
Overall difficulty	<p>Topic: beginner</p> <p>Preparation: beginner</p> <p>Facilitation: intermediate</p> <p>Handling a large number of kids and hot stoves in the room requires lots of attention.</p>

OVERVIEW

Children will make their own seitan patties from wheat flour, which is a fun tactile activity. This culminates with the final tasting of their own product and tasting of protein-rich insects. Also, discussion about nutrition -> protein -> meat and its alternatives will be instigated among the participants.

The environmental impact and low sustainability of producing meat will be presented to the participants as well.

OVERALL AIM

The goal of this workshop is to have children think and express ideas and experience new possibilities about food, and more precisely, the protein content in their food.

Within the setting of current information overload, it is easy to develop conflicting, polarizing and misinformed views about what we eat or should eat. Children should know what are the motivators behind different meatless (or less meaty) diets, what is the scientific consensus about diverse nutrition, and get an experiential introduction into food (protein) sources that they might not have thought fondly of before – to broaden their horizons, to better understand our changing world and to become more fit for the future.

However, it is essential for this workshop not to feel like top-down propaganda. This is why inter-participant discussion is used to get different ideas and viewpoints on the table. Scientific information will focus on the scientific consensus and not dwell on ethical questions of slaughtering animals.

SPECIFIC (LEARNING) OBJECTIVES

After the successful completion of this module participants are expected to be able to...

- Know why do we need protein in our food and what are the different options of getting it.
- Know about the environmental footprint of production of different protein sources.
- Articulate opinions about and analyze their own preferred source of protein.
- Cook a vegetarian “alternative meat” meal, widening their perspective on such possibilities.

SUGGESTED SCENARIO FOR IMPLEMENTATION

This workshop can be facilitated in many different settings. It is created as a science centre / science museum 1 hour workshop, that requires participants to be present for the whole duration, from start to finish. Trained facilitators can carry out the workshop multiple times in one day, with different participants.

With the necessary cooking equipment at hand, Taste Alternative Protein! workshop could also be facilitated, for example, in a classroom, as part of a science festival or some other science seminar, as a fun hands-on workshop to further engage and energize the participants.

The workshop is considered non-formal education, but implementing it with the right students at the right time, it could be connected with school curriculum as well.

TOPICS & COMPETENCES COVERED BY THE ACTIVITY

Thematic area(s)

Nutrition, health, taste. Also climate and the food system and alternative systems surrounding production of meat and other protein-rich food.

FOOD2030 Research & Innovation priorities		
<i>Priority</i>	<i>Indicate whether main or secondary</i>	<i>Addressed through</i>
Circularity & Resource Efficiency		
Innovation & Empowerment of Communities		
Nutrition & Health	Main	Presenting, making, testing and discussing different protein sources.
Climate & Sustainability	Secondary	Presenting and discussing information about the climate footprint of meat production.
Responsible Research and Innovation (RRI)		
<i>Related concept</i>	<i>Addressed through</i>	
Balance and connection between consumption habits, food culture, health suggestions, food industry and research necessary to support/dispute different views and to offer attractive alternatives.	Open discussion of different viewpoints.	
Research & Innovation (R&I)		
<i>Related concept</i>	<i>Addressed through</i>	
Research about nutritional needs and how different diets cover them, and different innovative food examples of the future.	Answers to questions about how plant-based diets can be nutritionally sound. Presenting future (and current) venues of food research and innovation, with the option to taste one of them – insects.	
(Food) Systems thinking		
Presentation of information and discussion on how our food affects the natural environment of the world, and what pressures our cultural and dietary preferences lay on the world (growing population, sustainable nutrition, land, energy and water needs required to grow animals and crops etc.). The actual eating cooking and eating process, health, climate footprint and the relevant scientific analysis behind them all are interlinked in this workshop.		
Other competences		
<i>Competence</i>	<i>Addressed through</i>	

Cooking competence	The assignment of making seitan patties.
Articulation of personal viewpoints	Asking questions from participants about different diets, what they know and how they feel about them, forming a discussion that gets as many different views on the table as possible.
Potential of bringing the arts, socio-economic science and humanities creatively or trans-disciplinarily with the module?	
Some of the information and discussion revolves around socio-economic aspects of protein-rich food. Choosing the shapes for their seitan patties and choosing the flavoring is a creative process.	

TARGET AUDIENCE

Audience category	Children and youngster from primary school to high school.
Recommended number of participants	15-20
Recommended age	7-18
Prerequisites	No prerequisites required, prior knowledge of nutritional components in food can help.

OPTIONS FOR MULTI-STAKEHOLDER ENGAGEMENT

<i>Stakeholder</i>	<i>Role envisaged in the activity</i>
Restaurant manager	This workshop could be carried out at a restaurant/cafeteria specializing in vegetarian food, as a one-off special event. Restaurants already have the necessary equipment and the infrastructure to clean everything efficiently after the workshop.
Cooking teachers, nutritionists, dietary experts	These specialists can be brought to the workshop to share their insights on what participants are currently doing, and help facilitate discussion or answer questions of the participants.


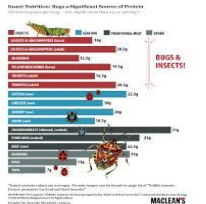








SETTING UP THE MODULE





FACILITATION/DELIVERY

One facilitator is sufficient. Facilitator should have a generally good grasp of different scientific topics, but most importantly, good grasp of the topic of nutrition. For a person that has a generally wide perspective on scientific topics and open mind, reading through the extra-information in the facilitation script should be enough to successfully carry out the workshop.



RESOURCES		
<i>Physical materials</i>		
<i>Resource name</i>	<i>Picture</i>	<i>Number</i>
Big photos exemplifying protein-rich foods, such as beef, chicken, pork, eggs, milk-products, beans, lentils, insects, fish, nuts etc.		10
Large infographic showing protein content in food		5
Large bowls		5
Pots		5 (can be shared, so 2 large pots might be enough)
Pans		5 (can be shared, so 2 large pants might be enough)
Sieves		5
Stoves		5 (can be shared, so 2 might be enough)
Spatulas		5 (can be shared, so 2 might be enough)

Measuring cups		5
Tap water		25 liters
Electric kettle (optional, but makes boiling water quicker)		1
Wheat flour		1 kg
Seasoning, spices, salt		5 different resealable packets is enough for variety
Soy sauce		1 small bottle
Dried edible insects		1 small pack
Paper towels to wipe hands, or preferably running water and fabric towels		1 pack of paper towels

Plates		5
Forks		20
Cutlery knife		5 (can be shared, so 1 could be enough)
Cooking oil		1 bottle (small bottle is enough)

Useful links, videos, articles

Online search keywords: protein, essential amino acids, vegetarian source of protein, seitan, insect protein, gluten intolerance etc.

Highly recommended short videos by Kurzgesagt:

<https://youtu.be/NxvQPzrg2Wg>

<https://youtu.be/8PmM6SUn7Es>

<https://www.healthline.com/nutrition/meat-good-or-bad#section12>

<https://www.youtube.com/watch?v=2pPwwU1N9hM>

<https://www.sciencedirect.com/science/article/pii/S0960982213004181>

https://www.sciencedaily.com/releases/2018/12/181206114729.htm?utm_medium=cpc&utm_campaign=ScienceDaily_TMD_1&utm_source=TMD

<https://www.vegansociety.com/go-vegan/definition-veganism>

<https://nypost.com/2016/08/04/selfish-vegans-are-ruining-the-environment/>

<http://www.fao.org/news/story/en/item/197623/icode/>

<https://www.healthline.com/nutrition/how-much-protein-per-day>

<https://www.medicalnewstoday.com/articles/321474.php>

<https://www.ahajournals.org/doi/pdf/10.1161/01.CIR.0000018905.97677.1F>

<https://www.vegansociety.com/resources/nutrition-and-health/nutrients>

<https://www.forbes.com/sites/quora/2016/12/23/how-humans-evolved-to-be-natural-omnivores/#4ed55acb7af5>

<https://www.health.harvard.edu/staying-healthy/the-hidden-dangers-of-protein-powders>

https://waterfootprint.org/media/downloads/Hoekstra-2012-Water-Meat-Dairy_1.pdf

https://en.wikipedia.org/wiki/Environmental_impact_of_meat_production

https://en.wikipedia.org/wiki/Feed_conversion_ratio

<https://en.wikipedia.org/wiki/Entomophagy>

<https://en.wikipedia.org/wiki/Protein>

https://en.wikipedia.org/wiki/Gluten-related_disorders

<https://www.health.harvard.edu/blog/going-gluten-free-just-because-heres-what-you-need-to-know-201302205916>

Soots, A. (2018). Health from Food. (Tervis toidust, in Estonian.)

PREPARING THE SETTING

The room should have as many tables as there will be groups making seitan patties together. If there are 20 people, then there should be 5 tables. 4 chairs around each table. Participants will mostly work by these tables.

If the stove in the room is fixed in a location, then this location will be used for boiling and frying, with participants moving around a bit when they get to those parts. Otherwise table-top stoves can be put on the tables as well. They can be put later on in the workshop or before the start. Extension cords are probably necessary for tabletop stoves, but these should be hidden as much as possible, because spilling water on extension cords can pose a danger!

It could be useful to keep all of the stoves in one location, to minimize the use of extension cords and potential confusion, that rises when everybody is doing everything everywhere. It is best to keep the materials participants need during the workshop at a large table at the front of the room.

DETAILED SCRIPT FOR IMPLEMENTATION

Step

5 min

Before starting the workshop, have people wash their hands. Guide early arrivers already to go wash their hands.

Welcome and introduction, dividing into groups of 4 if they are not already. Tell the participants that in this workshop they are going to learn what's up with these alternative meatless foods popping up these days, and make and taste some of them.

10 min

Quick round of questions on who eats or does not eat meat and why. Try to get answers from each table and add extra information to the discussion. Segway from talk on protein source into the next activity – cooking an alternative protein source.

Questions to ask participants (and extra information):

Raise your hand who over here eats meat?

Raise your hand who doesn't eat meat?

5% of the world population are vegetarians and less than 1% are vegans. This differs by country, for example 30% of Indians are vegetarian, often for religious reasons.

How do you call people who don't eat meat?

Vegetarians don't eat meat, chicken or fish, but they can eat eggs and dairy products. Vegans don't eat any of those. There are numerous different versions of these diets, for example:

Lacto vegetarianism (includes dairy products but not eggs)

Ovo vegetarianism (includes eggs)

Raw veganism (food is not cooked past 48°C)

Some vegans don't eat honey, because it hurts insects, but some do.

Do you know any people who don't eat meat?

Why don't these people eat meat?

Empathy for animals is the most reported reason – vegetarians **don't want animals to be killed** for their food. If regular vegetarians are happy with milking cows and collecting eggs from chickens, then vegans don't tolerate that either. The definition of veganism is "a way of living that seeks to exclude all forms of exploitation of animals for food, clothing or any other purpose."

Animals that are grown not only for consumption, but also for their milk and eggs, are often living in **very difficult conditions**, regarding space, sunlight, nutrition, diseases and abundant antibiotics to combat them etc.

However, this ethical question does not fall within the scope of this workshop, as it is difficult or impossible to translate personal moral views into scientific facts. Participants can, of course, express their views on this topic and you can ask others if they agree or disagree, and why, but the focus should remain on nutrition, health and environment.

Health benefits – vegetarians who also eat eggs and milk-products, are consistently shown to have **less cardiovascular diseases**, diabetes and obesity, a lower blood lipid count, lower blood pressure and **longer lifetime**.

These benefits come from the facts that plant food usually has **lower energy content** (less obesity), lots of fiber (helps regulate the digestive system) and is a less processed food (more

vitamins and antioxidants). But it should be noted, that “junk food vegetarians” (and vegans) also exist, who might eat, for example, large amounts of greasy fries. The quality of vegetarian food still matters.

Environmental reasons – Growing animals for food leaves a very large global environmental footprint. At any moment there are the following amounts of animals being grown for food: **23 billion chicken, 1.5 billion cows, a billion pigs and a billion sheep**. 83% of farmland is used to feed animals, as food crops or grazing lands. That is 26% of Earth’s total land area. Thus meat and dairy production accounts for 27% of global fresh water consumption. **18-58% of the greenhouse gases** created by humans are a product of the meat industry (depending on the calculation method and inclusion of deforestation, food loss, transportation etc.)

These numbers are high, because animals **don’t convert their food into muscle that efficiently**, much of their nutrition is used in their bodies to keep the animals alive. **Feed conversion ratio (FCR)** is used to measure how well animals convert the food they eat into the desired output (flesh, milk or eggs). A FCR of 7 means that 7 kg of animal feed are used to create 1 kg of flesh. The FCR numbers for different animals are:

Cow: 7

Pig: 4

Chicken: 2

Fish: 1

Cricket: 1

Note that these results vary wildly according to different sources. The FCR for cows could be as high as 25 kg of feed per kg of meat, and the freshwater footprint of a kg of beef could be as high as 15000 liters.

Different estimations show that our planet could support billions of more people if we simply ate the plants that we feed to animals. However, not all land that is used to feed animals (such as grazing land) can be used to efficiently grow edible plants for humans. Thus **a totally vegan world would not be the most environmentally sustainable**, instead growing animals for food in moderation would be the most sustainable way.

Why do other people eat meat?

Because it is considered **tasty and nutritious**. Meat is an excellent source of **protein, vitamin B12**, iron and also other vitamins and minerals. Proteins are essential building blocks of the body and they take part in all bodily functions. A **deficiency of protein leads to lowered muscle mass, stunted growth and development**, weaker immune system and impaired nervous system, among other things. Overconsumption of protein burdens our livers, but is mostly not harmful (unless overconsumption happens for extended periods).

But **meat is also rich in fat and salts**, which we shouldn’t eat so much of, and diets rich in meat have been linked with cardiovascular disease and cancer, according to many studies.

Early humans evolved to be drawn towards food that is **sweet, fatty and salty**, because such ingredients gave us necessary energy and minerals that were otherwise scarce. Other omnivores lick salty rocks when their bodies need minerals as well, but humans rely on sweating to release excess heat, so we have an even higher need for salty minerals.

At the modern times of abundance, however, it is **easy to eat too much of the things we like**, such as sweet, fatty and salty things. Couple that with the excessive environmental footprint of growing meat, and the fact that we can get our necessary protein from other sources, like vegetarians do and as participants are going to learn in this workshop, choosing to eat less meat should be logical.

Throwing garbage on the ground or in the nature is comfortable, yet we don't do it (at least we shouldn't!). Leaving electric lights on and music playing when we leave home is convenient, but we don't do it either. The same mindset should be adopted when considering our consumption of meat.

Cutting back on our unsustainable meat consumption and replacing it with alternative protein is one of the **goals of European Food 2030 strategy** and Fit4Food2030 project.

2 min

Instruct teams to come and take necessary items, and then return to their seat, and explain what each item is for.

At first, teams will need to take:

- A large bowl – for mixing the dough together;
- Flour and water – the basic ingredients of our experiment;
- A measuring cup – to measure the ingredients;
- A sieve – for washing the starch out of the dough;

7 min

Instruct teams to measure flour (1.5 cups) and water (0.5 cups) and to make the dough – mix the ingredients slowly and knead the dough thoroughly. Tell them to choose who does what, and how, and mention that there will be other important steps as well. Then let them work.

10 min

When the dough is ready, let it sit for 5-10 minutes. This is discussion time. Go deeper with the questions:

How often do participants eat meat?

The average Estonian eats about 50% more meat than is recommended – 78.5 kg per year (half of it is pork). That is equivalent to the meat content of 5 McDonalds cheeseburgers every day. In the past 5 years, Estonian meat consumption has risen by 15% and it is 10 kg more per year than the European average.

Estonian National Health Institute recommends to eat about 100g of meat per day. This recommendation includes fish and eggs. Fish is the most recommended out of these, followed by chicken and eggs. It is also noted that you don't have to eat these types of protein-rich foods every day, but in that case you should replace them with legumes and grain.

It is recommended to eat at least 0.8 grams of protein per kilogram of body weight. For an 80 kg adult that is 64 grams of protein. If you are training or growing, then you need more. But eating more than 1.6 g or 2.2 g of protein per kg of bodyweight doesn't add any more benefits.

Have they tried other sources of protein? How do they like their taste?

Introduce different sources of protein with images and protein-content chart. Ask:

Is something surprising in the protein chart?

If participants have not mentioned lack of certain essential nutrients in vegetarian food, then ask them about this:

Is it true that plant-based food lacks some of the key building blocks (nutrients) our bodies need?

What have you heard about this?

The protein that is so vital to our bodies, is made up of amino acids. Our bodies can create and recombine many amino acids, but there are the types that need to be obtained with food – our bodies cannot synthesize them. These are called **essential amino acids**.

It is a longstanding belief that only animal protein gives us all the essential amino acids, but this is not true. Meat has all of the essential amino acids and plants often miss some of them indeed, but **a mix of legumes and grains gives humans all of the different amino acids they need**.

However vitamin **B12 needs to be added** by food supplements or fortified food, because plant-based food doesn't have it. Deficiency of B12 leads to anemia and damage to the nervous system.

Plant-based diets can have low numbers of some other key nutrients, such as **vitamin D, calcium, iron** and some others (and some that are not researched so well yet, such as cholesterol and carnitine). Deficiencies of these ingredients can lead to serious health problems, but these deficiencies also rise among meat-eaters. **Eating diverse is key** for both plant-based and meat-based diets. Furthermore, lack of these nutrients affect our bodies differently. Some people, for example in case of low iron in their diet, will then absorb iron better. The best way to determine what your body needs, is to undertake a metabolic analysis (by giving a sample of blood or urine etc.).

Estonian health specialists **don't recommend a totally vegan diet**. Vegetarian diet, however, includes milk products and eggs and thus leads to more balanced nutritional intake. A balanced and **healthy vegan diet is certainly possible with conscious planning and perhaps food supplements, but it is safer to be an omnivore**.

Humans are **omnivores**, which is evident from the fact that our bodies don't create all of the nutrients we need. Cows, for example, create their vitamin B12 using bacteria in their gut. But being an intelligent omnivore in the modern era means that we can choose what we eat – a vegan diet is possible, so is a meat-only diet, but both of those need some added supplements.

A counterargument for meat-only diet is that carnivorous humans would need **vitamin C supplements**. Most animals create their own vitamin C, but humans, apes and monkeys, for example, cannot. Not to mention that carnivores would have to eat organs too, not only meat

tissue, to get a wider spectrum of nutritional intake. Thus we were evolved to eat both plants and animals.

5 min

During the discussion once you get to insects, offer participants to taste them. (This can also be done at a later part, when the seitan patties are boiling.) Ask participants:

How do you like the taste, texture etc.?

What does the taste resemble?

Insects are seen as a possible future food source, rich in protein and other nutrients. They need a lot **less resources** (feed, area, water, energy) to grow compared to animals and reach their full size in a matter of **weeks**. Insects are then freeze-dried or ground to make flour, which will be used to make different types of food.

In fact, only Europeans and North-Americans don't eat insects, but different kinds of worms, beetles, crickets, grasshoppers, cockroaches etc. have been eaten elsewhere in the world for thousands of years. The Food and Agriculture Organization of the United Nations lists around **2000 species of edible insects** and estimates that there are **2 billion insect consumers worldwide**. Insect farms have been set up in Europe and in the United States, in an effort to introduce this type of food here as well.

But even westerners eat bugs already, without knowing it. Chocolate, coffee and wheat grain contains **parts of insects**, with the largest amount actually in beer hops that are used to make beer – 25000 bugs per 100 grams. (But these insects are aphids that measure only a maximum of a couple of mm.)

10 min

When the dough is ready, instruct participants to wash the starch out of the dough. Tell them what will remain – stringy protein named gluten, that is supposed to have a texture similar to meat.

In the background, put the electric kettle on, to make boiling water in the next step faster. Fill the electric kettle to its limit and boil it.

Gluten is the stringy and sticky protein in wheat flour. It is **insoluble**, which means that other parts of wheat flour (mostly soluble starch – a carbohydrate used for energy) can be washed away, leaving only gluten behind. Different flours have different gluten content. Corn and buckwheat flour have none, but wheat flour can have 9%-80% gluten. When flour is made into dough, then the amount of gluten determines its baking properties – low gluten is good for crumbly cakes, but high gluten makes elastic bread.

Gluten, which as a dish also goes by the Japanese name **seitan**, is cooked before eating. The first time this ingredient is documented comes from the **6th century China** where Buddhist practitioners ate it as a substitute for meat. It is still popular in Asia, similar to soy-based tofu.

As gluten/seitan is a protein, the dish consists of almost **only protein** and water. It is a good protein source, but it is **not a complete protein** (it lacks other essential amino acids). You cannot survive eating seitan alone, but you should eat a variety of food anyway.

Not all people can eat gluten, however, because they have **gluten intolerance**. This includes the well-researched **coeliac disease**, which affects the small intestine and gradually makes absorbing nutrients more difficult, as a reaction to ingesting gluten. However more and more people self-diagnose gluten intolerance and report that they feel better if they cut gluten from their diet.

Estonian nutritional recommendations **suggest to not completely cut out food groups** from of your diet, such as wheat. This would raise the risk of having a deficiency of key nutrients. More research is required to understand completely whether it is gluten that can cause harm or some other factors, such as high consumption of wheat-based products.

Specialists are currently divided between **two opposing sides**:

Some say that gluten is **harmless**, the self-reported cases are *nocebo* (the negative opposite of *placebo*), you shouldn't follow trends based on little research and instead save money by not buying expensive gluten-free products;

Others believe that if the components of gluten are not digested completely, they will **form toxic substances**, and that even though bread has been eaten for thousands of years, modern wheat is genetically different (because of selective breeding) and can have abnormal side effects.

5 min

Once the flour is washed, instruct participants to start boiling the seitan patty. It will boil for about 5 minutes, until the patty rises to the top.

Boiling can be done at their tables or at the designated stove-area. Boiling needs to be overseen from time to time, but other than that it is hands-off.

5 min

Once the seitan patty has risen to the top, instruct teams to put their patty on their plate and add seasoning to it. Participants can experiment how they like – choose as much or as little flavoring as they want, different kinds, and also cut their patty into pieces, or not. Tip – they require quite a lot of seasoning. Marinating would be ideal, but quickly sprinkling spices, salt and/or soy sauce works good enough.

5 min

Instruct teams to fry their seasoned patty for a short while, from each side, to make it brown and crunchy.

10 min

Once the seitan patty is fried, let the participants put it on their shared plate, cut it (or let them cut it) and let them taste it! Encourage participants to share and test the results of other groups. Ask questions:

How does your seitan taste like?

How is the texture?

Is it similar to meat or not?

Should it be similar to meat or not?

Encourage participants to share and test the results of other groups.

1 min

Once finished, thank the participants for participating, let them leave the workshop and clean up after them. You can also ask participants help you clean.

ANNEXES

ANNEX 1: Table of food items and their protein content.

Protein content in finished foods

Source: Food composition database (tka.nutridata.ee/en)

**Foodstuffs
(ready to eat)
protein per 100g**

1. Beef	31g
2. Chicken fillet	29g
3. Peanuts	27g
4. Pork	24g
5. Salmon fillet	23g
6. Sunflower seeds	23g
7. Peanut butter	23g
8. Seitan	22g
9. Shrimps	21g
10. Grasshoppers	20g
11. Curd cheese	17g
12. Egg	13g
13. Beans	9g
14. Lentils	8g
15. Tofu	8g
16. Bread	7g
17. Milk	3g
18. Pasta	3g
19. Mushrooms	3g
20. Cauliflower	2g
21. Tomato	1g



City Lab Tartu: Taste Alternative Protein! – extra – Activity Guide and Teacher Guide



SEITAN - MEATLESS PATTY

Estonians eat on average 215 g of meat per person daily, which is more than twice the recommended maximum of 100 g. Long-term over-consumption of fat, protein and salt burdens our liver, kidneys and heart. In Asia people also eat for example seitan instead of meat. Nuts, legumes and insects are also excellent sources of protein. Lowering our meat consumption would lower our environmental footprint, as at least a fifth of all human-emitted greenhouse gases comes from livestock production.

Pasta is made of high-protein durum wheat flour.

Cats produce their own vitamin C in their bodies. Humans, for example, live in the Arctic and eat only animals, experience vitamin C deficiency.

TASK

Find out, how seitan is affected by:

- kneading duration;
- the time the dough ball rests;
- number of washes;
- boiling duration.

PLANNING

Remember to change only one variable in order to get reliable results. Decide which team will do the control experiment.

How many seitan patties should each team prepare?

CONTROL EXPERIMENT

1 MAKING THE DOUGH BALL
For one seitan patty mix 75 ml flour and 25 ml water. Knead until the dough doesn't stick to hands anymore. Let the ball rest for 15 minutes. Wash the ball with cold water until the rinsed water is more-or-less transparent. 1 wash = 1 liter water. Dough ball can crumble during washing. Press the pieces back into a ball.

2 IDENTIFYING STARCH
Put 50 ml of the final rinsing water into a glass. Add 5 drops of iodine solution. Compare your solution with the other teams and order the glasses by their starch content.

3 POST-PROCESSING
Form the resulting spongy mass into patties (thinner patties are easier to fry) and boil them for 3 extra minutes after rising to the surface. Make sure that the patties can move freely in the boiling water. Season with soy sauce and/or spices and finally fry them in a bit of oil until they are golden brown.

EXPERIMENT

Do the experiment by changing one variable and keeping the other variables as they are. Use 50 ml of the final rinsing water to identify starch content. Write down how long did you knead and how long did you let the dough rest; how many times you washed and how long did you boil.

RESULTS

Sort the fried patties according to the variable that you studied. Cut the patties so that everybody could taste different ones. Evaluate the results according to: taste, texture, similarity to a meat product.

ATTENTION!

Seitan is not suitable for gluten intolerants. Some barriers are hot. Hands are covered with microbes. Water droplets in hot oil make it splash around. A balanced diet is required to get all of the essential amino acids and other nutrients.

83% of agricultural land is used to grow food for animals, which is 25% of the surface area of Earth.

Estonian agronomist Mikael Pii proved in the 20th century that you can grow sufficient quality wheat in Estonia by breeding his own varieties.

Wheat has the most gluten, rye and barley have less and oat has the least.

Write down how long did you knead the dough, let the dough rest, how many times you washed and how long did you boil.

CONCLUSION

How are the properties of seitan affected by:

- kneading duration;
- the time the dough ball rests;
- number of washes;
- boiling duration;
- seasoning.

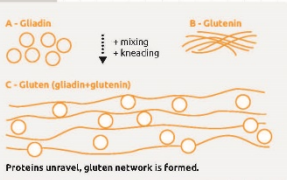
Is the resulting patty in any way similar to meat patty? Would you include seitan in your regular menu?

ADDITIONAL INFORMATION

Seitan is a meat substitute made out of gluten, a wheat protein. Starch must be removed from the flour in order to make seitan.

100 grams of seitan has the same total amount of protein as 100 g of fish.

Flour type numbers indicate the remaining bran content. A larger number indicates a larger bran content and darker flour. For example type 495 flour is suitable for baking sponge cake and type 512 flour, which is high on nutrients and low on energy contents, is good for whole wheat bread.



Celiac disease is a hereditary disease that leads to damage or disappearance of villi in the small intestine. This results in bloating, nausea, diarrhea, constipation, weakness and nutrient deficiency, because of the loss of nutrient absorbing surface.

A diet that eliminates entire food groups should still include as diverse foods as possible. Vegans should pay extra attention to vitamin B12 that our bodies don't produce on their own.



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SEITAN - MEATLESS PATTY

What kind of variables will most likely make seitan denser?

Longer kneading Letting the dough rest longer More thorough washing Longer boiling

Are there any other variables that can affect the properties of seitan?

Fill the table with planned and actual durations for each step.

Variable	Kneading (min)		Washing (min)		Resting (min)		Boiling (min) after rising to the surface	
	Planned	Actual	Planned	Actual	Planned	Actual	Planned	Actual
Control test	Until it doesn't stick to hands		More-or-less transparent water		15		5	
Test/ Team 1								
Test/ Team 2								
Test/ Team 3								
Test/ Team 4								

Mark the cell that has the variable that your team is going to study.

Write down the results of the taste test. Think about how will you evaluate the results. What kind of scale will you use? What are the outermost values of the scale?

Quality	Taste	Texture	Similarity to meat
Control test			
Test/Team 1			
Test/Team 2			
Test/Team 3			
Test/Team 4			

Best tasting seitan was Seitan most similar to meat was

The softest seitan was The toughest seitan was

The most was

Connect the pairs

If you boil seitan longer...
If you knead seitan less...
If the dough rests longer...
If you wash the dough less...

- ... your seitan will be denser.
- ... your seitan will be softer.
- ... your seitan will be softer.
- ... your seitan will be denser.

How to promote the formation of gluten?

How much protein does your final seitan contain, if you presume that you didn't wash out any of the proteins? (look at the package for more info)

Why is protein-rich flour more suitable for making airy bread and why can you find gluten in many bread products?

It is recommended to get 10-20% of your daily energy intake through proteins. How many grams of protein should you eat, if your daily energy requirement is 2000 kcal? (1 g of protein is approximately 4 kcal)

Choose the right amount of diverse protein sources for a three day menu.

Day 1	Day 2	Day 3

Which health problems are linked to eating too much meat? Which are linked to eating only plants?

KEYWORDS FOR ONLINE SEARCH
Cellulose, gluten, seitan, biomolecules, plant-based protein, edible insects, WHO (World Health Organisation), FAO (Food and Agriculture Organization)



Seitan - Meatless Patty



Duration

90 min



Related topics

BIOMOLECULES PROTEIN SOURCES

COOKING NUTRITION

GREENHOUSE GASES AGRICULTURE

THERMAL FOOD PROCESSING

GENETIC PREDISPOSITION TO DISEASE GRAIN FOODS



What you need (for each group)

- **300 g** Wheat flour (durum flour, if possible)
- **1-3 packs** Spices (low sodium, if possible)
- **30 ml** Iodine solution (enough for whole class)
- **1-2 tk** Measuring cup (100-200 ml) or spoon for measuring 150 and 50 ml
- **2 pcs** Small bowl (for seasoning boiled seitan)
- Small bottle of soy sauce
- Bowl (2-3l)
- Large measuring cup (1l)
- Oil for frying
- Kitchen burner
- Boiling pot
- Frying pan
- Spatula
- Plates, forks, knives for serving



Instructions

The goal is to show that every meal doesn't need to include animal protein and that there are different protein sources available. The task of the participants is to find out how is seitan affected by:

- kneading duration;
- the time the dough ball rests;
- number of washes;
- boiling duration.

Since there are 5 different experiments (including the control group) it is good to divide participants into 5 teams - one team performs the control test and 4 teams study the effect of a variable. There could also be more teams with some teams experimenting with new or combined variables. In order to better divide seitan patties for evaluation, each team could make as many patties as there are teams, e.g. 5 patties for 5 teams. Note that the recipe on the Activity Card is meant for one seitan patty. The patties can later be cut into smaller pieces, one for each team member.

Thinner seitan patties cook better and faster. People with celiac disease (or other forms of wheat allergies) should not eat seitan, of course.



Figure 1. The more starch there is in the solution, the darker it will become through reactions with iodine compounds.

To see if seitan contains starch or not, drop 5 drops of iodine solution into a small sample of the final dough-washing water. Order the test solutions by their starch content.

Lighter color indicates lower amount of starch in seitan.

Explanation

Seitan consists of the protein gluten (Latin for “glue”) which is a mixture of other wheat proteins. The formation of a gluten network is **promoted by**:

- **Kneading** (proteins that form gluten have a higher chance of positioning next to each other)
- **Resting** (dough has to rest, because network formation takes time)

The formation of gluten is **hindered by** additives in the dough, such as **starch** (or milk or oil). These will stop gliadin and glutenin (proteins) from making bonds.

It is sufficient to boil seitan for 5 minutes (after it has risen to the water surface). Longer boiling duration will make seitan denser.

Protein/gluten content is an important characteristic of flour. The properties of gluten will determine the properties of the dough made from that flour. Gluten swells up in contact with liquids and, with the help of gases emitted during rising and baking of dough, forms a strong and porous wireframe. These proteins also give baked goods their rigid form and dense crust.

Dough made of flour with a lower protein content rises less. Protein-rich flour (over 12%) is used to bake fluffy bread and pizza. Shortcrust pastry and sponge cakes use flour with a lower protein content (5-9%). A medium protein content (~10%) is suitable for most home-baked pastry.

In addition to protein content in food, the amino acid content of those proteins is also important. Our bodies are unable to construct some of the necessary amino acids and we must get them from food. These can be easily obtained from meat, but also from plants, if your menu is varied. Vegans should also take supplements or foods fortified with vitamin B12, which is important for our nervous system. Vitamin D, calcium and iron should also be noted, as they are more readily available in animal-based food, however these deficiencies plague omnivores as well, whose menu is very one-sided.

Starch is an organic substance that acts as the glucose reserve of plants'. Adding iodine into starch solution makes the starch molecules twist around iodine ions which forms a dark blue compound (Figure 2).

Insects (e.g. fly larvae, crickets and mealworms) are a sustainable alternative to usual animal protein. Their production doesn't require large land areas, but instead needs the right humidity and temperature (in the range of 22-30 °C).



Figure 2. Starch molecule chain twists around iodine ions, which changes the color of the solution.

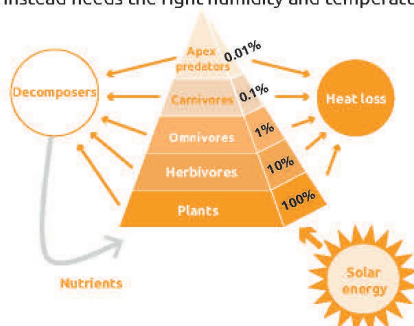


Figure 3. Ecological pyramid

Unlike regular livestock, insects reach their maximum weight within a few weeks. Once ready for consumption, insects are either freeze dried or ground into insect flour. One product, such as a patty, an energy bar or a pack of pasta, could require hundreds or even thousands of insects. Their nutritional value is high, 400-500 kcal per 100g.

If you don't count Europeans or North-Americans, humans have actually always eaten bugs. In fact, we have insects in our Western diets even now, for example in chocolate, coffee and grains. The largest amount of insects (tiny aphids) is in the hops that go straight into beer production.

The agricultural land that is used to grow animal feed could be used to directly produce food for humans. Raising animals requires additional drinking water, releases methane and could pollute the soil and water. Every level of the ecological pyramid captures about 10% of the energy available in the previous level (Figure 3.), the rest is dissipated as heat.

Keywords for online search:

Celiac disease, gluten, seitan, biomolecules, plant-based protein, edible insects, WHO (World Health Organisation), FAO (Food and Agriculture Organization)

Protein content in finished foods

Source: Food composition database (tka.nutridata.ee/en)

Foodstuffs (ready to eat) protein per 100g	1	2	3
1. Beef 31g			
2. Chicken fillet 29g			
3. Peanuts 27g			
4. Pork 24g			
5. Salmon fillet 23g			
6. Sunflower seeds 23g			
7. Peanut butter 23g			
8. Seitan 22g			
9. Shrimps 21g			
10. Grasshoppers 20g			
11. Curd cheese 17g			
12. Egg 13g			
13. Beans 9g			
14. Lentils 8g			
15. Tofu 8g			
16. Bread 7g			
17. Milk 3g			
18. Pasta 3g			
19. Mushrooms 3g			
20. Cauliflower 2g			
21. Tomato 1g			