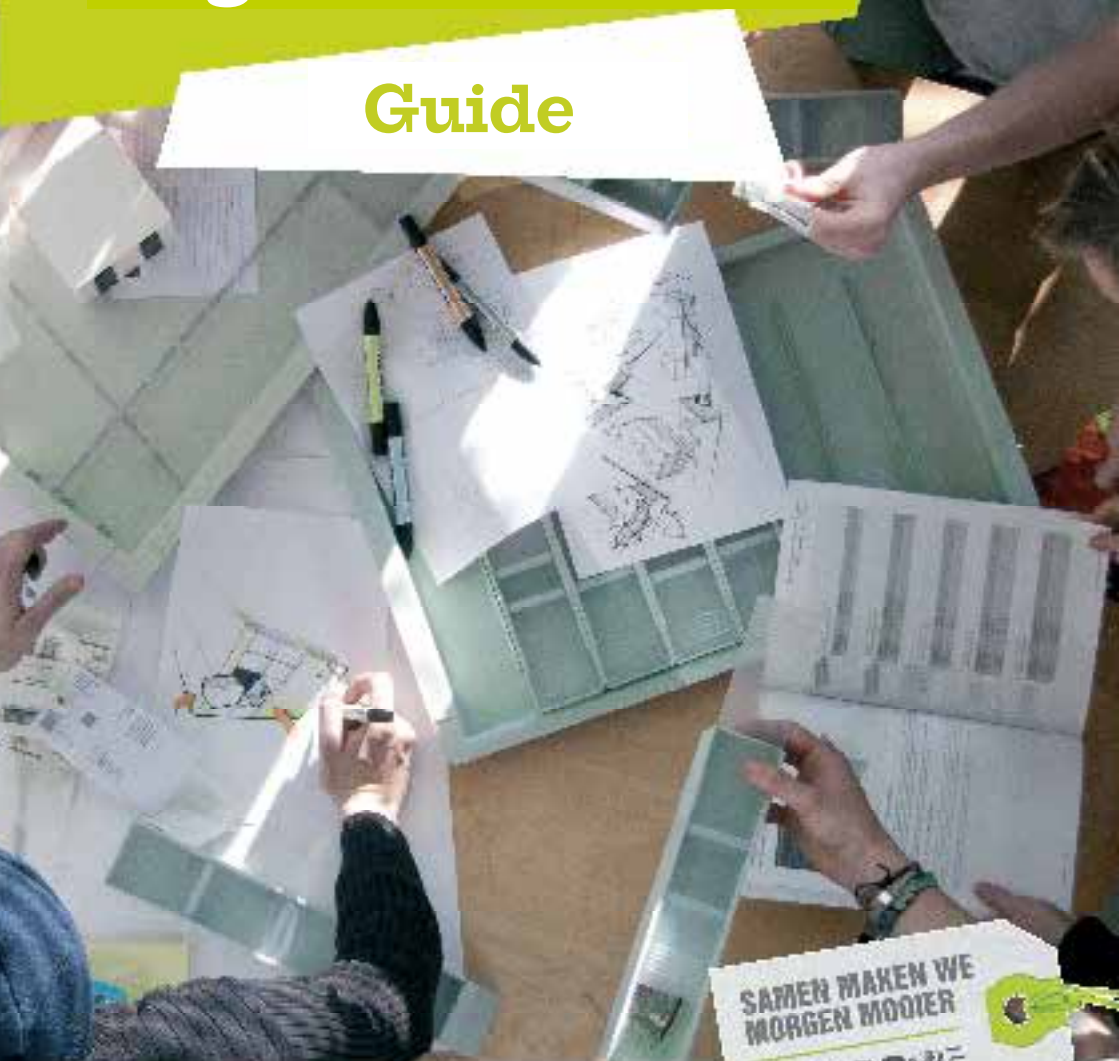


Ecodesign in Higher Education

Guide



SAMEN MAKEN WE
MORGEN MOOIER



Table of contents

1. Introduction	05
1.1. Purpose of the EHE kit	05
1.2. Need for the EHE kit	05
1.3. Target group of the EHE kit	06
1.4. Use of the EHE kit	07
2. Ecodesign as a component of sustainable development	09
3. Integrating ecodesign in higher education	13
3.1. Cyclical integration model for ecodesign in higher education	14
3.2. Vision and mission of the programme	15
3.3. Competences	17
3.3.1 Competences for sustainable development for students	17
3.3.2 Competences for sustainable development for teaching staff	22
3.4. Curriculum	24
3.5. Courses	27
3.6. Learning content	28
3.6.1 Themes regarding sustainable development	28
3.6.2 Themes regarding ecodesign	30
3.7. Teaching methods	30
3.7.1 Activating teaching methods	30
3.7.2 Diversity of teaching methods	30
3.7.3 Didactic model for preparing learning activity	32
3.7.4. Tips and tricks for successfully applying teaching methods	34
3.7.5. Teaching methods in the EHE kit	34

4.	Measuring baseline and progress	35
4.1	Existing measuring instruments	35
4.2	Measuring instruments in the EHE kit	35
5.	Getting started	37
6.	Examples, sources of inspiration and references	43
6.1	Practical example cards	43
6.2	Sources for more background information	43
6.3	Inspiration for class material	46
6.4	References	47
6.5	Dublin descriptors	50

The EHE kit was developed by Dr. Karine Van Doorselaer, Engineer, and Dr. Elli Verhulst from the Artesis University College Antwerp (as of October 2013, University of Antwerp), Department of Design Sciences, as commissioned by OVAM, and was substantially supported by the staff from the Ecocampus project from the Government of Flanders' Department of Environment, Nature and Energy and a variety of experts in higher education. The ECHO Expertise Centre from the University of Antwerp offered support with advice about activating teaching methods. Many thanks to all those who contributed to the EHE kit. The EHE kit is the result of investigation in the integration of ecodesign in higher education in Flanders and thus describes the Flemish situation.

INTRODUCTION

1.1 Purpose of the EHE kit

This manual, Ecodesign in Higher Education, provides a specific guide to teachers, professors, education coordinators and education councils for integrating ecodesign into higher education programmes. Ecodesign fits within the term ‘sustainable development’.

1.2 Need for the EHE kit

The students of today are the professionals of tomorrow. They obtain values, standards, skills and knowledge at school, among others. Education, and certainly higher education, is thus important for a sustainable society; the graduates end up in careers and functions where decisions are taken at many levels. The economic and ecological problems in our society compel the government, companies and consumers to take specific steps towards a sustainable society.

Sustainability, in the broadest sense of the concept, should therefore constitute the guiding framework for education throughout the entire educational system. One of the paths to a sustainable society is ecodesign: designing products that are sustainable through their entire life cycle.

Designing innovative, sustainable products does not depend solely on the designer. It is a collective process that is reinforced by a multidisciplinary approach. Everyone in the organisation must be fully aware of the intention to deliver sustainable products.

A short survey of Flemish companies teaches us that principally engineers or holders of a degree from an economic specialisation decide about the design and production process, and about the value chain of sustainable products and services, together with employees with a degree from a specific design programme. Ecodesign is thus clearly not only relevant for designers, but also for marketers, economists, process engineers or business managers.

In order to provide ecodesign with greater uptake in the business world, knowledge, insight, skills and above all the attitude focused on ecodesign must be anchored in relevant education packages so that not only product designers, but also other professionals start to consider the fundamental principles of ecodesign.

There is already steadily increasing attention for integrating sustainability into higher education. Still, there is little information specifically about ecodesign to be found. The EHE kit attempts to fill this void.

Those who would like more information about integrating sustainability in higher education can contact Ecocampus from the Department of Environment, Nature and Energy (Government of Flanders) in this regard. Ecocampus intends to be a catalyst for (re)orienting higher education towards sustainable development. Together with higher education, Ecocampus hopes to appeal to graduates who value sustainability in their private and professional lives.

1.3 Target group of the EHE kit

The EHE kit focuses on those in positions of responsibility in higher education (education coordinators, teachers...) who are enthusiastic about integrating sustainability/ecodesign in the curriculum.

The EHE kit gathers knowledge about integrating ecodesign and groups practical examples by way of illustration and inspiration. The practical examples are in the first place aimed at the 'Industrial Sciences, specialisation in Electromechanics' programme. But also education coordinators and teachers from other academic disciplines can gain inspiration from the cards containing practical examples, teaching methods and learning content. In essence, the approach to integrating ecodesign into the curricula remains the same.

1.4 Use of the EHE kit

The EHE kit consists of a guide, cards and worksheets.

1. The guide provides background information about the various steps for integrating ecodesign into a higher education programme. We recommend that you read the guide before getting started with the EHE kit.

2. The cards contain specific and concise information and have a workable format. There are three types of cards, each having their own colour, so that they are very recognisable and easy to use:

I) **Learning content cards** describe the various relevant themes connected with ecodesign. Each card gives a short description of the theme, the most relevant references about this theme and a link to practical example cards containing practical examples.

II) **Teaching method cards** describe teaching methods that you can apply for integrating ecodesign in the programme. Each card gives a short description of the teaching method and provides references to a more extensive explanation of the teaching method and a link to practical examples (practical example cards).

III) **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 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.

3. **Worksheets** make it possible for you to get started on your own. You will find the approach in Chapter 4. There is a work matrix and a blank example card.

I) The rows are already defined in the **work matrix**: the various themes concerning ecodesign (learning content) have already been completed. The team that will work on integrating ecodesign into the curriculum can complete the columns with the various courses from the curriculum or the proposed competences concerning sustainability/ecodesign.

The result: after analysis, the courses-learning content matrix provides an overview of the connections between the different courses in the curriculum in which ecodesign can be included (columns) and the potential themes (learning content) concerning ecodesign (rows).

After analysis, the competences-learning content matrix provides an overview of the connections between the different competences and the potential themes (learning content) concerning ecodesign.

II) **A blank example card** indicates a basic structure to the programme supervisor or teacher to make his or her own connection between a certain course, an ecodesign theme and a certain teaching method.

With its cards and worksheets, the EHE kit offers a simple instrument for a group to analyse the current curriculum and/or to come up with new proposals for integrating certain learning content and teaching methods - for instance during a group brainstorming session. By completing the matrix you obtain a nice overview of the current situation within the programme, but you also see the lacunae and which themes are (could be) offered in which courses. The matrix also provides an overview of the various teaching methods that can be applied in the programme. The cards thereby have a supporting role (learning content cards and teaching method cards) and an inspirational function (practical example cards).

The complete EHE kit - the guide, the cards and the worksheets - is available at: <http://www.ecodesignlink.be/en/research>

Ecodesign as a component of sustainable development

The concept of ecodesign fits within the term, 'sustainable development'.

Sustainable development is the development of society that meets the needs of the present without compromising the ability of future generations to meet their own needs, according to the UN Bruntland Commission Report from 1987¹. In practice, sustainable development is often translated into three dimensions: the ecological dimension (Planet), the social dimension (People) and the economic dimension (Profit/Prosperity). The pursuit is to achieve an ideal balance between ecological, economic and social interests, namely the 3 Ps: Planet, Profit/Prosperity and People. We can systematically present 'sustainable development' as follows:

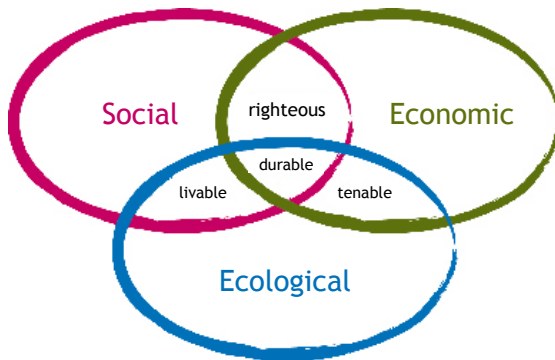


Figure 1: the traditional presentation of the 3 Ps of sustainability
Source: www.dolceta.eu

More and more, however, we hear support for a new model, a new vision and approach in which the economic dimension is embedded in the social dimension, which in turn is embedded in the ecological dimension.

1

World Commission on Environment and Development, 1987

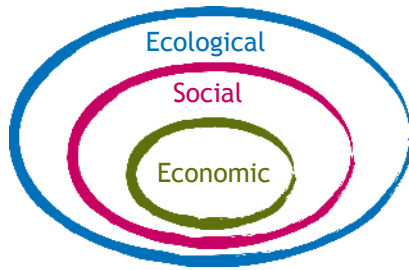


Figure 2: the evolved presentation of the 3 Ps of sustainability

Sustainable product innovation entails that the three pillars of sustainable development are considered when developing new, innovative products and services. This means the environmental and social aspects are also taken into consideration, in addition to functionality, design, ergonomics, economic aspects and safety. One can also speak of ‘a design philosophy that strives to minimise or eliminate the negative impact on the (natural) environment through skilful, sensitive design’².

Ecodesign can be described as an integral design activity in which the focus of the designer/engineer when making design decisions is mainly on the consequences for the environment, whereby he takes into account all the links of the life cycle: from raw material extraction to the moment the product is discarded. Through the application of ecodesign, he can limit the environmental impact of a product for the entire life cycle of the product.

By way of support for life cycle thinking, OVAM presents a life cycle scenario - based on the LiDS wheel - that offers possibilities for optimising the different phases in the life cycle of a product (see Figure 3). Additionally, OVAM also provides other tools in support of ecodesign, such as the Ecolizer for determining the environmental impact of materials, and the OVAM SIS Tool Kit for considering sustainable innovation within a broader system. Additional information can be found at: www.ovam.be/ecodesignlink.be/en/. Furthermore, there are tools such as Eco-Star, developed at the Department of Design Sciences at the Artesis University College Antwerp, which emphasises the relationship: economy-ecology. Experience teaches us that companies that pay greater attention to ecodesign have created a win-win situation between economy and ecology. More information about Eco-Star at: kvdoors@skynet.be.



Figure 3: life cycle scenario (OVAM), available online at: www.ovam.be/ecodesignlink.be/en/

Within all of these themes, ecodesign forms a defined component into which certain innovations fit: products and services that provide improvements (mainly) on the ecological level for products and services. When, during the design process and in the design, social and ethical aspects are also given significant consideration, this is considered sustainable design. To this end, the production as well as the consumer side can be examined. For instance, what can be improved within production on the level of energy consumption? On the side of consumers, one can look for ways to encourage the consumer to make more sustainable purchases or display more sustainable behaviour.

All of this fits within the larger context of sustainable development.
Figure 4 renders how the various fields of application are related to one another.



Figure 4: relationship between ecodesign, sustainable design and sustainable development³

3 Based on Charter and Tischner, 2001

Integrating ecodesign in higher education

The integration method for ecodesign presented in the EHE kit is based on implementation and integration models for sustainable development in higher education.

“Sustainable higher education does not require any ‘facile’ addition of sustainable development to the existing structures and curricula, but a fundamental change in our educational and research thinking and activities. In other words, sustainable development is not an additional topic that must be added to the already overloaded curricula, but a starting point for a different view of the curriculum, pedagogy, organisation, policy and lifestyle.”⁴.

Integrating sustainability within a university or university college, or within specific programmes in these institutions, takes effort from various actors and on many different levels. The complexity and multiplicity of aspects concerning sustainability often constitute a major obstacle to working on this. A framework and methodology with a roadmap provide welcome support.

Those interested in the different integration strategies and methods regarding sustainable development in higher education will find what they are looking for at the end of the chapter, “Examples, sources of inspiration and references”, and at Ecocampus at: <http://ecocampus.lne.be>.

3.1 Cyclical integration model for ecodesign in higher education

The EHE kit is aimed at integrating ecodesign into higher education. A simple cyclical model has been drawn up for this (Figure 5). The model is dynamic; the various stages are run through continuously and repeated, and are applied from the top-down as well as from the bottom-up within a programme. The EHE kit offers a practical guide that is feasible and workable in the short term. The focus is on specific actions that teachers, professors, education supervisors and councils can take to integrate ecodesign in the curriculum. The following chapters of this guide explain each element of the model in greater detail.

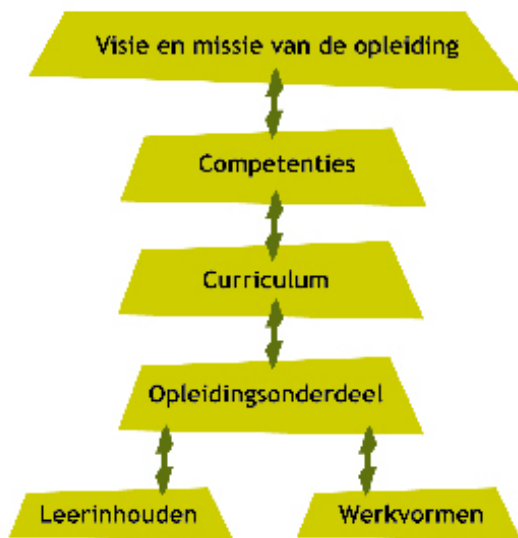


Figure 5: integration model for ecodesign in higher education programmes

3.2 Vision and mission of the programme

It is the moral duty of universities and university colleges to work on a sustainable society for this and future generations. Each educational institution should have a clear vision of its contribution to a sustainable society. It is their job and responsibility to offer their students the knowledge, insights, skills and attitudes necessary for sustainable development so that, in turn, they can contribute to the transition to a sustainable society.

Ideally, the entire educational institution highly values sustainability and it clearly indicates this in its vision and mission.

The vision on and mission for sustainability in the programme is then established and tested against the vision and mission of the educational institution (top-down approach). We therefore recommend to check whether there is already a vision regarding sustainable development within the educational institution, when establishing a vision and mission for the programme.

If there is (still) no vision and mission regarding sustainable development present in the educational institution, you may include ecodesign as a main theme in the vision and mission of the programme. This way the programme may function as a catalyst for a general vision and mission regarding sustainable development for the entire educational institution (bottom-up approach).

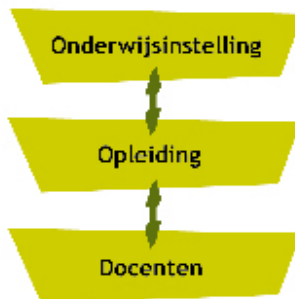


Figure 6: development of a vision and mission regarding sustainable development; top-down versus bottom-up approach

The approach depends on the specificity of the programme, the motivation of teachers, education coordinators, department heads and, of course, the educational institution as the overarching body.

In addition to establishing a vision and mission concerning sustainability, setting up a steering group for sustainable development appears to be one of the critical success factors for sustainable higher education. Appointing a steering group for sustainable development must contribute to preparing the policy concerning the integration of sustainable development. A variety of options are possible concerning the practical content of this steering group; preference is often given to a combined option⁴:

- a central sustainability coordinator, supported by
- a steering group of members from the department.

There are two core tasks of the steering group:

- conducting an inventory;
- formulating strategic and operational objectives, linked to indicators that express the policy ambitions.

Once the decision has been taken to integrate sustainability, the first step is to determine which elements are already present in education, curricula, competences, courses and projects, etc.

These often already contain clear elements of sustainable development. The realisation of sustainable education does not necessarily start from zero; you can often continue to build on existing elements.

The steering group brings together the various departments of the educational institution and functions based on the objectives of sustainable development. This steering group can also assume an important role in the integration of eco-design by including this topic in the inventory and the strategic and operational objectives of the various programmes and departments.

3.3 Competences

3.3.1 Competences for sustainable development for students

Naturally the vision and mission of the educational institution/programme must be made specific: not words but deeds!

It is the task of the educational institution/programme to prepare the students for their professional career in a complex, uncertain society. This is consistent with the reorientation of the educational system: from placing the transfer of knowledge centre stage, a transition has been made to ‘competence-guided’ education in which the student takes centre stage.

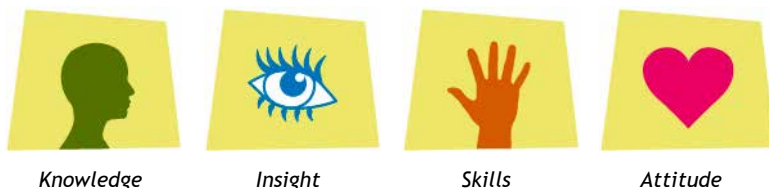
“A competence is an integration of related knowledge, insight, skills and attitudes that has an influence on a significant portion of someone’s job, role or responsibility that goes together with performing the job, which can be tested to accepted standards and which can be improved by means of training and development.”⁵

The core of competence-guided education is that all learning activities contribute to the fact that graduates can act competently in their professional activity based on solid professional knowledge.

According to a holistic approach, developing a competence occurs on four levels:

- You acquire knowledge with your memory: ‘What you know’.
- You acquire insight through your brain: ‘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.



The EHE kit wants to contribute to the fact that students develop certain competences that focus on sustainability. These competences can be divided into two groups: general professional competences and field-specific competences.

- **General professional competences.** This first group of competences applies to everyone, regardless of their area of study, and its goal is that students - as future professionals, policy makers and consumers - are capable of reacting to changing situations and complex challenges in society, such as globalisation, sustainable development, etc.⁶

The VESTIA+D model⁷ has 6 basic competences: responsibility, emotional intelligence, system-oriented, future-oriented, personal commitment and practical ability. They are supplemented by field-specific competences. For those who would like to know more about these basic competences, we would like to refer you to the publications at: www.lerenvoorduurzameontwikkeling.nl.

- **Disciplinary competences or field-specific competences.** This group of competences is specific to each discipline and should thus be set up by you or your team for each programme. The greatest common denominator of specific competences is valid for similar programmes. On the following pages we provide you with a number of theoretical models and ways of thinking.

6 Lambrechts, Van den Haute, Vanhoren, 2009

7 Roorda, 2011

A guide for establishing disciplinary competences can be found at the Forum of the Future⁸

1. Look at the student's profile and the values that you wish to convey; in this way, determine the key relationships on the professional and personal level.
2. Determine the level of the competences and any professional requirements.
3. For each relationship, determine which competences are needed to continue the relationship in a sustainable manner.
4. First develop the professional, specialised aspects of the relationship, then the professionally transferable competences, and finally the personal elements.
5. Certain competences will be repeated when treating a variety of relationships. While in the first instance this is a time-consuming activity, at a later stage it will be easier to determine the knowledge, insight and skills needed for the course.
6. Preferably arrange the competences (or some of them) in consultation with the students, graduates and representatives from the field.
7. Establish priorities for the output of this process.

Below you will find an example of field-specific competences for the 'Master in Industrial Sciences' programme.

- The Master in Industrial Sciences students are capable of critically analysing, assessing and improving their own designs and other designs with regard to environmental impact.
- The students have the attitude to critically approach their own designs and other designs as concerns environmental impact and to optimise their influence on the environment.

Based on the Dublin descriptors⁹, we made the following proposal.

- The student has demonstrable knowledge and insight in the field of ecodesign.
- The student is capable of applying knowledge and insight and problem-solving methods in new or unfamiliar circumstances within a broader (or multidisciplinary) context that is related to the field of ecodesign. De student is capable of integrating knowledge and of dealing with complex material.
- The student is capable of forming judgments about the ecological profile of products and services on the basis of incomplete information, and moreover of taking into account social, societal and ethical responsibilities that are associated with applying one's own knowledge and judgments.
- The student is capable of clearly and unambiguously conveying conclusions and the knowledge, motives and considerations on which the conclusions are based to an audience of specialists and non-specialists.
- The student has the learning skills that enable him or her to undertake a follow-up study of a largely self-directed or autonomous nature.

Example of competences for ecodesign within a design programme¹⁰
with the main objective being that: 'the student graduates as an ecodesigner'.

Secondary objectives are divided into the categories of knowledge, skills and attitudes (K, S and A). Overall, it concerns knowledge that is required to become an ecodesigner (K), the skills required of an ecodesigner (S) and the attitudes, or preparedness, to also apply this knowledge and these skills (A). The specific strategies for achieving these secondary objectives can also be used in the more general practice of design.

9 See 6.5 Dublin descriptors

10 Based on Stouten and Willems, 2011

The model distinguishes two secondary objectives and assumes that these are already present within the programme profile. They are thus not directly part of the main objective described above, but it is important that they are present:

K0: the student has basic technical knowledge of materials and production processes.

A0: the student is prepared to take a critical attitude.

Additionally, 9 secondary objectives are described that are specifically aimed

at realising the main objective:

Knowledge

K1: the student can define the concept of ecodesign in her own words.

K2: the student can formulate and summarise the abstract insights and principles of ecodesign.

K3: the student knows the customary tools within the discipline.

K4: the student understands how the tools function.

Skills

S1: the student knows how and when he should use a certain tool.

S2: the student can justify why he used a certain tool.

S3: the student can apply the principles and tools of ecodesign in practice.

Attitude

A1: the student is prepared to confront the products he has developed with the principles of ecodesign.

A2: the student is prepared to apply the principles and tools of ecodesign in practice.

3.3.2 Competences for sustainable development for the teaching staff

In order to teach students knowledge, insights, skills and attitudes, the teaching staff must of course have the necessary competences for sustainable development.

In the framework of the ESI-CSCT Project (Environment and School Initiatives - Curriculum, Sustainable development, Competences and Teacher training) implemented in 2008, a dynamic model was developed for Education in Sustainable Development (ESD), see Figure 7. As outlined above, ecodesign is part of sustainable development.

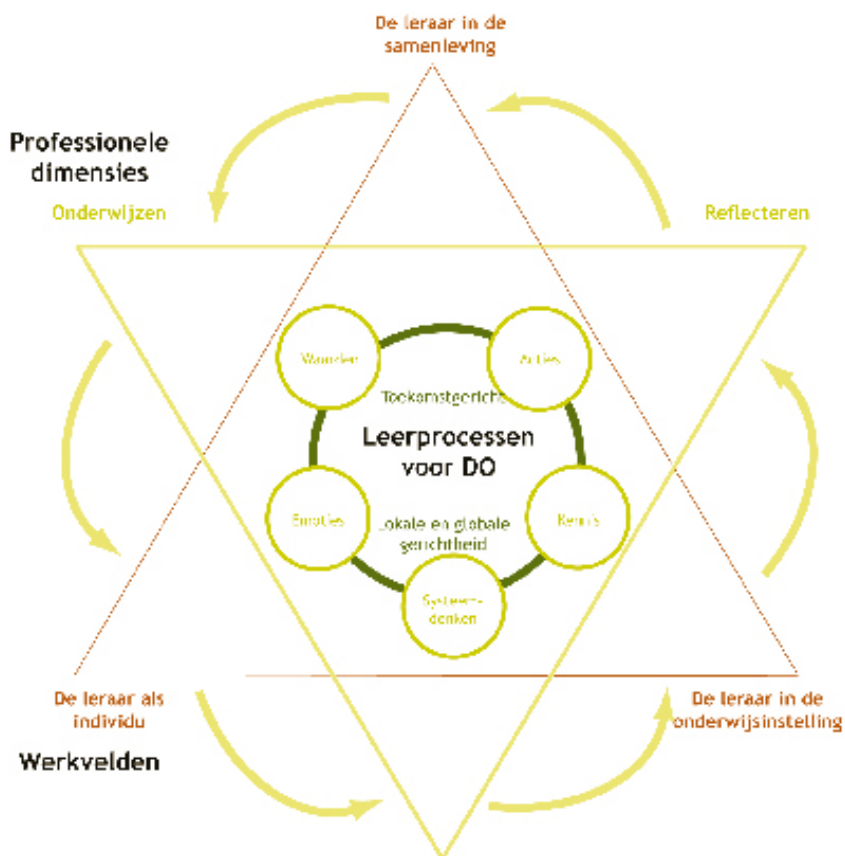


Figure 7: dynamic model concerning competences for sustainable development for the teaching staff¹¹

11 Based on Sleurs et al., 2008

This model considers the teaching staff as individuals that relate dynamically to their students, colleagues and the broad social context. It distinguishes three general competences for the teacher:

- communicating/teaching
- reflecting/developing a vision
- participating in networks inside and outside the school community.

In addition, when developing the teaching processes for sustainable development, five specific areas of competence are defined for the teacher:

- obtaining knowledge about questions of sustainability,
- thinking in terms of systems, integrated approach,
- appreciating situations and employing ethical norms,
- dealing with emotions that are invoked by certain questions of sustainability,
- ability to work with students in an action-oriented manner.

Note that these competences for teacher coincide closely with the competence model¹² for students as briefly described in Chapter 3.4. More information about this dynamic model is available in the publication, ‘Sustainable Development’¹³.

Recently (2012), UNECE released the publication, “Learning for the Future”, with an overview of ‘competences for educators’. The competences are inspired by the report by the International Commission for Education from UNESCO and are divided into 4 categories:

- Learning to know: refers to understanding the challenges of society (local and global) and the potential role of educators.
- Learning to do: refers to developing practical abilities and the ability to act in relation to education for sustainable development.
- Learning to live together: contributes to partnership and the appreciation of independence, pluralism, mutual understanding and peace.
- Learning to be: focuses on the development of personal characteristics and the potential to act with greater autonomy, the capacity to make judgments and personal responsibility in relation to sustainable development.

12 Vestia +D model by Niko Roorda

13 Sleurs et al., 2008

These basic competences are further divided on the basis of the essential characteristics of education for sustainable development, namely:

- holistic approach, systems thinking,
- exploring alternatives future images, learning from the past and inspirational engagement for today,
- to achieve transformation.

You can consult the entire publication with a visual presentation of the competences online at: www.unece.org/fileadmin/DAM/env/esd/ESD_Publications/Competences_Publication.pdf

3.4 Curriculum

Now that the required competences have been established, you must still determine the best way for the students to acquire them. Reorientation of the curriculum is thus required.

Support for the policy of integrating sustainability in education and the curriculum is essential (top-down approach); if not, the initiatives often remain limited to a number of enthusiastic and motivated teachers.

Still, the integration of sustainability can grow out of individual, separate initiatives. Several researchers start from this bottom-up approach and have developed methods or guidelines in support of small or individual initiatives¹⁴.

Sustainable development can be integrated into curricula horizontally as well as vertically¹⁵:

- Vertical integration: sustainable development as a concept is taught in one or more separate courses in the curriculum that focus specifically on sustainable development. The existence of a specialisation, Sustainable Development (SD) can serve as a lever for integrating SD in other specialisations, business operations, research and social services.
- Horizontal integration: sustainability is taught in various courses in the curriculum.
- Combined integration: a combination of the vertical and horizontal approach.

14 See Peet et al., 2004; Ceulemans and De Prins, 2010

15 Lambrechts, Van den Haute and Vanhoren, 2009; Ceulemans et al., 2011

We propose to offer basic knowledge of ‘ecodesign’ in a separate course called, for instance, ‘sustainable development’, and then to integrate various aspects of ecodesign in other courses or various projects. This approach is presented metaphorical with a tree.

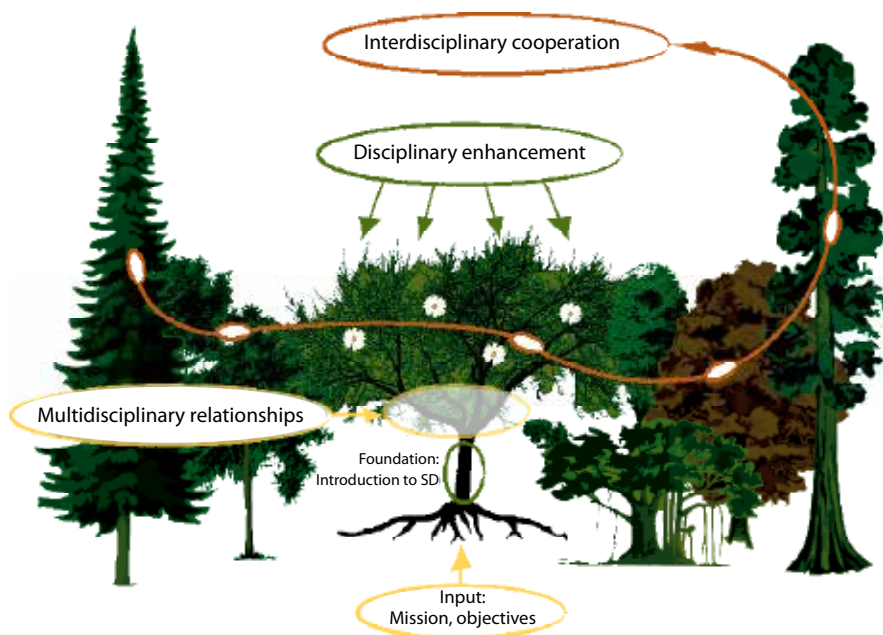


Figure 8: visual presentation of the approach to integrating sustainable development in higher education¹⁶

In this model, the roots represent the mission and vision of the programme or the educational institution: this is the intention to integrate sustainability - ecodesign in the programme.

The trunk represents offering an introductory module, a course with ‘sustainability’ as its theme.

The biochemistry that occurs in the tree represents the various teaching and working methods.

The branches are the various courses in which the link is established with sustainability = disciplinary enhancement.

16 based on Roorda, 2011

The crown represents multidisciplinary cohesion; in other words, the courses demonstrate a connection with sustainability as the common key word. The tree stands next to other trees; this is a metaphor for the fact that the programme or the institution forms part of society. The programmes prepare students to make a 'sustainable' contribution to society = interdisciplinary coherence.

The tree's growth process refers to the development and growth of the educational programme where it is continually tested by and compared with the needs and requirements of the society in which the students are educated.

Finally, the fruits - the flowers - are the output, the competences achieved by the students.

The major problem is that within the existing curriculum, there is often no room for integrating an extra course on 'sustainable development'.

What is feasible and doable is that each discipline grants at least minimal attention to

the aspect of sustainability. Indeed, as educators we become the 'shapers of future citizens' and there for are morally obliged to include the aspect of sustainability. Naturally, this demands an effort on the part of the teachers responsible.

If it is not feasible to dedicate an entire course to ecodesign in the programmes that are not purely focused on design, you can opt to provide a number of hours of theory about ecodesign in a relevant course, and then to apply this knowledge in an assignment.

If the existing teachers do not have the knowledge and skills necessary for ecodesign, you may be able to call upon guest lecturers, experts from the field and/or other learning institutions.

3.5. Courses of the programme

An important step is examining the curriculum and the various courses in order to know where ecodesign themes are already applied, but also in which courses certain content or themes regarding ecodesign can be integrated. This is different for each programme and people within the programme who have a clear vision of the curriculum and all the courses should be involved.

3.6 Learning content

3.6.1 Themes regarding sustainable development

Sustainable development includes many themes: depletion of raw materials, poverty, hunger, ethical and corporate social responsibility, etc. In the regional implementation strategy for sustainable development education, UNECE (United Nations Economic Commission for Europe) has made the following summary of the key themes of the concept, in which they emphasise the importance of a holistic approach¹⁷:

- Poverty alleviation
- Corporate responsibility
- Management of natural raw materials
- Biodiversity
- Citizenship
- Cultural diversity Democracy/Good Governance
- Ethics
- Gender equality Health
- Landscape diversity
- Human rights
- Environmental protection
- Rural and urban development
- Production and consumption patterns
- Justice
- Security Responsibility
- Peace

These themes are very general and can include many things. In the context of the EHE kit, we therefore put aside these topics and focus further on the aspect of ecodesign.

17 Lambrechts et al, 2011; UNECE, 2005

3.6.2 Themes regarding ecodesign

- Biomimicry
- Ecodesign tools
- Ecolabels
- Effects on people and the environment
- End of life cycle
- Energy and resources
- User behaviour
- Introduction to ecodesign
- Closing cycles
- Life cycle thinking
- Corporate Social Responsibility (CSR)
- Materials and environment
- Product-service combinations
- Cleaner production
- Systems thinking
- Future thinking
- Packaging and distribution
- Legislation concerning ecodesign

This list covers as good as possible the concept of ecodesign, defined according to the Triple P model in which People, Planet and Profit are in balance. This list is not exhaustive and may change over the course of time, according to the development of the interpretation of the concept ‘ecodesign’.

This list was NOT arranged in order of importance. Where specifically the priorities are placed is the responsibility of the teacher involved or the team that decides to integrate ecodesign in the curriculum. A learning content card has been made for each of these themes. This includes a concise description, the most relevant references and a link to practical examples described in the practical example cards. All of these cards are bundled under the ‘Learning content cards’ in the EHE kit.

3.7 Teaching methods

3.7.1 Activating teaching methods

Educational teaching methods are the various possibilities that support and structure the teaching process in order to realise the proposed competences.

The changeover from traditional, knowledge-guided education to competence-oriented education demands a different manner of curriculum organisation and the introduction of other teaching methods. New and different teaching methods are important for a variety of reasons, namely for the continued development of sustainable development, because students have different ways of learning, but also in the context of high-quality education.

One who wishes to introduce ecodesign into his/her course must know:

- which teaching methods are possible,
- what their advantages are,
- that there are many other advantages.

The new vision of learning focuses on flexibility, taking initiative, the ability to solve problems, the ability to work in a team, creative thinking, critical thinking, having a sense of responsibility and being able to act independently.

In order to satisfy these competences, different teaching methods are introduced. Traditional lectures, purely aimed at the transfer of knowledge, are often inadequate for developing the competences of sustainable development among the students. The use of adapted teaching methods is thus desirable. The emphasis of the new teaching methods rests on actively involving the students in the acquisition and processing of knowledge and skills and the formation of an attitude. The key words are: interactive, participative, action-oriented and in-depth research¹⁸.

3.7.2 Diversity of teaching methods

The way in which the learning material is presented and processed depends on a variety of factors: the content and nature of the learning material, the teacher's intent, the culture of the entire educational system and the competences to be achieved. To this end, the teaching method may also have a significant influence on the students' motivation to learn.

Some students are stimulated by individual research and group work, while others prefer a strict routine and lectures. The ideal situation suggests that the more diverse the number of educational forms, the greater the chance that each student will be satisfied, which promotes the learning process. It is thus desirable that a variety of teaching methods are offered.

3.7.3 Didactic model for preparing teaching activities

As we have just stated, there are several factors that guide the choice of particular teaching method. In order to determine one's own teaching method, the didactic model such as shown in Figure 9 may offer support. The model starts out from a few components that are common for most class preparations. A description of each of the components provides guidance for selecting and establishing an appropriate teaching method for each specific class situation. Every one of the components of the didactic model is discussed briefly.

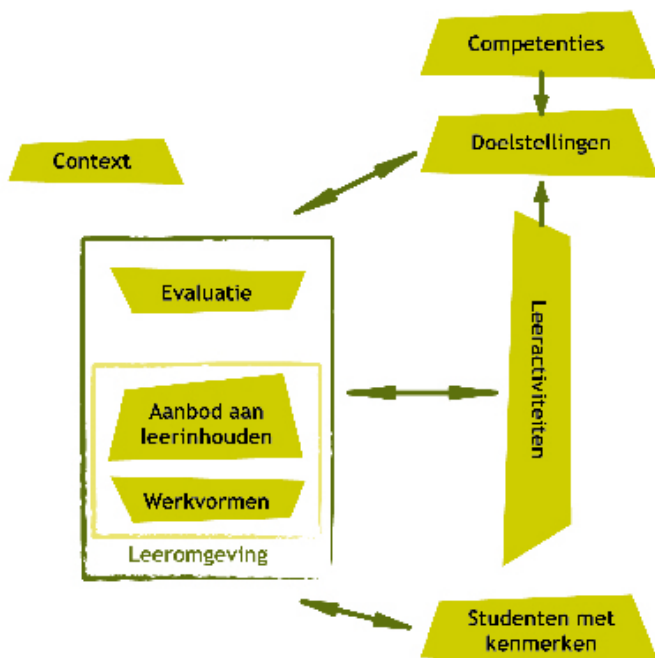


Figure 9: didactic model for determining a teaching method¹⁹

- **Context:** the environment in which the students will learn, the number of colleagues involved, the number of subjects, the physical space in which you must teach ... The human and societal vision of education. This is the context in which teaching must be incorporated.
- **Competences:** competences determine what one must know or be able to do at the end of the programme in order to be competent to perform a profession and are thus close to the professional field. You should thus consider which competences you wish to contribute to with the corresponding teaching activity.
- **Aims or objectives:** teaching aims are derived from the competences and determine what a student must know and be able to do at the end of short class (e.g. a contact). You should thus consider which teaching objectives you wish to contribute to with the corresponding teaching activity.
- **Student characteristics:** students have certain characteristics: are they taught in large groups of students, small groups, individual guidance ...? What is their prior knowledge, their interests, their age ...? Are there students with specific needs (different language, dyslexia...)? Is there a need for differentiation among the students? What is needed and how can it be achieved?
- **Learning environment:** this is the situation in which students are encouraged to learn. It includes learning content, teaching methods, materials and media used and the evaluation.
- **Offering of learning contents:** the content that will be offered to the students. The content that must be processed to achieve the objectives. These specific contents regarding ecodesign are included in the EHE kit.
- **Support, teaching method, materials:** the didactic teaching method is the way in which the learning content is presented to the students. Support and materials together form the didactic material that is used in the class.
- **Evaluation:** a course also needs an evaluation to know whether or not the objectives have been achieved at the end of the course. This includes the evaluation of the results (what has been learned) as well as an evaluation of the process to obtain that result (where did it possibly go wrong?)

- **Learning activities:** this forms the result of the preparations. These are the activities that will be undertaken with clear learning objectives, a specific content, the use of a chosen working and evaluation method, while taking other factors into account. Learning activities thus comprise the totality of what your students do in order to achieve the objectives (read syllabus, ask questions, perform practical exercises and research, solve case studies ...).

For more background information about preparing learning activities and class elements, we refer to a few practical guides that go into greater depth on this²⁰.

3.7.4 Tips for successfully applying activating teaching methods

- Give serious consideration to the learning objective to accomplish. For example: ‘Ability to apply ecodesign tools’.
- Activate important matters; avoid a passive attitude, for instance, showing a film without any follow-up.
- Activate students with the anticipated difficulties. A teacher usually knows from experience where the student encounters difficulties, where the problems are. The teacher can anticipate this by activating the student(s) at such a moment.
- Pay attention to a proper balance between the different aspects: acquiring knowledge, obtaining insight and skills, and attitude formation. This often results in a variation of different teaching methods or a multiple assignment instruction for the same working methods (e.g. one brainstorming session about the definition = knowledge; one brainstorming session about a problem = insight).
- Students’ attention level lowers after 15 to 20 minutes. Therefore, this is the time for an activating teaching method
- The working methods are also generally new to the students. Motivate the students to actively participate and keep the assignments limited. Through the act of doing it, one becomes familiar with the working method and expansion is possible.

20 incl. ‘Praktijkboek Activerend Hoger Onderwijs’ by Peter Van Petegem, 2009

- Indicate to the students for which objective the method is being used. Try to link an evaluation to the working method as much as possible. Unfortunately, the score he will get, is still the ultimate reason for the student to cooperate.
- Try to anticipate ahead of time the expected twists and turns, problems, and students' reactions when implementing the working method. Proper preparation is important for activation. This will eventually become easier as one gains more experience with activation.
- In advance, read and reread the task that accompanies the working method and estimate whether the students might misunderstand the assignment. For students, every word is important and can be misunderstood.
- Supporting questions when developing a task for the various working methods are:
 - *What are we going to do?*
 - *How are we going to do it (individually or in group)?*
 - *How large are the groups? (max. 6 students per group)*
 - *How much time is provided for it?*
 - *Is there an evaluation, and how?*
- Ensure that the teacher is available for the students when executing the assignment (physically or by current methods of communication).
- Ensure that the teacher is aware of students who are stuck or do not actively participate and try to encourage them in a positive manner.
- Arrange a considered schedule and follow it strictly.
- Always allow time for a follow-up discussion. Potential decisions that should be considered:
 - How many students will you allow to speak? If it is not possible for everyone, then always designate at random so that the students may always expect to have to give an opinion/conclusion.
 - As a teacher, how do you provide oral or written feedback?

- *What do you provide? A follow-up discussion can be rather chaotic. A focal point for the teacher - 'what do I mainly want you to learn from this assignment' - is then important.*
- *Have the follow-up discussion directly after the working method.*
- A few suggestions to get the students concentrated again after an activating moment:
 - *Clearly indicate that the class will be resumed.*
 - *Instruct chatting students to take the floor; they will likely quiet down.*
 - *Speak more softly; the students who want to follow the lecture will instruct their fellow students to quiet down.*

3.7.5 Werkvormen in de EHO-kit

Teaching methods that strongly support competences for sustainable development and ecodesign and that we have selected for the EHE kit are²¹:

Activating lecture
 Brainstorming
 Case method
 Demonstration
 Discussion
 Group work
 Jigsaw
 Educational
 DiscussionAssignments
 Presentation
 Project education
 Socratic method

You will find a discussion of these teaching methods in the teaching method cards. Here you will also find a link to relevant sources in the event that you would like to know more about a specific teaching method. There is also a link to the practical example cards containing examples where this teaching method is applied. All of these cards are bundled under the 'Learning content cards' in the EHE kit.

21 From: Scoullos and Malotidi, 2004; Lambrechts, et al., 2009, het IVOOR, 2009; www.bvdatbank.be; Van Petegem, 2009

Measuring starting point and progress

4.1 Existing measuring instruments

The first step you should take is screening the current situation regarding ecodesign in the programme. This means that you must first investigate the extent to which sustainable development and ecodesign are already embedded in the mission and vision of the programme, but also in the entire educational institution. Furthermore, you will also have to make an analysis of the extent to which and the way in which ecodesign is currently integrated into the current curriculum. There are various methods for doing this, among others, the AISHE method²³, the curriculum scan²³ and other assessment tools²⁴. These scans are very useful, but require a serious effort from the educational council and educators. We present a limited analysis in the EHE kit with the help of the matrix and the cards.

4.2 Measuring instruments in the EHE kit

The EHE kit includes worksheets (the working matrix and the various cards) with which you can qualitatively:

- Determine the start position with respect to ecodesign: Where are we at this moment with the programme? Which courses currently contain components regarding ecodesign? By means of which teaching method(s) are these themes addressed?
- You can search for proposals and possibilities for integrating certain content regarding ecodesign, combined with certain working methods. In this way, links can be established between ecodesign-content and particular courses from the curriculum. Connections can also be established between the various courses and the proposed competences.

We advise you to conduct this analysis with a team of educators, professors and education supervisors.

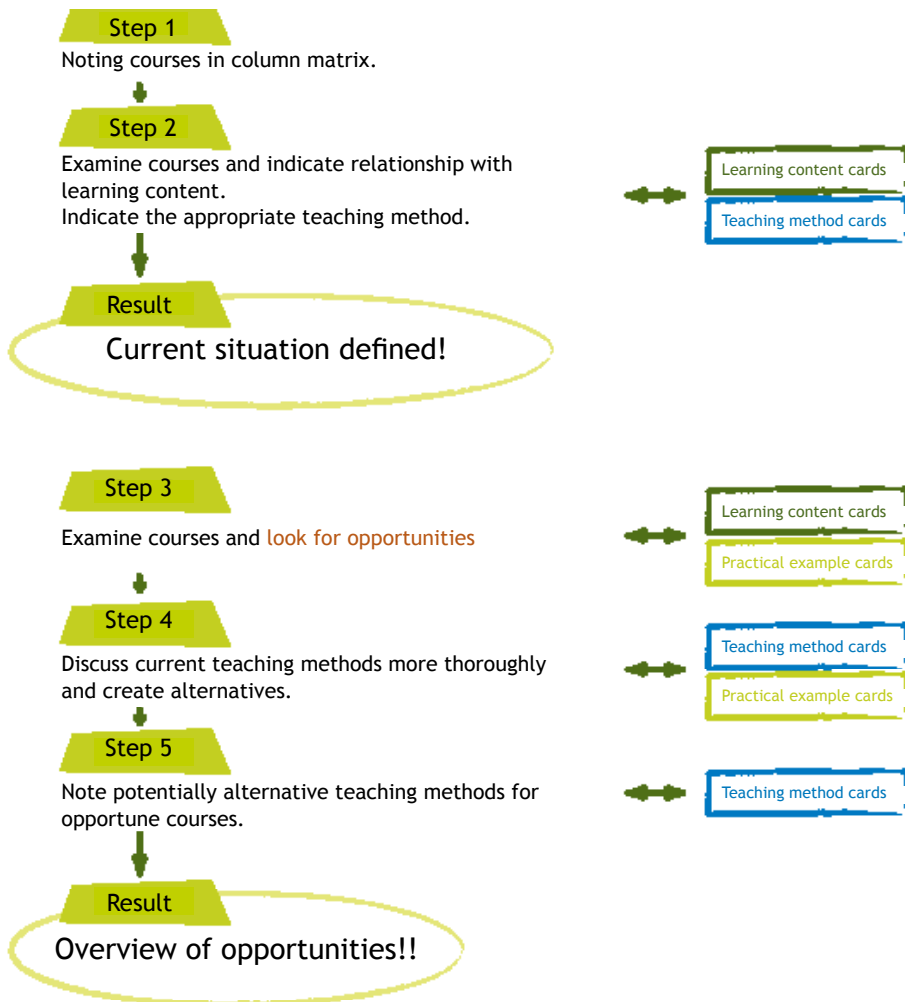
22 Hobéon, 2012

23 Roorda, 2012

24 Shriberg, 2002

Getting started

How you can get started with the EHE kit can be found in the graph below. The steps are then discussed one by one.



The workshop lasts approximately 2 hours. It is best to work with teams, among others, with the education coordinator, various professors or teachers, and possibly with some students ... Should the group be larger than six participants, we advise you to split them into smaller groups. The work of the different groups is then summarized.

Ingredients for a workshop (per group) are:

- The EHE kit,
- A printed copy of the curriculum of the programme,
- A description of the different courses (if available),
- A list of the competences of the programme,
- A blank matrix for each group (can be found under worksheets),
- Enough copies of blank practical example cards,
- Writing materials,
- And a great desire to integrate ecodesign into the curriculum!

Step 1

Definition of the columns: courses (or competences)

First of all, we want to know the extent to which ecodesign is already integrated in to the curriculum of the programme. For this, use the matrix containing learning content and courses/competences.

Several learning contents are already included in the rows of the matrix. You complete the columns with courses or competences.

You decide on your own whether you work with courses from the curriculum or with the competences that will result from the curriculum. We nevertheless recommend to begin with the courses. You can later use the matrix with the competences to check whether all competences were covered well.

If you work with the courses, ask yourself the question:

Which courses in the curriculum now already contain aspects of ecodesign, or are eligible to include this in the future?

Each course that is eligible receives a column. The course is described at the top of a column.

If you work with competences, ask yourself the question:

Which learning contents concerning ecodesign contribute to the realisation of a certain competence, now or in the future?

Now each competence is completed in the columns.

This first step creates a selection of all the courses or competences and ensures that you can work in a targeted manner regarding the most relevant aspects of the programme.

Step 2

Completing the matrix: current integration of ecodesign in the curriculum

Once the matrix columns are defined, you can begin to fill them in. Suppose that we work with the matrix, courses - learning content. For each course you tick which learning content is already offered.

You can consult the cards with the learning content as a reminder or by way of information. When filling in the matrix, the teaching method is also noted. After each course has been checked as to whether learning content concerning ecodesign is present or not, you have a fine overview of the current state of affairs.

Step 3

Completing the matrix: opportunities for (further) integration of ecodesign

The intention is to more thoroughly integrate ecodesign in the curriculum. The next step is therefore to look for courses that offer opportunities. The content of each course is tested against the question of whether or not a link can be established to ecodesign learning content. Here you can also consult the content cards and practical example cards to serve as a source of inspiration. Check through them column by column.

After examining and completing the matrix you have a fine overview of the topics concerning ecodesign that are already included in the various courses as well as opportunities to fill possible gaps in the content.

In order to make a distinction between the current situation and the opportunities, it is best if you use two colours when filling in the matrix; e.g. green for the current situation, and red for opportunities.

Step 4

Discuss current teaching methods more extensively and generate alternatives

In the next step, you examine which teaching methods are already used for ecodesign content in the different courses and how you can let them inspire you to use other teaching methods. When doing this screening, evaluate the teaching methods used and possible alternatives and briefly describe: evaluation method, size of the groups, familiarity of teacher with teaching method, time provided ... You can write out a more extensive version on a blank example card. For this you can take the cards containing the different teaching methods by way of support and inspiration.

After the evaluation it will be evident whether or not teaching methods other than traditional lectures are applied. The more various teaching methods, the better!

Step 5

Completing the matrix: teaching methods for opportunities generated

You then do the same exercise for the previously generated opportunities. Try to have as much diversity of teaching methods as possible throughout the entire curriculum. When determining possible teaching methods for the learning content that can be offered in the different courses, keep in mind the following aspects:

- Which teaching method can be used?
- Which evaluation will you apply?
- What is the size of the groups?
- How familiar is the teacher concerned with the teaching methods?
- How much time is provided?

At the end of this analysis you can take specific steps to integrate ecodesign into (certain courses of) the curriculum.

Additional support and inspiration: the practical example cards.

You can consult the example cards at any time during the working session as an additional source of information.

Working with the learning content matrix - competences

You can also establish the link with the learning content and the competences in a similar manner.

The various competences within the programme are shown in the columns of the matrix. In the first instance you can thereby determine which competences are already offered by certain content. After that, in consultation with a team of colleagues, you can formulate options about ways in which certain learning contents may contribute to completing certain competences. For this you can use the cards with teaching methods and learning content.

The development of integrating ecodesign in the curriculum: the use of regular working sessions.

Completing the matrix is preferably not a one-time event. When a team of educators and education supervisors regularly take the time to examine the curriculum in the way suggested, you can see the development and take actions on time to adjust it.

Examples, sources of inspiration and references

6.1 Practical example cards

The practical example cards demonstrate how certain themes regarding eco-design are already offered by specific teaching methods in various programmes in Flanders, Belgium and internationally. We hope that these cards are a useful source of inspiration. You start to work with the blank card on which you give a brief description of the content of the subject/the workshop, teaching objectives, the link to ecodesign themes, teaching method(s), the expected result ...

6.2 Sources for more background information

THE IVOOR

The IVOOR stands for Manual and Training for integrating Corporate Social Responsibility in Courses of the Regular system. It provides a ready-made instrument that helps educators to integrate attention for corporate social responsibility into the content of their courses. The manual is mainly aimed at business programmes, 'Business Administration'. The project is supported by the Flemish ESF Agency (European Social Fund).

Additional information can be found at: www.competento.be/ivoor

ECHO

The Expertise Centre for Higher Education (ECHO) supports and develops activities that are aimed at improving and modernising education at the University of Antwerp (UA) and the university colleges in the association (AUHA).

In the book 'Praktijkboek activerend hoger onderwijs' by Peter Van Petegem, numerous examples can be found about the approach, containing new teaching methods and alternative evaluation methods.

More information available at: www.ua.ac.be/echo

Ecocampus - Integrating sustainability in higher education

As a division within the Department of Environment, Nature and Energy, Ecocampus works to integrate sustainability in higher education.

Ecocampus has numerous initiatives to support integration at various levels, such as debate café's, developing a vision text concerning development in higher education ...

More information available at: <http://ecocampus.lne.be>

Sustainable development and Environmental issues

The introductory book, 'Duurzame Ontwikkeling', is intended for students in higher education (university colleges and universities) from all disciplines. It gives a balanced description of sustainable development, taking people, planet and profit/prosperity into account. Furthermore, elements such as 'place' and 'time' are included, which means that it addresses the global side of sustainable development and its future aspects.

Roorda, N. 2010. Duurzame Ontwikkeling Noordhoff Publishers.

Sustainable Development. A multidisciplinary vision.

This book examines the social, economic and ecological dimensions of sustainability through different scientific disciplines. From LONDO - the Leuven Research Network on Sustainable Development - the authors wish to outline a holistic, nuanced image of the sustainability issue. They want to provide insight into the way in which the various scientific disciplines can contribute to a sustainable society.

Duflou, J. (ed.) 2013. Duurzame Ontwikkeling. Een multidisciplinaire visie. Acco Publishing.

Teaching and Learning for a Sustainable Future

This programme is part of UNESCO's Decade of Education for Sustainable Development. It provides professional development for student teachers, teachers, curriculum developers, policy makers and authors of educational materials.

More information available at: www.unesco.org/education/tlsf

United Nations Environment Programme

The United Nations Environment Programme regularly publishes reports that describe the global ecological situation, such as "*The Global Environmental Outlook*". These reports are a source of information for the current state of affairs for a variety of environmental issues.

More information available at: www.unep.org and www.unep.org/geo

Flemish Regional Indicators (VRIND), Government of Flanders

VRIND describes the demographic, macro-economic, sociocultural and societal context in which the Government of Flanders is active. A variety of sustainability aspects are addressed: waste, water, air, energy, climate change ...

More information available at: www.flanders.be/en

Intergovernmental Panel on Climate Change (IPCC)

The IPCC was founded by the World Meteorological Organisation (WMO) and the United Nations Environment Programme (UNEP) in 1988. Its primary objective is to assess the scientific, technical and socio-economic information that is relevant for understanding climate change caused by humankind, the possible effects of climate change and possibilities for mitigation and adaptation. More information available at: www.ipcc.ch

Flanders Environment Report (MIRA), FEA

MIRA is a product of the Flemish Environmental Agency (FEA), a public institution. MIRA describes, analyses and evaluates the condition of the Flemish environment, discusses the environmental policy pursued and looks ahead to potential environmental developments. More information available at: www.milieurapport.be/en/home/

ecoTips Magazine

ecoTips is intended for business leaders, managers, environmental coordinators, environmental professionals and everyone who is professionally responsible for, or is involved in, sustainable business.

More information available at: www.ecotips.org

AISHE method

The AISHE method can be used to determine the extent to which sustainability is already integrated in your educational institution. To this end, AISHE provides a framework that makes it possible to measure sustainability.

More information available at: www.hobson.nl/thema_s/mvo/keurmerk_duurzaam_hoger_onderwijs

Corporate Social Responsibility

Website with much information about corporate social responsibility, specifically for Flanders. More information available at: www.mvovlaanderen.be

De mythe van de groene economie • Valstrik, verzet, alternatieven

Boek. Kenis, A. en Lievens, M. 2013. EPO uitgeverij.

6.3 Inspiration for teaching materials

The Story of Stuff - film: [www.storyofstuff.org/The 11th hour](http://www.storyofstuff.org/The_11th_hour)

Costing the Earth - film: www.youtube.com/watch?v=-ElsIpLsPX8

LNE Ecocampus debate cafés - film fragments

In the context of the debate cafés organised by LNE Ecocampus, a whole series of short film fragments were gathered that could be shown as an introduction to a discussion of a theme. Document '*Door ons uitgewerkte methodiek*' at <http://www.lne.be/doelgroepen/onderwijs/ecocampus/literatuur-materialen/educatie-voor-duurzame-ontwikkeling/debatcafes>

Ellen MacArthur Foundation - film fragments

The Ellen MacArthur Foundation takes a critical look at the current, linear economic model and advocates the circular economy. The website offers information and videos for different education levels, including higher education. More information available at: www.ellenmacarthurfoundation.org/education/higher

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6.5 Dublin Descriptors

Source: NVAO

Description of Bachelor's and Master's level

Bachelor Qualifications

Knowledge and understanding

Has knowledge and insight of a discipline which builds on the level reached in secondary education and exceeds it; usually functions at a level at which, with the support of specialised manuals, some aspects arise for which knowledge of the latest developments in the field is required.

Application of knowledge and understanding

Is capable of applying his/her knowledge and insight in such a way that this shows a professional approach to his/her work or occupation, and furthermore has competences for establishing and going in into depth into arguments and for solving problems in the discipline.

Making judgments

Is capable of gathering and interpreting relevant information (usually in the discipline) with the object of forming a judgment that is based in part on considering relevant socio-societal, scientific or ethical aspects.

Communication

Is capable of presenting information, ideas, problems and solution to an audience consisting of specialists or non-specialists.

Learning skills

Has the learning skills necessary to undertake a follow-up study that assumes a high level of autonomy.

Master Qualifications

Has demonstrable knowledge and insight based on the knowledge and insight at the Bachelor level and exceeds them and/or goes into greater depth, as well as offering a basis or opportunity to make an original contribution to the development and/or application of ideas, often in relation to research.

Is capable of applying knowledge and insight and problem-solving abilities in new or unfamiliar circumstances within a broader (or multidisciplinary) context that is related to the field; is capable of integrating knowledge and dealing with complex material.

Is capable of forming judgments on the basis of incomplete or limited information, and taking into account socio-societal and ethical responsibilities that are associated with applying one's own knowledge and judgments.

Is capable of clearly and unambiguously conveying conclusions as well as knowledge, motives and considerations on which they are based to an audience of specialists and non-specialists.

Has the learning skills that enable him or her to undertake a follow-up study of a largely self-directed or autonomous nature.

Knowledge and understanding

Application of knowledge and understanding

Making judgments

Communication

Learning skills

VLLI Dairy VITA, OVAM, Stationsstraat 110, 2800 Mechelen - OVAMA 75012121

For more information

www.ovam.be
info@ovam.be

T: 015 284 284
F: 015 203 275

Public Waste
Agency of Flanders,
Stationsstraat 110
B-2800 Mechelen

