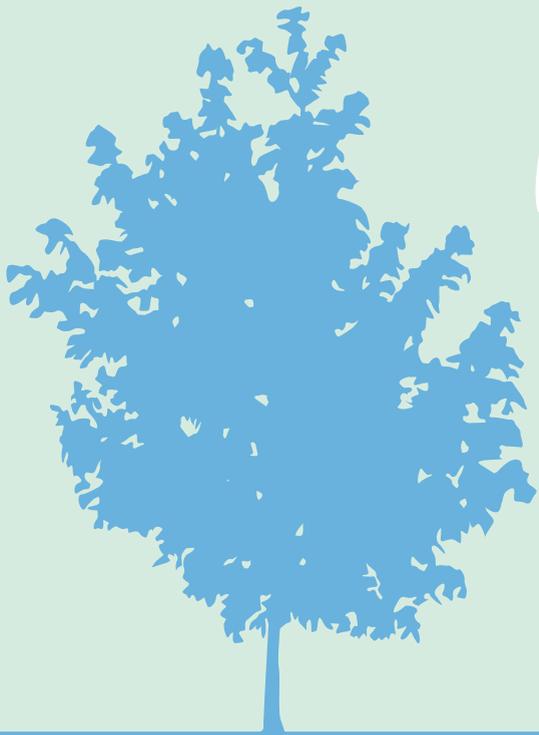
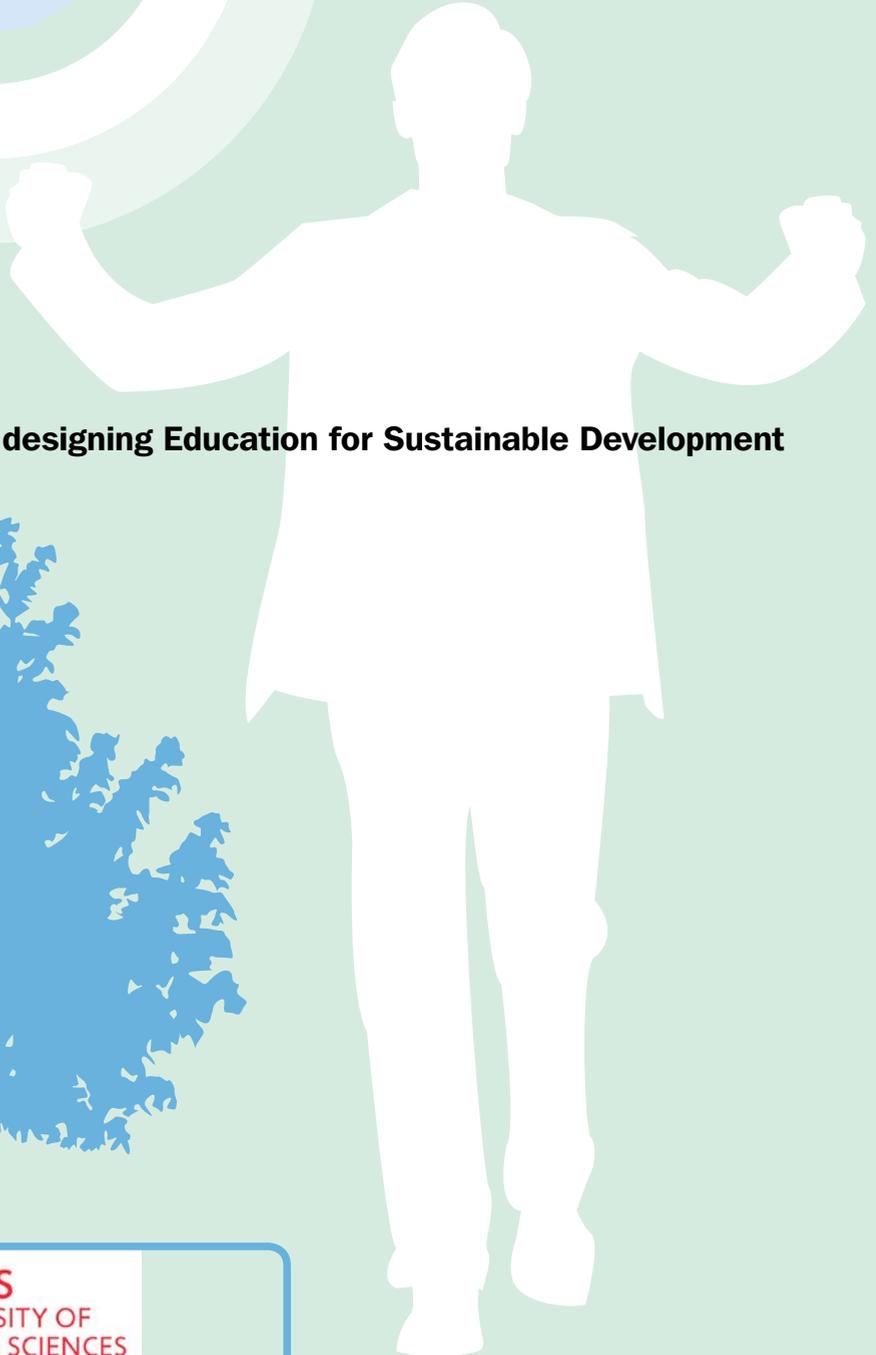


Education for Sustainable Development

Just do it!

Stan Frijters

Guidelines for designing Education for Sustainable Development



AERES
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WAGENINGEN



Education for Sustainable Development; Just do it!

Guidelines for designing Education for Sustainable Development

A product in the context of the NRO research project “Learning environment as a catalyst for Education for Sustainable Development”.

This publication was made possible with funding from the Netherlands Initiative for Education Research (NRO) and the Dutch Governmental ESD program “DuurzaamDoor”.

With the cooperation of:

Participants from the school: Sandra Bolkenbaas and Ilse Franken (Lentiz Onderwijsgroep), Michal Fekkes and Patricia Wilke (Aeres vmbo, Aeres mbo, formerly Groenhorst), Henri Weselink (Groene Welle), Moon Zijp and Fred Greuter (Clusius College).

Co-researchers: Prof. Wiel Veugelers (University of Humanistic Studies), Dr. Harm Biemans (Wageningen UR), Dr. Niek van den Berg and Ellen Messing (Aeres University of Applied Sciences Wageningen).

Sounding board group: Anne Remmerswaal (Wageningen UR), Heleentje Swart (Nordwin College), Martin Hup (Het Woeste Westen Amsterdam) and Jan Hoed (Aeres University of Applied Sciences Wageningen).

We thank Arjen Nawijn and Toon van der Ven (Aeres University of Applied Sciences Wageningen) for their valuable counsel.

Colophon

Publisher: Aeres University of Applied Sciences Wageningen (formerly Stoas)

Author: Stan Frijters (Stoas Vilentum Wageningen)

Editing: Erik Hardeman

Translation: Wageningen in'to Languages

Design: Explanation Design

Second revised edition

ISBN/EAN: 978-90-78712-24-4

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Guide to designing Education for Sustainable Development

Stan Frijters

Aeres University of Applied Sciences Wageningen

2016

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Introduction

Education for Sustainable Development (ESD) is focused on the development of knowledge, skills, attitudes and values necessary in creating a sustainable future (UNESCO, 2005). Teachers are being asked to devote attention to sustainable development in general, as well as to specific sustainability related themes such as climate change, food security and biodiversity (NRO, 2014). But merely knowledge, understanding and insight are not sufficient to prepare students for active participation in sustainable development. Instilling greater social engagement among young people calls for a specific pedagogical approach. In addition, a different, more hybridised learning environment is needed as well as a Whole School Approach (Wals, 2015, Remmers, 2007).

The question of how ESD can be shaped in practice prompted a group of seven teachers from Pre-Vocational Secondary Education and Technical and Vocational Education and Training and five researchers to formulate sustainable development-oriented design criteria and develop, implement and evaluate learning activities on the basis of these criteria.

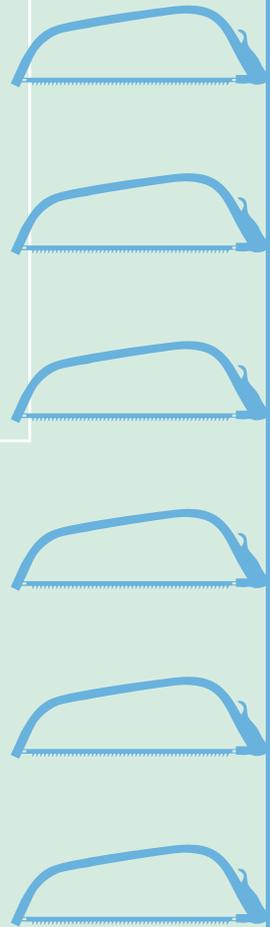
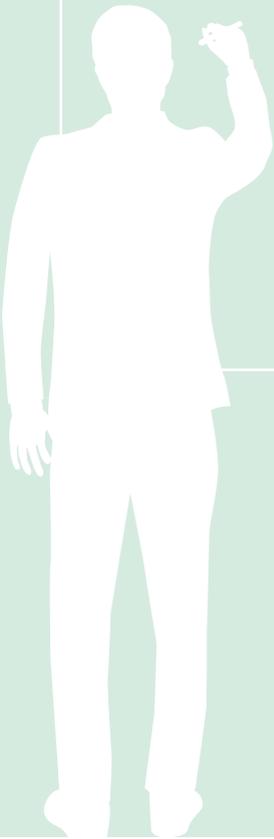
This publication provides a brief description of the theory, describes practical experiences with Education for Sustainable Development and provides an overview of relevant teacher competences and design criteria.

The following topics will be covered:

- What is ESD? (Chapter 1),
- How is it shaped? (Chapters 2 and 3),
- Practical experiences from the ESD NRO study (Chapter 4),
- Teacher competences for ESD (Chapter 5),
- Some conclusions (Chapter 6).

Part I

From theory to practice



1. What is Education for Sustainable Development?

FROM ENVIRONMENTAL EDUCATION TO EDUCATION FOR SUSTAINABLE DEVELOPMENT

The media devotes attention on a daily basis to what has been described as the “environmental crisis”. The twenty-first climate summit was held in Paris in 2015; and governments have been setting long-term goals to combat the continued deterioration of our living environment. Businesses are responding to this in their production processes and through their marketing. Citizens are also gaining more insight into environmental problems, but still often lack the crucial knowledge to play a meaningful role in tackling global problems such as the lack of food security, endangered biodiversity and resource scarcity (Wals, 2015).

The realisation that our education can make a significant contribution to creating public support for a more sustainable future is now widely shared (Van Poeck, 2014). Our understanding of the coherent way this should be done has also been growing. Education for Sustainable Development is an effective way to also get the point across to (young) people about how much action is needed in this arena. In this chapter we will discuss what ESD is.

In the 1960s, environmental education already received attention. Awareness, knowledge and environmentally friendly behaviour are the traditional learning outcomes (both real and envisioned) of environmental education (Stapp, 1969). Additionally, in the Netherlands, mandatory sustainability objectives have been formulated for education since 1985. And since the release of the Brundtland report *Our common future* (WCED, 1987), sustainable development has been a central theme in environmental education. Since UNESCO’s *Decade of Education for Sustainable Development* (2005-2014) from 2005, an integrated approach to sustainable development in society, and in particularly in educational settings, has remained a central theme.

Sustainable development is about the relationship between *people* (social), *planet* (ecology) and *profit or prosperity* (economy), making it cross-disciplinary and very broadly applicable. This is why an instrumental, linear approach within our teaching does not do justice to the complexity of the sustainability challenge. What is needed instead is a “regulative idea” (Sleurs, 2007 and Rauch & Pfaffenwimmer, 2013), i.e. a normative ideal to strive for, even though it will never be fully achieved and will take different forms in each situation. In educational reform, Van den Berg (2016) distinguishes between simple, complicated and complex/problematic issues. You could say that, as a regulative idea, ESD is a complicated problem at the very least; the issue is clear but the solution has yet to crystallise. Research can help in these kinds of situations in finding and testing possible solutions. Highlighting didactic principles for ESD, developing design criteria and describing teacher competences, as was the case in the present study, is in line with this research.

INTEGRATED APPROACH

Through an integrated approach, ESD strives to enable students to acquire knowledge, skills, attitudes and values in relation to sustainable development. UNESCO (2005) formulated this as follows: “*Education for Sustainable Development allows every human being to acquire the knowledge, skills, attitudes and values necessary to shape a sustainable future.*” UNESCO (2005) lists the following skills:

- *Envisioning*: Envisioning a better future for yourself. The principle here is that if we know where we are going, we will be better capable of determining how best to get there.
- *Critical thinking and reflection*: The ability of critical thinking helps people study economic, ecological, social and cultural structures in the context of sustainable development. Reflection teaches us to recognise our own knowledge, perspectives and opinions in our convictions.
- *Systems thinking*: Recognising complexity and looking for links and synergies in complex problems.
- *Building partnerships*: The ability to promote dialogue and teach people to negotiate and cooperate.
- *Empowerment*: Equipping people to participate in the decision-making. The development of the individual and collective capacity of people or groups of people to bring about change that goes above and beyond one’s own life: the capacity to exercise power and influence at the social, cultural, organisational and political level (Wagenaar and Balder-van Seggelen, 2010).

This is why the simple transfer of knowledge is not sufficient, because knowledge alone does not provide solutions for global problems in the area of environment, society and economy. Although producing new knowledge through a cooperative and critical learning process (Sauvé, 1996) is a key element, it is especially important to enable citizens to act on the basis of this new knowledge and participate in the decision-making. In this context, learning comprises formal learning, non-formal learning and informal learning. Formal learning means learning at school. Non-formal learning takes place outside the school, but it still involves intentional, organised and structured learning; social internships, nature conservation in the school environment and excursions are forms of non-formal learning. Informal learning is a type of learning outside the school that arises in a more or less spontaneous way and without being specifically organised. Seen in this way, learning can help bring about a change in attitude, behaviour and values towards a more sustainable future in people, at the social, ecological and economic level (*people, planet and profit*).

In other words, with ESD, you learn not just about sustainable development, but are also a participant in the process of sustainable development. One of the most important achievements of ESD is equipping students to act (Sleurs, 2007) in such a way that they can make informed choices as responsible citizens.

This *action competence* helps current and future citizens to become socially engaged in areas other than sustainable development alone. In this way, education in the field of ESD contributes

to civic education; it stimulates creativity and guides individuals to become critical thinkers who can work well with others.

ESD is also about an integrated approach to content, a learning environment within and outside the school and a pedagogical-didactic approach aimed at acquiring knowledge, skills and attitudes/values, spurring students to real action. The synergy of all these separate aspects is seen as an important precondition to success (Van Poeck, 2009, 2014). This means that ESD is eminently cross-disciplinary and cross-contextual in its nature.

Currently, discipline-specific goals determine the extent to which teachers can devote attention to issues related to sustainable development. This is why it seems difficult to shape the multi-disciplinary nature of ESD in all its facets within a single discipline. Nevertheless, course content within most existing curricula can be easily adapted to ESD. After all, there are few topics unrelated to sustainable development. However, implementing ESD in education is so all-encompassing that it always calls for action at the school level. It is of great importance that the school as an organisation takes responsibility for itself and assumes an exemplary role and develops its own vision: the so-called *Whole School Approach* (Wals, 2015, Remmers, 2007).

2. How can Education for Sustainable Development be implemented in educational practice? From theoretical principles to design criteria

Chapter 1 contains a brief description of what ESD involves. How can this be incorporated into educational learning activities today? In order to implement ESD, the national expertise centre for learning plan development SLO has formulated a core learning plan (Remmers, 2007) and a set of didactic principles (Bron, 2009). In addition, UNESCO (2005) and authors such as Sleurs (2007) have contributed to the crystallisation of the thinking on ESD. Based on these sources, important didactic principles of ESD have been formulated as follows:

Education for Sustainable Development:

1. is student-oriented.
2. relates to daily life and the student's direct living environment.
3. is future-oriented.
4. is action-oriented (together, participation) and works on the development of action competence.
5. promotes critical thinking, logical reasoning and the ability to make moral judgments.
6. is value-oriented.
7. views complexity as a challenge. Systems thinking is a starting point.
8. is about participation, both in class and in situations easily relatable to students.
9. benefits from an investigative attitude in students.
10. is a regulative idea (a normative ideal).

(Principles 1 to 8 are derived from Bron (2009). Sleurs (2007) emphasises 4, 6 and 8, and adds 9 and 10.)

Using these ten didactic principles in the 2014-2015 school year, teachers and researchers developed and implemented education activities in the NRO research project “Learning environment as a catalyst for Education for Sustainable Development”. As some principles are strongly correlate and are often also shaped jointly in practice, the below six cores are used in formulating the design criteria.

- 1 Student-oriented**
- 2 Value-oriented and focused on critical thinking**
- 3 Participation and collaborative learning**
- 4 Action-oriented**
- 5 Complexity and coherence**
- 6 Investigative attitude**

In this chapter we will discuss the six cores and related design criteria.

I Education for Sustainable Development is student-oriented

To concretise the possibilities for action in relation to sustainability, ESD should be consistent with the educational level, the field of interest and the learning and living environment of students. What do students know and want? What are their abilities? What knowledge do they have? What skills do they have? Which context exists in their daily lives in relation to sustainability? What are their choices regarding sustainable development? On which sustainability themes would they be willing work?

ESD should reflect the capabilities of students and be linked as much as possible to their personal ideas, values and perspectives. Although all education should be linked to its target group, for ESD, this didactic principle is indispensable in the realisation of truly authentic education. We wish to equip students (*empowerment*) with the ability to act in various situations in ways that will benefit sustainable development. This calls for knowledge, skills, attitudes and values that – both due to the uniqueness of each student and the complexity that often characterises sustainability questions – are continually being developed. Student-orientation in ESD therefore links on the one hand: building on the background of students (and taking into account their differences) and at the same time: staying as close as possible to the perceptions of students in relation to sustainability.

An example (*good practice*) of applying this group of principles can be found in a case about charging mobile phones. The students at a certain school realised that charging smartphones every day uses a lot of energy. Energy from the power outlet can have various sources: coal, gas, solar, wind or nuclear energy. These students thought it was a good idea to decide themselves which environmentally friendly energy source to use. In consultation with the school management, they used crowdfunding to have solar panels installed on the roof of the school.

CORE 1: STUDENT-ORIENTED: DESIGN CRITERIA

- In line with the mental development (level) of the student.
- Take into account the necessary (ecological) prior knowledge.
- Use the student's context (field of experience).
- Design student assignments and provide examples that are recognisable, realistic and meaningful for students.
- Work with assignments that enable students to act independently.
- Integrate a joint exploration of the concept of environment and its realistic and meaningful contexts into the learning activity.
- Give students as much substantive say as possible in choosing contexts that are realistic and meaningful for them.

II Education for Sustainable Development is about value orientation, critical and future-oriented thinking

How can I get my students to participate together so they learn how to apply value communication, critical and future-oriented thinking as authentically as possible?

Value-oriented education and learning how to think critically and in a future-oriented way calls for a safe social context, in which students can practice these skills and learn to apply them. This is especially important when students engage in lively debate with each other in the context of interesting case studies (Frijters, 2008, Leenders & Veugelers, 2004).

An important element of the learning process is to let students reflect on values and encourage them to make their values, attitude and skills explicit. ESD is about the future and our actions impact that future today. Students should learn to reflect on this and act accordingly. This is why ESD is asking for learning activities that allow students to name causes and consequences together. It is about working together on dilemmas and issues, and reflecting on complex issues with their fellow students. This means listening to each other, sharing, not imposing their views, trying to convince others and negotiate solutions. This implies that they will need to use logical reasoning and make and defend moral judgments, and consequently exchange well-reasoned positions.

In short: Students must learn to make judgments in relation to sustainable development based on their personal value orientation, to then (preferably) turn that judgment into concrete action in a real-life situation. Knowledge and social skills are needed to come to shared critical and balanced (moral) judgments. The trinity of *people*, *planet* and *profit* has proven to be a powerful tool in clarifying students' sustainability dilemmas in a balanced way. Given that existing education, according to Wals (2015), is mostly focused on "strengthening economic potential and on effectiveness and efficiency, i.e. the *profit* sector, (read: economy)", working with the complete trinity of *people*, *planet* and *profit* will certainly have added value.

CORE 2: VALUE-ORIENTED AND CRITICAL THINKING: DESIGN CRITERIA

- Let students make (moral) judgments on the basis of the trinity of *people*, *planet* and *profit*.
- Let students carry out activities in which sharing and exchanging reasoned views and reflecting on these is an essential element.
- Let students formulate and exchange personal solutions.
- Let students make their own reasoning explicit.
- Let students discuss (moral) dilemmas together.
- Let students formulate solutions together.

- Let students experience that not only a potential product, but even the (transformative) process is an important learning achievement.
- Let students express their values and attitudes more explicitly.
- Let students, during and after the learning activity, reflect on their values and attitude in relation to sustainable development

III Participation and collaborative learning are of great importance in Education for Sustainable Development

Sustainable development is not possible without the involvement and participation of the population, and that includes from young people (Remmers, 2007). ESD and civic education share important principles in the form of participation and collaborative learning. But how should you shape participation in real sustainability issues?

Participation means that students can be responsible for their own actions while learning and working in concrete situations. This involves being faced with as authentic, realistic and meaningful situations as possible, both within and outside of the school. The learning activities are focused on collaboration between students and collaboration between students and others inside and outside the school. In this way, a contribution is made to developing a shared sense of responsibility for the collaboration between individuals and society.

Collaborative learning stimulates the shared processing of knowledge, the dialogue between students and with it the development of values and attitudes. However, a central element of collaborative learning is also the interaction and dialogue with parties outside the school (De Jong, 2015), allowing students to create more connections. In this sense, learning is more of a dynamic process rather than a linear one. Sterling et al. (2005) call this “linking thinking”. To achieve good learning outcomes through collaborative learning, social and communication skills must be used optimally (Leenders & Veugelers, 2004). As not all types of collaboration lead to collaborative learning, we will delve a little deeper into the five key concepts for collaborative learning.

SUCCESSFUL COLLABORATIVE LEARNING; FIVE KEY CONCEPTS AND THREE RULES OF THUMB

According to Ross and Smyth (1995), the success of collaborative learning depends on five key concepts. These are:

1. *Positive interdependence*: Group members see or experience that they need each other to complete the assignment. Collaboration makes their task easier. “Students need each other to conduct collaborative assignments; one student cannot do it without the other.”
2. *Individual and group accountability*: Group members are accountable for their personal contribution within the group and for the shared outcome.

“The teacher or other students should be able to address each student both on his/her own contribution to the group as well as on the end result.”

3. *Promotive interaction*: During a collaborative assignment group members encourage and support each other, and communicate with each other directly. “Students should discuss things together directly, learning to motivate each other.”
4. *Interpersonal and small group skills*: In collaborative learning, group members must have interpersonal skills and skills for working in small groups, and must become motivated to use them. “Students must be able to use their social skills in their interactions with other students. They must get to know and trust one another, communicate clearly and unambiguously, accept and support each other and solve problems as effectively as possible.”
5. *Group processing*: Collaborative learning is more effective when the group members regularly discuss their own performance. “Teachers should pay attention to the process of collaborative learning and to the way in which the group has learned together.”

Three rules of thumb are of importance during collaborative learning (Tielman, 2009):

1. The teacher does nothing the students cannot do themselves. Support is given primarily through delaying help and helping through questions.
2. The teacher offers added value to students’ collaborative learning, either as a referee (safety) or as a coach (letting the group study separately from the teacher with a limited number of support scenarios).
3. The teacher looks for a good balance in guiding groups and distinguishes between groups that need support and groups that can manage on their own.

In guiding the collaboration between students, in addition to interaction, a great deal of attention must also be devoted to cognitive processes. Especially when the teaching activity is focused on ESD, critical reflection is hugely important.

CORE 3: PARTICIPATION AND COLLABORATIVE LEARNING: DESIGN CRITERIA

- Let students acquire or clarify the necessary (prior) knowledge.
- Let students work together on tasks that are realistic and meaningful for them, in situations where they can act independently.
- Create learning situations that give students the opportunity to be active in extracurricular contexts and to participate in real-life societal issues related to sustainable development.
- Let students work together with stakeholders within and outside the school.
- Apply the five core concepts for collaborative learning.
- Apply Tielman’s three rules of thumb.

IV Education for Sustainable Development is action-oriented, and leads to empowerment

ESD wishes for students to acquire competences that enable them to act sustainably now and in the future (*action competence*). This action-oriented (transformative) aspect of ESD cannot be acquired in an instrumental way (Sterling, 2001, 2005, de Jong, 2015), but then how?

Experiencing real participation inside and outside of the classroom, where students are responsible for their own actions and learning, will contribute to the development of a shared sense of responsibility. Participating in authentic learning situations serves as excellent preparation for participation in social processes (citizenship). ESD is not a separate discipline but rather cross-disciplinary, transformative education. It is transformative because education influences a person's identity, but is also because the student exerts influence on his or her social environment, and seeks to do so (participation). This will empower the student to contribute to sustainable development. Claims like "environmental consciousness doesn't affect me" and "there's nothing I can do to change it anyway" are expressions of powerlessness. A situation close to the students' reality should stimulate further investigation, and then it is often the case that more seems possible than originally thought.

CORE 4: ACTION-ORIENTED: DESIGN CRITERIA

- Let students link the results of their educational activities (research) to concrete action.
- Raise awareness amongst students of the transformative character of the learning activity.
- Let students carry out the actions on their own as much as possible.

V Education for Sustainable Development devotes attention to complexity and coherence, multidisciplinary knowledge and synergies

It is more often the rule than the exception that environmental problems have multiple causes. This gives sustainable development a high level of complexity, causing our education to demand something other than the “linear approach”. But which ones?

The core of that other approach is the application of systems thinking - recognising complexity and looking for links and synergies - in the curriculum. We must allow students to discover that ecosystems can become unbalanced through human interference, but that this process is reversible. An example of this is salmon, which disappeared from Dutch rivers mid-twentieth century, primarily due to water pollution. More stringent laws and regulations, however, improved the water quality of the major rivers, and the salmon returned. Now dams and weirs have been made more passable, with spawning sites have been restored for fish such as salmon.

The themes of climate change, food security and biodiversity offer a great deal of opportunity to use multidisciplinary knowledge to ultimately arrive at action. Sometimes, however, the complexity for an educational situation may seem too obscure, too daunting... or to quote Ulrich Beck (2015, p. 156): “*We are living in a world that is beyond controllability.*” And yet, it is precisely that complexity that is an essential part of ESD. Dealing with it demands students’ (read: citizens’) knowledge and skill to take action in perilous situations, to face risks and unpredictability and still stay in control of the situation. This clearly highlights the overlap between ESD and civic education (NRO, 2014, Veugelers, 2010 and Wals, 2012).

CORE 5: COMPLEXITY AND COHERENCE: DESIGN CRITERIA

- Use examples with a complexity level that students can comprehend.
- Let students work in complex situations with recognisable sustainability issues.
- Work on gaining insight into the relationships that characterise environmental problems.
- Use the combination of knowledge acquisition and skills development, as well as your personal stance to achieve the envisioned positive synergy in ESD.
- Let students work on a concrete scenario with multiple causes and consequences, but also with multiple potential solutions.
- Use recognisable examples and discuss the patterns found therein.

VI The student as a researcher, an inquisitive attitude

Learning to deal with complex, changing situations, participation and learning to act independently (empowerment) benefit strongly from an inquisitive attitude on the part of students. How can education focus on instilling such an inquisitive attitude in students?

An inquisitive attitude is a prerequisite for conducting research. Conversely, conducting research yourself can contribute to the development of an inquisitive attitude. Letting students conduct (action) research into a sustainability-related theme that is recognisable, realistic and meaningful to them, appears to be a suitable way to let them develop an inquisitive attitude. In line with Van den Berg's research (2016), further study ought to be conducted into how (teaching) an inquisitive attitude and (teaching how to conduct) research relate to each other and what this requires of teachers. By letting students conduct research into a topic close to their experiential level and that allows them to subsequently apply and evaluate that research, ESD becomes authentic and meaningful to students.

In this way, students acquire competences for sustainable action (*action competence*), now and in the future. Knowledge acquisition and personal and moral development go hand in hand within the concept of ESD: an important return. Given the theme, attitudes – and thus moral and normative questions – constitute an essential part of the action research conducted and the related necessary reflection (Veugelers, 2010). Yields from the research directly contribute to value orientation and the critical and future-oriented thinking in students.

Action research

According to De Lange, Schuman & Montesano Montessori (2010), action research has a number of fixed steps in a cycle. This can be easily translated into research within ESD, in which moral considerations and critical thinking are given a functional place in the research cycle. In the action research model (p. 113-115), the authors provide the following steps:

1. Formulating the practical problem with the (preliminary) research question.
2. The actual execution of the research with data collection.
3. Data analysis.
4. Evaluating and valuing the findings, and related to the problem, the research question and the theory.
5. Creating an action plan to improve the practical situation.
6. Executing and implementing improvement actions.
7. Evaluating the result.
8. Depending on the result, starting a new cycle.

In the context of ESD, value clarification, critical thinking and moral considerations can be inserted from step 4, and action and participation from step 5.

CORE 6: INVESTIGATIVE ATTITUDE: DESIGN CRITERIA

- Let students conduct action research into a problem that is recognisable, realistic, meaningful and related to sustainability.
- Let students go through methodical steps in their action research.
- Let students apply and evaluate the results of their action research.
- Let students reflect on the results of their research.



3. Positive and negative examples for the six cores and design criteria

Didactic principle	Designcriteria
<p>1. Student-oriented</p>	<ul style="list-style-type: none"> • Keep the mental development (level) of the student in mind. • Take into account the necessary (ecological) prior knowledge. • Use the student's context (field of experience). • Design student assignments and provide examples that are recognisable, realistic and meaningful for students. • Work with assignments that enable students to act independently. • Integrate a joint exploration of the concept of living environment into the learning activity and its realistic and meaningful contexts. • Give students as much substantive say as possible in choosing contexts that are realistic and meaningful for them.
<p>2. Value-orientation and critical thinking</p>	<ul style="list-style-type: none"> • Let students make (moral) judgments on the basis of the trinity of people, planet and profit. • Let students carry out activities in which sharing and exchanging reasoned views and reflecting on these is an essential element. • Let students formulate and exchange personal solutions. • Let students make their own reasoning explicit. • Let students discuss (moral) dilemmas together. • Let students formulate solutions together. • Let students experience that not only a potential product, but even the (transformative) process is an important learning achievement. • Let students express their values and attitudes more explicitly. • Let students, during and after the learning activity, reflect on their values and attitude in relation to sustainable development.
<p>3. Participation and collaborative learning</p>	<ul style="list-style-type: none"> • Let students acquire or clarify the necessary (prior) knowledge. • Let students work together on tasks that are realistic and meaningful for them, in situations where they can act independently. • Create learning situations that give students the opportunity to be active in extracurricular contexts and to participate in real-life societal issues related to sustainable development. • Let students work together with stakeholders within and outside the school. • Apply the five core concepts for collaborative learning. • Apply Tielman's three rules of thumb.

Positive examples	Negative examples
<ul style="list-style-type: none"> • Charging the phone. • Waste in the direct environment. • Growing your own vegetables. • Nutrition: meat or soya (conversion)? • Students' ecological footprint. • Recycle or incinerate the PET bottle? • Diversity: (improving) bird population levels in your environment. • Getting started with sustainability themes in the school environment. • Biodiversity in the school environment. • Increase of autumn storms in the Netherlands. • Dike reinforcement as a result of climate change. • New animal species in the Netherlands. 	<ul style="list-style-type: none"> • Decision on location of power plant. • Global CO2 problems without a local component. • Tropical rainforests and biodiversity. • Global decrease in diversity. • Irreducible complexity (cause and effect).
<ul style="list-style-type: none"> • A clear, safe learning environment. This way of working is not unusual and is seen as a part of regular education. • Open assignments and activities, students must feel that what they contribute personally, actually makes a difference in the process. • Elective assignments (Why did you choose... and not ...?). • Present students with existing dilemmas to link these with their own values. • Use case studies with peers. • Students create a retrospective view on the learning activity. • The teacher is more like a coach than an encyclopaedia. • Hold a discussion on the care for living organisms. 	<ul style="list-style-type: none"> • Closed assignments. • No reflection. • Find a solution to a problem using a linear approach. • Ethics as theory.
<ul style="list-style-type: none"> • Students work (possibly together with the neighbourhood) on a cleaner and safer school environment, but in addition also develop a prevention approach. • The school management is involved. • Based on research, students design a management plan for a park or body of water. • Students organise school elections. 	<ul style="list-style-type: none"> • The theory of citizen participation. • Students reflect on what could be done, but it remains a "practice round". • Group work means working together but not learning together.

Didactic principle	Designcriteria
<p>4. Action-oriented</p>	<ul style="list-style-type: none"> • Let students link the results of their educational activities (research) to concrete action. • Raise awareness amongst students of the transformative character of the learning activity. • Let students carry out the actions on their own as much as possible.
<p>5. Complexity and coherence</p>	<ul style="list-style-type: none"> • Use examples with a complexity level that students can comprehend. • Let students work in complex situations with recognisable sustainability issues. • Work on gaining insight into the relationships that characterise environmental problems. • Use the combination of knowledge acquisition and skills development, as well as your personal stance to achieve the envisioned positive synergy in ESD. • Let students work on a concrete scenario with multiple causes and consequences, but also with multiple potential solutions. • Use recognisable examples and discuss the patterns found therein.
<p>6. Investigative attitude</p>	<ul style="list-style-type: none"> • Let students conduct action research into a problem that is recognisable, realistic, meaningful and related to sustainability. • Let students go through methodical steps in their action research. • Let students apply and evaluate the results of their action research. • Let students reflect on the results of their research.

Positive examples	Negative examples
<ul style="list-style-type: none"> Care for the environment at school (in the classroom). Have a say in environmental conservation measures at school. Work in the green school environment. Social internships. 	<ul style="list-style-type: none"> School does not separate or hardly separates waste.
<ul style="list-style-type: none"> An ecosystem without predators. The increased clouding of lakes due to the increase of bream, leading to the lack of water plant growth, etc. The isolation of the elderly due to the lack of informal care due to second earners. Cheap, non-sustainable products as a result of child labour and poverty in the third world. Bees and fruit production and the impact of chemicals. 	<ul style="list-style-type: none"> The extinction of poisonous frogs due to the acidification in the atmosphere. The influence of temperature increases on water streams in the ocean and coastal weather patterns. Impoverishment of good information streams in the media landscape, and the role advertising plays in this.
<ul style="list-style-type: none"> Students conduct interviews or take stock of the possibilities. Students search for data sources themselves in an authentic situation related to their personal experiences. Students go through the cycle of action research. 	<ul style="list-style-type: none"> Students receive ready-to-use data or resources. Students work on an assignment in which the cycle of the action research cannot be completed.

Part II

Experiences from practice: The NRO study Education for Sustainable Development



The designed curricula

Seven teachers developed, implemented and evaluated a practice-oriented study in the 2014-2015 school year in which principles for Education for Sustainable Development were used. The study contained focused interventions (applying design criteria) based on a theoretical framework and explicit data from a previous case study. There was a strong emphasis on the bond with nature, citizenship, sustainable development, and on research, reflection and critical thinking. Scholastic and extracurricular learning environments are continually combined (hybrid learning environments). All classes taught fit within the regular Dutch curriculum.

THEMES AND INVOLVEMENT

The themes of climate change and biodiversity were linked in the research project with regular objectives of Pre-Vocational Secondary Education. The Technical and Vocational Education and Training level offered possibilities to link sustainability themes directly with the examination and graduation programmes. Through a focused choice of learning environment, for instance through working in a park, students' involvement with their learning environments was stimulated. Reflection on the learning activity and focused questions on sustainability aspects of current and future work processes an essential effect.

THINKING, REFLECTING, SYSTEMS THINKING AND COLLABORATION

The participants in the study stated that they considered the following skills most important for teachers: coaching, motivating students to reflect and guiding them in systems thinking. They observed how students, when motivated to do so by the teacher, arrived at spontaneous reflection through mutual dialogues. Sometimes this effect was limited to a single student, while in other cases the teacher succeeded to turn the reflection into a group activity. In addition to these opportunities for reflection arising (spontaneously) through the learning activity, more systematic reflection also took place. One school did this in a class-based setting at the end of every class. In other cases, a written reflection was conducted, that not only addressed sustainability, but also mutual cooperation during the learning activity.

Teachers stimulated students' systems thinking by asking clarifying or reflective questions. In this way, they encouraged the students to look for correlations. This took place on all levels, however, the stimulation of systems thinking was less explicitly incorporated into the learning activities than stimulation to reflection.

Making values explicit is seen unanimously as a key element of ESD. This calls for a continual alertness on the part of the teacher to what the students are discussing amongst themselves, which values are being clarified and exchanged, which links are being made, etc.

This process of value communication and critical thinking can also effectively take place to a certain extent in written form (Frijters, 2002, 2008). However, during the education activities in this project this mainly took place in oral form. Talking about values – more than written work methods – calls for teachers to be continually alert and be able to spur students to serious reflection.

TESTING?

Many teachers adhere to the mantra that “testing guides learning”. However, the classic question, “Miss, will this be in the test?” gives cause to suspect that testing may partially detract from the dynamic element of learning. The teachers in this project determined that, at least for ESD and civic education, testing should not be seen as the critical element in the education. All the teachers indeed evaluated the learning outcomes, but without cramping the students in any way. In addition to the products they also assess other aspects of the learning process, such as students’ involvement, their contribution to the group product and their presentations. The teachers concluded “Do not just grade the product, but also the process.” This is why ESD must be able to evaluate both the process and product in a suitable manner, as much as possible in line with the school culture.

5. The teacher

KNOWLEDGE VERSUS ATTITUDE OF TEACHERS

As stated earlier, the learning outcomes of Education for Sustainable Development include action competence, learning to detect coherence (systems thinking) and striving for an investigative attitude. Still, these skills alone are not sufficient. To achieve the envisioned depth in the learning activities, knowledge is crucial. Knowledge of ecological principles (planet) but also substantive knowledge of the relationship between people, planet and profit, as well as sustainable development. Analogous to De Winter's (2004) warning that a lack of knowledge on and involvement with the democratic process makes democracy extremely fragile, while citizens without basic ecological knowledge will have insufficient insight into sustainable development and participation, resulting in an insufficient contribution to sustainable development. To allow students to discover the systemic side of sustainable development through a green, ecological approach, participants in the study believe the teacher's knowledge is of great importance.

The students appeared to benefit from their teachers' open, stimulating, coaching attitude. During the learning activity, teachers encourage the students to reflect, for instance by continually asking the right questions (also see: Tielman, 2009). They also motivate them to ask these types of questions themselves, whether individually or in groups, in written or oral form.

TEACHER COMPETENCES

A willingness to acquire new knowledge about the role of sustainability within your discipline and preparedness to employ innovation with in teaching methods, these are two characteristics in which the participants believe teachers should definitely be adept, if Education for Sustainable Development is to be successful. The pursuit of transformative learning outcomes requires value-orientation, critical thinking and reflection, and non-linear, dynamic teaching to match. But above all, ESD demands a certain *state of mind* of teachers. They will have to not only focus on the process aspect of education, but, in this type of education (more *social learning*), they must now also relate to their students in a new way. For instance, the sustainable actions of the school as an organisation and of teachers as individuals also will be discussed.

In addition to the right *state of mind*, ESD teaching asks for organisational capabilities. The participants in the study observed that this organisational competence could be heavily tested with ESD. Both inside and outside the classroom, interrelated (hybrid) learning activities were organised in order to express the systemic character of ESD in education in as authentic a way as possible. The multidisciplinary nature of ESD also called for collaboration between teachers and colleagues within and outside of the school. The class schedule also required (temporary) adjustments at times.

All this, in combination with the fact that the ESD implementers were often *early adopters*, resulted in the study participants stating how important the organisational competence of teachers is!

In the literature we find a number of sustainability competences. As core competences, Wiek (2011) names the capacity to think systemically, normative competences (What do we find important?), anticipatory competences (anticipating the future), strategic competences (strategy for transition) and interpersonal competences. Others also cite the ability to change perspectives, to deal with complexity and uncertainty and take advantage of diversity (NRO, 2014).

In this section we discuss the specific skills and competences that were employed by teachers in this study to implement the learning activities. To this end, we have created a supplementary list to augment the competences formulated by the Dutch Association for the Professional Qualities of Teachers (SBL).

SBL competences	Specification for ESD (What should teachers be capable of?)
<p>Interpersonally competent</p> <p>Offer leadership and create a positive atmosphere in the collaboration among and with the students.</p>	<ul style="list-style-type: none"> • Instil an open, mentoring and reflection-oriented attitude. • Reflect on one's own role when explaining students' behaviour. • Motivate deeper reflection. • Dare to be put yourself in a vulnerable position in sustainability issues (reciprocity). • Provide and accept feedback. • Ask investigative questions to guide students to deeper process and knowledge levels. • Make clear agreements and ensure students stick to them. • Allow students acquire and apply relevant knowledge themselves. • Offer safety and space. • Create an open atmosphere and provide applicable coaching.
<p>Pedagogical competent</p> <p>Provide a safe learning environment and promote personal, social and moral development or: support their development into independent and responsible individuals.</p>	<ul style="list-style-type: none"> • Have an open, coaching and reflection-oriented attitude. • Stimulate reflection. • Guide moral and value development. • Demonstrate the importance of ESD. • Encourage the development of action competence. • Ensure that students are familiar with the core concepts of investigative, collaborative learning and are continually keep them in mind. • Define roles that students should fulfil in the context of collaborative learning. • Occasionally allow students create their own groups and vary the principles on the basis of which groups are composed. • Set up classroom tables in a way that encourages direct interaction. • Assist students in creating and sticking to a schedule. • In consultation with students set clear quality criteria for products. • Set clear quality criteria for collaborative learning.
<p>Professionally and didactically competent</p> <p>Provide a powerful learning environment and promoting learning.</p>	<ul style="list-style-type: none"> • Possess knowledge of sustainability themes related to specific disciplines. • Act in meaningful and personal ways. • Provide a suitable assessment for both processes and products, in accordance with the school culture. • Create a learning environment in which action competence can be practiced. • Possess basic ecological knowledge. • Use the school and its surroundings to let students take action. • Use systems thinking and inspire students to do the same. • Detect patterns and relationships in sustainability problems and translate them into learning activities. • Always keep the formative, "transformative" character of ESD in mind. • During the learning activity, allow substantive, student-oriented additions to take place. • Enter into dialogue with the students. • Possess knowledge of the school region (nature and culture) and use this and in doing so, create a link between education and the environment.

<p>Organisationally competent</p> <p>Provide a clear, orderly and task-oriented atmosphere and structure in the learning environment.</p>	<ul style="list-style-type: none"> • Ensure a safe learning environment – both socially, emotionally and physically – inside and outside of the school. • Organise and structure learning activities inside and outside of the classroom. • Organise in a cross-disciplinary way. • Use unexpected opportunities in the extracurricular sphere to implement concrete projects. • As an early adopter, possess an awareness of issues which promote or hinder implementation.
<p>Competent in collaboration with colleagues</p> <p>Ensure that the work is in line with other colleagues' efforts; contribute to the good functioning of the school.</p>	<ul style="list-style-type: none"> • Adjust school schedules to facilitate hybrid learning activities. • As an early adopter, possess an awareness of implementation issues.
<p>Competent in collaboration with the surroundings.</p> <p>In the students' interest, maintain a good relationship with parents, the neighbourhood, businesses and institutions.</p>	<ul style="list-style-type: none"> • Maintain and employ relationships with clients, the municipality, parents, the neighbourhood, businesses and institutions.
<p>Competent in reflection and development</p> <p>Ensure personal professional development and the professional quality of professional practice.</p>	<ul style="list-style-type: none"> • Stay up to date in terms of knowledge of educational reform, innovative learning activities, coaching strategies and sustainability themes. • Accept that teachers are allowed to fail. • Be aware of the variability and historicity of (sustainability) knowledge.
<p>Competent in research</p> <p>Organise and guide learning activities with research possibilities for students.</p>	<ul style="list-style-type: none"> • Be familiar with action research. • Coach students in conducting research (setup, execution, analysis, conclusions).

6 Some conclusions from the NRO research project “Learning environment as a catalyst for Education for Sustainable Development”

An ideal curriculum for Education for Sustainable Development in all its facets seems difficult to achieve within the current educational paradigm. The so-called Whole School Approach has not been achieved in this practice-oriented study. However, learning activities were realised that incorporated the ESD cores and many design criteria, themes such as value development, hybridisation of the learning environment and learning activity, participation and working on themes that are authentic to students. Due to the existing connection to the professional field, the Technical and Vocational Education and Training teaching programmes lent themselves particularly well to the multidisciplinary character of ESD. Teachers in Pre-Vocational Secondary Education are more productive working in a single discipline and do not have a continuous link with the extracurricular domain to the same degree. Nevertheless, they were still able to draw this link within the context of this project. Therefore, both in Pre-Vocational Secondary Education and Technical and Vocational Education and Training, linking scholastic and extra-curricular education in an authentic way has been shown to be possible.

This practice-oriented study has yielded a wealth of new information. Some examples:

- 1 In general, the most important conclusion after designing the programme together for a year is that it is possible to develop education that does meet many of the principles of ESD. In the practices examined, the formulated design criteria were successfully converted into learning activities, both for Pre-Vocational Secondary Education and Technical and Vocational Education and Training.
- 2 Basic ecological knowledge is mentioned by the participating teachers as a clear advantage; but they also emphasise the importance of being well-informed on sustainability themes such as the circular and *biobased* economy. Due to the special pedagogical and didactic nature of ESD, further knowledge is needed regarding innovative learning activities and coaching strategies. The realisation that knowledge in the sphere of sustainability is transient, compels teachers to commit to lifelong learning.
- 3 The teachers who participated in the pilot say they have discovered how difficult it can be to “be a little ahead of the game”. Due to the multidisciplinary nature and the desired *Whole School Approach* of ESD, this is an important issue.

- 4 Working in accordance with the cycle of action research turned out to be an excellent guide for designing education in which important ESD principles, such as value orientation and critical thinking received a functional place. Both in Pre-Vocational Secondary Education and in Technical and Vocational Education and Training, students have shown themselves capable of taking on the role of researcher. The participating teachers are convinced of the added value of the action research employed in Education for Sustainable Development. We do not yet know whether participation on the part of the students has now also become a citizenship ideal.
- 5 ESD is not a course – you do not use a teaching method – it is a regulatory idea. According to the teachers in this pilot, you are always (consciously) working in an investigative way in order to link a discipline's content to sustainable development. This is why they believe that working with ESD calls for “agility”, a “willingness to learn” and “accepting that you can fail!”
- 6 The participating teachers name student-orientation (linking with the students' development) as a basic skill for teachers in ESD. During ESD activities, the relationship with their students was different in nature than during their regular classes. This is due to the fact that the emphasis was not so much on teaching, but rather on meaningful and personal action. They also dared to put themselves in a vulnerable position in discussions on sustainability issues. In the ESD project they, in their own words, had a different *state of mind*.
- 7 Reflection in various forms often took place spontaneously. In this regard, the teacher had an important mediating role, thus ensuring the quality of the reflection. Stimulating systems thinking deserves attention and should be explicitly incorporated into the learning activities.
- 8 The teachers, depending on the learning activity, were able to stimulate student involvement with their environment. They did this by carrying out activities in the direct school surroundings or by conducting research for stakeholders. The hybrid learning environment offered a link to the (school) environment as well as relationships with stakeholders within and outside the school .

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The cores of Education for Sustainable Development

CORE 1: STUDENT-ORIENTED

- Keep the mental development (level) of the student in mind.
- Take into account the necessary (ecological) prior knowledge.
- Use the student's context (field of experience).
- Design student assignments and provide examples that are recognisable, realistic and meaningful for students.
- Work with assignments that enable students to act independently.
- Integrate a joint exploration of the concept of living environment into the learning activity and its realistic and meaningful contexts.
- Give students as much substantive say as possible in choosing contexts that are realistic and meaningful for them.

CORE 2: VALUE-ORIENTED AND CRITICAL THINKING

- Let students make (moral) judgments on the basis of the trinity of people, planet and profit.
- Let students carry out activities in which sharing and exchanging reasoned views and reflecting on these is an essential element.
- Let students formulate and exchange personal solutions.
- Let students make their own reasoning explicit.
- Let students discuss (moral) dilemmas together.
- Let students formulate solutions together.
- Let students experience that not only a potential product, but even the (transformative) process is an important learning achievement.
- Let students express their values and attitudes more explicitly.
- Let students, during and after the learning activity, reflect on their values and attitude in relation to sustainable development.

CORE 3: PARTICIPATION AND COLLABORATIVE LEARNING

- Let students acquire or clarify the necessary (prior) knowledge.
- Let students work together on tasks that are realistic and meaningful for them, in situations where they can act independently.
- Create learning situations that give students the opportunity to be active in extracurricular contexts and to participate in real-life societal issues related to sustainable development.
- Let students work together with stakeholders within and outside the school.
- Apply the five core concepts for collaborative learning.
- Apply Tielman's three rules of thumb.

CORE 4: ACTION-ORIENTED

- Let students link the results of their educational activities (research) to concrete action.
- Raise awareness amongst students of the transformative nature of the learning activity.
- Let students carry out the actions on their own as much as possible.

CORE 5: COMPLEXITY AND COHERENCE

- Use examples with a complexity level that students can comprehend.
- Let students work in complex situations with recognisable sustainability issues.
- Work on gaining insight into the relationships that characterise environmental problems.
- Use the combination of knowledge acquisition and skills development, as well as your personal stance to achieve the envisioned positive synergy in ESD.
- Let students work on a concrete scenario with multiple causes and consequences, but also with multiple potential solutions.
- Use recognisable examples and discuss the patterns found therein.

CORE 6: INVESTIGATIVE ATTITUDE

- Let students conduct action research into a problem that is recognisable, realistic, meaningful and related to sustainability.
- Let students go through methodical steps in their action research.
- Let students apply and evaluate the results of their action research.
- Let students reflect on the results of their research.

WHAT IS LEARNING FOR SUSTAINABLE DEVELOPMENT?

Sustainable development has become a crucial part of our modern society and our education. Sustainability is a complex concept. After all, what is considered sustainable to us now may not necessarily be so in the future. We need to continually review our judgments with regards to sustainability. Education for Sustainable Development is about knowledge, attitude, behaviour and values, in which the relationship between a social, an ecological and an economic perspective is always factored in. But what does this education look like?

Education for Sustainable Development. Just do it! was the motto for the practice-oriented study by Aeres University of Applied Sciences Wageningen, involving four schools and two universities. This publication describes the theoretical principles of Education for Sustainable Development and the design criteria as were used in this practice-oriented study.

This publication describes the theoretical principles of Education for Sustainable Development and the design criteria as were used in this practice-oriented study. These design criteria can help us develop and implement Education for Sustainable Development.

