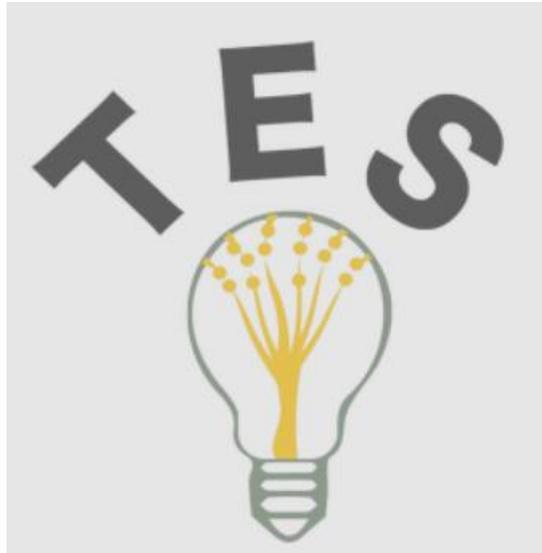# Teaching Sustainable Entrepreneurship:
Train-the-trainer guidelines, Work Package 3

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Teaching sustainable entrepreneurship

This report presents guidelines for teaching sustainable entrepreneurship (SE). The guide is developed in the Erasmus+ Strategic partnership project Teaching Entrepreneurship for Sustainability (TES) and is the third, and final, report from the project. The guideline builds on the two prior reports; a systematic literature review uncovering the most important competences for SE (Schadenberg et al., 2021) and a teaching module based on these competences. The module describes the desired learning outcomes, suggests content/syllabus, learning approaches and activities, tools for learning and assessment. The structure of the module is showed in Table 1:

Table 1: Structure of module for teaching sustainable entrepreneurship

	Main teaching approaches: Collaborative and active learning			
Learning Outcomes (competences):	**Content**	**Learning activity**	**Tools for learning**	**Assessment**
Normative Competence				
Anticipatory Thinking Competence				
Systems Thinking Competence				
Strategic Competence				
Interpersonal Competence				
Industry-specific knowledge				

This train-the-trainer guideline provides help in how teachers can carry out the module, with focus on tools for learning and how different tools contribute to the different competences. Figure 1 illustrates a suggestion for teaching path.
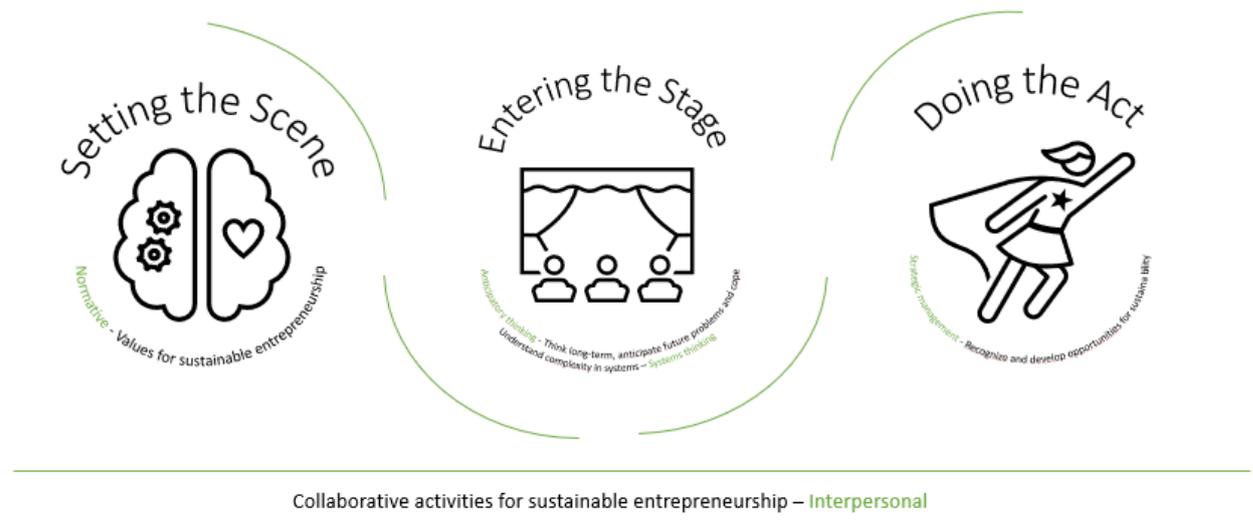
Figure 1: Teaching path Sustainable entrepreneurship

We suggest teachers start with *setting the scene* by introducing the core concepts of sustainability and entrepreneurship and their underlying values. The aim is to develop students' normative competences as this is considered the first and most fundamental competence for SE (Schadenberg et al., 2021). The next step in our model we label *entering the stage* where students learn how to identify and analyze both systems across different domains and disciplines and craft "pictures" of the future in which the impact of decisions on environmental, social, and economic issues is viewed in a bigger geographical and temporal scale (Ploum et al., 2018). Teaching related to this part of the model should develop students' system thinking and anticipatory thinking competences, which both concerns thinking beyond the here and now and entering into more complex and uncertain considerations (Schadenberg et al., 2021). The three competences developed in the first parts of the teaching path are the most sustainability-oriented competences and should be developed first because these lay the foundation for acting sustainable through understanding sustainable values (normative), anticipate the future of entrepreneurial actions for sustainability (anticipatory), understanding the system around a business and how entrepreneurial decisions can impact the triple bottom line (systems thinking) (Schadenberg et al., 2021). When the students have developed these competences, the teaching can focus on the more entrepreneurial competence of *doing the act*, which concerns planning and implementing changes and strategies for sustainability (Ploum et al., 2018). In our module this strategic management competence includes both the opportunity identification and action competences. The interpersonal competence is included throughout the module as the ability to collaborate and motivate collaborative activities is important throughout the module. All of these competences are described in the literature review conducted in work package 1 in this project (Schadenberg et al., 2021), and are further described in the teaching module in work package 2 with suggested content to include in the teaching. Hence, we refer to these reports for more details about the competences. We will further in this report present a toolkit for teaching the competences with detailed description and an analysis of how the different tools contribute to teaching the different competences.

Tools for teaching SE

In this project we collected tools for teaching SE through three main activities: (1) workshops with local stakeholders and academics from the university partners, (2) reports and web pages from similar projects (e.g. https://www.case-ka.eu/) and (3) internet search. We excluded tools which we considered not applicable in education and tools that where so extensive that they need more than three days in the classroom to finish. We also excluded tools that charge a fee or lacks information in English. This left us with a collection of 33 tools that are presented below with a short description, suggested which competence they might contribute to, which materials you might need, pre-work list, teaching plan (step-by-step), and sources where to find more information.

In collaboration with colleagues from Engage (Centre for Engaged Education through Entrepreneurship) we coded the tools according to the degree they can provide students with each of the five competences in the module (excluding industry specific knowledge) (Fauske et al., 2023). We divided the competence ratings into three categories – 0 ('To no degree' (red)), 1 ('To some degree' (yellow)) and 2 ('To a high degree' (green)). To ensure inter-coder reliability, every tool was coded by at least two independent coders. Table 2 shows how each tool scored according to each competence and the table gives a total score of each tool and each competence. The table shows that the system thinking, anticipatory thinking and strategic management tools receive the highest degree of support from the tools, whereas the normative and interpersonal competences receive a little less support.

Table 2: Overview of Educational Tools Related to Competences for SE

Tools	Systems Thinking competence	Anticipatory thinking competence	Normative competence	Strategic Management competence	Interpersonal competence	Number of competences supported by tool (green)	Number of competences supported a bit by tool (yellow)
ABCD Method	2	2	2	2	1	4	1
Agile Pattern Cards	0	1	2	1	2	2	2
Backcasting	1	2	1	1	1	1	4
Design Thinking	1	1	0	2	1	1	3
The Digital Product Ethics Canvas	2	1	2	1	1	2	3
The Five Capitals Model	1	1	1	2	0	1	3
Flourishing Business Model Canvas	2	1	2	2	1	3	2
Force Field Analysis	1	1	0	1	1	0	4
Foresight tool	2	2	0	1	1	2	2
Future Scenarios	1	2	2	1	1	2	3
Future Wheel	2	2	0	1	1	2	2
Gap Analysis	1	2	1	1	0	1	3
Hackathon	1	0	1	2	2	2	2
Hoshin Kanri	1	1	0	2	1	1	3
Individual Development Plan	0	0	0	0	1	0	1
The Impact Canvas	1	1	1	2	0	1	3
Life cycle assessments (LCA)	2	2	1	1	0	2	2
Megatrends	1	2	2	1	1	2	3
The Mission	2	2	2	1	2	4	1
PDCA cycle	2	1	0	2	1	2	2
Pitch competition	0	0	0	2	1	1	1
The Project Canvas	1	1	1	2	1	1	4
Reverse brainstorming	1	1	1	1	1	0	5
Root Cause Analysis	1	0	0	1	0	0	2
SDG Impact Assessment Tool	2	1	1	1	0	1	3
The Sustainable Business Model Canvas	1	1	1	2	1	1	4
Sustainability as a persona	1	1	1	1	1	0	5
Sustainability SWOT	1	2	1	1	0	1	3
The Sailboat Retrospective	0	0	0	0	2	1	0
The Thing From The Future	0	2	0	1	1	1	2
TIMEOUT -dialogue	1	0	1	0	2	1	2
The Triple Layered Business Model Canvas	2	1	2	1	1	2	3
Value Mapping	2	2	2	2	1	4	1
	39	**39**	**31**	**42**	**31**		

Table 2 can be used as a guide in choosing the right tools for your teaching according to which competence(s) you wish to focus on. A few tools are very specific in which competence they contribute to (e.g. the Sailboat Retrospective that aims at building interpersonal competence), whereas most tools support several competences simultaneously. Table 3 shows which tools that support each competence to a high degree.

Table 3: Overview of Educational Tools that Support Each of the Competences for SEE

Strategic management competence (10)	
ABCD Method	Pitch Competition
Design thinking	Value Mapping
Hackathon	The Five Capitals Model
Hoshin Kanri	The Impact Canvas
PDCA cycle	The Project Canvas

Systems-thinking competence (11)	Anticipatory thinking competence (12)
ABCD Method	ABCD Method
Flourishing Business Model Canvas	Backcasting
Foresight Tool	Foresight tool
Future Wheel	Future Scenarios
Life Cycle Assessments (LCAs)	Future Wheel
SDG Impact Assessment Tool	Gap Analysis
Value Mapping	Life Cycle Assessments (LCAs)
The Digital Product Ethics Canvas	Megatrends
PDCA cycle	Sustainability SWOT
The Mission	Value Mapping
The Triple-Layered Business Model Canvas	The Mission
	The Thing from The Future

Normative competence (9)	Interpersonal competence (5)
ABCD Method	Agile Pattern Cards
Agile Pattern Cards	Hackathon
Flourishing Business Model Canvas	The Mission
Future Scenarios	The Sailboat Retrospective
Megatrends	Timeout Dialogue
Value Mapping	
The Digital Product Ethics Canvas	
The Mission	
The Triple Layered Business Model Canvas	

Overview of tools

1. ABCD Method

Short description of Tool:
ABCD method is designed to assist in the time of co-creation of strategic progress towards sustainability at an organisational level. In fact, there is an inter-relation between the ABCD method and Backcasting approach and the Future scenarios approach. The so-called ABCD method is designed in a way that the group who are planning sustainable development can backcast through Sustainability Principles (SPs) or Future scenarios in this method. The method is very effective and includes envisioning, analysing, creating, and designing actions, community building and co-creation (Robèrt et al., 2012). The method is useful for simplifying when moving towards sustainability, by reducing too many unnecessary details and avoiding getting stuck into the current trends and situations which can be the reason for the problems as the method is centred on backcasting. The ABCD method is valuable in reaching sustainability as it offers a perfect platform for system thinking to set aspiring determined sustainable goals for the future, further, it assists the planners to find the most realistic possible paths to achieve those goals (Broman & Robèrt, 2017).

Learning outcome (link to competence(s) the tool contributes to a high degree to:
- Normative competence
- System thinking competence
- Anticipatory thinking competence
- Strategic thinking competency

Material list:
Guiding source: https://www.naturalstep.ca/abcd

Pre-Work Required by Students:
Prior learning of Backcasting and Future scenario approaches to make it easier for students to create a vision in the future. For the teaching or workshop day students will be divided into groups and find a topic of interest.

Teaching Plan (step-by-step plan):
The ABCD method consists of four steps and teaching the method can follow same order:
1. Creating a shared understanding and visioning, the planning team first set the stage for all the members related to sustainable development. After that everyone is on the same page, together they build a future vision which is in-line with SPs answering the question of what they want to achieve as a team in regard to sustainability (Robèrt et al., 2012).

2. Assessing the present status, the team initiates a baseline investigation of the current situation of their organisation (Robèrt et al., 2012). They will go through their activities to see which ones are in-line with SPs and contribute to sustainability and which ones are violating it.

3. Developing actions, in this phase the team will find the gap between their present situation and their created vision and will come up with some ideas to fill this gap. All the possible ideas and actions are welcomed in this level, the aim is to find actions that move the organisation from this unsustainable version into the sustainable future vision created in step B (Robèrt et al., 2012).

4. Prioritization, hereby the team will go through those measures made in step C and try to put them in order to get to a sustainable situation the fastest way. In this stage answering three questions can be the guideline to facilitate the team in prioritizing. 1. Does this action take us

into the right path? 2. Does this action create a flexible platform? 3. Does this action have a good return of investment? (Robèrt et al., 2012).

ABCD method steps

Source: https://www.naturalstep.ca/
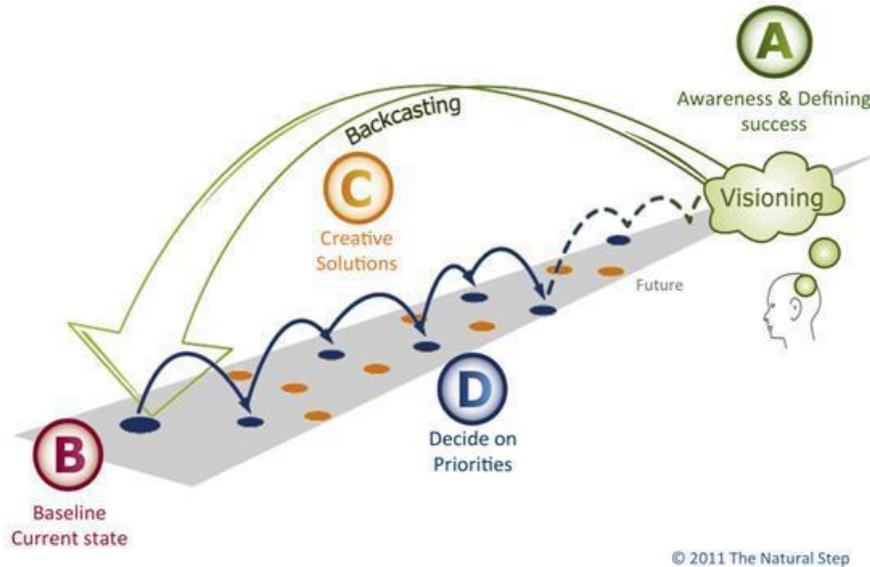
Theoretical foundations:
In fact, there is an inter-relation between the ABCD method and Backcasting approach and Future scenario approach. The so-called ABCD method is designed in a way that the group who are planning sustainable development can backcast through Sustainability Principles (SPs) or Future scenarios.

Sources:
Broman, G. I., & Robèrt, K. H. (2017). A framework for strategic sustainable development. Journal of cleaner production, 140, 17-31.

Robèrt, K. H., Göran, B., Ny, H., Byggeth, S., Missimer, M., Connel, T., ... & Oldmark, J. (2012). Sustainability handbook. Studentlitteratur

2. Agile Pattern Cards

Short description of Tool:

The Agile Pattern Cards are a Coaching Tool that we have created to facilitate structured and valuable conversations to enable Agile change.

Learning outcome:

- Normative Competence
- Interpersonal Competence

Material list:

- The pattern cards (attachment)

Teaching Plan (step-by-step plan):

1. Group people in smaller groups, 3-5 people. Give them a time box of 10-15 min to prioritize the 5 cards they find would bring the most value to focus on in the next period (3 – 6 months perhaps).
2. As always the discussions that are taking place are the most important thing, so try to walk around and listen in to what they are saying.
3. Ask them to add a sticky note to their prioritized cards with a short description to what problem they will adress with that specific pattern.
4. You can also ask them to pick the top 3 things they are already doing well in, if there is time.
5. When all groups are done you can ask them to share their prioritization, what problem they will solve with each pattern, shortly how they resonated and if it was difficult to agree and prioritize.
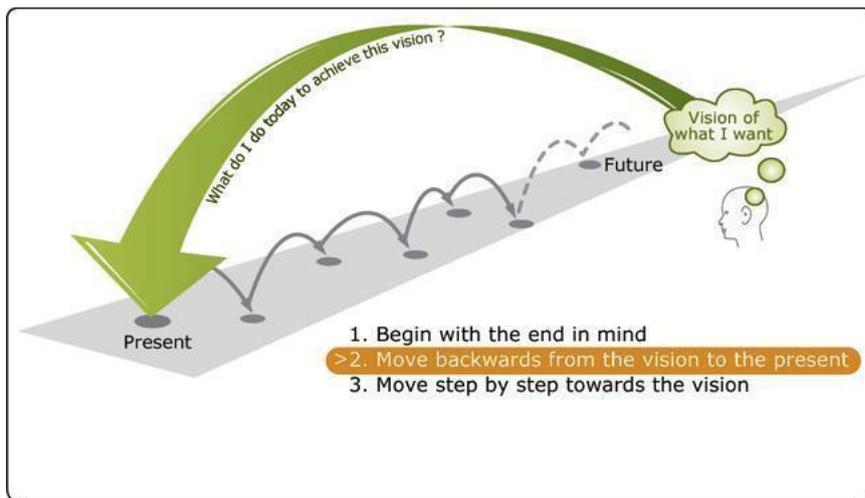
Sources:

- https://dandypeople.com/blog/pattern-cards-for-successful-agile-change-free-download/
- https://media.dandypeople.com/2018/02/free-Pattern-Cards-Print-2018.pdf

3. Backcasting

Short description of Tool:

Backcasting is a planning method towards sustainability, the method works by creating a vision of success in the future and then goes backwards to the current situation and looks for strategies and ways to get to that future vision (Holmberg and Robèrt, 2000). Backcasting is the opposite of forecasting which will create a future vision through the current trends. In the other words, backcasting is very useful when the present actions, plannings and trends are already a part of the problem.

Backcasting process illustration

Source: https://pergrankvist.se/

Learning outcome:

- Anticipatory thinking competence

Material list:

Using backcasting in study format and real life may have differences and it is clear that in real life when using backcasting there will be many different stakeholders involved in the process of decision making till implementation. Therefore, using backcasting in multidisciplinary courses where students with different backgrounds, expertise, values, methods, and tools are engaging will make it more simulative, participatory and real-life like (Quist et al., 2006).

Pre-Work Required by Students:

Students need to be assigned to small groups.

Teaching Plan (step-by-step plan):

Teaching backcasting can happen through lecture and workshop sessions together (Robinson, 2003). During the lecture sessions following topics will be covered:

1. The complexity of sustainability problems
2. Creating a future vision according to the sustainability principles and requirements
3. What is backcasting, how to use a backcasting approach (Robinson, 2003).
4. Then in the next step students are required to work on a project even short to understand the concept of backcasting and the usage of it.

Project's topic can be selected by students, but they are required to work with a topic that they can have access to the information or get the chance to interview the stakeholders. Understanding the status quo of the business or the subject of the project is one of the most important parts.

Sources:

Robèrt, K. H., Göran, B., Ny, H., Byggeth, S., Missimer, M., Connel, T., ... & Oldmark, J. (2012). Sustainability handbook. Studentlitteratur.

Quist, J., Rammelt, C., Overschie, M., & de Werk, G. (2006). Backcasting for sustainability in engineering education: the case of Delft University of Technology. Journal of Cleaner Production, 14(9-11), 868-876.

Robinson, J. (2003). Future subjunctive: backcasting as social learning. Futures, 35(8), 839-856.

Holmberg, J., & Robèrt, K. H. (2000). Backcasting—A framework for strategic planning. International Journal of Sustainable Development & World Ecology, 7(4), 291-308.
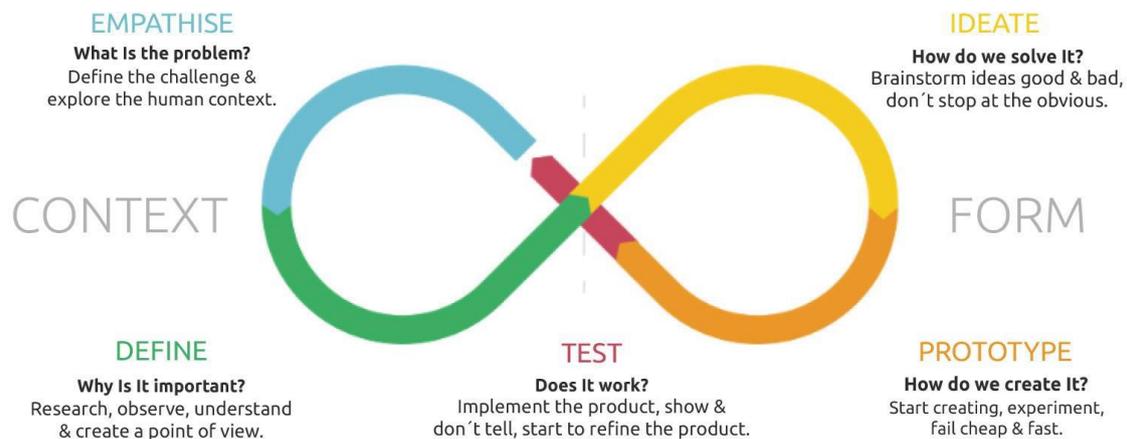
4. Design Thinking

Short description of Tool:

Design thinking is a non-linear, iterative process that teams use to understand users, challenge assumptions, redefine problems and create innovative solutions to prototype and test. Involving five phases—Empathize, Define, Ideate, Prototype and Test—it is most useful to tackle problems that are ill-defined or unknown. Design thinking is a method for developing innovative solutions for complex problems, by deliberately incorporating the concerns, interests, and values of humans into the design process. Design thinking is deliberately iterative and aims to rapidly develop and test multiple possible solutions to arrive at an optimal one (Brown, 2008; Denning, 2013).

DESIGN THINKING
A FRAMEWORK FOR INNOVATION

EMPATHISE
What Is the problem?
Define the challenge &
explore the human context.

IDEATE
How do we solve It?
Brainstorm ideas good & bad,
don´t stop at the obvious.

CONTEXT

FORM

DEFINE
Why Is It important?
Research, observe, understand
& create a point of view.

TEST
Does It work?
Implement the product, show &
don´t tell, start to refine the product.

PROTOTYPE
How do we create It?
Start creating, experiment,
fail cheap & fast.

Learning outcome:

- Strategic competence

Material list:

- Design thinking -process map to see different stages

Pre-Work Required by Teacher & Students:

- Form groups of 3-10 people, (best with 5-6 people per group)
- After forming groups, decide the topic: challenge, target group, SDG

Teaching Plan (step-by-step plan):

The Five Stages of Design Thinking

1. Empathize—Research Your Users' Needs

The first stage of the design thinking process allows you to gain an empathic understanding of the problem you are trying to solve. You will consult experts to find out more about the area of concern, and conduct observations to engage and empathize with your users. You may also want to immerse yourself in your users' physical environment to gain a deeper, personal understanding of the issues involved—as well as their experiences and motivations. Empathy is crucial to a human-centred design process such as design thinking as it allows design thinkers to set aside their own assumptions about the world and gain real insight into users and their needs.

2. Define—State Your Users' Needs and Problems

It's time to accumulate the information gathered during the Empathize stage. You then analyze your observations and synthesize them to define the core problems you and your team have identified. These definitions are called problem statements. You can create personas to help keep your efforts human-centered before proceeding to ideation.

3. Ideate—Challenge Assumptions and Create Ideas

Now, you're ready to generate ideas. The solid background of knowledge from the first two phases means you can start to "think outside the box", look for alternative ways to view the problem and identify innovative solutions to the problem statement you've created. Brainstorming is particularly useful here.

4. Prototype—Start to Create Solutions

This is an experimental phase. The aim is to identify the best possible solution for each problem found. Your team should produce some inexpensive, scaled-down versions of the product (or specific features found within the product) to investigate the ideas you've generated. This could involve simply paper prototyping.

5. Test—Try Your Solutions Out

Evaluators rigorously test the prototypes. Although this is the final phase, design thinking is iterative: Teams often use the results to redefine one or more further problems. So, you can return to previous stages to make further iterations, alterations and refinements – to find or rule out alternative solutions.

Overall, you should understand that these stages are different modes which contribute to the entire design project, rather than sequential steps. Your goal throughout is to gain the deepest understanding of the users and what their ideal solution/product would be.

Sources:

Brown, T. (2008). Design thinking. Harvard business review, 86(6), 84.

https://readings.design/PDF/Tim%20Brown,%20Design%20Thinking.pdf

Denning, P. J. (2013). Design thinking. Communications of the ACM, 56(12), 29-31.

Geissdoerfer, M., Bocken, N. M., & Hultink, E. J. (2016). Design thinking to enhance the sustainable business modelling process–A workshop based on a value mapping process. Journal of Cleaner Production, 135, 1218-1232.

5. The Digital Product Ethics Canvas

Short description of the tool:

The purpose of this tool is to identify the risk of digital products to individuals and society (Threebility, 2020). Digital products can harm people and societies in different ways, which is why analysing different risks related to digital products are important. There are different ways in which digital

products can be harmful: "Re-education of attention, creation of addictions, promotion of misleading information, impeding social interactions, creation of algorithmic biases, creation of unrealistic world-views (Gerlach, 2019)." By following the Canvas Instructions, professionals can at the very least increase awareness among top management about the hazards of digital products to persons and society, and in the best case, reduce their negative impact (Threebility, 2020).

Learning outcome (link to competence(s) the tool contributes to a high degree to:

- Normative competence
- Systems thinking competence

Material list:

Students can use the printed version or online version of the Digital Product Ethics Canvas.

Pre-Work Required by Teacher & Students:

Students should be taught how to use the canvas before they use it themselves. They can be given reading resources from the Threebility website, or the teacher can give a short lecture about the canvas.

Teaching Plan (step-by-step plan):

The Digital Product Ethics Canvas follows the same principle as the Sustainable Business Model Canvas (Gerlach, 2019).

This canvas is divided into four steps from left to right:

- The first step is to complete the left part of the canvas, where the user will identify the value proposition and revenue model.
- The second part is the main part of the canvas. In this part there are 6 dimensions of possible harms for users of digital products, and the goal is to identify risks of the product (Gerlach, 2019).
- When the second part is done, the users will analyse if any changes can be made in order to reduce the risks of the digital product, and to limit harm to individuals and society (Gerlach, 2019).
- When part 1-3 is done, the user summarises the positive and negative impact of the product on the right side of the canvas. This last step of the canvas can be used as a basis for the first impact assessment of the product (Gerlach, 2019).

Digital Product Ethics Canvas

Source: https://www.threebility.com/

Sources:

Gerlach, R. (2019). The Digital Product Ethics Canvas. Threebility.com. Retrieved from:

https://www.threebility.com/post/the-digital-product-ethics-canvas

Threebility. (2020). The Digital Product Ethics Canvas. Threebility.com. Retrieved from: https://www.threebility.com/digital-product-ethics-canvas

6. The Five Capitals Model

Short description of Tool:

The Five Capitals Model can be used to view and understand sustainability in terms of the economic concept of wealth creation, or capital (The Five Capitals, n.d.). It can be used by businesses to analyse and assess sustainability through five different forms of capital, and to develop strategies for how to maximise the value of each capital. Any organisation delivers products or services through five types of capital; natural, human, social, manufactured and financial (The Five Capitals, n.d.). Strachan (2018, p. 43) suggests that the model can be applied to entrepreneurial activities for assessing how an activity might increase or decrease the different capitals. It can be used by organisations to develop a vision of what sustainability looks like to them and how they deliver their products and services, and the aim is to consider what can be done to maximise each capital's value (The Five Capitals, n.d.).

Learning outcome (link to competence the tool contributes to a high degree to):

- Strategic management competence

Material list:

Students can use a computer or paper to conduct their analysis when using the Five Capitals Model.

Pre-Work Required by Students:

The students should be divided into groups of 4-6 people, and will be given relevant cases for analysing sustainability performance of a business or organisation.

Teaching Plan (step-by-step plan):

The Five Capitals Model can be used to develop a vision of what sustainability looks like for its own operations, products and services (The Five Capitals, n.d.). Students can create a vision by considering what an organisation needs to do in order to maximise the value of each capital. The analysis can be conducted by doing this for each of the five capitals, while considering how each activity impacts every capital to avoid trade-offs (The Five Capitals, n.d.). By using the report made for the Five Capitals Model, students can gain an understanding of each capital, for then to analyse how a business can maximise each capital; natural, human, social, manufactured, and financial.

The Five Capitals Model

Source: https://www.forumforthefuture.org/the-five-capitals
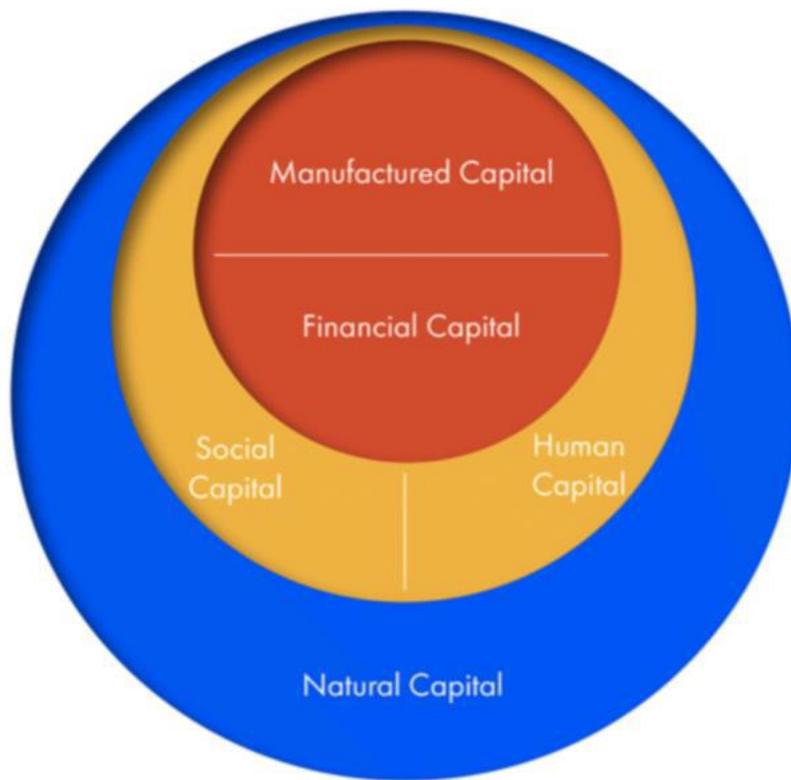
Sources:

Strachan, G. (2018). Can education for sustainable development change entrepreneurship education to deliver a sustainable future? Discourse and Communication for Sustainable Education, 9(1), 36-49. Retrieved from: https://sciendo.com/de/article/10.2478/dcse-2018-0003

The Five Capitals, a framework for sustainability. (n.d.). Forum for the future. Retrieved from: https://www.forumforthefuture.org/the-five-capitals

7. Flourishing Business Model Canvas

Short description of the tool:

The Flourishing Business Model Canvas can be used to create a visual framework through collaboration where it is possible to prototype, sketch, improve, communicate, understand, measure, diagnose, and tell stories about any business model (Flourishing business, 2021).

The Flourishing Business Canvas is a tool that embeds a common language to enable more effective collaboration by any group of stakeholders deemed relevant to designing the economic, social and environmental aspects of an organisation's business model (Flourishing business, 2021).

Learning outcome (link to competence(s) the tool contributes to a high degree to:

- System thinking competence
- Normative competence

Material list:

Either fill in the canvas online or use printed versions. It is also possible to use larger printed versions of the canvas and use post it notes for each building block. The canvas can be found [here](#).

**Pre-Work Required by Teacher & Students:**

Give a short presentation of the Flourishing Business Model Canvas to the students before they use the canvas themselves.

Teaching Plan (explanation of the canvas):

The Flourishing Business Model Canvas is divided into three contexts, environment, society and economy. The environment is the largest context in the world because we are entirely dependent on the environment, and everything we create comes from the environment. The next context is society, which consists of everything within our society such as human society and all the technology that exists within our society. Society is the second context because it exists within the environment. Society is contained by the environment, and society is also dependent on a healthy environment. The third context is the economy, which is created by society about how we work together to better meet our needs.

This canvas is also divided into four perspectives which are pictured as white boxes; people, value, process, and outcomes. The different boxes have different relationships with the contexts of the canvas. The people perspective is about who is engaged in your business. The value perspective is about what your business is doing to create value. The process perspective is about how the business is done, and where it happens. The fourth activity is about outcome, and it relates to the "why" and the purpose of the business. What are going to be the benefits and the costs of achieving the "why".

Flourishing Business Model Canvas
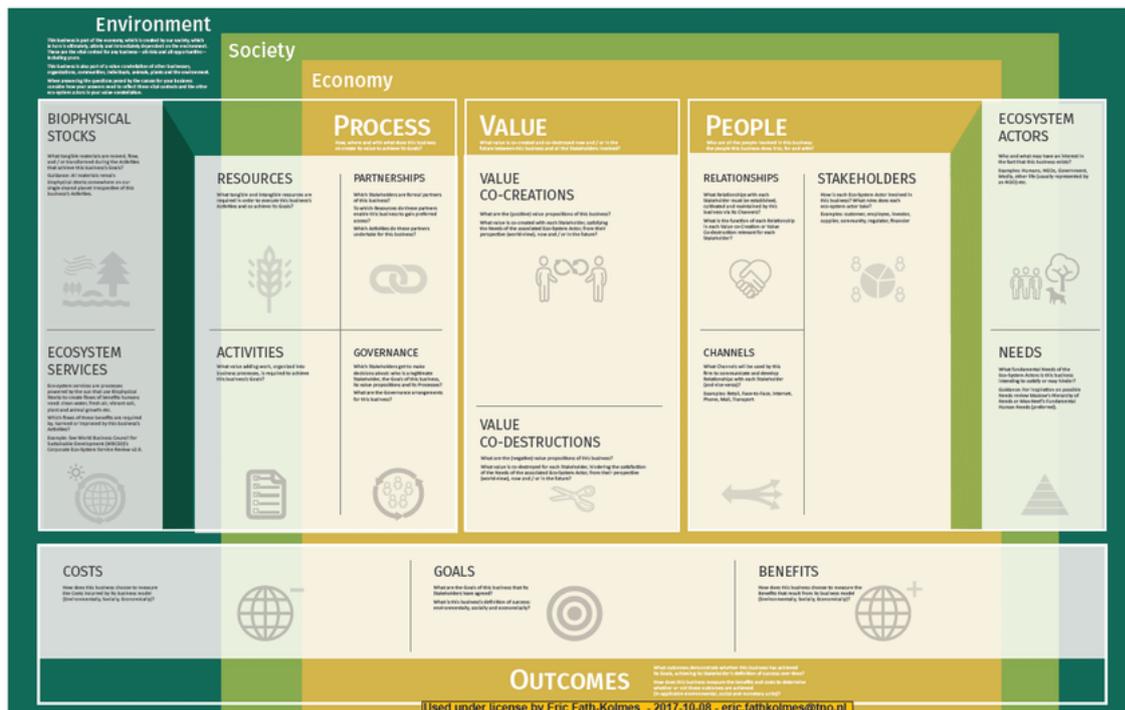
Source: https://www.researchgate.net/figure/

Theoretical foundations:

Based on the original Business model canvas.

Sources:

Flourishing business. (2021). Flourishing Enterprise Innovation Toolkit. Flourishingbusiness.org. Retrieved from: http://flourishingbusiness.org

Developed by the Strongly Sustainable Business Model Group (SSBMG), at the Strategic Innovation Lab at Toronto's OCAD University.

Flourishing Business Canvas. (n.d.). GCE NODE. Retrieved from: https://gcenode.no/competence-center/flourishing-business-canvas/

8. Force Field Analysis

Short description of the tool:

Lewin's Force Field tool is developed to engage every part of the team despite individuals varying commitment to sustainability (Courtnell, 2021). The tool can be used as a change management technique for process improvement for sustainability by analysing forces for and against change (Courtnell, 2021). The idea behind this tool is that situations in an organisation are impacted by an

equilibrium between the forces that drive change and the forces against change (MindTools, n.d.). For creating a change, the driving forces need to be boosted, or the resisting forces reduced, as there is no change when they are balanced.

Learning outcome (link to competence(s) the tool contributes to a high degree to:

Does not score high on any competence, but to some degree on several competences.

Material list:

The tool can be used by downloading a worksheet, it can also be used on a sheet of paper or whiteboard.

Pre-Work Required by Teacher & Students:

The teacher should provide students with knowledge about the force field analysis tool before it is used by the students themselves. More information that can be shared with the students is found on the MindTools website. There is also a video on how to do a Force Field Analysis.

Teaching Plan (step-by-step plan):

The aim of this model is to get an overview of the problem, and split factors into driving forces for change, and restraining forces against organisational change (Courtnell, 2021). In order to create organisational change, the driving forces need to be boosted and restraining forces need to be reduced (Courtnell, 2021). The analysis can be followed by 5 steps (MindTools, n.d.):

Step 1: Describe Your Plan or Proposal for Change

In the first step, the goal or vision for change should be defined. It should be written in the middle square of the Force Field Analysis, as shown in the figure.

Step 2: Identify Forces For Change

In the second step the forces for change are added to the left side of the figure. Forces for change can be internal and external (MindTools, n.d.).

Step 3: Identify Forces Against Change

In the third step the forces against change are added to the right side of the figure. Forces against change can be resisting forces or unfavourable forces (MindTools, n.d.). For instance: fears of the unknown, government legislation, existing structures in an organisation (MindTools, n.d.).

Step 4: Assign Scores

After the forces for and against change are defined and added to the worksheet, each force is going to be scored. The score should range from 1-5, or weak to strong. This depends on the influence the force has on the proposal for change (MindTools, n.d.). After the forces for each side are scored, they are calculated for each side, drivers and forces against change.

Step 5: Analyse and Apply

When the analysis is conducted, it can be used in two ways (MindTools, n.d.):

- Decide to move forward with the decision or change, or discard the idea.
- Or to consider which forces can be reduced or strengthened.

Force Field Analysis
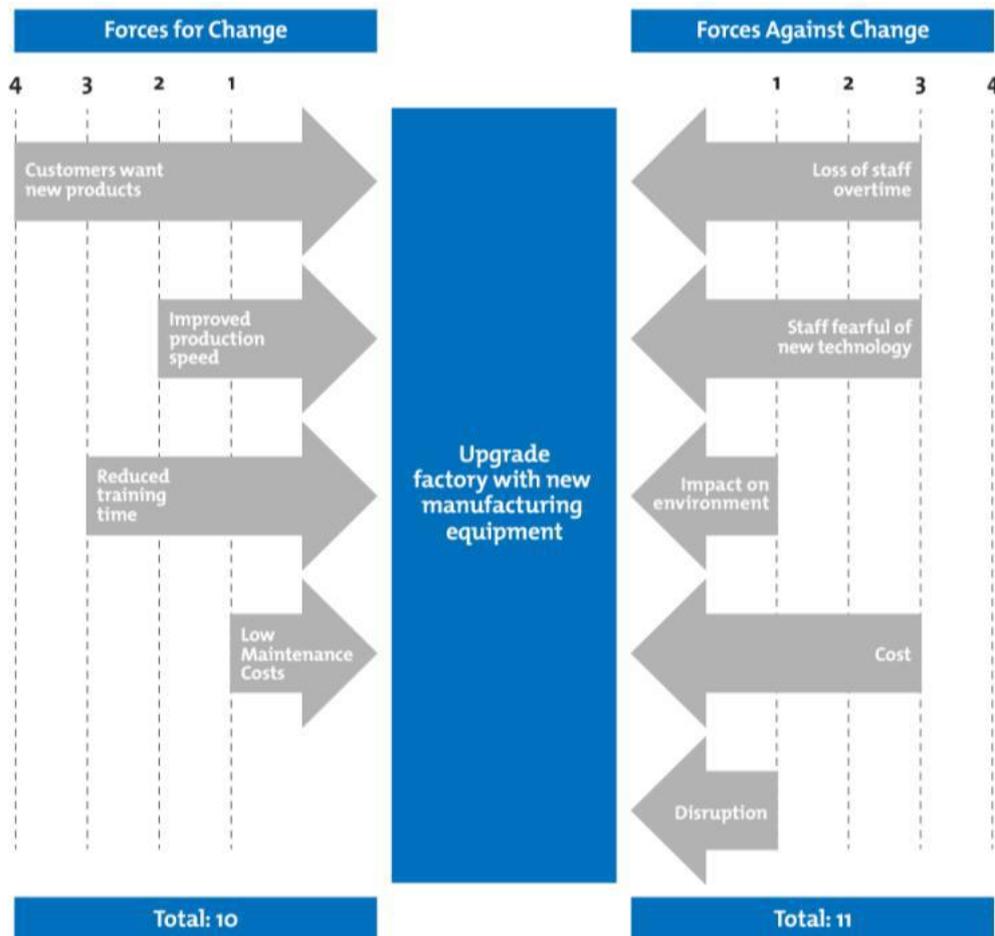
Source: https://www.mindtools.com/

Sources:

Courtnell, J. (2021, April 28). 10 Top Process Improvement Tools You Need to Create a More Sustainable Business. Taskmanager. Retrieved from: https://www.ntaskmanager.com/

Force Field Analysis. (n.d). MindTools. Retrieved from: https://www.mindtools.com/

9. Foresight tool: Determine market drivers, innovation opportunities and key-uncertainties

Short description of Tool:

When looking at the development of a random issue we are able to determine the change that has occurred in a certain timespan. We can determine change for all kinds of phenomena that have already taken place or that might occur in the future. Change can be described by addressing the corresponding "pattern of change". Van Rijn & Van der Burgt (2012) identified 9 patterns of change in four categories. That helps people to address change in such a way that they can talk about change in the same way.
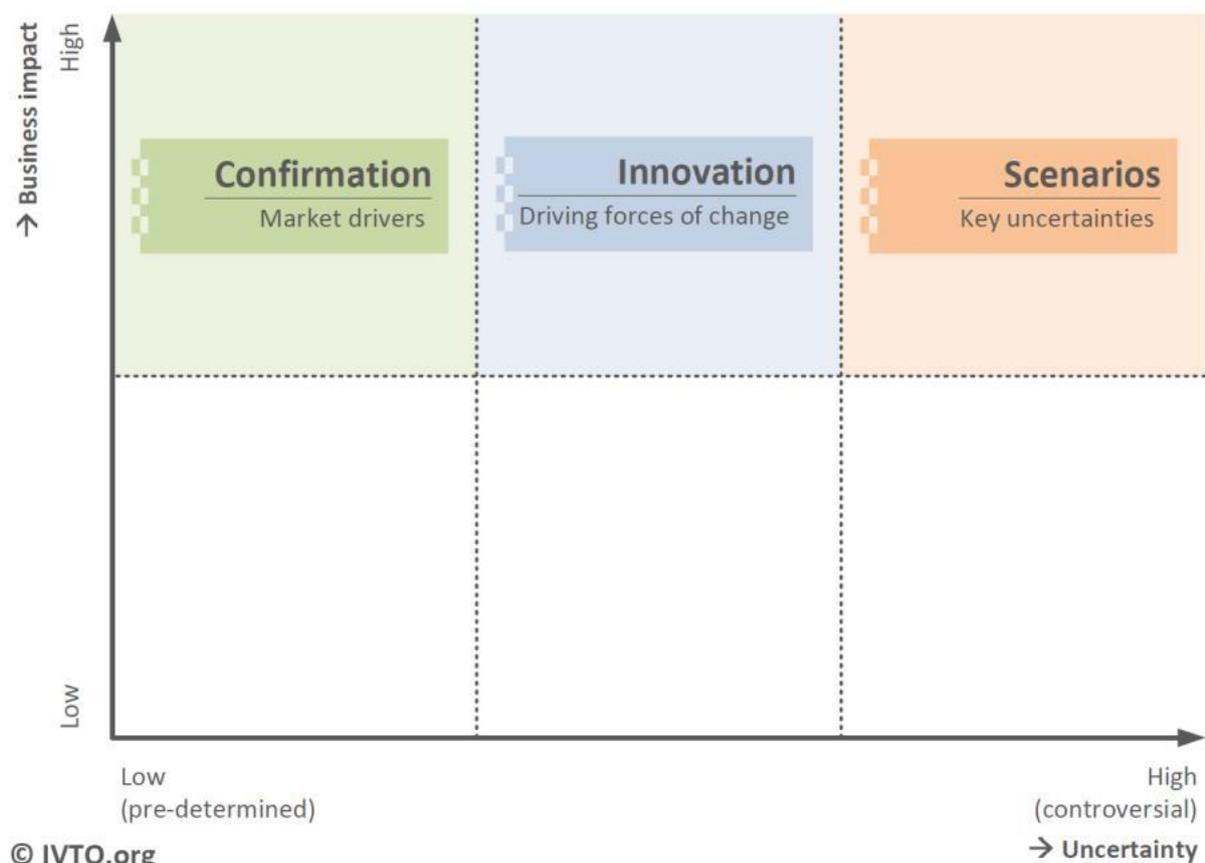
This tool is often used by the companies but it can be also implied to students' business ideas for example. Another option is to create an imaginary innovation or business and then try to understand how these trends may affect the innovation or business. To help students to innovate can use other tools or try out SDGs as the "business".

Learning outcome:

- Anticipatory Competence
- System thinking Competence

Material list:

- Patterns of Change -cards https://ivto.org/patterns-of-change-foresight-cards/

Download: https://ivto.org/scenario-planning-workshops-with-foresight-cards/

- Megatrend cards to help understand and get inspired by trends (another tool in the guide)

Pre-Work Required by Teacher and students:

- Order OR draw the patterns of change cards
- Print out OR draw an Impact diagram
- Print out the meanings of each card
- (Print out Megatrend cards)
- Blank paper and pencils for the exercise

Teaching Plan (step-by-step plan):

1. Create an impact diagram with sections: "Confirmation", "Innovation" and "Scenarios" on a large piece of paper. (See Material list)
2. Make teams of two or three people.
3. Each team should think of an event or trend that could be connected to the business and write it on a piece of paper or/and use the megatrend cards. Shuffle the megatrend cards among the teams evenly. You might like to make a pre-selection of cards if you're short on time.
4. Then position their cards in the appropriate sections on the impact diagram.
5. Discuss, as a team, which pattern of change is applicable to each of the cards. Write them down on separate pieces of papers and place them next to the cards. You should have now agreed on one pattern of change for each card on the table that gives you a complete overview of the current situation.
6. Once all the cards are positioned, group the cards into categories. Assign a new pattern of change to the categories that is based upon the individual cards within that category. The category and the main pattern of change combined can be defined as a driving force.
7. By now you should have identified the market drives, innovation opportunities and key uncertainties.
8. As a whole group discuss how these drivers influence your business

Three suggested discussion points could be:

– conformation – How do these drivers of change correspond with the current market? Is your company currently benefiting from those issues

– innovation – Which business opportunities arise out of the drivers of change? Is your company currently addressing those issues?

– scenarios – Which future scenarios can you derive from the drivers of change? Is your company currently aware of those scenarios?

<u>9 patterns of change</u>

Category 1: Trend

Definition: a repetitive pattern that evolves when (long term) data is taken into consideration. Patterns:

Stable / unchanging

Example: Life insurance ownership VS 1994 – 2006 (Trend – stable)

Steady increase

Example: Coal production VS 1949-2009 (Trend – steady increase)

Steady decrease

Example: Sea Ice extent 2005-2012 (Trend – steady decrease) 18

Category 2: Gradual discontinuity

Definition: a paradigm shift that evolves gradually (in such a way we might be able to alter the change to come)

Patterns:

Accelerated increase (exponential or saturated)

Example: Greenhouse gases 1750-2000 (Gradual discontinuity – accelerated increase)

Accelerated decrease(exponential or saturated)

Example: Radioactive decay or half-live of knowledge

Category 3: Hype or rage

Definition hype: a development of which people have far too high expectations

Definition rage: a product or lifestyle that, temporarily, is fashionable

Patterns:

Temporary increase

Example: Dotcom bubble 2000 (Hype – temporary increase)

Temporary decrease

Example: EHEC bacteria outbreak (Germany) 2011 – consumption of raw cucumbers

Category 4: Abrupt discontinuity

Definition: a paradigm shift that evolves so fast that a system becomes unstable (in such a way we can't alter change to come).

Patterns:

Abrupt increase

Example: Earthquake Japan 2011 (Abrupt discontinuity – abrupt increase)

Abrupt decrease

Example: Financial crash Down Jones September 2008 (Abrupt discontinuity – abrupt decrease)

Advanced use: combine patterns

You can combine patterns to describe a specific development over a certain timespan.

Sources:

- https://ivto.org/patterns-of-change-foresight-cards/

- Van Rijn, M., van der Burgt, R. (2012). Handboek Scenarioplanning: toekomstscenario's als strategisch instrument voor het managen van onzekerheid. Deventer: Kluwer, p32-p42. (in Dutch)

10. Future Scenarios

Short description of Tool:

Scenarios are stories about how the future environment might unfold for our organizations, our issues, our nations, and even our world. They are not predictions, but rather act as plausible descriptions of what could happen. They are stories built around carefully constructed plots, based on drivers, events and 'trends'. They assist in the selection of future strategies, they reveal uncertainties opening up lateral thinking and initiating a learning process. In this way they are part of the planning process, and need to be included as part of the wider plan, act, and reflect cycle. The following links describe scenario and visioning descriptions, steps and examples. They show how there are different approaches, and indicate which are better suited to different aims. The central element in the Scenario approach is dialogue aiming at moderating the participants to develop their own visions related to a specific focus question and their specific area of interest, and through discussions enabling the participants to identify and develop suggestions on options to achieve their vision.

Learning outcome:

- Anticipatory thinking Competence
- Normative Competence

Material list:

- INTRODUCTION TO SCENARIOS
- Shell's scenarios for inspiration https://www.shell.com/energy-and-innovation/the-energy-future/scenarios.html
- Four plausible futures: 2050 scenarios – Arup

Pre-Work Required by Students:

- Read the INTRODUCTION TO SCENARIOS
- Watch Four plausible futures: 2050 scenarios - Arup Future scenarios for 2050

Teaching Plan (step-by-step plan):

1. Give out one destination or theme (for example Rotterdam or Tourism) for the whole class.
2. Create groups. A minimum participation of four persons per role group is recommended. The maximum participation per role group should be limited to eight persons to give the individual participants a chance to discuss and bring forwards one's view.
3. The participants develop and discuss within their role group a scenario related to the scenario workshop focus question reflecting their interests and future expectations. To support this process, it is helpful to provide the groups with handouts to help develop the scenario, pointing out the main questions to ask and what steps to take. Can use a whiteboard or big paper to help to see the bigger picture. Writing and drawing are both recommended.
4. Each role group develops one common future scenario reflecting their interests and future expectations about the topic or destination. It is recommended to have around one and a half-hour of discussion time.
5. The individual scenarios are presented by on spokesperson or group and are compared with each other. Thus, one can learn to understand the ideas, fears and wishes of the participating

role groups and identify common ground and conflicting issues. The discussion stimulates mutual understanding. Individual motives, backgrounds, and intentions become visible, and decisions are made transparent and comprehensible.

Previous experience:

Workshop with SWEDESD about future forecasting

Sources:

- https://tulevaisuus.fi/menetelmat/ (In Finnish, possibility translate the page for English)

- INTRODUCTION TO SCENARIOS

- Shell's scenarios for inspiration https://www.shell.com/energy-and-innovation/the-energy-future/scenarios.html

- Four plausible futures: 2050 scenarios – Arup

11. Future Wheel

Short description of Tool:

The Futures Wheel is a way of organizing thinking and questioning about the future invented by Jerome C. Glenn in 1971. It is a foresight method that provides a model of the future based on the consequences of an event or trend for obtaining a deeper understanding of the problem domain being analyzed, so that the generated future model may be as accurate as possible. The Futures Wheel is a participatory ''smart group'' method that uses a structured brainstorming process to uncover multiple levels of consequences resulting from all types of change.

Learning outcome (link to competence the tool contributes to a high degree to):

- Systems thinking competence
- Anticipatory competence

Material list:

- The Future Wheel -template (attached)
- OR online tool for future wheel
  https://online.visual-paradigm.com/app/diagrams/#diagram:proj=0&type=FuturesWheel&gallery=/repository/ff34ada7-3b5f-4241-89f8-ab099923523e.xml&name=Futures%20Wheel%20Diagram%20Template
- Research example of using The Future Wheel: Bengston, David. (2015). The Futures Wheel: A Method for Exploring the Implications of Social–Ecological Change. Society & Natural Resources. 29. 1-6. 10.1080/08941920.2015.1054980.

Pre-Work Required by Teacher:

Think of an event or trend that you want to forecast.

Teaching Plan (step-by-step plan):

Students may do this exercise in three to six student groups. Every group needs own Future Wheel template or by using a whiteboard.

Instructions for group work

1. Short introduction:

At the beginning of the group work, everyone briefly introduces themselves to the others.

2. Organization of the group:

The group members choose from among themselves a registrar (or two) and a performer of the group's output. There can also be two performers. The groups have a pre-appointed facilitator who leads and maintains the discussion and guards the use of time.

3. Opening the group theme with the wheel of the future (~ mind map):

In group work, the wheel of the future is applied, which is the so-called mind map method. The matter under investigation in the wheel of the future can be broken down into its components. The wheel of the future can also be used to analyze and evaluate how the factors described in the wheel of the future affect each of the other components (each other). The wheel of the future can be used to organize, understand and clarify different views related to a particular issue, theme or future and their potential implications.

Step-by-step for students

1. Identify the Change Write the change that you need to consider in the centre of a piece of paper, or on a flipchart. This could be an event, trend, problem, or possible solution.
2. Identify Direct, First-Order Consequences Now, brainstorm possible direct consequences of that change. Write each consequence in a circle, and connect it to the central idea with an arrow. These are "first-order" consequences. Remember that consequences are not necessarily negative.
3. Identify Indirect, Second-Order Consequences You now need to brainstorm all the possible "second-order" consequences of each of the first-order (direct) consequences that you wrote down in Step 2, and add them to your diagram in the same way.
4. Then, repeat this by identifying the third-order consequences, fourth-order consequences, and so on. You may find it useful to colour-code each "level" of the wheel. This makes it easier to prioritize and analyze consequences once you've completed your brainstorming.
5. Once you've completed all of the levels of the Futures Wheel, you'll have a clear picture of the possible direct and indirect consequences resulting from the change.

Sources:

- Bengston, David. (2015). The Futures Wheel: A Method for Exploring the Implications of Social–Ecological Change. Society & Natural Resources. 29. 1-6. 10.1080/08941920.2015.1054980.
- https://www.mindtools.com/pages/article/futures-wheel.htm
- https://online.visual-paradigm.com/knowledge/decision-analysis/what-is-futures-wheel/

12. Gap Analysis

Short description of the tool:

The purpose of this tool is to examine and determine how a company currently handles sustainability, and then to make an action plan on how to bridge the gap between the current and the ideal situation (Courtnell, 2021).

Learning outcome (link to competence(s) the tool contributes to a high degree to):

- Anticipatory thinking competence

Material list:

Students should be introduced to the method in class or be given reading materials to familiarise themselves with the method before using it.

Pre-Work Required by Teachers & Students:

The teacher can provide relevant cases for discussions in class, or they can use this method in larger projects.

Teaching Plan (step-by-step plan):

The gap analysis examines and assesses performance to identify the difference between the current business state and where the business wants to be (Courtnell, 2021). This method can be a good way for students to make plans for how to get businesses where they want to be regarding sustainability. It is possible to use this tool for analysing and developing plans in projects or in case discussions in class.

The Gap Analysis consists of three factors (Courtnell, 2021):

1. The current situation, or performance.
2. The ideal situation, or potential.
3. What needs to be done to get from performance to potential, otherwise known as bridging the gap.

Gap Analysis

GAP Analysis

Source: https://gitmind.com/
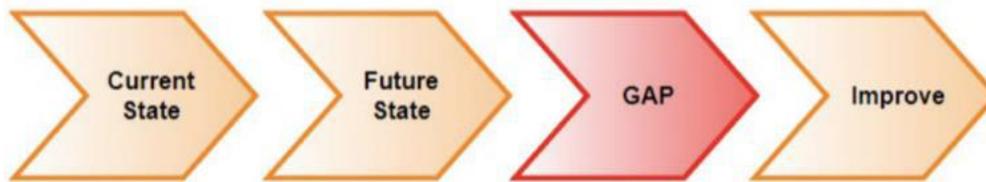
These three factors can be used as steps for conducting a gap analysis. For evaluating current sustainability performance, it is possible to read a company's sustainability report, or a case provided by the teacher in class. Students could then analyse what the ideal situation would be, and then develop a plan for how to get there.

Sources:

Courtnell, J. (2021, April 28). 10 Top Process Improvement Tools You Need to Create a More Sustainable Business. Taskmanager. https://www.ntaskmanager.com/

13. Hackathon
(Preparation 2-4 months before, the hackathon min. 2 days recommended)

Short description of Tool:

A hackathon is a short intensive event during which people come together, form teams and attempt to complete a project that is of interest to them. Teams are usually collocated, and often composed of people with diverse backgrounds, experience, and expertise. Hacking is creative problem-solving. Hackathon events are playgrounds for — and they're only getting more and more popular as our digital world becomes more advanced. More and more universities and higher education institutions have been organizing hackathons for their students, producing thousands of ambitious ideas and creating an innovative student culture in the process.

Learning outcome (link to competence the tool contributes to a high degree to):

- Interpersonal Competence
- Strategic management competence

Material list:

- The Hackathon Canvas (attachment)

Pre-Work Required by Teacher:

Hacking for change:

- Finding the area of innovation. It can be for example influenced by SDGs or stakeholder giving a challenge.

Hacking for innovation: setting up the event

- Whether you want to organise an internal or external hackathon.
- Any specific demographic details — eg. are you running a hackathon targeted towards females, graduates, those with specific credentials, etc.
- What your minimum viable product is. Are you expecting a working prototype? A pitch and a demo? Whatever it is, get crystal clear on it from the beginning and share it with your audience
- What skills you're hoping to attract. Remember, many people refrain from joining hackathons because they think you need to be a coder to join. There are lots of skills required at so make sure you outline them before you put out your call for submission. For instance, some of the main skills hackathon organisers look for are developers, designers, product owners and business analysts.
- How and where you're going to host your hackathon - the best hackathons are run on event management platforms with features geared specifically towards ideas sharing and seamless communication.
- The duration of the hackathon. Typically, organisers need around to build and launch the event (when participants can register, submit their initial ideas, form teams etc), the event itself can be the classical 48-hour build period but you can also consider anything from a 24-hour format to building for several weeks.
- Who your mentors will be — every hackathon needs great mentors, and you'll need to tap into your network to identify who you can call upon. Mentors can be both in-house or external specialists.
- Whether you'll have any sponsors and/or awards. Most internal hackathons opt for the latter, but remember, awards don't always need to have a monetary value. and support and/or implementation of the product, for example.
- What your judging criteria will be. How will you judge the teams? Will you have specific criteria? Here's a post we created to help hackathon organisers build a You can award post-hackathon mentoring simple criterion for selecting winners.

Teaching Plan during the Hackathon:

1. Agenda:
   Welcoming words by the organizers, presentation of hackathon agenda including idea pitches, mandatory checkpoints for idea proposers, talks and trainings, expected outcome (pitch presentation) and jury.
2. Stakeholder involvement:
   Introduction of sponsors and supporting individuals and institutions.

3. Mentoring:
   Introduction of mentors, their area of expertise and their role during the hackathon.
4. Ideation:
   Participants pitch ideas in front of organizers, mentors and other participants including information about which expertise they perceive to be required. Everyone can pitch. Not only participants that submitted ideas through the registration form.
5. Team formation:
   Ideas are written on large sheets of paper that idea proposers hang on the walls in the foyer of the hackathon venue. Participants that did not pitch ideas go around and talk to idea proposers, discuss their expertise and voice their interest. Idea proposers select suitable team members based on interest and expertise. Ideas that do not gain sufficient interest by other participants are abandoned and the proposers of these ideas join other teams.
6. Agenda:
   Idea proposers present their teams. Quick check by the organizers if the teams are of roughly equal size and if all teams have sufficient expertise to start working on their projects. Teams start hacking.
7. Mentoring:
   Mentors meet and form teams with diverse expertise. Each mentor team is assigned to a group of hackathon teams that they support during the hackathon. Mentors focus on their teams but also support others if necessary.
8. Agenda:
   Idea proposers present their progress in front of organizers and mentors at the end of the day and train pitching

Final day

9. Mentoring:
   Mentors meet, discuss potential difficulties that certain teams face and decide for mentors with related expertise to support them.
10. Agenda:
    Second pitch training for idea proposers before lunch time.
11. Agenda:
    Final pitches of idea proposers in front of all participants, jury, organizers, mentors and online audience (live stream).
12. Competition / cooperation:
    Online voting for audience favorite, jury decision and award ceremony.
13. Duration / breaks:
    Group pictures, networking, end of the hackathon and departure.

Sources:

- Burden H and Sprei F . (2020). Teaching sustainable development through entrepreneurial experiences. International Journal of Sustainability in Higher Education, 22(1), pp.142-156
- Pe-Than, E. P. P., Nolte, A., Filippova, A., Bird, C., Scallen, S. & Herbsleb, J. D. (2019). Designing Corporate Hackathons With a Purpose. IEEE Software 36, 1, 15-22. -Using Hackathons To Accelerate Corporate Innovation: A Guide To Run a Company

- Hackathon by Eventornado
  [7 Reasons Why Every University Should Host A Student Hackathon](#)
- [https://hackathon.guide/](#)
- [7 steps to a successful hackathon - MoreThanDigital](#)
- [Hackathon planning kit](#)

14. Hoshin Kanri Matrix

Short description of the tool:

Hoshin Kanri, or Policy deployment, is a strategic planning method that can be used to make employees work towards the same goals, and everyone should be involved in setting priorities for improvement (Courtnell, 2021). The idea is to align the company goals with the plans of all levels in the organisation, from managers to employees, in order to make everyone work towards the same goal (Hoshin Kanri). This is achieved by creating transparent feedback loops across all levels in an organisation (Courtnell, 2021).

Learning outcome (link to competence(s) the tool contributes to a high degree to):

- Strategic management competence

Material list:

The students should be given a [template](#) for the Hoshin Kanri Matrix. It can be used online or printed to be used by the students in class.

Pre-Work Required by Students:

The students need to learn how to read the Hoshin Kanri Matrix before using it in their projects or assignments. The chart is divided into five sections (Laoyan, 2022):

- Long-term strategic objectives go in the southern section.
- Annual objectives go in the western section.
- Improvement initiatives go in the northern section.
- Improvement targets or [KPIs](#) go in the eastern section.
- Resources go in the far east section.

Hoshin Kanri Matrix

Source: https://asana.com/
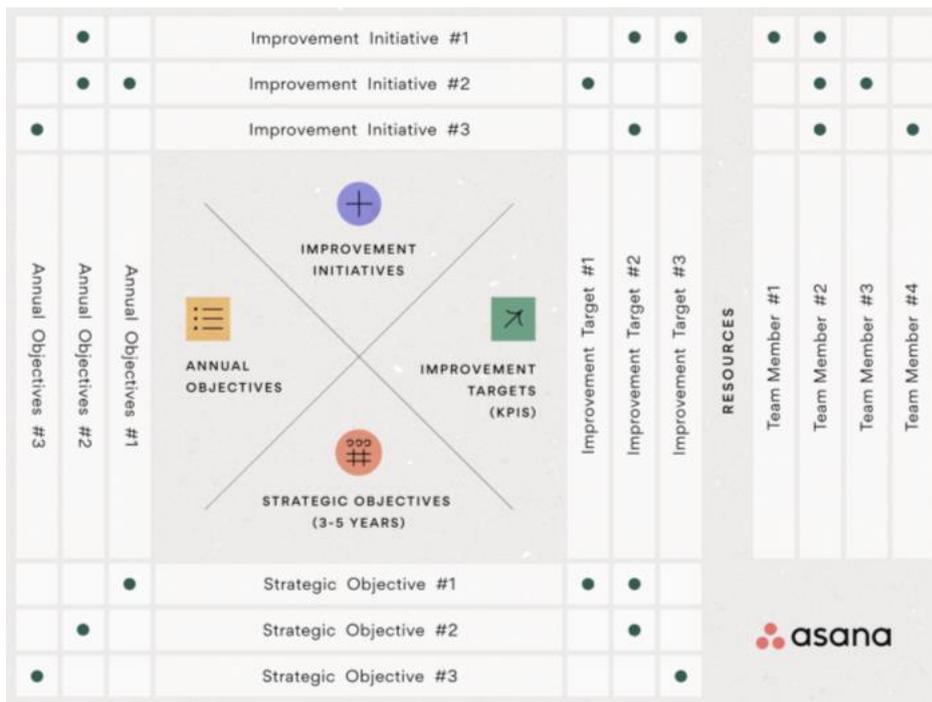
"To read a Hoshin Kanri matrix, you start at the bottom and work your way clockwise. In each corner of the matrix you'll find small dots to represent how each initiative or objective connects back to each other. The resources on the far right identify which team member is responsible for which improvement initiative and KPI." (Laoyan, 2022).

Teaching Plan (step-by-step plan):

The Hoshin Kanri method requires 7 steps. Step 1-4 can be skipped if you already have a strategic plan (Laoyan, 2022).

1. Establish your organisational vision

In this step, the organisation's mission, vision, and values are identified. This requires creating a vision statement that supports the team's goals and is connected to the company's mission statement (Laoyan, 2022).

2. Develop strategic objectives

Developing strategic objectives involves identifying and making changes to achieve the vision made in step 1. The objectives should be long term, and you only need three or four strategic objectives to keep the focus on only a few at a time (Laoyan, 2022). The strategic objectives should be added to the matrics in the bottom of the matrix.

3. Develop annual objectives

The next step is to set some annual goals for the team to achieve. This can be done through breaking down the strategic objectives into smaller short-term goals, making it easier to achieve them (Laoyan,

2022). It is suggested to make around 10 annual goals. Each goal should be measured using a KPI, which is on the left side of the chart (Laoyan, 2022).

4. Cascade goals throughout the organisation

This section is about segmenting the yearly goals into even smaller and easier to achieve goals (Laoyan, 2022). This way, the team can understand the whole systemic process for achieving the larger goals, and the work that is required.

5. Execute annual objectives

Step 5 is about implementing the goals. When the goals are split into such small sections, teams will have different strategies (Laoyan, 2022). They will eventually come together to meet the annual goals set in step 3. Goals can be executed in many ways, for example by using the Lean Six Sigma model or the PDCA cycle (Laoyan, 2022).

6. Implement monthly reviews

A monthly review system should be implemented to connect the information between the goals and strategy, and the teams day to day work (Laoyan, 2022). This will ensure everyone is on the same track.

7. Conduct annual reviews

After 12 months, the progress of the team should be reviewed. This can be done through analysing if goals are achieved or not, and what could be done differently (Laoyan, 2022). Now new goals can be set for the next year, and start the process all over again (Laoyan, 2022).

Sources:

Courtnell, J. (2021, April 28). 10 Top Process Improvement Tools You Need to Create a More Sustainable Business. Taskmanager. https://www.ntaskmanager.com/

Hoshin Kanri. (n.d.). Leanproduction.com. Retrieved from: https://www.leanproduction.com/

Laoyan, S. (2022). How to use the Hoshin Kanri method for strategic planning. Asana. Retrieved from: https://asana.com/resources/hoshin-kanri

15. Individual Development Plan

Short description of Tool:

A document that allows you to assess skills and values, identify goals and strategies for meeting them. Create a framework for a conversation with faculty/advisors. It explicitly define career goals. Helps to Identify the necessary skills and knowledge for your career path

Clearing to assess skills and knowledge

Learning outcome (link to competence(s) the tool contributes to a high degree to:

Does not contribute to any competence to a high degree, but to some degree to the interpersonal competence

Material list:

- Matrix of career paths and goals

Career Paths	Goals could focus on
Academic • Faculty • Researcher • Staff • Administration	**Academic** • Publications/Presentations • Teaching • Mentoring • Grant Writing
Outside of Academia • Other Education Positions • Industry • Government • Non-Profits	**Outside of Academia** • Skills necessary for the job and field • Writing • Presentation skills • Technical skills

Teaching Plan (step-by-step plan):

1. Every student does this task individually online or to the paper. Create the matrix (See below) to the notes
2. Assess Current Skills and Abilities
   What do you like to do? Think outside the box here, and try to pinpoint the exact skill or element you enjoyed about a task. For example, if you enjoy teaching, what is specifically that you find rewarding?
3. Track your development and set new goals to the matrix

Sources.

https://canvas.unl.edu/courses/73802/pages/individual-development-plan-101?module_item_id=1976829

15. The Impact Canvas

Short description of the tool:

The tool can be used for businesses to systematically identify the positive and the negative impact of their product or business idea, which can aid them in creating a realistic impact assessment (Threebility, 2020). The tool has three levels that considers all the potential impact categories of a product or business, and it can help social entrepreneurs to underpin their discussions with investors (Threebility, 2020). In education, the tool can be used by students in projects, case discussions in class, and in collaboration with business partners.

Learning outcome (link to competence(s) the tool contributes to a high degree to):

- Strategic management competence

Material list:

Printed or online version of the canvas. Threebility provides cue cards for each of the 6 steps of the Impact Canvas. They are an explanation for each of the steps, and they are suitable for being printed out and to be used in groups.

Pre-Work Required by Teachers & Students:

The students should be given relevant cases to analyse a business or product in groups. It is also possible to use this tool in entrepreneurial projects for students to analyse the positive and negative impact of their ideas.

Teaching Plan (step-by-step plan):

As shown in the picture below, the canvas is divided into 6 parts, and students should start in the upper left corner marked as 1. The printable cue cards provide an explanation of the main principles in each step (Gerlach, 2015):

1- Maximise capture of waste or emissions (technology / product level)

Main Principles: Wherever possible, use materials for your product which are considered „waste" and are currently polluting the environment, If feasible, engage in "industrial symbiosis" with relevant industrial partners, Explore the potential of long-term or permanent capture of greenhouse gases in your product

Benefits for provider and consumer: Potentially lower manufacturing costs, Potential eligibility for subsidisation, Benefits for brand

Risks: Unstable future supply of resources, Immature technology 15

2 - Minimise life-cycle impact of technology (technology / product level)

Main Principles: Design for longevity and resilience, i.e. via modularity, Design for timeless product appeal, Identify and utilise product as a service strategies, Use low eco-impact raw materials, Optimise production processes, Decarbonise distribution processes

Benefits for provider and consumer: Preempting of tightening regulations, Higher customer appeal for eco-aware customers, Energy and material savings, Lower manufacturing costs, Independence of volatile commodity prices

Risks: LCA time and cost extensive, long-term performance of materials may be unknown, Set up costs of recycling system, Increased durability as threat to future sales

3 - Maximise optimisation- and substitution potential (application level)

Main Principles: Optimisation, Improve technology to optimise energy, fuel or capacity usage, Substitution: Identify potential disruptive qualities of application, Digitalise, virtualize, dematerialise

Benefits for provider and consumer: Higher customer value, Higher market potential

Risks: Rebound effects, Difficulty to assess impact of substitution process

4 - Minimise planned obsolescence and induction (application level)

Main Principles: Induction, Identify and minimise previously non existent forms of resource consumption, Obsolescence, Match real software life cycles to HW life cycles

Benefits for provider and consumer: Lower energy and resource usage, Lower obsolescence induced replacement costs

Risks: Challenge to internalise external costs, Difficulty to adapt life cycles of products of different providers

5 - Maximise incentivisation and smart decision making (system level)

Main Principles: Incentivisation, Use gamification elements (personification, virtual incentives and rewards, community challenges) to 'nudge' users towards sustainable behaviour patterns, Decision making, Create improved management tools to enable user directed optimization through better decisions

Benefits for provider and consumer: Soft mentoring ('nudging') of user towards beneficial behaviour, More efficient decision processes

Risks: Importance to not patronise users with excessively high 'nudge' frequency, Complexity of decision processes

6 - Minimise systemic risks and rebound effects (system level)

Main Principles: Rebound effects, Take into account increasing resource consumption on aggregated scale (Jevons paradox), Prevent over-optimized processes at expense of resilience, Take into account rising complexity of systems

Benefits for provider and consumer: Reliable products and services

Risks: Challenge to internalise costs of rebound effects, Difficulty to assess complexity of related risks

The Impact Canvas

Source: https://www.threebility.com/
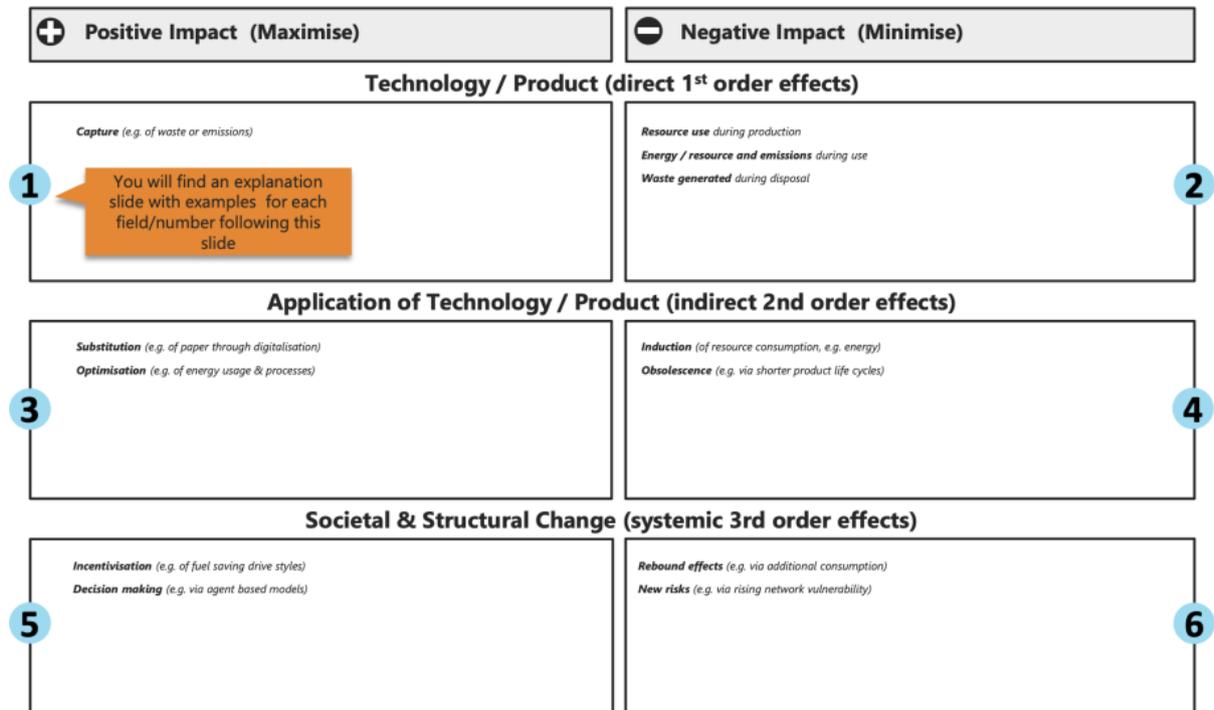
- Can be used as input for the sustainable business model canvas.

Sources:

Gerlach, R. (2015). The Sustainability Impact Canvas - A foundation for Sustainable Innovation. Threebility. Retrieved from: https://www.threebility.com/post/

Threebility. (2020). The Impact Canvas. Retrieved from: https://www.threebility.com/sustainability-impact-canvas

16. Life cycle assessments (LCA)

Short description of Tool:

Life cycle assessment or LCA is a methodology for assessing environmental impacts associated with all the stages of the life cycle of a commercial product, process, or service. LCA studies the environmental aspects and potential impacts throughout a product's life cycle as it is famous for cradle-to-grave which means from raw materials extraction through production, use and disposal (Ilgin and Gupta, 2010;

Matthews et al., 2014). The other cycles of LCA depending on the phase of the life cycle process are as follows (Muralikrishna and Manickam, 2017):

Cradle-to-Grave: a full life cycle assessment from the start of manufacturing (cradle) until the consumption phase to the disposal phase (grave).

Cradle-to-Gate: Cradle-to-gate is an assessment of a partial product life cycle from production (cradle) to the factory gate.

Cradle-to-Cradle: Cradle-to-cradle is a specific kind of cradle-to-grave assessment, where the disposal step for the product is a recycling process.

Life Cycle Energy Analysis: Life cycle energy analysis (LCEA) is an approach in which all energy usage for production is being considered, not only direct energy inputs during production, but also all energy inputs used for making components, materials, and services needed for the manufacturing process.

Life Cycle Assessment types,
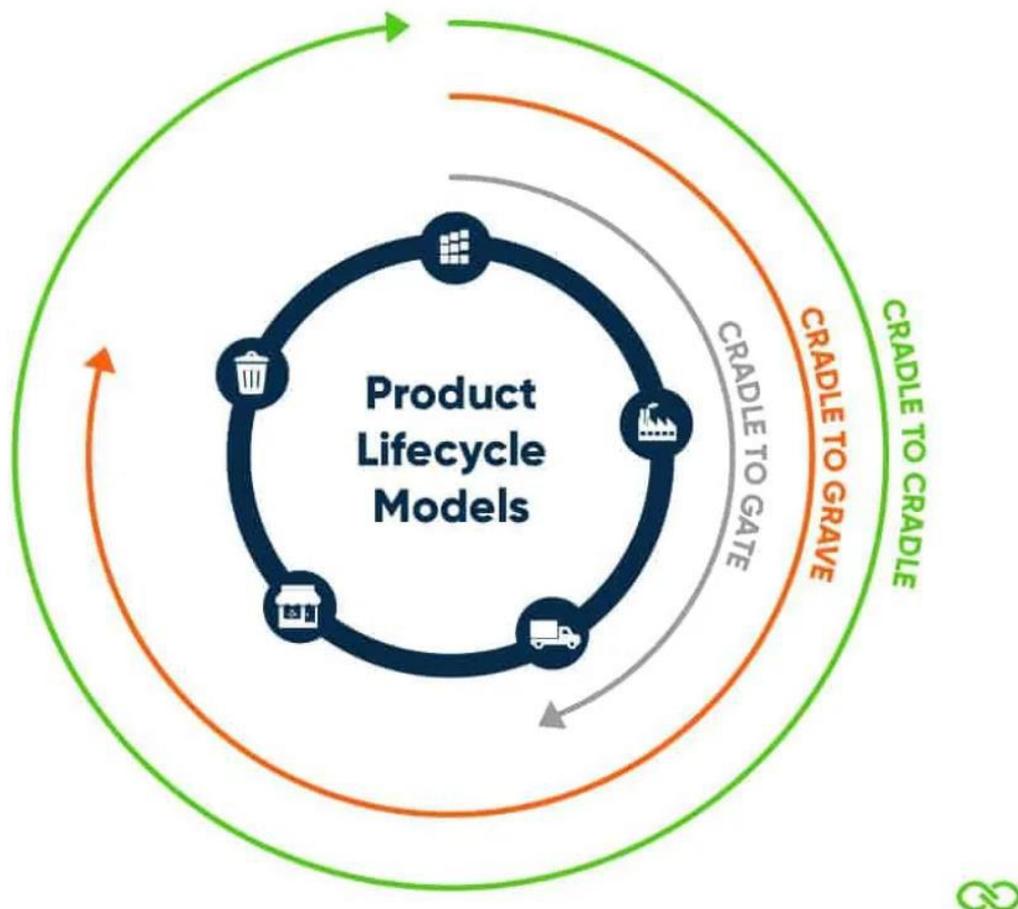
Source: https://ecochain.com

Learning outcome (link to competence(s) the tool contributes to a high degree to):

● System thinking competence

● Anticipatory thinking competence

Material list:

Having the life cycle assessment model.

Teaching Plan (step-by-step plan):

Students will understand the life cycle assessment through the five main steps of a life cycle analysis as following, the steps are inspired by (Muralikrishna and Manickam, 2017);

1. Goal and scope definition

Goal and scope objective is to define what parts of the product life cycle will be taken in assessment and until what stage the assessment will be serving. The criteria used in the assessment and time frames will be described in this stage.

2. Inventory analysis (model of the product's inflows and outflows)

In this step, inventory analysis defines the material and energy flow from the production, environmental interaction, emissions, and raw material used in the different processes of the production.

3. Impact assessment

An evaluation of the environmental relevance of the inflows and outflows, details from inventory analysis will be used for impact assessment. The index results of all impact categories are being assessed in this step.

4. Interpretation

In this step the interpretation of a life cycle involves critical review, determination of data sensitivity, and result presentation.

Life Cycle Assessment

Source: http://www.paradigmsustain.com

Sources:

Ilgin, M. A., & Gupta, S. M. (2010). Environmentally conscious manufacturing and product recovery (ECMPRO): A review of the state of the art. Journal of environmental management, 91(3), 563-591.

Matthews, H. S., Hendrickson, C. T., & Matthews, D. (2014). Life cycle assessment: quantitative approaches for decisions that matter. Open access textbook.

Muralikrishna, I. V., & Manickam, V. (2017). Environmental management: science and engineering for industry. Butterworth-Heinemann, an imprint of Elsevier.

18. Megatrends

Short description of Tool:

With the help of trend cards, one can make one's own thoughts nimbler and stretch them further while creating new ideas and visions about the possible future. You only need the trend cards, a pencil, paper – and a couple of friends!

Learning outcome (link to competence(s) the tool contributes to a high degree to):

- Anticipatory thinking competence
- Normative competence

Material list:

- Megatrends cards (attachment)
- Sitra's trend cards are based on Sitra's work on megatrends, www.sitra.fi/megatrends

Teaching Plan (step-by-step plan):

1. STUDY. Read through the deck of trend cards and contemplate the thoughts that the trends provoke. Are they familiar to you? What trends can you already detect in your daily life? What seems surprising? Which trend would you like to challenge?
2. RANK. Pick up, at random, 3 to 6 cards from the deck and arrange them in order of importance according to your own understanding. If you work with others, discuss and compare the ranking of the trend cards with them. Are there common themes emerging in your discussion? Are you of the same opinion?
3. VISION. Pick up 3 to 6 cards or use those you've already picked up. Based on these, create a story about the future. Add to the story themes you work with or themes which are related to your own life. Share the story with others.
4. BRAINSTORM. Get the day's newspaper and select a news story that interests you. Pick up 3 to 6 trend cards and think what the news item would be like if the events your trend cards were part of daily life right now
5. DREAM. Pick up 3 to 6 trend cards and, based on them, create the best possible future image by describing the future of something that is important to you and links to your cards.
6. INVENT. Pick up 3 to 6 cards and, based on the ideas derived from them, create a future service, solution, product or method related to your object of interest to improve its development
7. CONCRETISE. Move, step by step, from the future image backwards in the direction of the present. What kinds of concrete events have you noticed taking place on your backwards journey to the present?
8. BE SURPRISED. Pick up 3 to 6 cards and invent completely opposite development trajectories to them. What needs to happen in order for the opposite development trajectory to materialise? Can you identify any surprising viewpoints or black swans*? Let others know your most important and astounding thoughts. Think about whether these trajectories could actually materialise.

Sources:

- www.sitra.fi/megatrends
- https://www.sitra.fi/app/uploads/2016/11/megatrendcardswebeng31-08-2018.pdf

19. The Mission

Short description of Tool:

The primary goal is to start a process where the student gradually discover vital elements in a sustainable world and get a feeling of how they influence each other. The Mission can be used for a number of different purposes and that of course influences the guidelines very much. That means that you will have to adapt the following to the prevailing circumstances.
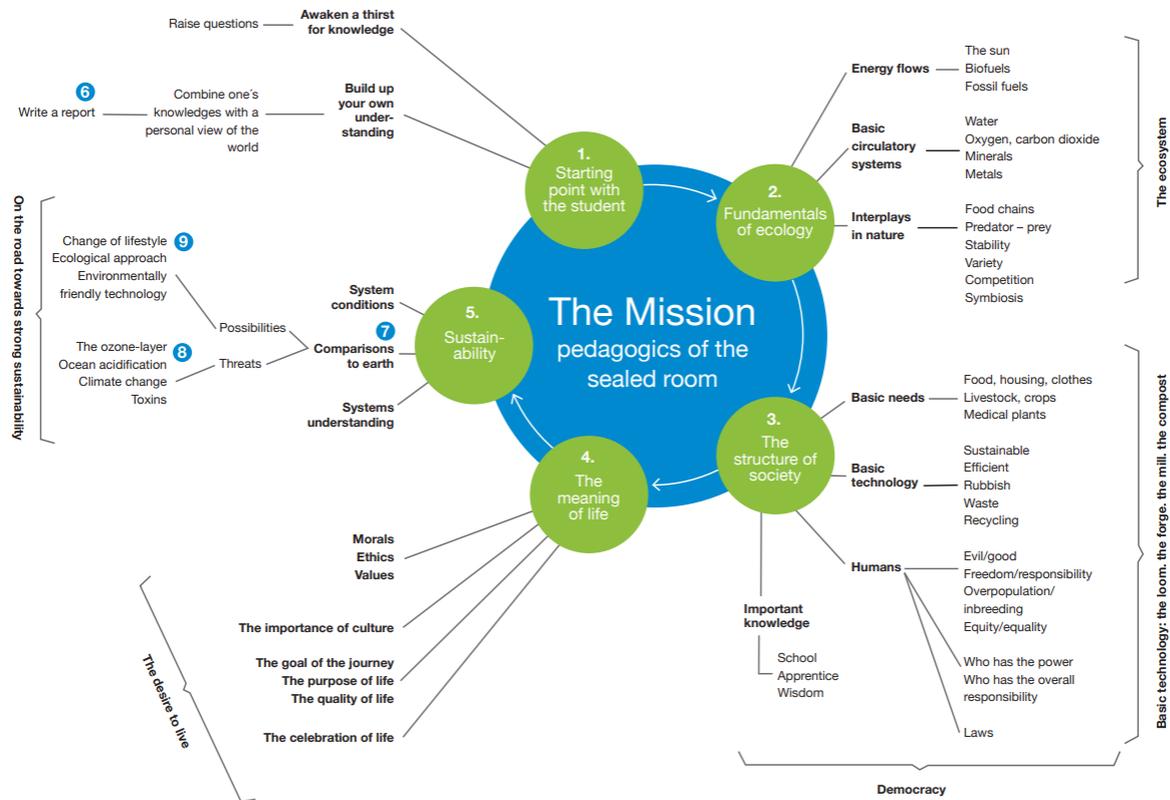
Learning outcome:

- System Thinking Competence
- Anticipatory Thinking Competence
- Normative Competence
- Interpersonal Competence

Material list:

The Mission Instructions and slides (attahment)

Reminder for the teacher:

As you face your group with this extraordinary task you also start a development process where they themselves are the main actors. This also means that you as a facilitator of the process should adopt a somewhat restrained and cautious attitude:

- Never reject a proposal or an idea – even the "wild ones". Let them argument and discuss, let them even go in directions that you already know will lead to dead ends.

Because, it is much better if they themselves discover that instead of hearing it from an omniscient teacher.

- Don't deliver readymade solutions to their upcoming problems but stimulate their thinking and creativity through discussions and parables.
- Provide them with tools to handle the mass of aspects they have to embrace and a structure that can help organize their discussions.

Teaching Plan (step-by-step plan):

1. Giving out the task
   Hand out The Mission and let everyone consider the task individually during 5-8 minutes. No discussions are allowed and the participants are instructed just to put down what comes into their heads on a piece of paper.
2. Form groups
   4-6 people and start their work by just asking them to read to each other what they have written down without any long explanations.
3. Group work - free flow
   From now, they are free to pursue their work as they like, but with the common goal that: "The interior of your spaceship should be so well designed and inviting that all the others would like to join your spaceship!" A simple contour of the spaceship may be helpful in this face of the process.
4. Discussion - Basic needs
   Ask them to use Maslow´s "hierarchy of needs" and urge them to begin to find solutions for the most "fundamental needs". Later on they can tackle the ones higher up in the hierarchy.
5. Discussion - No waste hatch
   Some groups may get stocked with the idea that they can solve all their problems by just taking everything they need for the journey with them from Planet Earth and put it in a huge storing room onboard the spaceship. Challenge their assumptions and introduce the fact that "there is no waste hatch so you can´t throw garbage into space".
6. Discussion - The inner space
   Some groups may run into difficulties because they design their spaceships with many floors, staircases and elevators. Urge them to collect all the essential life functions on one floor and start to design that one. A key aspect to get an inner space in their ships may evolve from their discussions when trying to find solutions to the circulation of water. Make sure that this will be one of the first tasks, and then the other pieces easier will fall into place.
7. Discussion - Gravitation
   After a while some students may discover the lack of gravitation onboard the ship. Congratulate them to that finding and reward them by offering them free gravitation of exactly the strength they prefer. Without gravitation they will have to rotate their ships and the design will become much more difficult.

There will be a lot more difficulties and challenges for the students and it is up to us as facilitators to support and encourage them not to give up. Depending on how far you would like to go into the process you have to set concrete and achievable goals for your students. Getting a glimpse of sustainability always demands a holistic perspective and that a number of elements are present at the same time.If there isn´t time to go deep into all of them it is better to do it more superficial instead of leaving a number of them out.

Sources:

The Mission © 1996, Wolfgang Brunner Translation from: Solvagnen, visioner till din miljöundervisning

20. PDCA cycle

Short description of the tool:

The PDCA cycle is a process improvement tool developed for implementing improvements for sustainability in business processes (Courtnell, 2021). The concept of this tool is a cycle which makes organisations able to continuously address and improve sustainability in their processes. PDCA stands for Plan, Do, Check and Act. The process consists of making a plan for what needs to change, make improvements, compare old and new processes, and lastly, everyone should take action for improving sustainability (Courtnell, 2020). The Plan-do-check-act cycle is an important component of Lean management for constant improvements, and can be helpful for development, analyses, and planning for the future (Courtnell, 2020).

Learning outcome (link to competence(s) the tool contributes to a high degree to:

- System thinking competence
- Strategic management competence

Material list:

Students can be given articles and other relevant resources about the PDCA cycle before starting projects.

Pre-Work Required by Teachers & Students:

The PDCA cycle can be used in group projects which requires relevant cases to be provided for the students. The students should read about the method and be familiar with it before starting with the project.

Teaching Plan (step-by-step plan):

There are many options for using the PDCA cycle in education. Students can for example use the method for solving specific problems in a given case, where they use this method to plan, analyse, and develop improvements. The method can also be used in a project as steps students follow for working with their projects, where they follow the Plan-Do-Check-Act steps as a working process. Regardless of how the PDCA cycle is used in educational projects, the steps for using this method should be the same:

1. Plan

Planning is the first step in the cycle. Here, the steps that should be taken in the future are planned, which starts by identifying the problem, and then developing an action plan (Courtnell, 2020).

2. Do

The second step involves implementing the action plan (Courtnell, 2020). It is the most important step in the PDCA cycle, and it is important to keep track of all the changes. If the plan is implemented in small steps it is possible to evaluate and plan throughout the process, which minimises risks of failure (Courtnell, 2020).

3. Check

The third step is to evaluate if the implementation of the action plan was successful (Courtnell, 2020). Results should be evaluated and analysed, and it is possible to analyse pros and cons (Courtnell, 2020). If something did not work, it is possible to make changes at this stage.

4. Act

The last stage is where the plan can be changed based on the outcomes. If the plan was successful, it can be introduced on a larger scale (Courtnell, 2020). If it was unsuccessful, it is possible to start the PDCA cycle all over again (Courtnell, 2020).

The PDCA Cycle

Source: https://kanbanize.com/
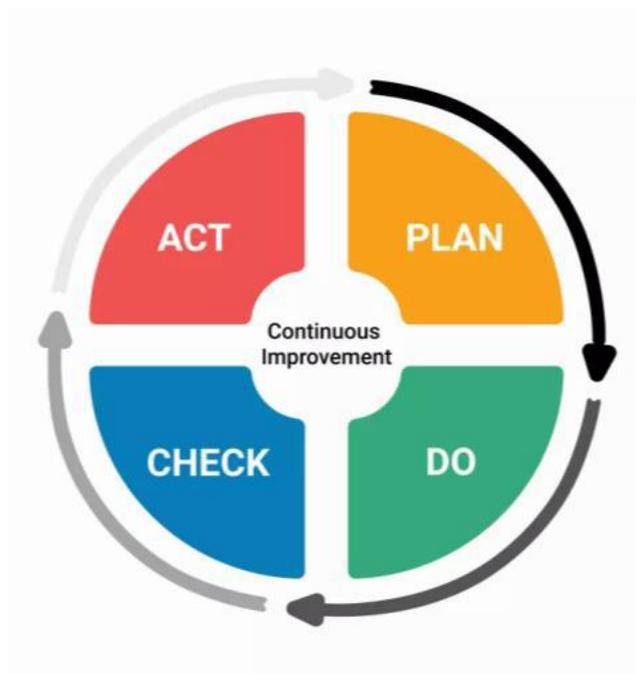
Theoretical foundations:

The idea for the PDCA cycle was founded by American physicist Walter Shewart in the 1920s, with an aim to improve quality (Courtnell, 2020). It was then developed by an American professor William Deming (Courtnell, 2020). He developed the cycle based on the scientific method of problem-solving (Courtnell, 2020).

Sources:

Courtnell, J. (2021, April 28). 10 Top Process Improvement Tools You Need to Create a More Sustainable Business. Taskmanager. https://www.ntaskmanager.com/

21. Pitch competition

Short description of Tool:

A pitch competition is an event in which individuals showcase their business idea to a panel in order to catch attention. Any pitch competition can have its own set of restrictions and guidelines but having a business plan is the must in all the pitch competitions.

The pitch competition can be a great start point for students studying entrepreneurship to learn about the venture capital and angel investment worlds.

You'd want to express the right image. Your pitch should highlight the essential features of your company's strategy, goods, and services you offer, significant financial predictions, alongside capital requirements. It should stand alone as a graphical presentation, but it will essentially seek to tell your company's story.

Learning outcome (link to competence(s) the tool contributes to a high degree to):

- Strategic management competence

Material list:

Creating a contest situation and having people for the panel to judge the pitches and for the students to have a business plan.

Pre-Work Required by Students:

Revise and optimise the pitch deck.

- Get somebody from outside your class to look through your pitch.
- Focus on making the modifications that were recommended to you.
- Improvise presenting your pitch till it becomes second nature to you, then keep improving overall performance.
- Film yourself and review it again with an advisor who can comment on your nonverbal cues, choice of words, and other aspects of your presentation.
- Prepare answers to any query that may be posed. Keep track of yourself and set aside some time before the competition. Rise to the occasion as the grand prize winner!

Teaching Plan (step-by-step plan):

1. Students need to learn and understand a challenge or a business idea they want to work on it,
2. Then work on the business idea or challenge to create a prototype solution,

3. Design a business proposition to show how it worth the investment,
4. Rehearse and record a 5-minute pitch to convince judges that your idea is the best.
5. The teacher should set a pitching atmosphere in the classroom and bring others to act as a judge, better to have experts with different backgrounds.
6. Students start their pitches and judges will give advice.

Sources:

https://sites.ced.ncsu.edu/design-and-pitch/virtual-pitch-competition/classroom-virtual-pitch-competition/

22. The Project Canvas

Short description of the tool:

The project canvas is a tool that can be used to identify research and development projects. It was developed by the Norwegian Research Council (Forskningsrådet, 2019), and businesses in Norway use this tool to compose project descriptions which can be used for dialogues between participants in the projects and consultants. It can also be used when applying for funding. The goal is to go from an idea to a well formulated project description for research and development projects. The project canvas is easy to use, and it contains the needed questions for creating a good project description, with a focus on sustainability as well.

Learning outcome (link to competence(s) the tool contributes to a high degree to):

- Strategic management competence

Material list:

Printed or online versions of the project canvas.

Pre-Work Required by Teacher & Students:

Students should use this tool in projects to form a project description and show how their idea will be sustainable and useful for society. The tool can be used in any research and development project, so it is useful for courses with a focus on innovation, entrepreneurship and sustainability where students develop an idea.

Teaching Plan (step-by-step plan):

The project canvas can be used by businesses and in education in order to assess the sustainable impact of projects. The canvas does not require you to answer all of the questions, and it is possible to answer questions only related to your own project. In education, it can be suitable to use the canvas

at the start of larger projects in order for students to generate and develop their ideas and generate a detailed project description. The canvas will also show how their idea will be useful for society.

The Project Canvas

Source: https://www.forskningsradet.no/

Sources:

Forskningsrådet. (2019). Prosjektcanvas. Retrieved from: https://www.forskningsradet.no/sok-om-finansiering/hvem-kan-soke-om-finansiering/naringsliv/prosjektkanvas/

The Project Canvas (2019):

https://www.forskningsradet.no/siteassets/malgruppene/prosjektkanvas/prosjektkanvas-naringsliv---forskningsradet.pdf

23. Reverse brainstorming

Short description of Tool:

Reverse brainstorming is a thinking technique which is turning over the commonly used brainstorming method. Reverse brainstorming is very useful when the problem at hand is complex and consists of multi levels and paradigms. In contrast to typical brainstorming that generates actions and ideas for solving a problem, in reverse brainstorming the idea is imagining the worst case of the problem and the reasons causing this situation. Next step is that you turn over those ideas aiming at detecting new aspects that you could not see in the past. This method is giving people a totally new perspective to look at the problems, the causes of the problem, and the possible solutions (Mcconnel, 2018).

Reverse Brainstorming in a Nutshell

Source: https://fourweekmba.com/

Learning outcome (link to competence the tool contributes to a high degree to):

Does not contribute to a high degree to any competence, but to some degree to some competences

Material list:

No specific material is needed, just having the specific problem assigned for each group. 39

Pre-Work Required by Students:

Students need to be assigned to small groups.

Each group needs to find a future vision or problem to work with.

The problem or vision better be within the groups' expertise or at least some members have knowledge around the topic.

Teaching Plan (step-by-step plan):

The step by step process has been inspired by the model introduced in by (Mcconnel, 2018).

1. First a description of the reverse brainstorming in the class will be done as what has been mentioned in the description of the tool.
2. Teaching reverse brainstorming in the classroom will happen within a workshop session where students in a group will work on one topic (problem) at hand.
3. Description of the problem within each group; The problem must be clearly defined and everyone in the group should be on the same page understanding the problem.
4. Reversing the problem; in this stage the problem will be flipped and the opposite way of the problem will be introduced. In a way the worsen case of the problem scenario will be the new way of looking at it.
5. Generate ideas; Students in their groups start to come up with ideas to get to that reversed goal. Any idea will be helpful in this stage and no limit in brainstorming.
6. Reversing the idea generated in the previous step; Now students with their teammates start to reverse those ideas that they created that leads to the reversed goal.
7. Evaluation and prioritisation; in this stage students in each group will sit together and evaluate those ideas carefully one by one to come up with the best and most doable ones. Then students will prioritise the ideas according to their knowledge.

The Reverse Brainstorming Model

Souce: https://blog.mindmanager.com/
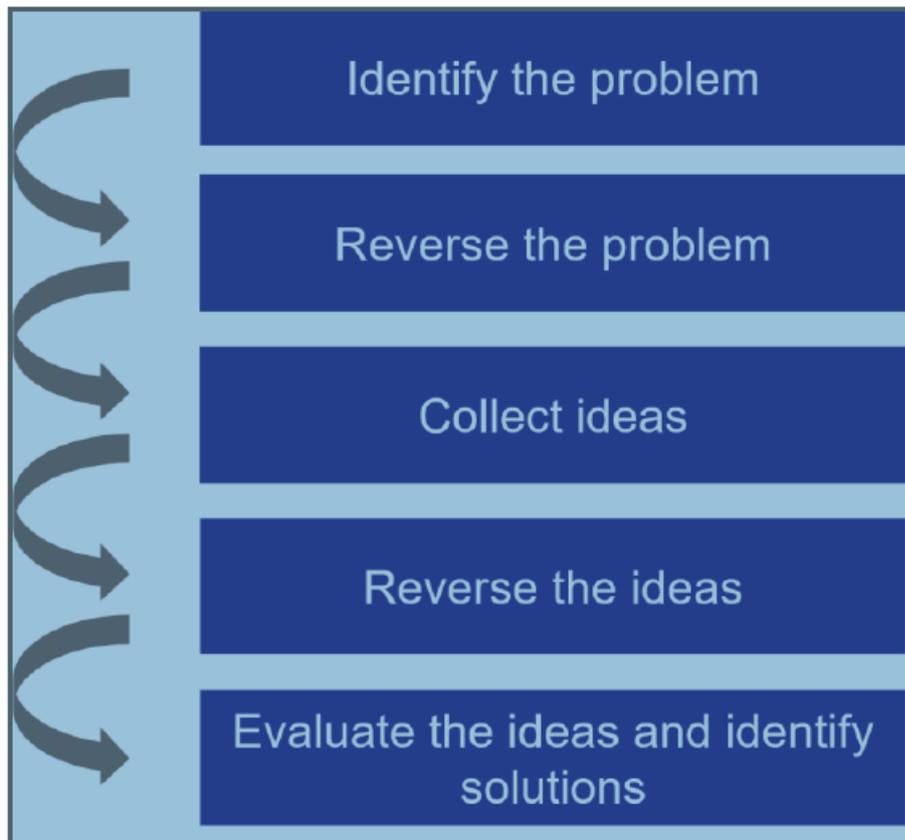
Sources:

Mcconnel, B. (2018). How reverse brainstorming helps to solve business problems. MindManagerBlog. https://blog.mindmanager.com/blog/2018/06/28/201806solve-business-problem-reverse-brainstorming/

24. Root Cause Analysis

Short description of the tool:

The root cause analysis helps to understand and identify the underlying causes for the issues behind the biggest sustainability pain points in a business. It is also a good tool to find root causes for problems that are not obvious (Courtnell, 2021). It is suggested to use the tool along with the gap analysis in order to figure out what is preventing a business from reaching a better potential state for sustainability (Courtnell, 2021).

Learning outcome (link to competence(s) the tool contributes to a high degree to:

Does not contribute to a high degree to any competence, but to some degree to some competences

Material list:

The students will need pen and paper to conduct a root cause analysis by drawing the Fishbone Diagram.

Pre-Work Required by Teachers and Students:

It is a useful tool to identify the root cause of sustainability pain points in a business (Courtnell, 2012). Thus, it is possible for students to use in projects where they collaborate with industry partners, or in workshops. The most important part is to give the students a relevant case for conducting their analysis together in groups.

Teaching Plan (step-by-step plan):

For implementing the root cause analysis it is possible to use a Fishbone Diagram. This is illustrated in the article by Courtnell (2021).

Steps in the Fishbone Diagram include (Courtnell, 2021):

- Identifying the problem
- Brainstorming possible causes
- Constructing the fishbone diagram with the main problem in the centre (the fishbone)
- Fill in possible causes for the problem, these are the fish rib bones which is arranged around the main problem (the fishbone)
- The branches will eventually become more and more specific, and at last you reach *the root cause.*
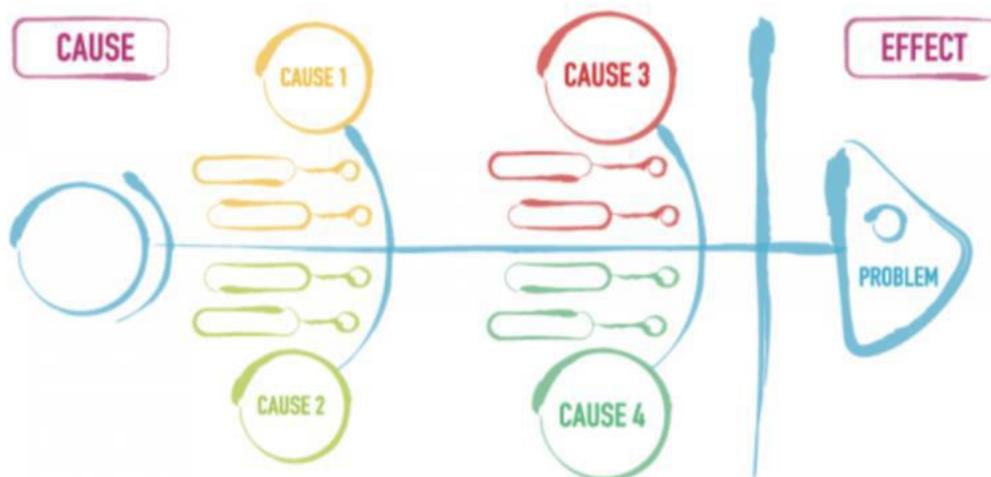
Fishbone Diagram

Source: https://www.ntaskmanager.com

Sources:

Courtnell, J. (2021, April 28). 10 Top Process Improvement Tools You Need to Create a More Sustainable Business. Taskmanager. https://www.ntaskmanager.com/

25. SDG Impact Assessment Tool

Short description of Tool:

The SDG Impact Assessment Tool helps you assess impact of solutions, research activities, organizations, projects or other initiatives, hereafter called 'case', on the Sustainable Development Goals (SDGs). With your own knowledge as base, you will be able to identify opportunities (positive impacts), risks (negative impacts) and knowledge gaps. At the end you will have a better understanding of how your case relates to the SDGs and be better equipped to priorities actions ahead.

The tool will help you take on the SDGs in a simple and structured approach, but the outcome is fully depending on your and your collaborators' expertise, commitment and drive to seek new insights. The SDG Impact Assessment Tool is first and foremost a learning experience and a first strategic step towards improving sustainability.

Learning outcome (link to competence the tool contributes to a high degree to):

- System Thinking Competence

Material list:

Online tool https://sdgimpactassessmenttool.org/en-gb/tool/assessments

Pre-Work Required by Students:

- Read about 17 SDGs
- Sign in to the website for doing it online.

Teaching Plan (step-by-step plan):

Steps in the self-assessment method

STEP 01	STEP 02	STEP 03	STEP 04	STEP 05
Gather your forces	Define, refine, draw the line	Sort the SDGs	Assess your impact	Choose strategy forward

1. Gather your forces. Are you up to the task alone or can you gather a team? The 17 SDGs span across a wide range of topics. Keep this in mind when inviting collaborators to attend. The knowledge you put in is also what you will get out. Ideally you will have the help from a small group with a moderator to inspire discussions and open your minds. This is not, however, a contest of being right or wrong – together you seek to challenge yourselves in the complexity of sustainable development and gain new insights. "Together you are strong."

2. Define, refine and draw the line. It might sound trivial but agreeing on what it is you are assessing and where you draw the line (the framing and scope) of your case – is crucial. In what setting and context is it relevant to discuss 'impact'? Value chain, life cycle thinking, and causality might be to your help here. "Don't try to bite more than you can chew!"

3. Sort the SDGs. Doing the assessment in the order SDG 1 through 17 is not always preferably. A more inspiring approach might be to take them on as you perceive their order of relevance to your case. Therefore, you can sort the SDGs according to "Relevant", "Not relevant" and "I don't know". View this step as a guesstimate to trigger your thinking and to establish an order of assessment, without spending too much time here. How you sort the SDGs have no consequences for the result. "You've got this sorted."

4. Assess your impact. The assessment is done for each SDG. The tool provides a short introduction to each SDG and its targets. Since the SDGs are agreed on a global level, there might be a need to put an SDG in a national or local context. The objective is to formulate one summarized impact for each SDG. That limitation could pose dilemmas where, hypothetically, a case might be assessed as having positive impacts on one target and negative on another. Sustainable development is typically associated with compromises and making a final prioritization in such situations is part of the methodology. Each SDG is assessed according to the following categories:
   - Direct positive
   - Indirect positive
   - No impact
   - Direct negative
   - Indirect negative
   - More knowledge needed

"Direct positive" or "direct negative" are defined as immediate impacts of implementing the case, whereas "indirect positive" or "indirect negative" are impacts that might arise as secondary consequences of the implementation. "More knowledge needed" is chosen when the knowledgebase is too uncertain or simply lacking to make an assessment.

Each impact assessment must be motivated. Explain your reasoning by providing relevant arguments, based on up-to-date knowledge, in a transparent and clearly understandable way. The motivation is the basis for any review and evaluation of your impact assessment.

5. Choose your strategy forward. Based on the result, formulate actions to mitigate trade-offs (negative impacts), support further synergies and potential benefits (positive impacts) and/or take on knowledge gaps. Focus on what can be done here and now and which additional partners or competencies might be needed.

As indicated in the picture above, the method is iterative in that sustainable development is an ongoing, continuous process where our knowledge is always on the move and improving. Hence, reassessing cases in face of new knowledge might yield new outcomes.

Sources:

- https://sdgimpactassessmenttool.org/en-gb/articles/instructions
- https://sdgimpactassessmenttool.org/en-gb/articles/resources

26. The Sustainable Business Model Canvas

Short description of the tool:

A tool that encourages businesses to be greener. For policies to be implemented successfully in the Nordic countries, it will be necessary to uncover whether there are current or up-coming strategies of initiatives in each of the countries where the above recommendations would fit, and whether the policy recommendations can be implemented in the current frameworks. Existing relevant green innovation funding programs could include or have a strategic focus on the life cycle and incentive models such as ESCOs or C2c.

Learning outcome (link to competence(s) the tool contributes to a high degree to:

Does not contribute to any competence to a high degree, but to several to some degree

Material list:

Online or printed versions of the canvas. The canvas can be downloaded here.

Pre-Work Required by Teacher & Students:

Students should be given a short presentation about the Sustainable Business Model canvas before using it themselves.

Teaching Plan (explanation):

The Sustainable Business Model Canvas is a great tool to enable users to think about the most relevant areas of their business within a triple-bottom-line (TBL) context. It allows users to maximise the sustainability impact of their venture whilst minimising negative externalities, and it is fast and easy to complete. The Sustainable Business Model Canvas can also be used as part of our Sustainable Business Model Innovation Game.

The canvas can be followed by filling out each of the 13 building blocks. Students should first fill in the two blocks at the top, positive and negative impact. After, they should move on to the blocks in the middle of the canvas. These consist of; Sustainable partners, sustainable value creation, sustainable tech & resources, sustainable value proposition, sustainable customer relation, sustainable channels, responsible customers, and end of life. And lastly, they can fill in the three building blocks at the bottom of the canvas; Cost structure & additional costs, subsidiation, and revenue and sustainability premium.

The Sustainable Business Model Canvas

Source: https://www.threebility.com/

Sources:

Threebility. (2020). The Sustainable Business Model Canvas. Retrieved from: https://www.threebility.com/sustainable-business-model-game

27. Sustainability as a persona

Short description of Tool:

Persona is not a person but it is showing a characteristic of the person. In this case, Persona is sustainability which leads to seeing sustainability from multiple aspects. What are the pains and gains of sustainability and opportunities etc. This canvas can be also used to customer segmenting exercises as it's mostly used by companies to define their customer.
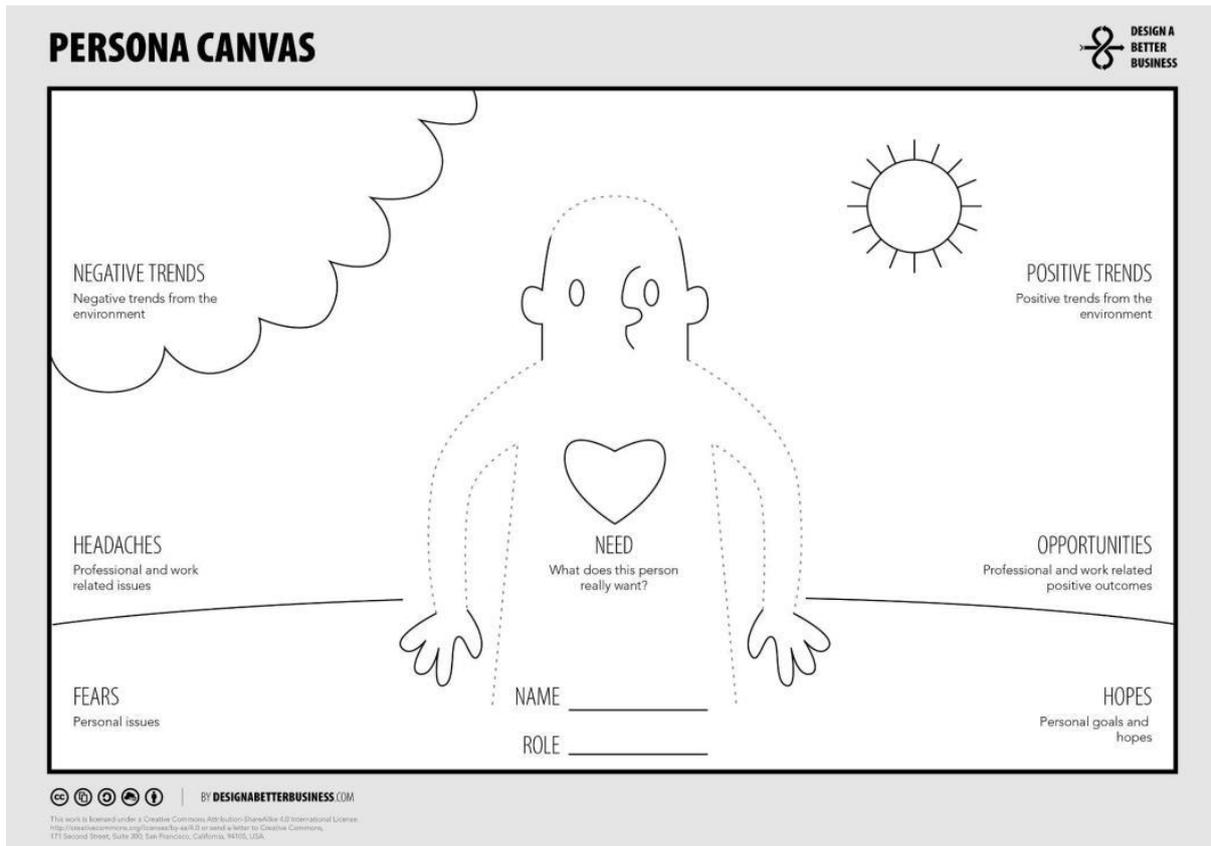
Learning outcome (link to competence(s) the tool contributes to a high degree to):

Does not contribute to a high degree to any competence, but to some degree to some competences.

Material list:

Persona canvas (Attachment)

Teaching Plan (step-by-step plan):

1. Research the sustainability as a person

The first thing you should take care of when creating a Persona is gathering information about your 'person'. It's fine to start with hypotheses if you validate them afterward. But in general, without research, goals, tasks, needs, and pains of your Persona will be about your imaginary person, not real ones. Populating your Persona with unreliable data won't do you any good as you won't be able to come up with improvement ideas for people who really use your product or service.

It is important to keep in mind that you cannot use one Persona to represent your whole topic. Nor can you base a Persona just on one specific information you happened to know. It has to be a significant group of customers with similar characteristics, needs, goals, and behaviours.

2. Segmenting sustainabilty into Persona

When it comes to segmenting sustainability into Persona, the first thing you need to do is analyze the research data you have collected. Then identify them in the Persona canvas.

- NAME & ROLE Giving your persona a real name and role helps anchor them in reality. Using a real person is even better.
- OUTLINES The canvas is designed to make it easy for you to draw what your "customer" looks like on top of it. Is it a man? A woman? Is he or she happy? Or sad? Do they wear specific clothes? Make a rich picture.
- NEED In the end, we want to try to identify needs for the persona. What do they really want? What decisions will they take? The rest of the canvas helps to zoom in
- POSITIVE TRENDS What are positive trends the persona experiences in their life?
- OPPORTUNITIES What are positive opportunities the persona experiences in their life? These could be in work, or private life.
- HOPES What hopes does the persona have for the future?
- NEGATIVE TRENDS What are negative trends the persona experiences in their life?
- HEADACHES What are negative headaches the persona experiences in their life? These could be in work, or private life.
- FEARS What fears does the persona have for the future'

3. Discussion and benefits of the personas

Now you have the persona and you may use it to see the bigger picture of the sustainability. In the company or group work: The picture of the persona that you share as a team. Making it visual makes sure everyone has the same picture. And you can use it to create a mental model or profile of any person or group. It is clear that persona's can be used for many more things that are now left to chance or long discussions.

Sources:

- https://www.forbes.com/sites/rajeevpeshawaria/2021/10/11/sustainability-soulful-or-shamful/
- https://uxpressia.com/blog/how-to-create-persona-guide-examples
- https://www.designabetterbusiness.tools/tools/persona-canvas

28. The Sustainability SWOT Analysis

Short description of Tool:

The Sustainability SWOT Analysis is made for companies to identify and assess environmental risk, and to then use this analysis to take action for solving environmental challenges in their companies (Threebility, 2020). Since the tool is based on the original SWOT analysis, users will identify risks and opportunities for sustainability. The goal of the Sustainability SWOT is to drive action for collaborating on sustainable issues in a company, and to create long-term sustainable business value (Threebility, 2020). The tool is based on the report by Metzger et al. (2013), and it is suitable for use across departments, with suppliers, and to motivate colleagues to take action for sustainability (Threebility, 2020).

In education, the Sustainability SWOT can be used in the same way as the original SWOT analysis. For example to analyse sustainability in case discussions in class, in projects, or on exams. It is also suggested to use the tool in combination with the sustainable business model canvas, which is based on the classic Business Model Canvas (Gerlach, 2018).

Learning outcome (link to competence(s) the tool contributes to a high degree to):

- Anticipatory thinking competence

Material list:

Two options: Use the Sustainability SWOT online, and students can work together and do the SWOT analysis on their computer. It is also possible to print the Sustainability SWOT for the students to write on paper.

Pre-Work Required by Students:

It is good for the students to be familiar with the regular SWOT analysis before they use the Sustainability SWOT, as they will have more understanding of how to conduct their analysis. Students will be divided into groups of 3-6 people for the teaching or workshop day, and they should be given suitable companies or cases to use for conducting their analysis.

Teaching Plan (step-by-step plan):

The Sustainability SWOT analysis canvas is divided into three main sections (Gerlach, 2018), and the users should complete the analysis based on the three sections starting from the left to the right.

The Sustainability SWOT Analysis

Source: threebility.com

Step 1: Environmental and Social Challenges and Big Trends
The first step is to assess and analyse the big environmental and sociocultural challenges and trends (Gerlach, 2018). It is suggested to ask the question: "What do I and others see changing in the world, and which related challenges do arise?". Examples of climate challenges are water scarcity and plastic pollution, and trends could include an ageing population (Gerlach, 2018). The goal of this first step is to ensure that external challenges related to the environment and sociocultural trends are considered when making decisions (Gerlach, 2018).

Step 2: SWOT Analysis with a triple-bottom-line focus
In the second step, the classical part of the SWOT analysis is performed. The user should consider the analysis in the first step, while also taking into account Strengths, Opportunities, Weaknesses and Threats, with a focus on environmental and social challenges (Gerlach, 2018). This analysis can also initiate innovative ideas, and users of this tool should come up with innovative ways to address problems or opportunities they discover (Gerlach, 2018).

Step 3: Prioritisation and Action
In the last part, the users of the tool will prioritise the discoveries made during the analysis. They will then make a strategy to take action in the short-, mid- and long-term (Gerlach, 2018).

Sources:

Gerlach, R. (2018). The Sustainability SWOT Analysis - A tool for Strategic Sustainability Management & Innovation. Threebility. Retrieved from: https://www.threebility.com/post/the-sustainability-swot-analysis

Metzger, E., Putt Del Pino, S., Prowitt, S., Goodward, J., & Perera, A. (2013). sSWOT A Sustainability SWOT. World Resources Institute, WRI.org. Retrieved from: https://inlac.org.ve/wp-content/uploads/2020/08/sustainability_swot_user_guide.pdf

Threebility. (2020). Sustainability SWOT Analysis. Retrieved from: https://www.threebility.com/sustainability-swot-analysis

29. The Sailboat Retrospective

Short description of Tool:

The sailboat retrospective is a retrospective technique where you and your agile team members will envision the last sprint as a sailboat. It's a visual way for your team to identify what pushed the project forward, as well as what held it back.

Learning outcome:

- Interpersonal competence

Material list:

- Picture with the sailing boat
- OR draw the image to the whiteboard
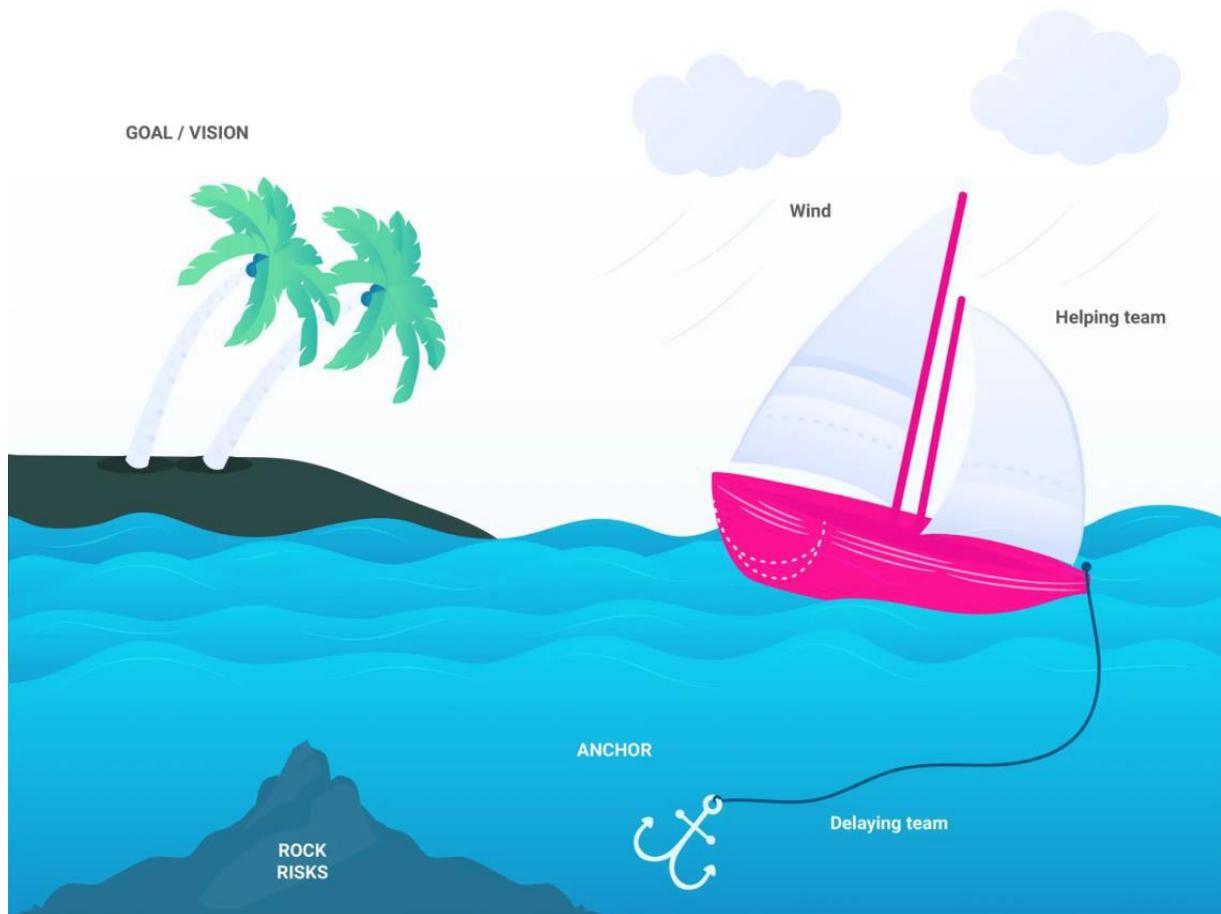
Key elements:

1. Rocks (risks)

What happens if a boat hits a rock? It gets hung up and damaged. The same is true for your sprint. The rocks represent a potential risk or obstacle for your sprint. These can persist for a long time if your team doesn't come up with a way to address them.

2. Anchors (delaying issues)

An anchor keeps a boat in one spot, and that's why they're the perfect representation of the things that held your sprint back. What caused major bottlenecks or challenges? What inhibited your agile team from making as much progress as possible?

3. Wind (helping teams)

Wind propels a sailboat forward, and that's why it represents what went well with your previous sprint. You'll identify what was quite literally putting wind in your sails. You might also hear this referred to as the helping team.

4. Land (the goal)

Finally, the land is where your boat is headed. Using the sailboat metaphor, it represents your goal or vision for the sprint. It can include both long and short-term objectives for the agile team.

Pre-Work Required by Students:

-To think about their groups' teamwork challenges and opportunities

Teaching Plan (step-by-step plan):

1. Groups

All the students gather into their work/project groups. If there are other key stakeholders for your specific work/project invite them to the retrospective as well. This specific type of exercise really benefits from having different opinions and perspectives. Online: If your team is distributed or remote (as many are these days) you can still perform the Sailboat Exercise. Consider using a great online tool designed specifically to help distributed teams facilitate retrospectives, for example, Miro.

2. Set some ground rules

It's important to set the tone for how you envision your retrospective going. There are a few things that should never be included in any retrospective, and the Sailboat method is no exception.

3. Sketch your Visual

The rough sketch above (in materials) is a pretty standard depiction for this type of retrospective. If you don't want to draw your own, a simple Google search of sample Sailboat Retrospective images can help you find more examples. Your visual should include all of the elements you'll be discussing in order to help facilitate the exercise.

4. Set up your Template

Next, you'll want to set up the template you'll be using to capture your team's thoughts. You can use a white board and post-its for this, but we'd suggest using an easy-to-build online template (like this one) to keep things organized. Add all of the categories you will be discussing to your template. Then, take a few minutes to explain in detail what each category represents.

5. Brainstorming and/or discussion

Once your categories are all laid out on your template, you can either ask your team to quietly brainstorm for each one, or you can hold a group discussion. Really, this depends on the communication style of your team. If you feel it might be better to have team members submit their feedback anonymously, they can write out their notations on post-its and you can gather them before the discussion. Once you have everyone's thoughts and additions, add them to your template.

6. Review

This is the final phase of the retrospective. At this point, you and your team should identify what the biggest successes of your project were and what attributes you'd like to carry forward. Discuss your anchors (obstacles) and brainstorm ways to overcome them. Also discuss ways to mitigate your potential risks (rocks) and how close or far you are from reaching your ultimate goals.

Once everyone is on the same page, conclude your retrospective and move forward with a plan and improved understanding of team performance!

Sources:

https://easyretro.io/templates/sailboat-exercise-sailboat-retrospective/

https://miro.com/guides/retrospectives/how-to-run-sailboat-retrospective#the-4-steps-to-a-sailboat-retrospective

30. The Thing From The Future

Short description of Tool:

The Thing From The Future is an imagination game that challenges players to collaboratively and competitively describe objects from a range of alternative futures. The object of the game is to come up with the most entertaining and thought-provoking descriptions of hypothetical objects from different near-, medium-, and long-term futures. Each round, players collectively generate a creative prompt by playing a card game. This prompt outlines the kind of future that the thing-to-be-imagined comes from, specifies what part of society or culture it belongs to, describes the type of object that it is, and suggests an emotional reaction that it might spark in an observer from the present. Players must then each write a short description of an object that fits the constraints of the prompt. These descriptions are then read aloud (without attribution), and players vote on which description they find the most interesting, provocative, or funny. The winner of each round keeps the cards put into play for that round, and whoever has the most cards when the game ends is declared the overall winner.

Learning outcome (link to competence the tool contributes to a high degree to):

- Anticipatory thinking Competence

Material list:

- The Futurething cards and instructions (attachment)
- The thing from the future -sheet (attachment)

Pre-Work Required by Teacher:

- Print and cut out cards and instructions.
- (optional) Print and cut out playsheets. Make enough copies so that each of your players will be able to play several times.

Teaching Plan (step-by-step plan):

1. Form a group of 2-6 players. Shuffle deck well and deal out one dozen cards each.

2. Starting with the dealer, compose a creative prompt by taking turns placing cards of different "suits" on the table (suits are indicated by the letter at the top of each card). Take turns placing cards until the suit letters on the tops of the cards spell the word, ATOM. A complete prompt has one and only one of each letter. If you can't contribute, draw a card.
3. Give a FutureThing Playsheet to each player and record the four elements of the prompt. Silently produce your own brief description (and sketch if you wish) of your thing from the future. This gets easier as your imagination warms up!
4. When everyone is ready, share future thing ideas with the group.
5. The creator of the group's favorite idea wins the cards in play. Whoever has earned the most cards when play ends wins overall.

Cards:

(A) ARC outlines the type of future world that the "thing" comes from, and how far away it is from today. There are four types of Arc, each an umbrella for countless possible scenarios:

(T) TERRAIN is the thematic context or location where this object could be found in that future.

(O) OBJECT is the focus for your imagination: a specific cultural artifact that reveals something about how this future is different from today.

(M) MOOD suggests how it might feel to experience this thing from the future.

Sources:

http://situationlab.org/futurething-print-and-play-edition/

31. TIMEOUT -dialogue

Short description of Tool:

Timeout training is to increase expertise in the planning and implementation of dialogue-based participatory practices and the capability for constructive discussion in society. It is aiming to help to deepen understanding of different things without pressure for unanimity or quick resolutions. At the same time, they enable you to build trust and participation in the community. Timeout was developed using the methods of co-creation and is intended for open use by everyone wanting to promote constructive discussion. The model consists of tools for planning and facilitating discussions and ensuring their effectiveness. Timeout discussion is always an answer to an identified problem to be examined and resolved through constructive discussion. Such problems could include a polarised discussion culture, domination by the loudest speakers, ineffective participation practices or conflicting opinions.

Learning outcome (link to competence the tool contributes to a high degree to):

- Interpersonal competence

Material list:

- Instructor guide: https://www.sitra.fi/app/uploads/2021/11/timeout-instructors-guide.pdf
- Timeout -cards:
  https://eratauko.s3.eu-west-1.amazonaws.com/production/2020/04/07133946/erataukokeskustelukortiten.pdf

All materials are available at www.timeoutdialogue.fi

Pre-Work Required by Students:

Read and understand the Ground rules of Timeout dialogues:

- Listen to others, do not interrupt or start side discussions.
- Join others' talks and use everyday language.
- Tell about your own experience.
- Address others directly and ask them about their views.
- Be present and respect others and an atmosphere of trust.
- Search and build. Work boldly on emerging conflicts and look for what remains hidden.

Teaching Plan (step-by-step plan):

Attuning into the workshop:

1. Instructions for the students: "What is a safe and inspiring discussion like, and what kinds of experiences do you have of such discussions?"

2. After the pair discussion, each pair introduces themselves to everyone and tells them something essential from their own discussion

Dialogue exercise 1

1. Divide into groups of three people
2. The groups choose one of the following topics: a) autumn b) own relationship to music c) impact of childhood on life Alternative topics: a) vocation, b) democracy and c) ageing.
3. Agree the order in which each group member acts as a facilitator for 10 minutes
4. Start the discussion, the instructor says when the facilitator changes
5. Wrap-up: 1) what was it like to be a participant in dialogue? 2) what was it like to practise facilitation? If there is time, you can have another dialogue exercise right after the first one, with more time for preparation and planning. Objective: the participant understands the importance of dialogue preparation and the different phases (attuning, having and deepening the discussion and ending).

Dialogue exercise 2

1. Stay in the same groups of three

2. Choose another topic for discussion than the one used in the last round from the list above.
3. Distribute roles among the three people. One picks attuning to discussion (card "Attuning to equal discussion"), one deepening (card: "How to deepen the discussion") and one ending (card: "Ending the discussion"). Ask the participants to read the card and plan the phase of discussion for which they are responsible for a while.
4. Each one facilitates the discussion for 10 minutes in the following order;
    a. attuning, 2) deepening the discussion and 3) ending the discussion.
5. Wrap-up: how did this discussion differ from the first exercise?

Dialogue exercise 3

1. The teacher assigns a challenging topic or lets the participants pick one: Examples: - Future threats - Social inequality - Worsening state of the environment
2. Select the facilitator who gets the cards to use
3. Have a longer dialogue on the topic
4. Wrapping up the exercise: a) what was the discussion like from the point of view of dialogue? b) how did the facilitator's actions influence the discussion?

Longer workshop: IMPLEMENTATION: INTRODUCTION + CASE EXERCISE

Divide the participants into groups of 3–6 people and hand out the assignment for working the case. If there is a minimum of 1 hour for the work, you can assign all of the following tasks. If there is less time, it is appropriate to only have the participants complete the discussion planning template.

Assignment for the case exercise:

1. Read the case through
2. Discuss the thoughts that the case arouses. What kinds of problems are being solved and what kind of discussion is needed?
3. Start filling in the discussion planning template, discussing it in order one box at a time
4. Discuss who should take part in the discussion and how the invitation process will be realised
5. Present the finished plan with key highlights to the other members of the group – how did you set out solving the case and what were the key insights. 5 min per group.

Sources:

- Timeout -guide, Sitra (2021)
- Lindgren Helde, Mette (2012). The Dialogue Handbook – the art of conducting a dialogue and facilitating dialogue workshops. DUF – Danish Youth Council and Danish Centre for Conflict Resolution online publication.
  http://duf.dk/uploads/tx_tcshop/DialogHaandbog_UK_new.pdf

33. The Triple Layered Business Model Canvas

Short description of the tool:

The Triple Layered Business Model Canvas is a tool for sustainable business model innovation, and it can be used to 73isualize existing business models (Joyce & Paquin, 2016). This business model canvas is based on the original business model canvas by Osterwalder & Pigneur (2010), but with two added layers: one environmental layer based on a lifecycle perspective and a social layer based on a stakeholder perspective (Joyce & Paquin, 2016). These three layers show how a business can generate different values: economic, environmental and social (Joyce & Paquin, 2016).

The economic layer can help users to align profit and purpose towards sustainability (Osterwalder & Pigneur 2011; Joyce & Paquin, 2016). However, critics argue that the economic layer is mostly focused on creating a profit, and they emphazise the need for other tools to create more sustainable business models (Joyce & Paquin, 2016).

The TLBMC provides businesses with a triple bottom line perspective to sustainability by adding two more layers to the canvas, the environmental and the social layer. This way, helping businesses to explicitly integrate economic, environmental, and social value into a holistic view for corporate sustainability (Joyce & Paquin, 2016).

Learning outcome (link to competence(s) the tool contributes to a high degree to):

- Normative competence
- System thinking competence

Material list:
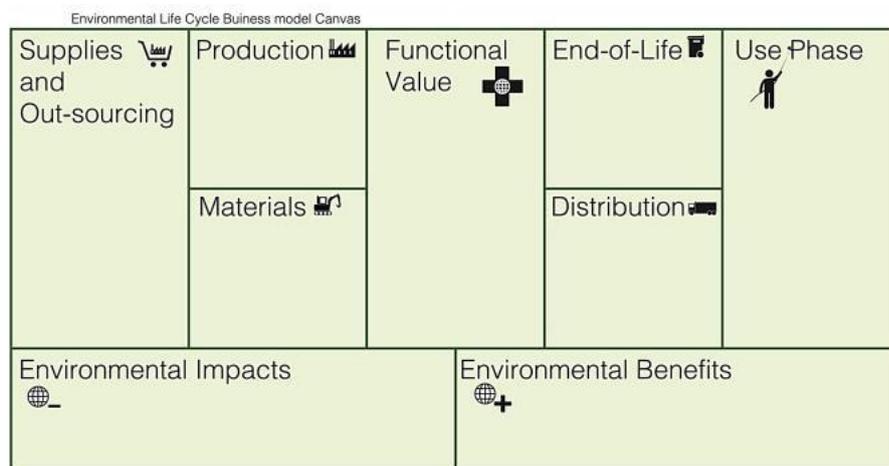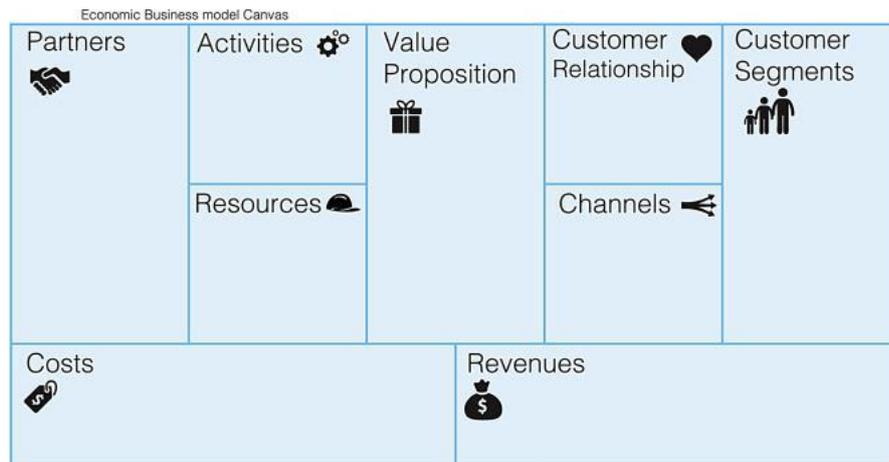
Online or printed versions of the canvas.

Pre-Work Required by Teacher & Students:

Students should learn about the original business model canvas before using it in their projects.

Teaching Plan (step-by-step plan):

The Triple Layered Business Model Canvas can be used in the same way as the original Business Model Canvas. The difference is that they need to use all three layers instead of only using the economic layer. The best way is to start with the economic layer, followed by the environmental and social layer. All three layers can be completed in the same way, and they all consist of 9 building blocks.

Triple Layered Business Model Canvas

Economic Business model Canvas

Partners	Activities	Value Proposition	Customer Relationship	Customer Segments
	Resources		Channels	

Costs	Revenues

Environmental Life Cycle Buiness model Canvas

Supplies and Out-sourcing	Production	Functional Value	End-of-Life	Use Phase
	Materials		Distribution	

Environmental Impacts	Environmental Benefits

Social stakeholder Buiness model Canvas

Local Communities	Governance	Social Value	Societal Culture	End-User
	Employees		Scale of Outreach	

Social Impacts	Social Benefits

Sources:

Joyce, A., & Paquin, R. L. (2016). The triple layered business model canvas: A tool to design more sustainable business models. Journal of cleaner production, 135, 1474-1486. https://www.sciencedirect.com/science/article/pii/S0959652616307442

Lüdeke-Freund, F. & Dembekde, K. (2017). Sustainable business model research and practice: Emerging field or passing fancy? Journal of Cleaner Production, 168.

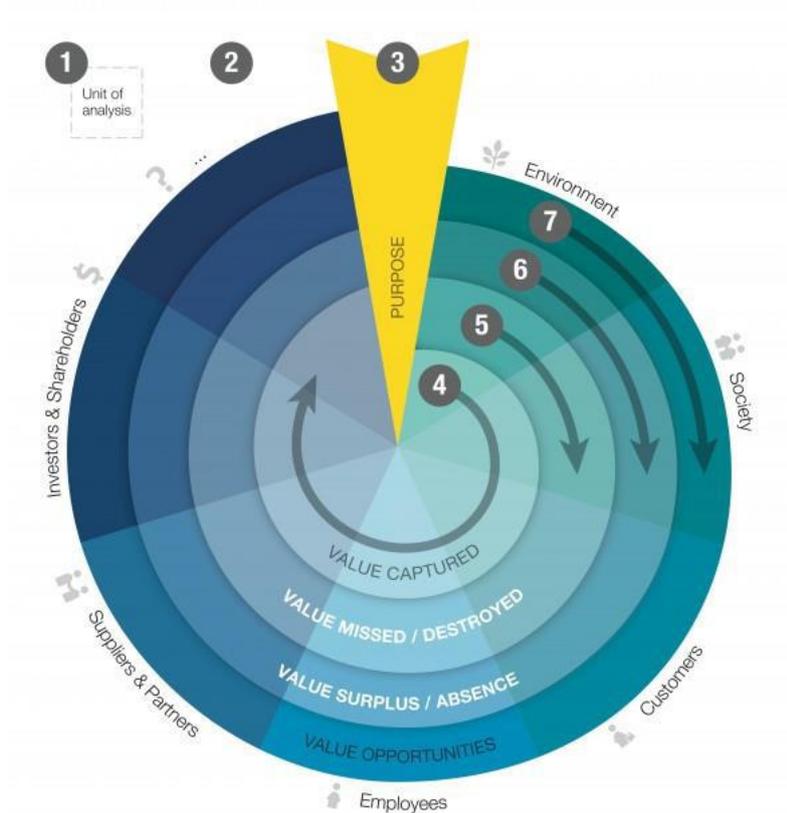Value mapping

Short description of Tool:

The Cambridge Value Mapping Tool provides companies with different stakeholder perspectives and a network-centric rather than firm centric perspective on value. It facilitates an analysis of the current value proposition; the value being destroyed, wasted, and missed; and new value opportunities for a range of possible units of analysis. In the circular value mapping tool, pie slices represent stakeholder groups and rings represent different forms of value (e.g., missed, destroyed). The tool is intended to facilitate the creation of sustainable value for firms within their existing business models (Bocken et al., 2013).

Material list:

- Value mapping tool
- Value Mapping Tool explained (Youtube video, case: Nespresso)

Pre-Work Required by Students or teacher:

● Deciding the company which use to make the analysis

Teaching Plan (step-by-step plan):

Students respond to each question about their company and place it on the map. The Value Mapping Tool takes you in a guided step-by-step process through the following questions:

1. What is the unit of analysis eg product, service, company, industry?
2. Who are the stakeholders for the unit of analysis?
3. What is the purpose of the unit of analysis?
4. What is the current value captured?
5. What is the value missed and/or destroyed?
6. What is the value surplus and/or absence?
7. What are the new value opportunities?

Sources:

Bocken, N., Short, S., Rana, P., & Evans, S. (2013). A value mapping tool for sustainable business modelling. Corporate Governance, 13(5), 482-497

The Cambridge Value Mapping Tool - Institute for Manufacturing (IfM).

References

Fauske, I. M., Verhulst, E., Wigger, K., Solvoll, S., & Jakobsen, S. (2023). Teaching entrepreneurship for sustainability – A review of educational tools (work-in-progress).

Ploum, L., Blok, V., Lans, T., & Omta, O. (2018). Toward a validated competence framework for sustainable entrepreneurship. *Organization & environment*, *31*(2), 113-132.

Schadenberg, D., Long, T., & Folmer, E. (2021). *Systematic literature review: Report for Teaching Entrepreneurship for Sustainability (TES) Work Package 1*.