Practical example cards

The practical example cards provide practical examples for specific learning content and teaching methods and can serve as inspiration for applying ecodesign in one's own programme. Each card succinctly describes the practical example, the learning content provided, development of competences, the applicable teaching methods, possible points of attention and refers to the programme to which the example is applied.

Overview of practical example cards

Practical example cards

The core of competence-guided education is that all teaching activities contribute to graduates being able to act competently in their later profession on the basis of thorough professional knowledge.

Developing a competence occurs according to a holistic approach on four levels:

- You acquire knowledge with your memory: ‘What you know’.
- Acquiring insight occurs with understanding: ‘What you understand ’.
- You use your hands to acquire skills: ‘What you can do’.
- You form an attitude with your heart: ‘What you are’.

These 4 aspects of the competences are presented in the practical example cards by icons. Those aspects that are less present in the example are shown in a lighter font.

Knowledge Insight Skills Attitude

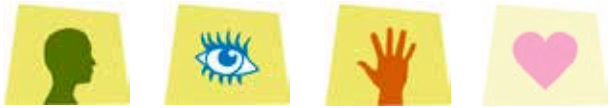
The Practical example cards are also available at: www.ecodesignlink.be/en/tools.

Analysis of environmental impact of product materials

Description of example

In the training component concerning sustainable materials, the students perform a project regarding a certain product, e.g. a refrigerator or freezer. They determine the environmental impact of the product by examining which materials and how much of which it contains. Using the eco-points method, they can also calculate the environmental impact of the materials (Eco indicators available at: *www.ovam.be/ecodesignlink/en*, under Ecolizer 2.0). The use and reuse of materials throughout the entire life cycle of the product are also analysed.

Based on this analysis, the students propose an improved, less environmentally harmful appliance.



EX.1

Learning objectives

- Learning to determine the environmental impact of materials using the eco-indicators method
- Analysing the life cycle of the product
- Learning to apply ecodesign tools: eco-indicators method

Learning content

LC. 12 Materials and the environment

Prior knowledge and skills required

Knowledge of sustainable materials, pointed out in the course component: sustainable materials.

Result and evaluation

Report with environmental impact of materials in the existing appliance with the help of the eco-indicators method + proposal for improvement: a less environmentally harmful appliance.

Already applied by

The Department of Materials and Chemistry (MACH), Faculty of Applied Sciences, Free University Brussels, Course: Environmental technology and sustainable materials (1Ba)

Contact: *Prof. Hubert Rahier - hubert.rahier@vub.be*

Info course: *https://caliweb.cumulus.vub.ac.be/caliweb/?page=course-offer&id=003106&anchor=1&target=pr&language=nl&output=html*

Teaching methods used

TM. 6 Group work, TM. 9 Assignments

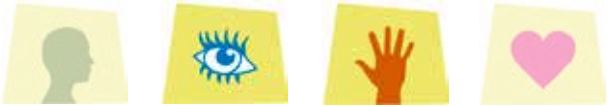
Product-service system + business model

Description of example

The students are divided into groups and each group analyses a product that could be reinforced by offering it in combination with a service. The students themselves select a product from their own environment. For instance, a TV, computer or lawnmower.

Brainstorming product-service systems: by means of a brainstorming session in small groups, they consider and discuss the possibilities and limitations of product-service combination. Based on the brainstorming session, they summarize these possibilities and limitations and examine specific design criteria: what must be adjusted and supplemented to the current product and the surrounding system in order to arrive at a successful product-service combination?
Brainstorming business models: by means of the business model canvas (available at www.businessmodelgeneration.com/canvas), they link proposals for product-service combinations to possible business models. In doing so, the students must consider the various elements within the system for offering the product-service combination, and how these can fit within a company's business model. This brainstorming exercise also takes place in small groups.

The results are presented in class to the other groups, with the possibility of reflection and further discussion of the proposals.



EX.2

Learning objectives

The students gain insight into the substantial aspect and the systematic overview of the product-service combination, as well as applying knowledge of business models.

Learning content

LC. 13 Product-service combinations, Sustainable business models

Prior knowledge and skills required

- Insight into business models: objective, content and approach
- Prior experience with brainstorming exercises can simplify the session, but are not necessary.

Result and evaluation

Results of the brainstorming session in the form of a broad spectrum of ideas for product-service combinations and the business models that they support in the form of a developed proposal for a product-service combination linked to a business model.
Evaluation may occur on the basis of active participation in the workshop, although this is not always easy to monitor (depending on the size of the group). In addition, the students may also be asked to further develop (in group) one of the ideas from a brainstorming session: a product-service combination with an appropriate business model. The result is a group report containing the developed proposal for the idea selected. Students can be evaluated on this.

Teaching methods used

TM. 2 Brainstorming, TM. 3 Case method, TM. 6 Group work

Self-reflection on sustainable behaviour

Description of example

Successful work on ecodesign within higher education is only possible if the students themselves are aware of the need for more sustainable development. To this end, reflection on one's own behaviour and the extent to which this is sustainable may constitute an important turning point. This activity serves to encourage students to think about how issues related to sustainability are embedded in our daily activity and how this is related to our behaviour. Students are asked a variety of questions about their own behaviour in everyday life. By means of self-reflection they become aware of their own impact on the environment, their surroundings, social relations, etc. Possible questions:

- Are electronic appliances such as the TV or computer on stand-by?
- Do you take a bath or a shower? How long do you shower?
- What did you eat for lunch (meat, fish, vegetarian; self-prepared, pre-prepared ...)?
- How did you get to school?
- Have you bought anything in the last few days? What purpose does the product serve? Where is it manufactured?
- Have you thrown anything away today? What? Why? What do you think will now happen with that discarded product?

The students discuss these questions in groups of two for 15 minutes. The answers are then collated and discussed by the teacher. The next step in the discussion is calculating the ecological footprint, CO emissions or the environmental impact for one or a few of the questions (*www.ecolife.be* and *http://footprint.wwf.org.uk/*).

EX.3

Learning objectives

Giving the students insight into and increasing awareness about their own behaviour and how this may or may not fit with the principles and ideas concerning sustainable development and ecodesign. This technique is a good method for the initial discussion of sustainability, but can also serve as an activity to be repeated if students forget to think integrally.

Learning content

LC. 2 Ecodesign tools (Ecological footprint, CO emissions and calculating environmental impact),
LC. 8 Introduction to ecodesign

Prior knowledge and skills required

No prior knowledge of sustainable development or ecodesign required. The ability to reflect on one's own behaviour may simplify the exercise.

Result and evaluation

In this example, the main objective is to increase students' awareness about their own behaviour, whether sustainable or not. Calculating the ecological footprint and the environmental impact are methods for increasing these insights, but are not the objective itself. In this example, the evaluation of growing awareness is not an objective in itself.

Teaching method used

TM. 8 Educational discussion

Sustainable consumer behaviour

Description of example

By means of a case study, an existing product for which consumers often display non-ecological or non-sustainable behaviour, the students will examine in a group how they, as designer, engineer ... can influence the behaviour of consumers. Each group receives its own product.

The assignment consists of several components: analysing the existing consumption pattern and consumer behaviour for the specific product, but also, in a broader context, making an analysis of the actions in a certain environment and situation (e.g. taking a bath, doing the laundry, boiling water) within a specific culture. The result of this analysis forms a starting point for determining behaviour that must be changed in order to arrive at sustainable consumer behaviour. Then a brainstorming session is held in the group, or among the various groups, whereby the students search for different ways to achieve the change in behaviour. From this brainstorming session, one method is selected per group for changing and making consumer behaviour sustainable for the group's product. This is further developed into a concept for a new design.

A specific example of a product for which consumers display non-sustainable behaviour is an electric water boiler: how can the design of a boiler be adjusted so that the consumer heats the correct amount of water and does not again turn the boiler on again if the water is not hot enough.

EX.4

Learning objectives

Obtaining insights into consumer behaviour for a specific product in its context:

- Learning to analyse existing behaviour patterns and learning to distil and formulate the sustainable behaviour desired;
- Formulating ideas for improving and adjusting the current pattern of behaviour to more sustainable behaviour;
- Developing an idea for more sustainable usage of a product into an improved and more sustainable product concept;
- Working in a group.

Learning content

LC. 7 Consumer behaviour

Prior knowledge and skills required

The ability to conduct a group brainstorming session independently.
Basic knowledge concerning sustainable consumption.

Result and evaluation

A file is submitted for each group containing the analysis and synthesis of current consumption, a report of the brainstorming session and the ideas generated, and an elaborated concept for a change to more sustainable behaviour and consumption of the product.
The system of peer review can be used for the internal functioning within the group, such that students can mutually evaluate one another.

Teaching methods used

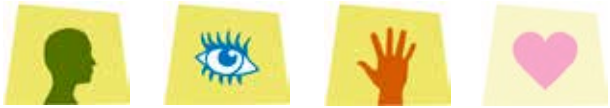
TM. 2 Brainstorming, TM. 6 Group work,
TM. 9 Assignments

Ecodesign and Life Cycle Engineering

Description of example and learning objectives

Master course (in English) concerning ecodesign and life cycle engineering.
Complete programme at: *onderwijsaanbod.kuleuven.be/syllabi/e/H00O3AE.htm*

The learning objective is to achieve greater awareness concerning the consequences of design decisions on the ecological impact during the entire life cycle of a product. Ultimately we would like to educate engineers that are aware of their influence on the environment and that are capable of making their contribution to sustainable use of the raw materials available. The continuous considerations between marketing and technological possibilities are hereby not lost from view. Thorough understanding of the business-economical life cycle of a product and the costs, as well as the derivative business models are crucial to guarantee the cost effectiveness of an enterprise and therefore constitutes the final objective.



EX.5

Learning content

Almost all of the themes: introduction to ecodesign, life cycle thinking, closing cycles, CSR, ecodesign tools, materials, packaging and distribution, consumer behaviour, energy and resources, end of life cycle, systems thinking, effects of the environmental issue, legislation concerning ecodesign and ecolabels.

Prior knowledge and skills required

The student has a strong scientific background, preferably engineering. The course is not specifically affiliated with a degree programme, but is rather supplemental to programmes aimed at developing new products. The substance of the final assignment can be adapted to the programme of the student. It is advisable to follow the course at a late stage of a Master's programme so that the lack of technical knowledge does not form an obstacle for conducting case studies or successful completion of the final assignment.

Result and evaluation

Assessment based on a written report and an accompanying presentation with questions concerning a final assignment to be developed: an in-depth LCA study or ecological comparison of two alternative products and their life cycle.

Already applied by

Faculty of Engineering Science, KU Leuven
Contact: **Prof. Joost Duflou** - *joost.duflou@mech.kuleuven.be*

Teaching methods used

TM. 1 Activating lecture (12x2hrs),
TM. 9 Assignments w.r.t. detailed manual (2x2hrs)

Interdisciplinary class on sustainable development

Description of example

This series of classes approaches the concept of sustainable development from several perspectives:

- Introduction to sustainable development: what, why, indicators, eco-efficiency indicators, support for consumers and manufacturers;
- Overview of environmental issues and contributions from various sectors;
- Sustainable development: recent developments in (supra) national environmental and energy law;
- Sustainable products: life cycle analysis and ecodesign;
- Sustainable energy;
- Sustainable living;
- Sustainable production and waste treatment;
- External costs, applied to transport;
- Life cycle management.

The content of these presentations are adjusted annually to recent relevant developments. In addition, a lesson is reserved for guest speakers from the industry.

EX.6

Learning objectives

This course will give the students insight into the necessity, complexity and possibilities of sustainable development from several perspectives.

Learning content

Almost all of the themes, including : introduction to ecodesign, life cycle thinking, closing cycles, CSR, ecodesign tools, materials, cleaner production, packaging and distribution, consumer behaviour, energy and resources, end of life cycle, systems thinking, effects of the environmental issue, legislation concerning ecodesign and ecolabels.

Prior knowledge and skills required

No specific prior knowledge is required.

Result and evaluation

Written, closed-book exams based on essay questions. Each teacher gives a few sample questions at the end of his class. In the exams, students receive three clusters of three questions from different classes. They address those from one cluster of their own choosing. Individual teachers correct the questions.

Already applied by

Faculty of Engineering Science, KU Leuven

onderwijsaanbod.kuleuven.be/syllabi/n/H04M8AN.htm

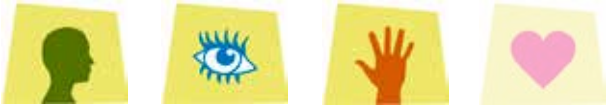
Teaching method used

TM. 1 Activating lecture (10x2u), taught by specialists in the field for each theme.

Ecological investigation of production processes

Description of example

Inventory, analysis and improvement of the ecological impact of production processes. The student is assigned to analyse the input and output of energy, raw materials and process emissions of a certain process



EX.7

Learning objectives

The objective of this investigation is threefold:

- Documenting all process input and output: energy, raw materials and process emissions.
- Quantifying and analysing the environmental impact of the processes investigated.
- Identifying potential ecological improvements to these processes.

Learning content

LC. 14 Cleaner production, LC. 6 Energy and resources, LC. 3 Ecolabels, LC. 2 Ecodesign tools

Prior knowledge and skills required

The student preferably has a strong scientific background in production processes. Method for systematic inventory of production processes is available at:

Kellens, K. et al., 2012, Methodology for systematic analysis and improvement of manufacturing unit process life-cycle inventory (UPLCI) – CO2PE! Initiative, Part 1: Methodology description, Int J Life Cycle Assessment, 17/1:69-78.

Result and evaluation

Assessment based on a written report and accompanying presentation with questions concerning a final assignment to be developed.

Already applied by

Faculty of Engineering Science, KU Leuven

Contact: **Ing. Karel Kellens** - *karel.kellens@cib.kuleuven.be* or **Prof. Joost Duflou** - *joost.duflou@mech.kuleuven.be*

Examples: CO2PE! - *www.co2pe.org*

Teaching method used

TM. 11 Project education: Thesis (Bachelor's thesis, Master's thesis)

Applied environmentally-oriented design

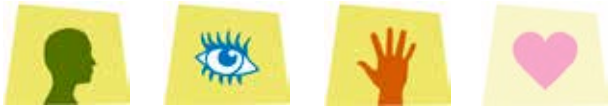
Description of example

This example describes a course that is organised around the theme, ‘applied environmentally-oriented design’. Within the course, knowledge about several sub-themes is offered, after which the students must apply this knowledge in a disassembly and redesign assignment that focuses on environmentally-oriented improvements to the design.

8 sessions are offered, each of 1h 45, 7 sessions of which with activating lectures and 1 practical disassembly session. The learning content covered in the activating lectures is:

- Introduction to course and topics, perspective of designer, perspective of companies, themes linked to stakeholders
- Foundation of applied ecodesign + organisation
- How to lower the energy consumption of products
- How to deal with the use of materials and related topics
- Guest lecturer: the value of operational language + concepts for environmental protection
- Collection and recycling
- Packaging and transport

In the practical dismantling session, a product is dismantled and analysed by the group. This forms the input for the redesign and redefinition of the value of the product.



EX.8

Learning objectives

Mastering the skills of environmentally-oriented design and obtaining insights into the environmentally and business-oriented value chain.

Learning content

LC. 4 Effects on people and environment, LC. 5 End of life cycle, LC. 6 Energy and resources, LC. 8 Introduction to ecodesign, LC. 10 Life cycle thinking, LC. 17 Packaging and distribution

Prior knowledge and skills required

Basic knowledge of design. Has the ability to cooperate with other students.

Result and evaluation

Assessment based on the final report, based on knowledge from all lectures and applied in dismantling session, analysis and indication of improvement options for the product analysed.

Already applied by

Elective in the Master programme in Industrial Design (2006) - TU Delft

Teaching methods used

TM. 1 Activating lecture, TM. 6 Group work, TM. 9 Assignment

Sustainability and design in companies

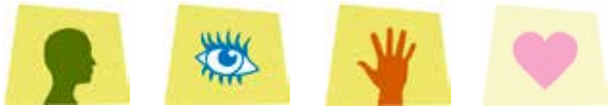
Description of example

Environmental and sustainability problems in a business environment are more extensive than the application of tools for ecodesign. The course, 'Sustainability and design in companies' strives to provide insight into the way in which companies manage the internal and external value chain. Several themes are offered as learning content within this course, each time with one theme per lesson. The learning content is immediately tested for practical applications. For this, sustainability reports from four companies on different continents serve as the basis.

The students prepare for each lesson by making a comparative analysis of the four sustainability reports on the theme of the next lesson. This occurs in the form of a thesis that the student formulates, based on personal analysis and with justification and argumentation for the thesis.

Each lesson, two to three students are invited to present and defend their thesis (approx. 3 minutes). This is followed by a discussion starting from the theses and oriented to the theme of that week (15-30 min).

The remaining class time is completed with an activating lecture on the same theme and allows room for interaction and questions.



EX.9

Learning objectives

• Obtaining insight and knowledge about various learning contents concerning sustainability within a business context;
• Critical analysis and comparison of sustainability within a business context and synthesising into a supported vision.

Learning content

LC. 11 Corporate Social Responsibility (CSR), management of the supply chain, green marketing, perspectives of various stakeholders and new themes concerning sustainability and corporate social responsibility.

Prior knowledge and skills required

Basic knowledge about ecodesign.
Debating and discussion skills.

Result and evaluation

Each lesson, the student makes an individual analysis and synthesis in the form of a thesis about the theme of the next lesson + argumentation about this thesis. The evaluation occurs on three levels: 1) weekly preparation, 2) participation in discussions, and 3) an individual, final assignment. In this assignment, the student must draft an official letter to one of the four companies studied, with an evaluation of the sustainability report (general impression of report, strong and weak points in comparison with sustainability reports of other companies, at least 10 suggestions for improvement of sustainability report).

Already applied by

Elective in the Master programme in Industrial Design (2007) - TU Delft

Teaching methods used

TM. 1 Activating lecture, TM. 5 Discussion, TM. 9 Assignments, TM. 12 Socratic method

Learning from the past

Generating sustainable solutions by reflecting on the past

Description of example

One who considers creativity and innovation will almost immediately keep in mind the most high-tech solutions. It can also be otherwise. Based on interesting and not always known examples, first a number of creative solutions for everyday problems are presented, which are based on fundamental principles that were discovered hundreds of years ago.

What did the world look like before the industrial revolution?

Based on a brainstorming session, an image is formed of everyday consumer activity. The focus is on environmentally harmful activities. The students are then divided into small groups. Each group is responsible for one 'environmentally harmful activity'.

Each group now looks at how consumers used to conduct the activity and/or whether there were similar activities that people realised easily. Then the challenge for each group is to rework or rethink current activities with age-old principles

EX.10

Learning objectives

Becoming aware that technology is not the only way to make the transition to a sustainable society. Systems thinking is stimulated among the students. Dealing creatively with principles and translating them to current products.

Learning content

LC. 15 Systems thinking, LC. 16 Future thinking

Prior knowledge and skills required

No prior knowledge required.

Already applied by

Artesis University College Antwerp,
Product Development programme
Contact: **Karine Van Doorsselaer** - *kvdoors@skynet.be*

Useful info: Kris de Decker, author from Lowtech Magazine

Teaching methods used

TM. 1 Activating lecture, TM. 2 Brainstorming, TM. 6 Group work

Debate on depletion of raw materials

Description of example

By setting up a debate according to the Socratic method of conversation, awareness is created about the depletion of raw materials, the limits to natural resources and how to deal with this.

Example thesis: should we be economical with our raw materials or may we assume that if a raw material is exhausted, mankind is intelligent enough to anticipate this.

Some time before the day of the debate, the students are assigned to study the exhaustibility of materials. In the debate, the moderator (teacher) asks the students a variety of questions with divergent positions in order to arrive at an animated, considered and instructive debate.
Thorough preparation concerning the proposed thesis is required by means of independent study and/ or processing of information provided.

EX.11

Learning objectives

The student is stimulated to systems thinking, is encouraged to form her own opinion and is capable of debating about this (articulate, interpret and process arguments).

Prior knowledge and skills required

No prior knowledge required.

Teaching method used

TM. 12 Socratic method

Learning content

LC. 12 Materials and environment
LC. 15 Systems thinking
LC. 16 Future thinking

Future thinking by back-casting

Description of example

Using the backcasting method, we will backcast from a desired image of the future. A future image could be to close cycles by 100% by 2050. The future image is outlined clearly and, depending on the time available, you consider a specific product or think more generally. On the basis of questions, the students construct an argument about which necessary changes are required in the current economic context and what their role is in achieving this future image as a professional and citizen.

The final result of backcasting is a strategy for a sustainable image of the future.

EX.12

Learning objectives

The students learn systems thinking and become aware of their own role in the transition to a sustainable society.

Learning content

LC. 9 Closing cycles
LC. 10 Life cycle thinking
LC. 15 Systems thinking
LC. 16 Future thinking

Prior knowledge and skills required

Basic knowledge of materials and techniques, recycling possibilities and limitations ... in short, the life cycle of current products and insight into the current economic models.

As the start of the educational discussion, the film ‘The story of stuff’ may be shown.

Teaching methods used

TM. 5 Discussion, TM. 8 Educational discussion

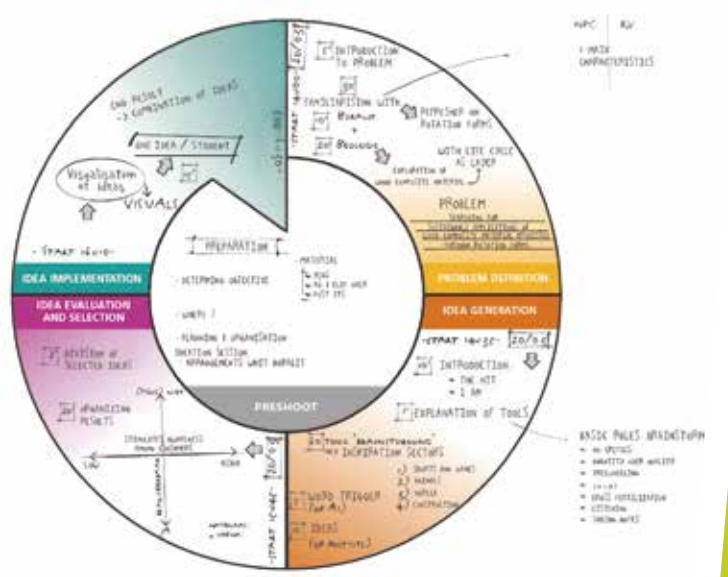
Generating sustainable solutions

Description of example

In collaboration with companies, we generate sustainable solutions and alternatives for existing or related products that belong to the core of the company.

The techniques used for the brainstorming session are included in the tool, 'Idea to Market', a very convenient and usable tool developed at Artesis University College Antwerp, Product Development programme.

The diagram at the right shows the approach to the brainstorming session at the Boralit company, which intends to create sustainable products from PE + wood fibres using rotation forms.



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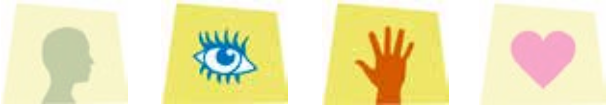


EX.13

Learning objectives

The students learn the techniques of brainstorming and learn the ideas generated with a view to estimating sustainability.

Learning content

LC. 2 Ecodesign tools, LC. 10 Life cycle thinking

Prior knowledge and skills required

For the evaluation of the ideas generated, knowledge about life cycle thinking is required so that one can estimate whether or not ideas are sustainable.

Already applied by

Artesis University College Antwerp,
Product Development programme
Contact: **Karine Van Doorsselaer -** *kvdoors@skynet.be*
More info re. Idea-to-market at:
designresearch.be/?page_id=140

Teaching method used

TM. 2 Brainstorming

Critical approach to the environmental impact of materials

Description of example

During the lesson on sustainable materials, after the discussion of the theory about the eco-indicator values, follows a brief inquiry in which materials are compared. The student searches for the respective eco-indicators, investigates which materials score better and offers a critical approach about this conclusion. For instance, the student considers the raw materials used for the materials, the application of the materials to products (focus on the use phase), its current potential for recycling ...

After some 10 minutes, a number of students are asked their opinion. In the discussion that follows, the student learns that the environmental impact of a material is not unambiguous good or bad.

The teacher leads the discussion and, immediately or in the next lesson, zooms in on the reservations mentioned, depending on the time available.

EX.14

Learning objectives

Learning to determine and interpret the environmental impact of materials with regard to the eco-indicator method; learning to think critically.

Learning content

LC. 12 Materials and environment

Prior knowledge and skills required

Knowledge about materials and recycling possibilities, ability to establish the relationship between materials and products.

Result and evaluation

Discussion of a number of considerations. Evaluation is not necessary. The teacher can screen the active participation of the students.

Already applied by

Artesis University College Antwerp,
Product Development programme
Contact: *Karine Van Doorsselaer - kvdoors@skynet.be*

Teaching methods used

TM. 5 Discussion, TM. 9 Assignments

Becoming aware of the life cycle stages of a product

Description of example

The teacher takes a product to the class; for instance a juicer. The product is disassembled ahead of time so that, during the class, the various components as well as the assembly process can be discussed.

The teacher shows the various components and asks questions about materials, respectively: raw materials, processing techniques, assembly techniques. Then the question is asked as to where the product is produced, what the possible packaging is and the methods of distribution.
Furthermore, questions are asked about using the appliance, including potential causes of failure, among others. We conclude with a variety of disposal scenarios.
Based on the questions, the entire life cycle of the product is mapped out from an environmental perspective.

Depending on the time available, by means of questions the teacher can attempt to generate more ecological alternatives for a variety of environmental impacts.

EX.15

Learning objectives

• Students learn to outline the various stages of the life cycle and become aware that life cycle thinking is the foundation of ecodesign in which every phase of the life cycle has a certain environmental impact.
• The student learns to think critically.

Learning content

LC. 10 Life cycle thinking

Prior knowledge and skills required

Knowledge of materials and recycling possibilities, processing techniques, joining techniques.

Result and evaluation

Together with the students, the teacher constructs the various life phases of a product and establishes the link to the potential environmental impact of each stage. Evaluation is necessary. The teacher can screen the active participation of the students.

Already applied by

Artesis University College Antwerp, Product Development programme
Contact: *Karine Van Doorsselaer - kvdoors@skynet.be*

Teaching methods used

TM. 4 Demonstration, TM. 8 Educational discussion

Environmental impact of the various phases of the life cycle of a product

Description of example

The teacher takes a product to the class; for instance a grass trimmer. The product is disassembled ahead of time so that, during the class, the various components as well as the assembly process can be discussed.

The students are divided into groups and each group is assigned to discuss a part of the life cycle of the product focusing on the environmental impact. The various topics of the assignments are: raw materials extraction, design, production, distribution and use, disposal. Depending on the time available, the students may be asked to present more ecological alternatives for the environmental difficulties analysed.

After 15 minutes, the various groups present their findings to the class. The main environmental difficulties throughout the entire life cycle are mapped out.

EX.16

Learning objectives

Students learn to outline the various stages of the life cycle and become aware that life cycle thinking is the foundation of ecodesign since every phase of the life cycle has a certain environmental impact. Learning to think critically.

Learning content

LC. 10 Life cycle thinking

Prior knowledge and skills required

Knowledge of materials and recycling possibilities, processing techniques, joining techniques.

Result and evaluation

Together with the students, the teacher constructs the various life phases of a product and establishes the link to the potential environmental impact of each stage. Evaluation is not necessary. The teacher can screen the active participation of the students.

Already applied by

Artesis University College Antwerp,
Product Development programme
Contact: **Karine Van Doorsselaer -** *kvdoors@skynet.be*

Teaching methods used

TM. 6 Group work, TM. 9 Assignments,
TM. 10 Presentation

Raising students' awareness of the current economic system

Description of example

Beforehand, the students watch the film **'The story of stuff'**: *www.youtube.com/watch?v=gLBE5QAYXp8* or the film **'The Story of Electronics'**: *www.youtube.com/watch?v=sW_7i6T_H78*

This film is discussed in the following class.

The teacher can get the discussion started by proposing a number of theses, such as:

- 'Discarding is less expensive than repairing'
- 'Production in the Far East has a positive influence on the living conditions of the people there'
- 'Dumping waste in the Far East is a good solution'
- 'We can still retain the same way of living by consuming less'

EX.17

Learning objectives

• Becoming aware of the economic model and the consequences for the environment.
• Becoming aware of the need for corporate social responsibility.

Learning content

LC. 7 Consumer behaviour
LC. 10 Life cycle thinking

Prior knowledge and skills required

No prior knowledge required.

Result and evaluation

The teacher evaluates the active contribution of the students.

Already applied by

Artesis University College Antwerp,
Product Development programme
Contact: **Karine Van Doorsselaer** - *kvdoors@skynet.be*

Teaching method used

TM. 5 Discussion

Stimulating the environmental awareness of the student as consumer

Description of example

During class, the students watch short films about sustainable behaviour; for instance, the film about encouraging consumers to use the stairs instead of the escalator: www.youtube.com/watch?v=2lXh2n0aPyw
or the flash mob about picking up rubbish: www.youtube.com/watch?v=GYnd5JRu86E .
In connection with this, the teacher gets the discussion going by means of a number of theses or questions that encourage the students to consider their own behaviour and to see how far they wish to or are able to go with 'sustainability'.

Sample questions:

- What is this film/documentary about?
- Did you already know this?
- What do you think about this issue?
- How can it be solved?
- What do you need as a student to be able to work on/contribute to a solution, as citizen and as a professional?

EX.18

Learning objectives

- Becoming aware of one's own behaviour as a consumer.
- Stimulating attitude for sustainable behaviour.

Learning content

LC. 7 Consumer behaviour

Prior knowledge and skills required

No prior knowledge required.

Result and evaluation

The teacher evaluates the active contribution of the students.

Already applied by

Artesis University College Antwerp,
Product Development programme
Contact: **Karine Van Doorsselaer** - *kvdoors@skynet.be*

Teaching method used

TM.5 Discussion

Teaching the use of ecodesign tools

Description of example

The teacher brings a product to class and explains step-by-step how the analysis of the environmental impact occurs based on the Eco-indicators (or the LiDS wheel).The students may of course be asked questions during the demonstration. Analysis of the product occurs, as it were, together by the teacher and students.
The environmental impact of each stage of the life cycle is expressed in an eco-score.

EX.19

Learning objectives
The ability to apply Ecodesign tools.

Learning content
LC. 2 Ecodesign tools

Prior knowledge and skills required
The demonstration connects with the theoretical explanation of the tools.

Result and evaluation
The demonstration supports the lecture.

Already applied by
Artesis University College Antwerp,
Product Development programme
Contact: **Karine Van Doorsselaer** - *kvdoors@skynet.be*

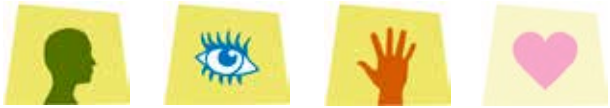
Teaching methods used
TM. 4 Demonstration, TM. 8 Educational discussion

Biomimicry

Description of example

The students are divided into groups of two.

On the website *www.asknature.org*, each group searches for a fine example from nature and translates the principle to a relevant, usable application.



EX.20

Learning objectives

The application and use of the principles of biomimicry.

Learning content

LC.1 Biomimicry

Prior knowledge and skills required

No prior knowledge required.

Result and evaluation

The findings are gathered in a report.

Already applied by

Artesis University College Antwerp,
Product Development programme
Contact: **Karine Van Doorsselaer** - *kvdoors@skynet.be*

Teaching methods used

TM. 6 Group work, TM. 9 Assignments

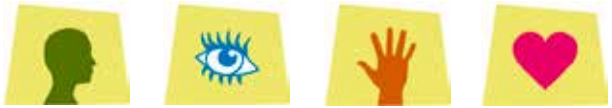
European Project Semester (EPS)

Description of example

A European Project Semester, EPS, provides international multidisciplinary project training in teams. EPS falls within the Erasmus student exchange programme. A provider (a university, university college, training institution ...) describes a project, for instance applying NFC (near field communication) technology for events. To this end, teams of 4-6 students are formed, containing a minimum of 3 different nationalities and 3 different disciplines; for instance, a marketing student, a designer and a graphic designer.

An EPS has a duration of 1 semester, for a total of 30 credits (ECTS, European Credit Transfer System), divided into two components: 20 to 25 credits for the project itself, 5 to 10 credits for general subjects such as culture, language, team building, project management and theory in support of the project.

Ecodesign can be integrated within an EPS programme in a combination of theory concerning ecodesign (6 to 8h) and application within the project. The projects often provide an interesting starting point for a product-service combination. Additional attention may be given to this in the lectures. After these theoretical classes, the students apply their acquired knowledge to their specific project. Interim supervisory times are provided for guiding this integration in the project.



EX.21

Learning objectives

- The students obtain knowledge about ecodesign strategies, and more specifically about product-service combinations.
- The students learn to collaborate in an interdisciplinary, international team.
- The students learn to assume a specific role in a long-term project.
- The students learn to plan, develop and embed a product-service combination concept in a semester project.

Learning content

LC. 8 Introduction to ecodesign, LC. 2 Ecodesign tools, LC. 13 Product-service combinations

Prior knowledge and skills required

Theoretical introduction to ecodesign and a basic background in product-service combinations. Sufficient knowledge of English.

Result and evaluation

The result of ecodesign in an EPS project consists of several elements: the students learn the fundamentals of ecodesign and product-service combinations and apply this knowledge in a concrete project. In addition to substantial knowledge, there is also interaction among students, disciplines and nationalities, such that the students learn much about one another and how to work in a team. A jury performs the evaluation of the EPS project with internal and external members. The section concerning ecodesign is processed in this final jury and forms a part of the final report and the final presentation.

Already applied by

Artesis University College Antwerp, Product Development programme, European Project Semester (EPS) Contact: **Sarah Rohaert** - *sarah.rohaert@uantwerpen.be*
http://www.artesis.eu/international-relations/general-eps-information.htm

Teaching methods used

TM. 1 Activating lecture, TM. 11 Project training

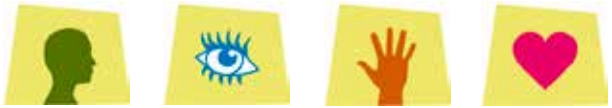
Ecological and innovative automotive solutions

Description of example

"Ecological and Innovative Automotive Solutions. A Challenge for Young European Communication Professionals to lead Customer Behaviour towards Sustainability"; this is the title of the Erasmus Intensive Programme (IP) in which 65 European students and 16 teachers from 8 different universities and university colleges are immersed in an intensive collaboration project.

Automotive students from Antwerp and Portugal and Communications management and Marketing students from Kortrijk, Hungary, Austria, Spain and Finland join forces to develop new marketing and communications strategies so that the client accepts the end of the reign of 'Car Almighty' and to interest the new generation in ecological vehicles. They work in mixed teams of 7 to 8 students for 10 days on various approaches to arrive at a solid combination of ecologically innovative and commercially interesting automotive solutions.

During these 10 days, the students are presented with a varied programme of lectures, discussions, workshops and excursions. They participate in sessions about marketing, branding and advertising, specifically for the auto industry, presented by teachers and experts from the automotive world. Each team is assigned an alternative fuel or engine that is currently being developed in automotive technology and will develop a complete communication plan including a media campaign. Their own teachers, as well as international teachers and experts, guide them and also give them advice.



EX.22

Learning objectives

• To gather, record and process much knowledge and information in a short period of time from various disciplines into a group result.
• Fully develop the communication plan and media campaign.
• Learn to cooperate in a group including other disciplines and nationalities.

Learning content

LC. 6 Energy and resources, specifically for the automotive industry

Prior knowledge and skills required

Students with different backgrounds, from different training programmes and countries are placed together. The language aspect is important here: sufficient knowledge of English is crucial to be able to actively participate in the programme.

Result and evaluation

An IP always works within a clearly defined period (in this project: 10 days). At the end of the period, the results are presented to a jury of experts from the auto industry and the teachers. This jury assess the communication plans and marketing strategies and also presents an award to the best team.

Already applied by

In 2012, the IP was jointly coordinated by Howest (Communication management Howest Kortrijk) and Karel de Grote University College (Auto Technology Antwerp) and was in part made possible by financing by the EU Lifelong Learning Programme from Erasmus.
www.ip-ecommotive.be en *ec.europa.eu/education/erasmus/ip_en.htm*

Teaching methods used

TM. 6 Group work, TM. 10 Presentation,
TM. 11 Project learning

Student purchasing behaviour

Description of example

This is an activity to make the students more aware of themselves as consumers. Their decisions have an influence on the life and livelihood elsewhere in the world. Teachers can adjust this exercise by linking the choice of their products to their own programme. You can discuss all aspects of sustainability or you can try to discuss ecological, economic and social aspects separately. Examples: energy in use; materials necessary for production; potential for disassembly; packaging (also see learning content, life cycle thinking).

Purchase beforehand a selection of products that are relatively good or poor concerning one of the aspects of sustainability (economic, social, environmental or in general). Number each product; for example, 1A, 1B, 2A and 2B. Ask the students to imagine that they are going shopping. Ask them to select an item from a few products, take note of their choice and a brief reason for their choice. At this stage, sustainability is not a criterion; the intention is that they make their own choice as normal consumers. Make a short report about their choices. On the board, make an overview of the most important criteria that consumers use for their decisions.
Ask the question of sustainability. Is the criterion often used when making decisions as a consumer? Have the students provide more background information about the products and their relative sustainability. After the information has been handed in, ask the students to again consider their decisions. Has this led to changes in their choices?
Sample products: standard mouse pad versus recycled mouse pad (incl. function, recycling and packaging).

EX.23

Learning objectives

To make the students more aware of their own behaviour and decisions as a consumer.

Learning content

LC. 2 Ecodesign tools
LC. 7 Consumer behaviour

Prior knowledge and skills required

No prior knowledge required.

Result and evaluation

The main objective here is raising students' awareness. A short, verbal evaluation at the end of the exercise can take stock of their (new) attitude with regard to their purchasing behaviour.

Already applied by

Practical Action Project, "Sustainable Design & Technology": *www.sda-uk.org/sa4.html*

Teaching method used

TM. 8 Educational discussion

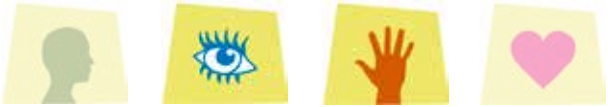
Redesign product based on the LiDS wheel

Description of example

Select a product and analyse it based upon the LiDS (Lifecycle Design Strategies) wheel. Define the problem areas. Redesign the product based on the analysis. Also analyse the new design based on the LiDS wheel. Now compare the different analyses. This exercise can also be conducted using other ecodesign tools, e.g.: MET-matrix, Ecolizer, LCA, Eco-Star, and checklists.

Example: deodorant packaging. Less waste and less packaging for the same content thanks to a new design. This example works around the life cycle strategies:

- Excess after use
- Decreasing consumption of raw materials
- Limited energy consumption during manufacture



EX.24

Learning objectives

The student gains insight into the use of ecodesign tools and learns to consider which tool is most relevant for the objective intended.

Learning content

LC. 2 Ecodesign tools

Prior knowledge and skills required

The student must have had an introduction to ecodesign and theory lessons with a background into ecodesign tools in order to also be able to effectively apply them to a case study.

Result and evaluation

The students can write out the result in a report. This report forms the basis of the evaluation of the student. Another possibility is to work by means of peer evaluation, in which the students evaluate each other's work and thereby obtain a view of the strong and weak points in their own work and that of others.

Already applied by

UC Limburg, PHL, based on the Prevent pack model: File "How can design reduce the environmental impact of packaging?" Edition: October 2009; VU: J. Goossens, Fost Plus vzw - *www.preventpack.be*

Teaching methods used

TM. 3 Case method, TM. 11 Project education

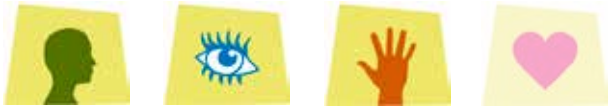
The OVAM SIS Toolkit

Description of example

The OVAM SIS Toolkit offers a summary and workable model in order to search creatively for sustainable solutions for products, services and other aspects within business operations. SIS stands for Sustainable Innovation System. The philosophy behind the OVAM SIS Toolkit is to obtain a broader image of sustainability by examining the company and possible opportunities from various perspectives. It goes further than a strictly ecological dimension and transcends the pure design-technical aspect.
The OVAM SIS Toolkit can be explained in the form of a lecture or presentation. Thereafter, an exercise session or workshop can be implemented, in which small groups of students work on a couple of sample cases provided by the teacher (exercise session), or on a specific project on which the students work (workshop, see EX. 21 EPS).

Each group of students receives a file they have to work on. Each file presents a combination of a specific perspective, e.g. social or financial, with a certain phase in the live cycle; e.g. production, consumption or disposal. For each file, the students first consider the main question that is asked about the file, in function of their case or project. Then opportunities are sought for the case or the project, linked to the file. After a brainstorming session in small groups, the results are presented to the entire group.

This exercise can be repeated approximately three times, in each instance with a different file in order to, in this way, become acquainted with the OVAM SIS Toolkit.



EX.25

Learning objectives

- The student obtains insight into and knowledge about sustainability from a systematic perspective.
- The student applies the new knowledge by solving a case with the help of the OVAM SIS Toolkit. This gives the students the opportunity to study a specific case from a broader perspective and to improve their own skills with regard to systems thinking.
- The student learn in group how to creatively search for new ways to deal with sustainability within a specific project, product or service.

Learning content

LC. 15 Systems thinking, LC. 16 Future thinking

Prior knowledge and skills required

Background knowledge of ecodesign is not necessary, but can benefit the process of the brainstorming session.

Result and evaluation

At the end of the workshop, the results of each group are presented to the entire group. Evaluation can occur based upon these results and the course of the workshop. Another possibility for evaluation is to have the students write a report in their own group describing the workshop and the results of the brainstorming session.

Already applied by

Artesis University College Antwerp, Product Development programme, European Project Semester

Teaching methods used

TM. 1 Activating lecture, TM. 2 Brainstorming
TM. Case method

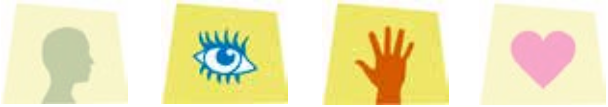
GAME 'CSR at the helm'

integrated into a business project

Description of example

The game, 'CSR at the helm', is organized in the context of a business project: 'Examination of an enterprise'. During this project, students from the Commercial Sciences and Bachelor of Commercial Engineering programmes investigate in group an enterprise from a variety of perspectives.
Corporate Social Responsibility (CSR) constitutes an actual component of this assignment. The game gets students interested in CSR, and enables them to become acquainted interactively during hours with the principles of CSR.

During the game, the participants take the helm of a cruise ship. As the management team of the ship, each group of players makes a number of strategic business decisions. During the game, it is up to the players to make the correct decisions and to take responsibility for them.



EX.26

Learning objectives

Learning experiences are constructed around a number of the basic principles corporate social responsibility that arise explicitly during the game. Upon completion, the students apply these principles to the company that they examined for the business project. To what extent does the company participate in CSR? What are its motivations? Which 'P' does it emphasize? Who are the most important stakeholders?
Alongside an appetizer for the business project, 'CSR at the helm' also contributes to the social-critical education of the students. The game provides them knowledge and insights about sustainable enterprise and conscious consuming.

Learning content

LC. 11 Corporate Social Responsibility (CSR)

Prior knowledge and skills required

Pupils and students in secondary and higher education, intermediary organizations and entrepreneurs will play the game, 'CSR at the helm'. No specific prior knowledge is required.

Result and evaluation

The students will be evaluated according to the way they apply the principles of CSR to the business project. Among others, they report about this in a paper and during a presentation at the end of the project.

Already applied by

UCU Brussels, Bachelor of Commercial Sciences and Bachelor of Commercial Engineering
All information about the game, 'CSR at the helm', at:
www.mvoaanhetroer.be

Teaching method used

TM. 3 Case method, TM. 8 Educational conversation (in the form of a 'learning game')

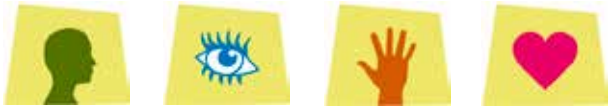
Interdisciplinary Assessment Project (IAP)

Description of example

The “Interdisciplinary Assessment Project” (IAP) is an initiative from the Commercial Engineering (HUB), Environment and Prevention Management (HUB), Industrial Engineering (KAHO) and Agoria Flanders programmes. It enables students to work in interdisciplinary teams on an actual company project. The students work on a solution for a specific company problem from three angles within an interdisciplinary theme that varies annually; economic profit, technical feasibility and sustainability.

The IAP starts with a kick-off prepared by teachers from HUB and KAHO and speakers from the field. The students actually start their project, which they are assigned based on their preference. They first visit the company to discuss the issue further and to further define the assignment. From that point on, they largely define their own function in the team and are themselves responsible for the progress of the project. In the meantime they receive feedback from a business coach and three internal coaches (teachers). In this way the students can adjust their planning and/or approach along the way as necessary.

They work toward a final product for 10 weeks: a consultancy report and a presentation by means of a poster. The IAP concludes with a closing day. At this time the students present their project to a jury of teachers and staff from the companies. After that there is an event where the best group receives an award.



EX.27

Learning objectives

- Working on a current theme in interdisciplinary teams at companies.
- Transcending the limits of their own course of study and coming up with solutions in a team that demonstrate an interdisciplinary approach.
- Formulate recommendations for one or more business problems within the theme, containing aspect of economics, technology, innovation and sustainability.
- Formulating advice on the given issue for the company in the form of a consultancy report and a poster.
- Defend and argue for the solution obtained in front of the company and for fellow students.

Learning content

LC. 11 Corporate Social Responsibility (CSR)

Prior knowledge and skills required

The IAP is a project in the final stage of the three participating programmes. It is a project that in a broad sense rests on the competences and skills already acquired from other stages and/or programme components.

Result and evaluation

The output of the project is a consultancy report for the company and a poster for presenting the results to a wider audience.
The evaluation is a combination of product and process evaluation and evaluation of the oral presentation for the internal coaches and business coach. The scores are adjusted on the basis of a peer evaluation.

Already applied by

The Commercial Engineering (CE) and Environment and Prevention Management (EPM) programmes of the HUB, the Industrial Engineering programme of KAHO (Ghent) and Agoria Flanders.

Teaching method used

TM. 6 Supervised independent group work

Life cycle analysis and ecodesign of vehicles

Description of example

The earth is warming, the roads are clogged, fine particles choke us, acid rain damages our buildings and crops and crude oil is being depleted. Our current vehicles are strong contributors to this. The Master's course, 'Sustainable Mobility and Logistics', addresses this in depth. We discuss the social, economic, ecological and technological aspects of our mobility; methods are also provided for investigating more sustainable solutions.

The research assignment focuses on potential solutions for limiting the negative impact of our mobility on our environment. If cars are inevitable, then environmentally friendly vehicle technologies are indispensable. Consequently, some students opt to study vehicle technologies in detail and to formulate environmentally friendly solutions based on a life cycle analysis. For example, they study most vehicle technologies/fuels (diesel, petrol, LPG, CNG, biofuels, biogas, hydrogen, battery electric, hybrid electric and fuel cell electric vehicles) by means of a life cycle analysis. A life cycle analysis studies the impact of a product or a service on the environment over its entire life cycle and can help during the development of a product.

This type of systems thinking encourages students to consider all the life phases (extraction of raw materials, production, distribution, consumption, waste treatment) of a product. In the past, for instance, solutions were formulated concerning the manufacture and ecodesign of electric engines and batteries, the use of charging infrastructure and electricity production, and the waste treatment of electric vehicles.

EX.28

Learning objectives

In the form of research assignment, the students are challenged to search independently for a sustainable solution to the current mobility problem. A multidisciplinary approach is indispensable; the students are expected to take into account the social, economic, ecological and technological factors that are discussed in the course.

Learning content

LC. 2 Ecodesign tools, LC. 6 Energy and resources, LC. 10 Life cycle thinking

Prior knowledge and skills required

The students have received a technical and/or economic education.

Result and evaluation

On the one hand, the student is assessed by means of a written exam on the theoretical knowledge from the field. On the other hand, the research assignment is assessed based on a written report and accompanying presentation with questions from the jury.

Already applied by:

Free University Brussels (VUB), in the programmes: Master of Science in Engineering, Master of Science in Applied Economics and Master of Science in Geography.
Additional information at: *mobi.vub.ac.be/*
Contact: **Prof. Joeri Van Mierlo** - *joeri.van.mierlo@vub.ac.be* and **Maarten Messagie** - *maarten.messagie@vub.ac.be*

Teaching methods used

TM. 3 Case method, TM. 6 Group work

Debate café on the theme of ‘sustainability’

Description of example

The debate café is based on the method of the ‘world café’. The participants are split into groups (4 or 5 students) that discuss a certain topic in an informal atmosphere - at café tables. The topic is determined on the basis of a selected film to which a series of questions is linked. After each film, one changes interlocutors to arrive at greater insight and cross-fertilisation. All the ideas are accurately noted on a large piece of paper. For each topic, the ideas and results are given feedback in group.

By means of the method of the debate café, we focus on the theme of ‘sustainability’ interactively and in an approachable manner by means of dialogue. The focus on specific themes - for instance, sustainable materials management - may change in function of the audience. The debate café raises awareness and allows students to consider their potential commitments as future professionals and citizens within a society in transition.

EX.29

Learning objectives

Students learn to conduct an authentic conversation interactively, to think in an innovative manner and to listen actively and respectfully. In this way, every student's thoughts are given equal value. Students then exchange knowledge and examples about sustainability themes from their own environment and increase awareness of their own behaviour.

Learning content

LC. 1 Introduction to ecodesign is situated in the broader framework of sustainable development. In this way we can focus on a selected theme such as ecodesign.

Prior knowledge and skills required

Specific prior knowledge about the themes is not required. Nevertheless, it is advantageous if the discussion can be supplemented by knowledge about the various themes so that maximum exchange and interesting cross-fertilisation may occur.

Result and evaluation

Evaluation is not necessary. It is essential that the debate café take place in an informal atmosphere. Students must have the opportunity to speak freely and to formulate their opinion.

Already applied by:

Ecocampus – in collaboration with higher education teachers - moderates these debate cafés at various higher education institutions.
You can find the method at the Ecocampus website:
www.lne.be/doelgroepen/onderwijs/ecocampus/aan-de-slag/debatcafes/methodiek_debatcafe.pdf

Teaching method used

TM. 2 Brainstorming, TM. 3 Case method, TM. 5 Discussion, TM. 6 Group work, TM. 8 Educational conversation, TM. 9 Assignments