



SUSTAINABLE INNOVATION

A DESIGN THINKING PROJECT

Janneke Koorn

Felipe Perez de Arce Inostroza

Matt Decovsky

Turi Schäffer



Sustainable Innovation Project

Lesson description

The sustainable innovation project challenges students to develop their own sustainable product or idea using the design thinking cycle. They have to work together in teams to identify local problems concerning climate change and come up with ideas to solve those problems. Subsequently, in teams the students will work out one idea, make a prototype, test it with the audience (advanced) and pitch it to their peers. Students are also free to tackle any issue ranging from global to local problems.

Domain: Nature, Life and Technology (NLT), Environmental systems and societies (IB DP), interdisciplinary

Topic: Developing a sustainable innovation, product or startup idea.

Level: Extra-curricular project for any level and year / Advanced: HAVO 4, VWO 4, IB DP, BTEC Business Programme and higher

Time: 4 lessons + 4 hours homework

Connects to: Sustainability, entrepreneurship, teamwork, autonomous-learning, design thinking, prototyping.

Connects to exam programme:

- Nature, Life and Technology (NLT) (Dutch VWO exam: A1, A6, A13, B1, C2)

Pre-knowledge: There is no specific set of pre-knowledge required for this project. Students are free to choose a problem that is in their interest and that they are familiar with or want to learn more about.

Learning goals

Main goal: Develop an idea for an innovation that contributes to a more sustainable planet.

Specific goals

Students will:

- Become aware of (local) environmental problems.
- Get acquainted with (local) sustainable innovations, entrepreneurs, projects etc.
- Develop a sustainable concept that solves a problem related to climate change using design thinking:
 - Empathize with the target audience
 - Define the problem
 - Brainstorm and ideate for solutions
 - Create a prototype
 - Evaluate the prototype with the target audience or expert
- Explain how the idea contributes to a more sustainable future.
- Pitch the idea.

Materials

- ECCC E-book and website
- Sustainable innovation lesson plan
- Design thinking worksheet
- Access to internet for the students
- Prototyping tools (such as pens, papers, posters, Adobe Suite etc.)
- Sticky notes
- Screen to show video

Detailed lesson plan

1. Lesson 1: introduction to design thinking

1.1 Student preparation (homework)

The students are required to search for at least 2 sustainable innovations which they consider inspiring initiatives (individual assignment). Per innovation, the students have to describe in less than 250 words:

1. Why they have chosen that innovation
2. What problem the initiative is trying to solve
3. What the mission and vision is of the people behind the innovation
4. What makes this initiative unique

1.2 Inspiration (20 min.)

In the first lesson, the students will get to know existing sustainable innovations and projects by looking at the examples that they have collected. Students will be asked to share interesting finds from their preparatory work with the rest of the class or in smaller groups. This activity is held to inspire the students before they start on their own innovations.

1.3 Introduction to design thinking (15 min.)

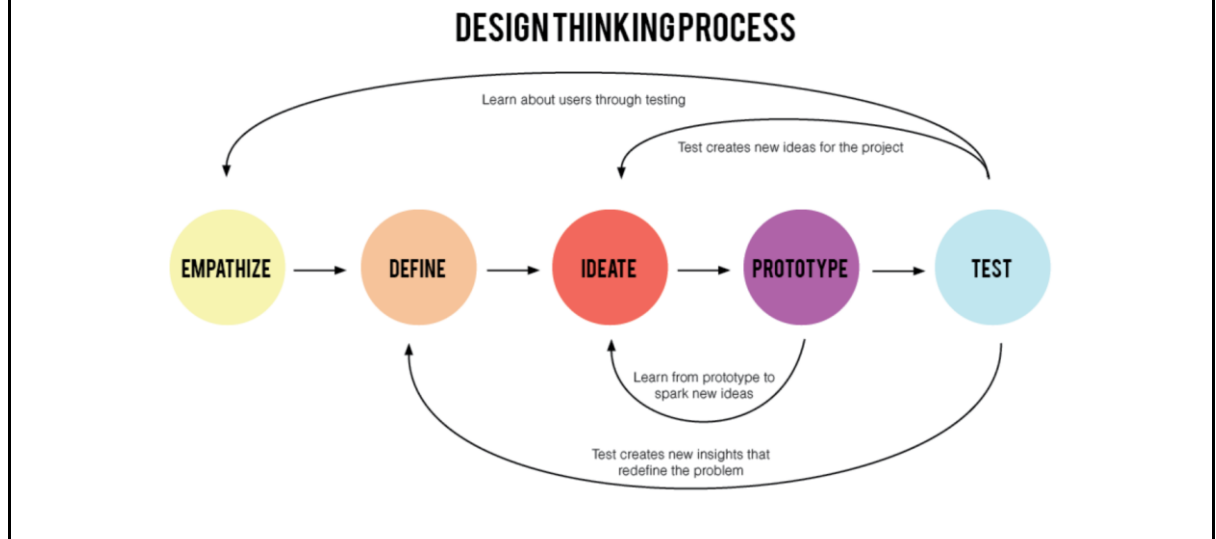
The steps of the design thinking strategy will be used by the students throughout the project. The students are introduced to design thinking with the following video:

https://www.youtube.com/watch?v=w0afmCPpjws&ab_channel=Protellus

After showing the video, the teacher hands out the worksheet and can elaborate on the design thinking process with the following information:

Design thinking is a user-centered design strategy. For sustainable design thinking, not only the user is at the center of the process, the planet is of equal importance. The process starts with understanding the user's needs by talking to them and asking questions. In this step, the empathizing phase, also the needs of the planet are identified. After that the needs are translated into a problem statement. Through brainstorming, ideas and solutions to the problems statement are created. The idea(s) with the most

potential are constructed into a prototype to present the idea to the target audience. The prototype is tested by the original audience and is evaluated on the impact it has on the planet. There are several feedback loops in the design thinking process that ensure that the needs of the user and planet stay at the center of the design.



The teacher makes teams of 3-4 students who will work together during the rest of the project.

1.4 Empathizing with the audience and planet (15 min.)

Step 1 of design thinking is empathizing with the audience and planet. The teacher explains how students can successfully complete this step.

- Talk to friends, family and people around you (general public) or find a niche target group
- Set out a questionnaire or focus group
- Talk to experts
- Follow the news and look for trends
- Identify problems that humans and the planet are dealing with

Examples of questions to ask:

1. What do you think that we and the planet need to battle climate change?
2. What are the biggest problems for the planet right now in your opinion?
3. What aspects in your life do you want to make more sustainable? (e.g. food, clothing, transport, work)

Useful resource: https://www.youtube.com/watch?v=q654-kmF3Pc&ab_channel=MindfulMarks

1.5 Homework

The students have to complete the empathize exercise. They have to talk to at least 4 people from the general public or niche target audience. If the project is held within one day at school, the students can ask fellow students or teachers.

2. Lesson 2: Defining the problem and ideating

2.1 Defining the problem (25 min.)

The students come together in their team to discuss the needs of the people and planet that they have identified. The team chooses the problem that they are most interested in to solve. The problem is defined by answering the following questions:

1. What is the problem?
2. Why does the problem exist?
3. Who is causing the problem and who is affected by it?
4. How is the planet affected by it?
5. When did the problem first occur, or when did it become significant?
6. Where is the problem occurring and on what scale?

The following example can be used to give students more guidance on defining the problem:

1. What is the problem?

Recycling packages is better for the environment than disposing the packages, that's why we have separated waste streams. However, for many packages it is not clear whether it should go with paper, plastic, glass etc. Therefore, many people make mistakes in selecting where their trash should go. This makes it impossible for recycling to become an environmentally friendly solution.

2. Why does the problem exist?

Most people are aware of the benefits of recycling by now. However, for some packages it remains unclear to people in what waste stream the packages belong.

3. Who is causing the problem and who is affected by it?

The general public at home is causing the problem that too many packages end up in the wrong bin. The waste and recycling companies are the most affected by it. They still have to separate 'separate waste streams'.

4. How is the planet affected by it?

Not being able to recycle waste will result in massive piles of trash. Non-recyclable waste either gets burned, buried or ends up in the sea. These are all not eco-friendly options resulting in higher CO2 emissions or the destruction of ecosystems.

5. When did the problem first occur, or when did it become significant?

Ever since recycling has gotten more attention. In the Netherlands people have been used to separating glass and paper for quite a while, but since 2010 plastic has also gotten the attention. A campaign informed people that there are separate bins for plastic, tins and milk cartons.

6. Where is the problem occurring and on what scale?

Throughout the Netherlands, but likely in other countries too.

7. How can this problem potentially be solved?

For information on the packages itself.

Public awareness campaign.

Robot that separates trash.

2.2 Ideate for solutions (25 min.)

After defining the problem, the question "How can this problem potentially be solved?" is raised. A brainstorm session is held to generate many possible solutions. The students write potential solutions on sticky notes and put them in the order of the highest potential to the lowest.

Advanced: Whether an idea has the highest potential can be assessed with the [sustainable SWOT analysis](#).

The role of the teacher during the lesson is to monitor the teams and provide support when needed. By the end of the lesson every team should have a general direction for their innovation.

2.3 Homework

Each team completes the problem definition and the students are allowed to brainstorm for more solutions. At the same time, the ideas have to be narrowed down to the solution with the highest potential. The chosen solution will be the starting point for lesson 3, in which the prototype is made. The students are asked to bring their own prototyping tools, otherwise the tools have to be provided by the teacher.

3. Lesson 3: Prototyping

3.1 Explanation of prototyping (10 min.)

At the beginning of the lesson, the teacher explains what prototyping is and why this step is essential for design thinking. The following video can be used for the explanation:

<https://www.youtube.com/watch?v=Q4MzT2MEDHA>

Prototyping can be done in many ways. However, it is essential that the prototype can communicate the idea to the target audience, fellow students or potential investors. Examples of prototypes:

- New sustainable food product: packaging or even let the audience taste the product.
- Sustainable product: model of paper, glue etc., drawing, computer artwork.
- Sustainable service or project: a poster or video explaining how that would work in practice.
- An app or website: prototype made in Photoshop, Adobe XD, Paint or even with pieces of paper.

3.2 Creating a prototype (30 min.)

The students get time to work on the prototype of their idea in their team.

While students are working on their prototype, the role of the teacher is to provide feedback on the problem statement and suggested solution. Furthermore, the teacher has to ensure that the students know how to continue and what kind of prototype is suitable for their idea.

3.3 Introduction to testing (10 min.)

Testing happens after prototyping (but is not the last step because design thinking is a cyclic process).

The students are introduced to testing at the end of the lesson with the following video: <https://www.youtube.com/watch?v=UVEQCNM6X-A&t=0s>

3.3 Homework

The teams have to finish the prototype. After that, they have to go back to their target audience and ask them what the target audience thinks of the innovation. The suggested questions to ask the target audience:

- What does the user think of the idea?
- What does the user like about the idea?
- What does the user think needs improvement?
- Is the user likely to use this in his / her daily life?
- Does the idea solve a problem related to sustainability?

With the answers the students are able to formulate improvements for their design. They are not required to implement these changes. The students have now experienced a first loop of the design thinking cycle.

4. Lesson 4: Pitches

4.1 Preparing the pitches (25 min.)

The lesson starts with instructions on how to give a good pitch. The teacher shows the 7 steps on the board so that the students have a framework to prepare their pitch.

Pitch framework

1. Introduction that attracts attention
2. Problem identification
3. Proposed solution (your team's idea, service or product, show the prototype!)
4. Strengths of the idea and why people/the world should want it. What differentiates your idea from existing ideas?
5. What did you learn from the evaluation?
6. What are the ambitions for the future for your team and innovation?

7. End with a catchy closing statement

The students prepare their pitch in the remaining time.

4.2 Pitches (25 min.)

Every team (one person per team) pitches in front of the class.

4.3 Homework

The students can finish the worksheet, prototype and evaluation and hand the materials in at the beginning of the following lesson.

Assessment

The students can be assessed based on the worksheet, prototype and pitch. Depending on the course the project was linked to a suitable assessment can be chosen.

Note: If the lesson plan is not spread over multiple days, but finished as a one-day project, it is advised to let the students do the preparatory work before starting the project and skip the target audience evaluation. The tools to create a prototype are to be provided by the teacher.