



WWF

EDUCATION



**SUSTAINABLE DEVELOPMENT
AND LEARNING – inspiration
for university teachers**

SUSTAINABLE DEVELOPMENT AND LEARNING
– INSPIRATION FOR UNIVERSITY TEACHERS
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PART 1 - INTRODUCTION

WHAT IS SUSTAINABLE DEVELOPMENT AND WHY IS IT IMPORTANT?¹

Over the last century, mankind has caused changes to the earth in previously unmatched pace and scale, provoking climate change, depleting ecosystems, causing poverty, increasing the gap between rich and poor countries and isolating marginalised social groups. This unsustainable development raises issues and demands analyses of such aspects as global justice, human rights, poverty and consumer patterns, as well as a discussions of basic value assumptions about what constitutes a good life and how we should relate to nature.²

From development to sustainable development

What is the difference between sustainable development and development in the sense of poor countries becoming richer? Throughout the post-WWII period, development theories and development aid have concentrated on modernizing poor countries and populations to increase general prosperity. The concept of sustainable development implies a difference of principle from conventional development. The development debate has focused on the poor countries and their problems; sustainable development is as much about the transformation of rich societies. Further, in sustainable development, the relationship between rich and poor countries is key;

Must rich countries give up anything so that poor countries can develop?

Is there a global justice that we must adhere to?

¹ This section is based on a chapter with the same title written by Lennart Olsson at Lucsus, the Lund University Centre for Sustainable Studies, published in a report by Högskoleverket (Swedish National Agency for Higher Education): 2005:47 R, Perspektiv på hållbar utveckling: Erfarenheter från högskola och näringsliv.

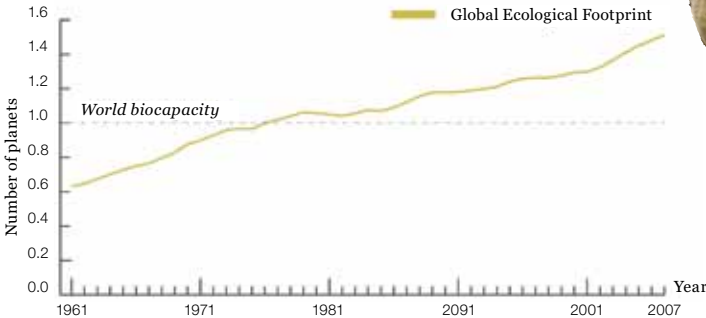
² Matilda Hald and Hanna Wetterstrand, "Cemus – ett unikt exempel på lärande för hållbar utveckling" in the Högskoleverket (Swedish National Agency for Higher Education) report #2005:47 R, Perspektiv på hållbar utveckling: Erfarenheter från högskola och näringsliv.

Is there even a universal right to sustainable development and, if so, are there implicit responsibilities?

Examples of conflict areas are the depletion of the world’s fisheries and the climate issue. If we recognise an upper limit to how much the oceans can be taxed of their fish and the rights of poor countries to fishing waters, this must imply that the rich countries reduce their exploitation of the seas. If there is an upper limit to the amount of greenhouse gases the atmosphere can absorb and we also recognise the right of poor countries to develop, this must imply that the rich countries — so far, largely responsible — must reduce their emissions.

The debate about sustainable development has been going on for the last two decades, dating from the release in 1987 of the Brundtland Commission report, *Our Common Future*, which launched the term for a wider audience. The term has been defined in many ways and interpreted by many actors. The meaning most often attached is that current generations must satisfy their needs without putting at risk the ability of coming generations to do the same. What this exactly implies is almost impossible to say and difficult to build consensus on. It opens up for a number of contradictory interpretations. What are our needs? Even if there is a minimum level identifiable as fundamental human needs: sufficient food and water, shelter from the elements, protection from assault and disease, access to education, the opportunity to earn a living, justice, and friendships, it is a tough question.

Ecological footprints, 1961–2007



WWF’s Living Planet Report shows that humankind’s accumulated ecological footprints are growing. We are exceeding the planet’s biological production capability and create more waste than nature can absorb. Differences in lifestyle between countries are great and people in the richer countries leave a considerably larger footprint per capita than people in the so-called developing countries.

From the United Nations Millennium Declaration³ it is obvious that we must see to that these fundamental human needs are met for *all* without harming the planet's life-support systems – the atmosphere, the water cycle, earth and biological diversity. This makes it easier to express the concept in practical terms, and thus to design interdisciplinary higher education for sustainable development.

A thorough analysis of the UN's work in sustainable development and the definitions used within the UN highlights four ethical principles:

- ecological – or physical – viability
- global justice
- generational justice
- civil society involvement.⁴

The central issues in the concept are ecological viability – the boundaries for economic development – and the time and space aspects of just development. How many Westerners would accept a local shoe factory that produced cheap shoes by using child labour, under-paid, working 12–14 hour shifts seven days a week, denied schooling – and with the factory releasing toxic waste that made the local beach unusable? Most people buy cheap shoes anyway, because of the separation of production and consumption caused by increased globalisation. Production in one region, consumption in another. Another reason is the firm belief, etched into political rhetoric, that economic growth creates the conditions for solving every environmental and resource problem. Now that sustainable development has become established as a normative value in higher education it is important to have a penetrative discussion on what sustainable development involves. We need that discussion *with* and *for* every country and every person, in the meantime protecting our underpinning global ecological systems: atmosphere, water, earth and biological diversity.

There is a vital ethical dimension to sustainable development that pertains to justice, rights, and responsibilities between groups, countries and generations. This discussion must be kept active at universities.

³ K. A. Annan: We, the Peoples: The Role of the United Nations in the 21st Century, UN, New York 2000.

⁴ Merle Jacob, 1996. Sustainable Development: A Reconstructive Critique of the United Nations Debate. University of Gothenburg, Gothenburg. See also Jan Olsson (red), 2005. Hållbar utveckling underifrån: Lokala politiska processer och etiska vägval. Nya Doxa, Nora.



The ecological, social and economic dimensions are often seen as parts of a whole.

“No constitution exists to guarantee the survival of ecological systems.”

Dimensions of sustainable development

Three aspects are commonly defined: ecological, social and economic. These are frequently explained in relationship to each other: humans must adjust activities to the options of ecological systems; the economic dimension must be seen as the facilitator for our social goals for example. The economic system involves the exchange of goods and services between individuals, companies, organisations and countries. Money is the basic means of measuring and studying these exchanges. But the economic system is embedded in a social system that implies relations between individuals and societies and rests on values, norms and laws.

Freedom of expression and assembly and for the right to influence, through open elections, the management of society — all are examples of what most people would reluctantly attach a monetary price to. The social aspect of sustainable development includes a fairness condition — the right of all people to meet our needs but also the right to participate in society and be complicit in creating sustainable development. The participation and involvement of people have been seen, since the beginning of the sustainable development discussion, as requisite. The economic and social systems, in turn, are embedded in the underpinning processes of the ecological system. But the ecological system lacks a constitution to guarantee its survival. The balance between economic value and ecological damage is constant. And in contrast to how the above-mentioned social freedoms are approached, a monetary value is increasingly being attached to the ecological systems.

In the special laws and rules protecting these systems are built-in clauses stipulating economic evaluation in situations where economic and ecological considerations collide. Thus, we have a dilemma that ought to be food for scientific research:

Against society's technocratic tendencies, it is important to assess the importance of history, literature, languages, music and art for our human need for well-being and therefore sustainable development.

what are the relationships between sub-systems and what could be guidelines for minimising conflict between the sub-systems? Such research must be trans-disciplinary but also demand a broad base where the normative preconditions of many stakeholders can be weighted.

An additional aspect is the cultural dimension that can be said to permeate the ecological, economical and social dimensions. Against society's technocratic tendencies, it is important to assess the importance of history, literature, languages, music and art for our human need for well-being and therefore sustainable development. Communication, flexibility and openness towards 'the unknown', but also critical reflection of what we 'own' is important in this context. And the cultural dimension is where we can ask ourselves: What is a good life?⁵

The picture is "Shere Khan", an original lithography by artist Madeleine Pyk, part of her collaboration with WWF.



⁵ Sture Packalén, Mälardalen University



When learning is advantageous to sustainable development, it encompasses a broad range of people's thinking, values and actions. In extension, it is not enough to merely understand the connection between phenomena that threaten the ecological balance or widen the gaps between rich and poor to build sustainable development.⁷

LEARNING AND EDUCATION FOR SUSTAINABLE DEVELOPMENT⁶

The UN Decade of Education for Sustainable Development (DESD) runs from 2005 to 2014. The campaign is directed by UNESCO with the goal of globally integrating the principles and values of sustainable development in all aspects of education and learning.

What must we learn and how can we learn it?

Learning for sustainable development can be viewed from the perspectives of two basic issues (1) *What must we learn* and (2) *How can we learn it?* Environmentally didactic researchers have indicated three traditions in Swedish environmental education that provide somewhat different answers.⁸

The answer according to *fact-based* environmental education is: facts. This educational tradition, developed in the 1960s and refined in the 1970s, puts the focus on basic subject knowledge. Environmental problems are best solved through augmented scientific knowledge: science holds the answer. Learning is mainly through the communication of scientific facts and concepts by a teacher to the pupil/student, who, in possession of this knowledge, is thereby expected to act in a more environmentally correct way.

A *normative* environmental school appeared in the 1980s to challenge the fact-based tradition by purporting that knowledge itself is insufficient unless complemented by values. Environmental problems were now to be seen as stemming from people's values and choices. Teachers in this tradition point to the possibility of making different assumptions from the same fact base. Normative environmen-



Learning for sustainable development is a process which can be viewed as a compass course one takes towards the future.

tal education does, however, give us a different answer to the question of what we should be studying. Alongside scientific fact-gathering, we also need to teach ourselves and coming generations the values and consequent behaviours that can be assumed to lead to a more environment-friendly lifestyle. With the importance of value judgement for both learning and behaviour-adaptation, didactic exercises based on the students' own experiences was introduced into environmental education in Sweden. With this approach, the question of how we learn is answered by the student-activating, problem-oriented working model.

The *critical* or *pluralistic* tradition is interest- and conflict-oriented. The political dimension on micro and macro levels are studied. Here, the answer to our first question emphasizes the goal of learning to be the ability to actively and critically evaluate and support alternative perspectives to environment and development issues. This implies a more complex environment/development view. The tradition believes that by themselves, scientific facts or natural science-founded values are insufficient. Environmental knowledge and environmental morality are both seen as interest-based, and the focus is on critical discussions about how to act and what knowledge is relevant for a given purpose.⁹

Education for sustainable development is situated within the sphere of critical or pluralistic environmental learning tradition. The following are characteristics of quality education for sustainable development at university level:

- *Interdisciplinary*: integrating learning about sustainable development in all scientific areas and disciplines and not standing as a separate subject;
- *Value-based*: choosing a base of values that, challenged, can be said to form a foundation for sustainable development;
- *Critical and problem-solving*: leading to readiness to tackle the challenges involved in work for sustainable development;

“As an educational tradition, learning for sustainable development grew from the realisation that, so far, individual and collective education has largely counteracted sustainable development.”

- *Pluralistic*: learning by various methods: traditional lectures, artistic expression, drama, debate, silent knowledge and experience, and more.
- *Student-driven*: where students have some participation in organising learning and in its focus.
- *Local relevance*: focused locally and globally.¹⁰

These six characteristics place demands on students and teachers. To be genuinely critical and problem-analytical involves motivation, meaningfulness and belief in one's own ability. For the student, this implies insight into personal motivation and why he or she needs to learn about sustainable development. There is also a need for a climate of trust and mutual respect, so the student feels safe enough to spur curiosity.¹¹

As an educational tradition, education for sustainable development grew from the realisation that, so far, individual and collective education has largely counteracted sustainable development. Collective learning processes were leading to dependency on fossil fuels and to a culture dominated by consumption as a goal. Our technological and economic solutions have allowed us to alter our surroundings and social structures in ways that we now see as unsustainable. Space is given in education for sustainable development to problem-hunt and critically review those solutions and their effects, looking for other norms, customs and solutions that will favour sustainable development.¹²



⁶ David Kronlid & Johan Öhman, Department of Theology, Uppsala University; Eva Friman, CSD Uppsala, Uppsala University and SLU Uppsala.

⁷ Att lära för hållbar utveckling, SOU 2004:104, 68.

⁸ The presentation of environment teaching traditions is from Östman (ed.), 2003 and Öhman, 2006.

⁹ See Kronlid (2005) for an example of how environment-ethical and social-ethical theory can be used for critical and systematic review of environmental and development issues.

¹⁰ The UN decade website: <http://www.portal.unesco.org>

¹¹ The fact that education for sustainable development is multi-disciplinary implies challenges for teachers and students alike. Great demands are made on the change processes in learning and the security of mono-disciplinary skill is attacked.

¹² This section partly based on the previously noted text by Lennart Olsson.

“Education for sustainable development involves knowledge, values and action competence. Students develop the capacity to act if they work with real and meaningful issues where they experience their work leading to change. The goal must be for students to acquire both the ability and the desire to act for sustainable development.”

So how to educate for sustainable development? One way is to let students discuss in groups and critically review texts and arguments. When students, supported by teachers, are made to express their thoughts within groups, the learning activity accelerates, channeling into a meaningful process.¹³

Problem-oriented learning may be suitable since it creates opportunities for the students to guide the process. Teachers are to become part of a learning pool, supporting the students' learning through a monitoring function rather than a control function.¹⁴

Education for sustainable development involves knowledge, values and action competence. Students develop the capacity to act if they work with real life, meaningful issues where they experience their work as leading to change. The goal must be for students to acquire both the ability and the desire to act for sustainable development. After critical reflection, the students will accumulate knowledge about various development processes and different values, and the capacity to act in relation to these. The learning process and its content are equally important – no process no product, and vice versa. Higher education that embraces this can give students the ability and will to critically engage and also alter their actions, thereby challenging the students to change not only their verbal attitudes but also their lifestyles.¹⁵

If everyone in the world were to consume the volume of resources that we do in Europe, three planets would be needed to produce the resources and absorb the waste.





“In the course of their operations, higher education institutions shall promote sustainable development to assure for present and future generations a sound and healthy environment, economic and social welfare, and justice.”

Sweden's Higher Education Act

Challenges for higher education¹³

Education for sustainable development involves both specialization and holistic overview. Currently higher education is, however, almost without exceptions, devoted to specialization. The old division into humanities and social sciences on the one hand and natural sciences including medicine on the other hardly corresponds with the learning goals in education for sustainable development.

There are at least three challenges for including education for sustainable development in higher education, related to stipulations regarding education for sustainable development in Sweden's Higher Education Act (Högskolelagen).¹⁶

The first is *categorisation versus multi-disciplinary science*. Can any academic discipline claim to have found a comprehensive solution or a full explanation to a single environment/development problem? Probably not. The separation into subject areas must not be at the cost of a complete lack of laterally integrated thinking across subject and faculty lines. So different kinds of interdisciplinary education for sustainable development are needed.¹⁷

The need for interdisciplinary education for sustainable development leads to the second challenge: *atomisation versus totality/wholeness*. Science typically tends towards specialization. To avoid fragmentation, there is a need for researchers and professionals in all areas to be able to move between a greatly reduced level and the most wide-ranging. Especially for education for sustainable development, an emphasis is needed for deep and comprehensive understanding. Sustainable development encompasses several ethical dimensions and aspects that cannot be studied or understood independent of each other.¹⁸

The third challenge is *free versus committed knowledge*. Tension exists between the freedom of research on the one hand and, on the other, socie-

ty's demand that research be of palpable use.¹⁹ The risk is that this tension will increase as competition for economic resources sharpens. It is, however, possible to visualize researchers who are free in their science practice and who also approach society as engaged actors. In other words, that researchers, teachers and students, critically analytical in their professional roles and with the ability to think freely and experimentally, contribute as citizens to the development of sustainable societies.

Against the background of Sweden's Higher Education Act (Högskolelagen), the challenges for universities are for all knowledge fields to negotiate both factual matters (sustainable development) and didactics (learning for sustainable development) so that students are not left with specialized courses on sustainable development or that only special programs for sustainable development are created. Every student is to be confronted with questions about what sustainable development means and be given opportunities to critically evaluate and discuss the obstacles and possibilities.

In these learning processes, attitude goals and hands-on preparedness are as important as knowledge goals. Even if educational goals for sustainable development will be different depending on knowledge fields, there are general competences, approaches and insights that everyone who completes university-level education in Sweden should have.²⁰ The student's responsibilities and hands-on education are central. This demands critical assessment and a capacity to absorb everything from mono-disciplinary to interdisciplinary themes and issues.

The role of university management is critical if Sweden's Higher Education Act (Högskolelagen) is to be adhered to. This does involve day-to-day work giving clear signals to staff that education for sustainable development is highly valued. This support is vital. The concept of sustainable development implies a visionary future-view — and surely higher education and science strive to be visionary?²¹

¹³ See Sandell, Öhman & Östman, 2005 for a review of the didactic content in education for sustainable development.

¹⁴ Lökenagaard Hoel, 2001. See also Hansson & Kronlid, 2005 about using writing and response work in education for sustainable development within research training.

¹⁵ Lundegård, 2007.

¹⁶ Öhman, 2006.

¹⁷ Lennart Olsson, Swedish National Agency for Higher Education (Högskoleverket) report 2005:47 R, Perspektiv på hållbar utveckling: Erfarenheter från högskola och näringsliv.

¹⁸ See Latour, 1993 on the complex and trans-scientific character of environment/development problems.

¹⁹ The need for a balance between entirety and specialisation was realised as early as 1940 when Elisabeth Tamm and Elin Wägner wrote: "... it is not possible to work for separate solutions, be it for the peace issue, the land-ownership issue, the health issue, the population issue or the issue of children's upbringing. Each must be part of a re-evaluation of mankind's relationship with the planet, life and realities, which implies a change of system with all that involves in social transformation" (5).

²⁰ See Forsman, 2004, on this tension.

²¹ See Wickenberg et al (ed) (2004) for a collection of essays about different methods of educating, learning for sustainable development.

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PART 2 – SOME EXAMPLES

DIDACTIC COURSE IN SUSTAINABLE DEVELOPMENT FOR UNIVERSITY TEACHERS AT UPPSALA UNIVERSITY²²

The course is led by UPI (section for the development of education and interactive learning) in cooperation with Cemus (Centre for Environment and Development Studies), IRES D (Institute for Research in Environment and Sustainable Development) at the Department of Curriculum Studies, and WWF Utbildning (WWF education, Sweden).

In December 2006 the vice-chancellor of Uppsala University requested all faculty councils to integrate sustainable development as perspective and with knowledge content in all educational programs and appropriate courses. Previously, a multi-faculty working group had studied needs and conditions for education for sustainable development. The vice-chancellor's request meant that the integration of sustainable development in all academic programs was to be supplemented by the improved opportunity for students to use credits from specified courses in sustainable development towards their degree.

What prompted the course?

The course was first held in late 2007 at the initiative of the vice-chancellor of Uppsala University. The aim is to help the university's teachers better integrate knowledge of and perspectives on sustainable development through various educational programs and suitable independent courses. The over-arching, long-term goal is for all graduates to be able to combine and transform their specified and theoretic knowledge about sustainable development into a personal standpoint in their subsequent social and professional lives. Teachers who have completed the course should be able to give examples of political and human motives for sustainable social development based on our interaction with nature in a local and global perspective. They should also be able to discuss the university's mission and opportunity to use education for sustainable development.

Relevant aspects of sustainable development as an integrated knowledge area, including perspectives on social development and human interplay with nature, must be identified and clarified. When the course has been completed, participants will be able to plan and carry out learning that increases student skills in terms of contributing to social development that meets the needs of the current generation without putting at risk the ability of coming generations to fulfill their needs.

Mainly, course participants will, on completion of the course, be more motivated and better pre-

²² Jöran Rehn, at UPI, Uppsala University.

pared for the task of integrating sustainable development into the education at their departments.

Here's how

The course takes six weeks and consists of three attendance days alternating with individual studies and work on developing individual learning plans. The course corresponds to a one-week module in the University's educational training for teachers. A credit that counts as educational qualification, for the course demands attendance and active participation in dialogues with the teacher as well as a report on home studies and projects.

During the course, participants are introduced to sustainable development and education for sustainable development, from general terms to the subject-specific. Lectures, literary studies, discussions, group work and exercises, as well as homework, highlight how different subject areas can contribute to the teacher's and students' knowledge of sustainable development. We also discuss how to integrate sustainable development into education in various subjects, both in terms of knowledge content and perspective. The participants also have the opportunity to refine and test ideas for their own learning.



Since course participants come from different faculties, opportunities arise to share experiences and widen perspectives. At lunch on days marked for attendance, we provide food and drink that underscore the message of sustainable development. Below is a plan for the course work.

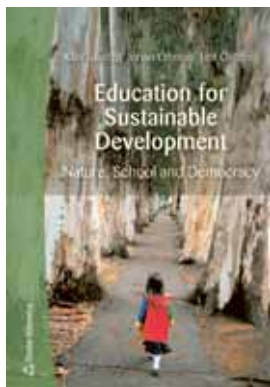
Eating sushi in Sweden leaves an ecological footprint on many other countries.



COURSE LENGTH	CONTENT/TASK
Day 1	The sustainable development concept <i>Genesis, meaning and historical survey</i>; current national and international rules and undertakings, the Swedish Higher Education Act (Högskolelagen) and Higher Education Ordinance (Högskoleförordningen). Current rules, functions and support for education for sustainable development. Current perspectives on mankind's circumstances, society's development and nature's conditions. Challenges, locally and globally, how these can be treated in different subject spheres. Conclusion: what does this imply for us and demand from us teachers at Uppsala University? Interpretation and application.
MID-PERIOD 1-10 days	Literature - shared text Course text, Education for Sustainable Development. Keep a reading log with reactions and views. Prepare a group discussion based on: 1) Which texts were of most interest and most useful for your own learning or planning? 2) What are the advantages, for you as a teacher and for students, of integrating sustainable development into your subject/program and your learning? 3) Which current learning goals benefit from or are disturbed by the integration of sustainable development into education at your department? 4) How to formulate an appraisable learning goal for your course/program that meets the demand for integration of sustainable development in the education?

COURSE LENGTH	CONTENT/TASK
MID-PERIOD 1-10 days (cont'd)	Literature – individual choice Find a text on sustainable development or learning for sustainable development that fits personal interests and/or subject areas. Keep a reading log with reactions and views. Prepare a group discussion based on: 1) What in the text could be of use in your own subject? 2) What obstacles are there to using the text in your subject/program/learning to integrate sustainable development as a perspective or in content? 3) What solutions are there to this? And which changes are practicable at your department or in your program?
MID-PERIOD 1-10 days (cont'd)	Written submission Provide examples of how sustainable development can link with or be exemplified in content and perspective in your courses/subject/program. Treat sustainable development as an interdisciplinary perspective on human life conditions, social development and nature's requirements. Relate to vital future issues/challenges, locally, regionally or globally. Find connections and collaborative possibilities with other subjects.
Day 2	Education for sustainable development The concept (content and perspective); the integrated perspective; and didactical issues. How should education for sustainable development be conducted generally? How specifically to approach the subjects/courses/programs represented by the participants? Exercises and group discussions. Planning of individual, minor development work.
MID-PERIOD 2 3-4 weeks	Individual development work How can education for sustainable development be integrated into individual courses/stages and what is needed for execution? Development projects are presented in writing as educational development proposals and submitted at a discussion seminar (Day 3).
Day 3	Discussion of various user perspectives on education for sustainable development. Follow-up of project work. Education for sustainable development in the context of individual subjects. Oral submission and discussion of project work. Advantages/disadvantages, obstacles/opportunities, possibilities for partnerships. Next steps?

Evaluation indicated that the participants were pleased with the course. Highest rating went to the heterogeneous mix of participants and to the discussions.”



The course book was *Education for Sustainable Development* and participants were asked to keep a reading log of reactions and viewpoints. In addition, participants prepared a group discussion.

What have we learned so far?

The structure of the course worked well, the schedule was kept to and we teachers felt that, largely, we were able to include the content aimed for.

Evaluation also showed that the participants were pleased with the course. After the practical arrangements, highest rating went to the heterogeneous mix of participants and the discussions. Ten of the eleven participants contributed to the evaluation; the fact that only eleven applied when provisions had been made for twenty participants was the most negative aspect of the first course series.

The written evaluation reports and the wrap-up discussion at the end of the course have provided the impetus for planned changes:

- Shortened introduction on Day 1 (political background + presentations, etc.) – bringing in sustainable development earlier and more fully.
- Clearer segue from sustainable development (Day 1) to education for sustainable development (Day 2).
- Reversing the order so that the lecture on a didactic perspective on sustainable development comes before we read the relevant chapter in the course literature.
- Extending the course (from about 6 weeks to almost 10 weeks), especially for mid-period 2, to make it easier for participants to test their ideas about integrating education for sustainable development into their own learning.

CEMUS EDUCATION FOR SUSTAINABLE DEVELOPMENT²³ AT UPPSALA UNIVERSITY

Cemus was initiated by students at the Center for Sustainable Development in Uppsala.

“Tomorrow’s students will be holistic, critical, solutions-oriented and hands-on citizens, interdisciplinarily educated.”



²³ Matilda Hald, principal of studies at Cemus, Hanna Wetterstrand, former assistant researcher at Cemus now at Kooperation utan gränser and Gloria Gallardo, researcher and program director at Cefo.

²⁴ See next example.

²⁵ Student grants distributed as administrative solution through Uppsala University’s technical-natural science faculty, the formal home of Cemus and now of the Uppsala Center for Sustainable Development.

Contribute to a big-picture outlook and hands-on preparedness for a better world

What prompted Cemus was the awareness that the huge challenges facing humanity call for citizens with different kinds of knowledge than the fragmented specialism that dominates current education and research. Subject-specific education must be complemented by an interdisciplinary approach, multi-disciplinary cooperation and mutual learning. Tomorrow’s students will be holistic, critical, solutions-oriented and hands-on citizens, interdisciplinarily educated.

An interdisciplinary forum

Cemus is run by a director, several program directors for basic training and the research section,²⁴ one site manager and about 20 students working as assistants. Each course is run by two part-time research assistants who independently plan, following guidelines, the course direction, lectures, literature and examinations. Supporting them is an interdisciplinary working group guaranteeing the quality of the science and functioning as formal examiners. The working group fields questions from the assistants during planning.

Cemus gets an annual earmarked basic grant from both universities. This goes to base organisation costs. The courses are financed by a university capitation allowance.²⁵ Close to 2 000 students have taken the fifteen interdisciplinary 5 and 10 credit courses Cemus offers.

The courses are on climate and energy issues, perspectives on economy and development, values and worldviews, global challenges, sustainable so-



lutions and more. Because student influence and democratic work methods characterize the Cemus organisation, topics and learning methods reflect student demand. As far as possible, the operation is run by students and driven by their priorities. Cemus is staffed by students who shape course content, through continual discussion with students taking the courses and through representation on the program council and on the board of the Uppsala Center for Sustainable Development (CSD).

Students are encouraged to suggest courses and projects that tally with Cemus's operation and to participate in work groups. Without staff teachers, Cemus students are free to choose between prominent Swedish and international lecturers from all imaginable disciplines and arenas.

The ideas that generated Cemus's very first course, *Man and Nature*, are still prominent: the interdisciplinary approach, critical discussion and reflection as well as interactive education and learning. We are working continuously to increase awareness of how values constantly affect issues. The process makes use of critical essays, role-playing and value exercises. The students also learn debate technique and to critique the writings and viewpoints of others.

To avoid the feeling of hopelessness that the course material often generates, we study possible solutions to problems and discuss the students' own function in social transformation. Action-oriented learning reinforces the students' desire and ability to act on and react to social conditions. The students are offered practical and financial support to implement project ideas born from the courses. Many organisations use Cemus as a meeting place. Local and national actors cooperate and discuss sustainable development issues here. Students on staff at Cemus are their guides and represent the Cemus point of view, both at Cemus and in the



many official contexts where Cemus can promote education for sustainable development.

Since 2002, the Cemus research forum, Cefo, has been offering interdisciplinary studies in sustainable development for PhD students from all disciplines and faculties. The PhD students themselves suggest the courses and act as coordinators. Cooperation between Cefo's coordinator of research studies and other experienced teachers and researchers at Uppsala University and SLU, the Swedish University of Agricultural Sciences, Uppsala, and at other Swedish and foreign universities, secures the scientific quality, for example in course working groups and the program council. PhD students who join Cefo are those accepted for research studies at their home departments. Once attached to Cefo, students always work with a PhD mentor who also must approve the association. On approval, students are offered an assistant mentor from a different discipline who will then collaborate with mentors and doctoral students for interdisciplinary education and treatises.

Cefo's participatory and democratic mode of operation represents a unique concept in research education in Sweden. Solely through association with Cefo, doctoral students extend their scientific networks and can take part in Cefo's financed group study visits to important centres for sustainable development and interdisciplinarity throughout the world. Twenty PhD students are currently associates, half of them from Uppsala University and half from SLU in Uppsala. The disciplines the doctoral students represent include cultural geography, didactics, theology, economic history, ecology and evolution, sociology, forestry, urban and rural studies, plant production ecology and biometrics.

What we have learned

What we have learned can be described as a result of the ideas of committed students, the subject-specific skills of researchers and their common interest in cooperation. The willingness of university management to support this cooperation has been decisive for the realisation of the students' ideas. Importantly, the Cemus program council, working strategically, is composed of members from all faculties at Uppsala University and SLU as well as four student representatives and that the CSD Uppsala board is also cross-faculty.

A majority of the students who come to Cemus are perhaps familiar with, or are interested in, sustainable development. They appreciate the training and Cemus courses are frequently praised in evaluations. The greatest need, however, is among students who lack knowledge and interest.

Academic programs often limit students' choice of courses, so it is important that sustainable development issues are obligatory components. Cemus



The active and visible participation of students generates increased commitment and a sense of responsibility and self-confidence. Students, teachers and researchers all contribute in a valuable and unique way to the learning process.”

could become an alibi for university management wishing to avoid pushing for integration of sustainable development into all learning. Cemus has a role to play as a complement to other education at the university but by the same token, Cemus’s courses must be complemented by obligatory inclusion of sustainable development education in all academic programs. Greater freedom of choice within programs would allow students to expand their knowledge of sustainable development through Cemus.

Cemus’s success and the quality of the education is largely due to the way the organisation can link student interest and drive to existing skills resources at both universities. Sustainable development-specific expertise is not needed for the Cemus method of education. Combining contemporaneous research at Uppsala and other universities into aspects of environment/development produces an interdisciplinary program.

On the other hand, unique skills are created within our organisation. Cemus’s students, assistants and doctoral students get a wide overview of sustainable development issues that would not be possible within a single scientific field. These skills can then be used to disseminate knowledge through other academic programs and to society at large, as has been done through teacher-training and in the organisation’s out-reach programs. Former staff at Cemus have taken with them and benefited by this unique knowledge in later work with public authorities, companies and organisations. Since the Cemus organisation plan implies a large staff turnover, the routines and structures built up over time are important for maintained quality. Committed individuals, both students and researchers, were vital for the launch of Cemus but the organisational structure is by now so established that the education no longer stands or falls with the commitment and skills of individuals. The thoughts and ideas

that established Cemus and still comprise our educational philosophy are close to the features that the government backs in its paper on sustainable development learning (Att lära för hållbar utveckling – SOU 2004:104). The paper states that sustainable development learning must be through democratic methods and have an interdisciplinary approach — the foundation of the Cemus operation.

The organisation aims, as do its courses, to have students share in the way the training and the rest of the Cemus operation is designed. The active and visible participation of students generates increased commitment and a sense of responsibility and self-confidence. Students, teachers and researchers all contribute in a valuable and unique way to the educational process. This way of attaining knowledge also stimulates critical thinking, a central aim of education in sustainable development, as indeed for all higher education. Since we cannot hope that experts will provide solutions for all environmental and development problems and since sustainable development issues are often coloured by value judgement, the academic tradition of critical review is important. Our experience and what we have learned leads us to recommend the following to all university teachers (and students):

- *Apply for financial support from the university* with reference to Sweden's Higher Education Act (Högskolelagen) and the argument that the global challenges facing mankind make it vital for sustainable development to be given more place in the country's higher education programs.
- *Utilise the interests, knowledge and commitment of students and doctoral students.* Sustainable development issues engage the interest of many young people and will continue to do so. Their knowledge and interest can contribute in many ways — even, as in the case with Cemus, in driving an educational program.



Young researcher in ESD from Denmark presenting her work to peers during a international graduate student gathering in Sweden.

- *Make use of existing competences among colleagues at the school.* As Cemus has shown, an operation does not demand specialist expertise; instead, understanding of the issues arises from the meeting of researchers, teachers and students from various disciplines and operations. In other words, every place of learning holds unexploited potential for learning sustainable development.
- *Cooperate across discipline and faculty borders.* For the university's competences to result in education for sustainable development on all levels, cooperation is needed across disciplinary boundaries. Create natural meeting places for you and your teacher colleagues, students and researchers from different fields. Interdisciplinary seminars and other events can facilitate, create and re-create interdisciplinary courses and programs.
- *Join forces to start operations like Cemus's.* A way to realise all the above four points is to join together to create something similar to Cemus. Cemus would never have come about if the students — and later doctoral students — had not been given support by teachers, researchers and university management. Courage is needed in the creation of anything new and different. The creation of a similar set-up to Cemus's can produce not only courses in sustainable development but also spin-off effects such as increased cooperation and knowledge-sharing between institutions as well as projects that contribute to a university's 'third mission' (disseminating findings to the community).

At Uppsala University we can also find the Graduate school in Education and Sustainable Development, GRESD, with more than 15 PhD-candidates, and the Institute in Education and Sustainable Development, IRESD, gathering leading researchers. Both in partnership with several universities in Sweden.



SUSTAINABLE DEVELOPMENT AT STOCKHOLM UNIVERSITY²⁶

Stockholm Resilience Centre's mission and goals

Courses in sustainable development are held by several institutions at Stockholm University. The faculty-independent Stockholm Resilience Centre (SRC) has a special mission — but no monopoly — to initiate and coordinate interdisciplinary environmental courses. SRC has a Council for Interdisciplinary Environmental Studies with researchers from all faculties. SRC also gives doctoral courses and offers access to a mentor pool for students writing interdisciplinary papers and dissertations.

The structure of courses at SRC

Ecosystems, Institutions and Globalisation, a two-year Master's program refining students' knowledge of problem-based interdisciplinary environmental research with emphasis on ecosystem management. The Stockholm Resilience Centre, in partnership with several institutions at Stockholm University, has developed six unique courses for this purpose. Case studies are used to understand the complexity of interlinked socioecological systems. We have been inspired by the UN Millennium Ecosystem Assessment²⁷ study that emphasizes humankind's and society's dependency on well-functioning ecosystem services. Globalisation means that natural resources management is impacted by global economic, political and ecological forces. So we need to develop institutions and governance on various scales, from conflict-solving and cooperation between different stakeholders locally to global rules and conventions. Governance must also adapt to the natural changes in ecosystems and strengthen their resilience, i.e. their ability to absorb disturbances and still provide the free ecological services we depend on: water purification and plant pollination, for example. The academic program consists of six mandatory courses (45 credits), two to three optional courses or internships (15–22.5 credits), as well as examination work (52.5–60 credits). Most of the second year's studies can be abroad. The program is in English and is research preparatory.

Hållbart företagande (Sustainable Enterprising) is a two-year Master's program with a business and organisation perspective. The foundation for successful sustainable enterprising is knowledge

²⁶ Thomas Hahn, Stockholm University.

²⁷ www.maweb.org

about socio-scientific and natural scientific principles. Expert teachers and assistants with advanced interdisciplinary knowledge on sustainable enterprising are increasingly in demand. This program provides interdisciplinary training with relevant practical knowledge and skills for sustainable business and also qualifies the student for graduate studies. It offers a combination of lectures, discussion seminars, role-playing, field trips, workshops, practical on-site work in environmental management and auditing, group work and independent work on a thesis project. The program consists of obligatory courses for 30 credits, thesis work for at least 30 credits and at most 60 credits, and optional courses for a maximum of 60 credits. The program allows students access to — and the chance to participate in — research as well as the opportunity for internships in both public and private sectors. The course lecturers are top authorities in their respective fields, providing good opportunities for close contact with different professional disciplines and current research practices. The program, which started in late 2008, is in cooperation with the university's Department of Biology Education, the Department of Law and the School of Business, but has been run for about ten years as a one-year Master's program.

Hållbar samhällsutveckling (Sustainable social development) is a one-year interdisciplinary introductory course in Swedish that provides a basic understanding of the interaction between mankind, nature and society. The course is given by the Department for Physical Geography and Quaternary Geology in cooperation with SRC. The course is suitable also for students with previous study experience since the content is unique and the broad perspective of the course allows it to complement other studies. The idea is that work with sustainable development will ultimately become an accepted part of all academic studies: social science, economy, behavioral science, law, humanities, science or technology. Teachers from different departments are responsible for environmental science, environmental politics, environmental management, the individual and consumption, environmental ethics, development, globalisation and the environment, ecological economy, and environmental communication. The course is meant to stimulate to further studies, but should also contribute to general knowledge that can be put to use in a future profession even without further academic studies. Generous time is allotted to discussion and reflection.

Världens eko (Echo of the World) is a part-time, evening orientation course (7.5 credits) in Swedish that aims to take a comprehensive look at issues regarding people, nature, development and justice. The course introduces students to the environment/development issue from a multi-subject perspective. Invited lecturers from various disciplines begin every meeting with a lecture, after

which students discuss the evening's topic and the course theme. The course is led by two students (or doctoral students). By university standards the course is a radical one: the students' desire to save the world is taken seriously at the same time as they are trained to analyse different perspectives and challenge their own views. On completion of the course, the students will be able to describe the different views and definitions of sustainable development, describe environmental conflicts from various perspectives, and analyse issues using theories and perspectives from different disciplines.

What we have learned

Developing interdisciplinary courses and programs based on research was one of CTM's assignments from the then vice chancellor when the operation re-started in 1999. This has proved fruitful. CTM has been able to support and encourage 'isolated' environmental researchers at various institutions, partly through Environmental Research Days. Many of these researchers have subsequently developed courses with or without support from CTM/SRC. Thanks to this network of researchers, new student groups have been reached by skilled lecturers.

SRC does not have the right to dispense degrees (except for *Världens eko*), 'forcing' us to collaborate with various institutions. Two constant problems are: dividing annual performance revenues (HÅP), and how individual teachers' educational duties are affected when we assign them to courses outside their regular institutions. Through multiple meetings with program managers, prefects and individual teachers, we continually address problems by focusing on the student perspective (i.e. quality and content) instead of the institution perspective (in the form of time sheets and bureaucracy).

Our experience is that inspiration, commitment and skill will get you far: many of our partners report being stimulated by the positive spirit in working for sustainable development. Instead of making our courses mandatory components of various programs, we inform program managers of what we're doing and look constantly for synergies. This is especially important since all departments are now developing their own Master's programs.



The idea is that work with sustainable development will ultimately become an accepted part of all academic studies: social science, economy, behavioral science, law, humanities, science or technology."

SUSTAINABLE DEVELOPMENT IN TEACHER TRAINING WITH NATURAL SCIENCE ORIENTATION²⁸ AT MÄLARDALEN UNIVERSITY

In this course the orientation is comprehensive and lifelong in relation to teaching and learning – this is what we mean by education for sustainable development. The course has been given for the past five years at Mälardalen University. Even more important than the contents of the course are the thoughts about how it is to be conducted, one's attitude to knowledge, and the students the course builds on.



The challenge for the future is to acquire conceptual abilities that are presently lacking, and to learn to see uncertainty and doubt as opportunities and reasons for change.”

What did we want to achieve?

The goal was to implement the well-integrated subject of sustainable development and teach it from the standpoint of ‘education for sustainable development’ for all students in the teacher-training program at Mälardalen University. One of the aims was also to give the program an international perspective.

What did we do? Working from our goal, we developed a course with several approaches and varied subject matter: ‘A World to Take Responsibility For’ is mandatory for all categories and streams in the teacher-training program at Mälardalen University in the final term of general education. Late in the program the teachers are well-versed in their subjects, allowing them to actively participate in local development projects at partner schools and contribute to the creation of the course. But there is a disadvantage: the sustainable development approach — the ‘filter’ — comes late in the program and opportunities for international perspectives are therefore limited.

The course is strongly researchbased, with a researcher as course-managing teacher. It provides a forum for formal and informal learning with student teachers, working teachers and the city’s international coordinators in the same classroom, and with lectures also by education authorities and WWF. Within the course framework, the students are, as mentioned previously, cocreators, through their choice of projects and through the evaluations made.

The projects the students work with are real tasks at selected partner-schools, and all of them have to do with further development or implemen-

tation. The teacher-student work-teams are constructed to be heterogeneous, and a trust-relationship is created between each team and its partner-school team. When it comes to grading, the students themselves choose their own level of ambition. For a passing grade they can write a reflective paper; for 'passed with distinction', a scientifically structured article.

Important in the course is that learning for sustainable development and environmental education are not the same thing. This is thoroughly discussed. Learning for sustainable development is more of a general attitude to lifelong learning in all areas of society. A further message in the course is that the relation between sustainable development and learning for sustainable development is not to be treated as given. You can be interested in sustainable development but not in educational questions – and vice versa. The motto 'Dare to be Grey!' is emphasised; there are no simple solutions to complicated problems. Further, the course reflects on the normative element in the the future teacher's own education: who has priority of interpretation in questions concerning the future? Should you as a teacher, for example, refrain from discussing globalisation in a school class only because there are no set answers? The challenge for the future is to acquire knowledge and skills that we currently lack, and to learn to see uncertainty and doubt as opportunities and reasons for change. Knowledge can be viewed as constituting temporary resting places.²⁹

What did we learn?

The teacher-students were very satisfied with the course, and asked that the number of credits it provides be increased. We chose instead however to develop a consistent ecologically oriented line which, from January 2007, has now permeated the teacher-students' education during the whole learning period, i.e. three-and-a-half to four-and-a-half years.³⁰ In other words, instead of a single course, sustainable development will constitute a thoroughgoing perspective and attitude to learning and learning for the whole educational program. There is a progression from the provision of basic knowledge about sustainable development and its rise in relation to the discussions taking place in the global community, on to discussions about nationalisation and globalisation, finishing off with the students' working with actual tasks, i.e. developing sustainable-development projects in school practice. The aim of the project part of the course is to include the school, NGOs and society's other actors in shared development projects involving actual meetings.

²⁸ Per Sund, School of Sustainable Development of Society and Technology at Mälardalen University.

²⁹ Nyberg & Sund, UNESCO.

³⁰ For further information visit the homepage: www.mdh.se/ibk/utbildning/kurser/, or contact Per Sund: per.sund@mdh.se, or +46 16 15 51 66 (office).

SUSTAINABLE DEVELOPMENT IN TEACHER EDUCATION WITH A DOMESTIC-SCIENCE ORIENTATION³¹ AT THE UNIVERSITY OF GOTHENBURG

To develop a learning attitude towards sustainable development requires that the students try different working methods, are confronted with complex questions, and can handle the dilemmas and identify the tasks and problems for common analysis and solution.

Increase the number of sustainable teachers and students ...

Our goal was to integrate sustainable development into the home and consumer studies at the University of Gothenburg, so that all included moments will be highlighted from the three dimensions of sustainable development. Since the teacher education involves all departments at the University, this step was quite sweeping. The study program we chose contains general courses, practical work, and immersion and specialization courses. The students can themselves set their own study pace.

Immersion and specialization courses develop the teacher-students' subject competence and didactic skills together with sustainable development. Household and consumer science has much to do with sustainable development because it involves both the inner and outer environment; and here sustainable development is studied as relating to planned resource use, health, culture and equality – all of which are themes in domestic economics – as are aesthetics, internationalisation, history and the environment.

... by combining subject-knowledge with subject-didactics

When we developed courses for teacher education, the central question was what a teacher-student needs in order to work long-term with sustainable development in the school world. Our conclusion was that the integration of subject competence and subject didactics provides the teacher-student

³¹ Helene Wählander, Home and Consumer Studies at the University of Gothenburg.

³² Helene Wählander & Anna Freij, Mat på hållbar väg, WWF 2005.

with a learning attitude that is suitable for education for sustainable development.

‘The Everyday Life course’ provides a knowledge-base regarding sustainable development from a household perspective. ‘Food and meals in a sustainable society’ deepen our knowledge of sustainable food and sustainable meals, including sustainable use of the kitchen. The courses ‘Act for the Future’ and ‘Living in a Global Context’ take up other aspects of sustainable development, and inspire the students to long-term thinking (the future perspective) on a broad front (the global perspective). The specialization courses deepen the students’ knowledge of sustainable development as regards sustainable food habits from ecological, economic and social perspectives.

Here teacher-students also deepen their knowledge of nutrition and health. We work with methods that the teachers can use to obtain greater pupil involvement, input and responsibility. The course ‘Consumption and Sustainable Development’ focuses on the home’s consumption choices in relation to sustainable development.

The students work with different methods of connecting sustainable development to domestic-science themes. It can be a matter of the handling of food, or the composition of meals, which among other things have been taken up with the help of a role-play involving family members who together got to cook a meal.³² In a workshop where the students prepare food prior to cooking, they are to consider ecological effect, economic cost, energy use and nutrition. The marking of food, seasonal choices, transportation, and imported food in relation to locally produced food, are themes that are also handled. Research reports and IT methods for judging the dilemma between food trends and sustainable development are used frequently.



The students work connecting sustainable development domestic-science themes.

What we have learned

It is important and engaging for the students that their work results in actual tools that they can use. A group of teacher-students used a game concerning ecological footprints, and decided to reconstruct the game and test it on some pupils during the project. The pupils' feedback led to improvements in the game, and the student group is now engaged in developing it further, and creating teacher instructions for it. The sustainability issue is best handled through cooperation in general themes, between different actors in the school.

When we worked on the course plans in order to adapt them to the Bologna Accord, one of the criteria set up has been to formulate learning goals:

- 1) sustainable development and education for sustainable development is clear so that;
- 2) the analysis and inventorying of different texts and tasks, etc. are possible;
- 3) the goals exist in a meaningful context;
- 4) they lead to the course's content including steps that show what sustainable development means in the particular context being dealt with; and
- 5) they involve a progression as well as an integration into a whole, i.e. they involve subject-theory, subject didactics and learning practice.

We know now through course evaluations and what we have to date seen the students carry out in the new teacher-education (starting 2002), that the students:

- have learned to handle sustainable development in their own learning process and teaching.
- have been able to work with the various dimensions of sustainable development, and analyse how they fit into steps in their education. Reports and oral presentations have aspects of, or are completely or partly based on sustainable development.
- feel familiar with how the course plan in the home- and consumer knowledge program, and the perspectives it contains (health, resource conservation, equality and culture), can be interpreted and set in relation to education for sustainable development
- appreciate that their education is based on the idea of sustainable development, and that this perspective exists in every step wherever possible.

We know that if sustainable development is well integrated in goals, the course content and literature we don't have to call it by name all the time.

DESIGN FOR SUSTAINABLE DEVELOPMENT³³ AT THE UNIVERSITY OF GOTHENBURG



Designers have a decisive influence on the formation of future product and service development. If we are to be able to contribute to sustainable development, we have to learn about today's situation, and how we can contribute in various ways to a product and service development that is more sustainable.”

Focus the design's significance for sustainable development

If we are going to manage to convert to a sustainable development, we need the efforts of many people in all parts of the community. There is much left to do. The level of knowledge is high about what we as designers and design teachers should do and enormous potential exists for the necessary technique and product renewal, with resource conservation as the motor. Technology can help bring about part of the transition, but in the end it's nevertheless a question of our lifestyle. Are we truly happier thanks to a surplus of gadgets and such? Perhaps we could solve a number of problems simultaneously by emphasising other values for creating quality of life.

Designers have a decisive influence on the formation of future product and service development. If we are to contribute to sustainable development, we must learn what the situation is today, and consider how we can, in various ways, contribute to a more sustainable product and service development. This is our motivation for the course in design and sustainable development. The aim is to inspire students to acquire basic knowledge concerning the ecological, social and economic dimensions of sustainable development. Students, designers and businesspeople shall together learn what can be done to change present development, and what methods and tools exist to help.

³³ Kristina Sahlqvist, School of Design and Crafts at the University of Gothenburg



Designed shopping bags that can be used many times are a strong and growing trend.

Educate to inspire sustainable designing

The course consists of eight lectures and an exam. The students learn about design tools, Fair Trade, quality of life and standard of living. They discuss 'design for everyone', environmental influence and material, and good examples.

The course includes a group project where the participants, making practical application of the 'thoughtful design' method, develop a suggestion for sustainable design in one of the areas of products, services, or spatial or visual communication. The sustainable-design projects are presented in plenum at the end of the course.

The course is multidisciplinary and open to those studying design and architecture in Västra Götaland, as well as to professional designers, architects and businesspeople, and those working in the public sector. All participants must be qualified for university-level studies, or have corresponding work experience.



What we have learned – design is responsibility

Emphasising the design assignment's breadth and multidisciplinary character clarifies the responsibility, included in a designer's decisions, for people's physical environment and their activities and attitudes. *In this responsibility there is a positive opportunity to participate in a change of attitude towards consideration, equality and sustainable development in society.* To educate yourself to be a designer means making it clear to yourself which position you take in every design problem, and to assume responsibility for it.

GLOBALISATION, THE ENVIRONMENT AND THE MEDIA³⁴ AT HALMSTAD UNIVERSITY

The course is intended for students who want basic social and natural-scientific knowledge about the environment, as well as about the role of the media in reporting the causes and consequences of environmental destruction in an international perspective. The course takes up people's, the state's, and business's part in environmental degradation. The consumer society, population growth, and the connection between political and economic interests are important in this respect. The course also takes up civil society's opportunities and limitations in the fight to save our life-sustaining environment. Information, media and business's lobbying and PR activities are taken up.



³⁴ Veronica Stoeihel, Halmstad University.

Create understanding for the relations in the sustainable development problematique

The overall aim of the course is to provide the students, without their even having begun to familiarise themselves with the literature, with an understanding of sustainable development. Thus they should be able to identify the causes and consequences of various environmental problems, as well as begin to ask relevant questions and obtain an idea of possible solutions to the sustainable development problem.

The name of the course, Globalisation, the Environment and the Media, suggests a relation between these three notions. Globalisation points to the relation between what happens on different sides of the earth. It can be a matter of the relation between releases of carbon dioxide in the United States and drought in Africa and/or an increase in temperature in the Arctic, or between political-economic measures taken in Japan and overfishing in the Pacific. Part of what is important in this context is the ecosystem's function and the impact of environmental destruction on human health seen in a global perspective. Last but not least, the concept of the *media* concerns the channels that funnel information about the environment and globalisation to the world's citizens. We focus on the importance of the way the questions are taken up, as well as on different companies' ways of making use of information channels to convey their message. When the course is over, the students will be expected to be able to:



The course uses documentary films on sustainable development aspects, including climate changes, and their causes and consequences — natural catastrophes such as hurricanes, drought and floods. The picture shows a tornado in the Adriatic. Note the relative size of the sailboat.

- 1) understand the relation between nature and culture, including the media's role in this understanding;
- 2) demonstrate, on different levels, people's dependence on various ecosystems; and
- 3) explain the relation between environmental economics, politics, lifestyle and civil society.

What we do

The course is an introductory summer course at Halmstad University, to help students participate while taking related courses in previously chosen programs or subjects during the academic year; this is basic in order to provide them with a platform from which they can seek further information. The course consists of 36 lectures concentrated into 6 days, which means 6 hours/day, so that the students can plan other activities during the summer.

Most of the material the course is based on is on a website the students can access. There are short reviews of the literature in the course, a number of PowerPoint presentations, lists with alternative news and information sources on the Internet, and a selection of the students' own work. From the teacher's perspective the site is an opportunity to add material and adapt the course to developments in the area of sustainable development. The exam for the course consists of an independent or two-person research project, investigating in-depth a chosen theme from the course.

Over and above the lectures, the course uses documentary films on:

- 1) ecological questions, such as the relation between sharks, herbivorous fish, algae and coral reefs, and the connection between wolves, their prey, trees and erosion;
- 2) climate changes, their causes and consequences;
- 3) the impact of political-economic questions on the environment;

- 4) transnational corporations' role;
- 5) media exhortations to consume; and
- 6) political power and the media.

Day 1 focus is on environmental trends and human dependence on ecosystems. Students develop insight into the relation between human well being, ecosystem services, and direct and indirect causes of ecosystem changes. We discuss the footprints of different world regions and how they would look if development were sustainable. We look at how both carbon dioxide emissions and temperature increase, which countries emit most, and how the greenhouse effect works. Examples are given of the consequences of climate change such as floods, fires, sandstorms and species on the verge of extinction, and of unsustainable human activities such as water contamination and overfishing.

Day 2 Half the day is spent discussing large-scale forest felling. The consequences of felling are presented, followed by a discussion. The role of large corporations in this activity, the roles of industrial and developing countries, and possible remediation measures. The other half of the day is devoted to the functions of ecosystems through history and their multiple connections, the importance of biodiversity, and resilience.

Days 3, 4 and 5 take up basic economic concepts, the environment, and the media. The political and economic causes of environmental destruction are discussed, as well as the effect on people. Certain transnational corporations' activities and interests are exemplified. We look at air and water contamination, the consequences of contamination by the chemical industry and from over-fertilisation, acid rain and the use of uranium in war. We also discuss industrial pollution incidents (Union Carbide, Exxon Valdez, Sandoz, BP etc.). The roles of the media, advertising and sponsors are also investigated over the three days.

Day 6 treats the community, Agenda 21, and the role of the media again. Civil society's opportunities and difficulties are discussed, not least using new media. For-and-against arguments for Agenda 21 are taken up, and high-income and low-income countries' respective responsibilities are debated. The relation between poverty and environmental destruction is highlighted, as are the rights of future generations. Further discussion is on technology as an environmental aid and the proof-dilemma of science.

What we have learned

On the evaluation after the course, on a scale from 1 (very poor) to 5 (very good), the median was 4. Students experienced the days as too long, and the information too dense, but were otherwise satisfied. All students responded to the eval-

uation, and would recommend the course to other students.

In other words, the evaluation didn't indicate what we might have done differently. However in the future we will mix the lectures and seminars more, so that discussion amongst the students gets more space, and is kept alive and continuous. We shall develop the media part of the course by giving a greater number of concrete examples of how the media has treated the sustainable development problem. We shall show more clearly the flaws that research has revealed regarding connections, which in turn can contribute faulty knowledge about the whole. We are currently involved in developing a correspondence course, so that more students will be able to participate, and teachers from other regions won't have to travel to Halmstad. The course itself will become more sustainable.

Forest-felling and its consequences for biological diversity, and the involvement of large corporations are discussed. The roles of the industrial and developing countries are also examined, as are possible counter-measures.



INTERNATIONAL MASTERS YEAR IN ECOLOGICAL ECONOMICS³⁵ AT MÄLARDALEN UNIVERSITY

Ecological Economics – Studies in Sustainable Development has been given at Mälardalen University as a one-year (60 credits) Master's program. Focus is on the integration of the ecological, social and economic dimensions of sustainable development. It is interdisciplinary, with courses on the advanced level in both the natural and social sciences. A number of analytic dimensions of sustainable development are treated; for example, connections between ecosystems, economics, democracy and the community. The courses (15 credits each) included are:

- 1) Environmental issues and Sustainability,
- 2) Ecological economics and Organisations,
- 3) Discourses and Sustainable Development, and
- 4) the Thesis.

Inspiring the students to in-depth multidisciplinary knowledge and a critical attitude ...

The aim of the program is to inspire students to acquire in-depth multidisciplinary knowledge about theories, methods and matters concerning ecological economics and sustainable development. The program's goal also includes training students in having a critical attitude.

... through a programme on economics, society, the environment, and development, from the local to the global

Ecological economics, itself a multi-disciplinary subject, constitutes the basis of the program. In ecological economics the relations between the economy, society, the environment and development from the local to the global is analysed. Didactic methods help the students interpret, understand, critically analyse and deepen their reflections over these questions. Emphasis is also put on their ability to express what they know, as well as on writing proficiency, to benefit their future research, or senior positions they later occupy in organisations or trade and industry.

The first course in the program, *Environmental Issues and Sustainability*, takes a mainly natural-scientific perspective, where the understanding of ecological principles and the human contribution to nature's environmental burden is the focus. Technical solutions to environmental problems, as well as environmental legislation and other environmental controls, are presented. Learning is through lectures and seminars where the students

³⁵ Eva Friman och Birgitta Schwartz, School of Sustainable Development of Society and Technology at Mälardalen University.

themselves discuss their own prepared questions on the basis of the literature. A larger project is carried out in groups, and is documented by each group in a report. The course ends with a written exam.

The *Ecological Economics and Organisations* course has a social-scientific and business-economics perspective, discussing the interaction of business and organisations in sustainability issues and ecological economics. Emphasis is on groups studying different businesses. Group work simulates work-related situations. Individual businesses or organisations are examined by parallel teams. The students are trained to apply management and organisation-theoretic perspectives in investigating the preconditions for sustainable development. The course ends with a take-home exam.

The development discourse's relation to sustainable development is thereafter focused on in a third course, *Discourses and Sustainable Development*. Alternative definitions and visions of development are discussed. The use of language and power aspects in relation to development and sustainable development are studied as well. Why, when a development project is evaluated, are the environmental and legal aspects of the project added afterwards, while GDP is allowed to be the centre?

The course also investigates the relation between theory and practice when it comes to development generally and sustainable development in particular. Which actors have the right to define and express themselves in the relevant arena, and why? The students are inspired to obtain a deeper understanding of concepts, theories and ideologies, through an understanding of the history-of-science context. In the course the students perform an actor's analysis in groups, and have a written take-home exam.

In the last course, *the Thesis*, the students write a Master's thesis on the subject of ecological economics. In their theses they are expected to use the theories and perspectives dealt with in the program's various courses. They choose a subject themselves, and the writing process is supported by method lectures and teacher supervision, as well as by a number of seminars where the students oppose each others' papers.

The didactic methods used in the program include studies of literature, the writing of essays and reports, various forms of group-work, and actor's analyses and seminars involving oral presentation and opposition. Guest lecturers from the academic world as well as from the public sector, private organisations and NGOs, bring their own perspectives. The student groups are very heterogeneous as regards countries of origin and previous knowledge, which has both advantages and disadvantages.

“Given responsibility and shown faith in their competence, students can manage advanced thought exercises and projects. On the basis of clear instructions, both written and oral, our students have been able to seek out and evaluate information independently.”

What we have learned

Given responsibility and shown faith in their competence, students can manage advanced thought exercises and projects. On the basis of clear instructions, both written and oral, our students have been able to seek out and evaluate information independently. They have carried out branch studies in groups, and have made comparative studies of the potential for sustainable development in Sweden and one other country. Often the results have been sophisticated, and the students have generally shown an ability to handle independent study and an increased readiness to act.

The advantages of having an internationally constituted group, and of being able to use the various cultural backgrounds and experiences in group assignments, outweighs some initial language deficiencies among the students.

The group-work format is appreciated by the students once they are underway with their assignments. Many are not used to working in this way, and it has meant a conceptual conversion from their earlier experiences at their home-universities, where group-work or oral presentation is often hardly used at all.



ECONOMICS AND LEADERSHIP

FOR SUSTAINABLE DEVELOPMENT³⁶ AT GOTLAND UNIVERSITY

Globalisation entails new demands on companies and organisations. The lifecycles of companies are diminishing — as are profit margins. Future leaders as well as their collaborators must see the organisation as a system. In slimmed-down organisations everyone must be able to take on a variety of roles and periodically act as leader. Such motives as global competition, technological development, and demands for sustainability mean that a successful organisation must focus on continuous education, involving everyone.



³⁶ Raine Isaksson, Gotland University.

³⁷ Hellsten & Klefsjö (2000).

Educate the future's long-sighted leaders and live as we teach – nine evaluations

In the fall of 2007 we started the program Economy and Leadership for Sustainable Development (180 credits) at Gotland University. In order to live as we teach, a project group was formed that started work by discussing the major values assumed both in the course content and the development-group's work. We started from a definition of aggressive quality development as a management system consisting of values, work methods and tools,³⁷ and translated this into sustainable development terms by expanding the 'customer focus' to 'interested-party focus', with the customers as interested parties.

The nine motifs, or agreed principles, we chose are: interest focus, systems-thinking, management commitment, transparency, process-thinking, continuous improvement, universal opportunity and responsibility to participate, fact-based decisions, and diversity. We applied the principles fully to both the program and our internal work. The work methods for the program contents are different from those employed in carrying out the project. The focus of interest on the program level means that we begin with the organisation's – the future employer's – various interests, which include customers, suppliers, employees, competitors, the community and the environment. Examples of work methods that support interest focus on this level are customer-steered planning, environmental consequence analyses and leadership.

The work method that we build into the cours-

Swedes are world leaders at recycling paper – a habit to be proud of.



es is supported by the motifs we have defined. On the project level and on the education level the focus on interested parties means that the valuations support the work method in developmental and education work. Included in the developmental work are important interested parties such as future employers and the students who were interviewed about the contents of the program.

“The program’s set-up helps students take responsibility and cooperate – partly with other classmates, but also with external persons and experts in various organisations who have different skills.”

We will be using work methods that permit quick feedback from the students and the educational team. We use a systems-based process model to describe organisations and their interrelations with their surroundings. The program is characterized by practical problem solving, where the aim is to acquaint the students to with real work tasks as quickly as possible, and to begin with value-creation measured in sustainability terms. Each student has her/his own mentor from the business world or from a public sector organisation. Personal development interviews are carried out every term.

The program’s set-up helps students take responsibility and cooperate – partly with other classmates, but also with external persons and ex-

perts in various organisations who have different skills. We want to prepare the students for the future by making the forms of study as similar to working life as possible.

The program is aimed at students who primarily want to work with developmental and improvement work in companies and organisations. The student receives a branch-independent education that provides broad knowledge of organisational development. The program studies include leadership, business economics, quality development and environmental science. The program also emphasizes the theoretical and practical aspects of project methods and project management.

The students' future tasks in improvement and development work mean that they must be prepared to work with or lead groups. This is why leadership constitutes an important part of the program. The students study group dynamics and leadership, with elements of ethics and gender-science. They acquire an understanding of how they, as individuals and groups function, and how leadership problems can be solved.

The combination of subjects provides the students with preconditions for systems-thinking and contributes to long-term sustainable development in the future organisation. For better big-picture understanding, the students also analyse and discuss how systematic development work in an organisation interacts with microeconomics, environmental economics and sustainable development.

Optional courses help the students shape their education. Quality technology or business economics can be their major, and courses in other areas can be chosen according to interest. These can be enhancement studies in environmental science, law, or something completely different.

The thread running through the program is development and improvement seen from a sustainability perspective in their economic, social and ecological dimensions. Development and improvement are given a long-term perspective, where profits do not accrue through other interested parties' losses.

What we do

The program involves different types of learning —traditional lectures, seminars, independent studies, individual assignments and reality-linked projects at companies and other organisations. Students can work individually, in pairs, and in various constellations and receive a basic academic competence. To link this knowledge to how organisations actually function, guest lecturers inform the students about tried-and-tested measures and practical forms of learning such as project work. In cooperation with host companies we create a three-

step educational model: theory, application and understanding.

The exams are to check if the students can understand and apply the knowledge gained. We continually examine the students during the course through short written tests and take-home assignments, oral presentations, reports, laboratory work, studies of the literature, seminars and project work. The program can lead to a Bachelor's degree in quality engineering or business economics.

“The first response from the students is that it is good to have a variety of examination methods; and it is good to have individual mentors.”

What we have learned so far

The first response from the students was that it is good to have a variety of examination methods; and it is good to have individual mentors. In the educational team we have discussed the importance of living as we teach. The program is based on nine principles, which prompted the content of the program's courses. How can we as an educational team bring the same values to our own organisation?

We work on defining a process-based management system that makes us continually improve the program on the basis of the various stakeholder demands and needs. We have defined stakeholders as the students, future employers, Gotland University, the state, nature and the community – with some emphasis on Gotland – as well as the staff. On a broader level we defined our main processes as ‘educating in knowledge improvement’, ‘to develop’, and ‘to contribute positively to the community’. By measuring process performance and improvement with a Triple Bottom Line, we try to capture the entirety of what improvement for sustainable development means.



CASE METHODS FOR SUSTAINABLE DEVELOPMENT IN CHALMERS' BASIC EDUCATION³⁸

Mother Earth 2050 is the theme of a workshop where the effects of global warming are the worst conceivable. The workshop is used in the step in a Master's program dealing with sustainable development to illuminate the social and political aspects of global warming. Our part consisted of the students' work on aspects of sustainable development, and ended when, through negotiation, they produced a document detailing a common action plan for sustainable development. The student group was international, which meant that their cultural understanding and their experiences of politics, poverty, corruption, democracy and so on varied. The workshop was developed for use in a context where the students were from all over the world.

Multi-disciplinary ability to communicate and action competence

As well as providing students with a quick course on global warming (GW), the workshop aims to lead into the subject of sustainable development. The goal is that the students receive:

- 1) knowledge and understanding of the natural-scientific facts used in discussions about the greenhouse effect and global warming,
- 2) knowledge of the political motives on national and international levels with regard to global warming,
- 3) proficiency in applying natural-scientific facts as arguments in a context of politics and self-interest,
- 4) knowledge of how the same arguments are used in different ways depending on the political context,
- 5) knowledge of the consequences of national suggestions globally, and
- 6) proficiency in cooperating and communicating (argumentation), as well as in giving oral presentations.

Execution

The didactic methods used are group work, presentations, negotiations and scenarios. The teacher is to present up-to-date material, describe a worst case scenario, divide the students into groups — with consideration given to nationalities — as well as define key concepts and organise written material. The students' task is to slow climate change and present an internationally binding treaty with

³⁹ Anna Nyström-Claesson, Chalmers.

“As well as providing students with a quick course on global warming, the workshop aims to lead into the subject of sustainable development.”

a control program to keep greenhouse gases at current levels.

Day one of the workshop deals with the scientific perspective. The workshop is introduced with a presentation and an odyssey round the world for the global economic, ecological and social consequences of the worst case scenario. The students are divided into national groups or groups with cultural, political, linguistic and/or development-need similarities.

The task is to create situations in, and conceptual understanding of, the natural-scientific terminology used in GW. The groups employ the terminology to describe the national consequences of the worst ecological, economic, cultural and political scenario. The groups provide an account in ‘concept maps’ of the concepts and how they relate to each other. Further, they give an account of a problem description and a consequence analysis of the GW scenario on the national level from a strictly scientific point of view.

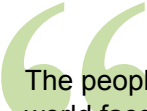
Day 2 deals with the political perspective. The country’s political arena is presented through newspaper articles with political pronouncements about global warming. Each student-group’s natural-scientific national consequence analysis of global warming gets a political and social context. The country’s political arena and motives for action are charted with the help of the group’s knowledge of their home-country, together with information supplied by national newspaper articles. The students describe the country’s political arena with regard to: 1) method of governing, 2) those in power, 3) companies, 4) corruption, and 5) religion.

Day 2 is rounded off with oral presentations of the national programs, which are to include measures for global warming, based on political context and natural-scientific facts:



- 1) Program of measures for global warming,
- 2) an overview of national support for the program,
- 3) the country's economic growth.

Day 3 deals with international agreements. At this stage the groups prepare the international negotiations on the basis of their own notes and the handouts, with their own country's interests in mind. Then come the negotiations. In preparation, the teacher address the difference between argumentation and dialogue. *Argumentation* means that participants are not listening to each other, trying to beat each other with clever attacks. Argumentation can ultimately lead to personal attacks when objective arguments run out. A *dialogue* is characterized by active listening and confirmation of understanding. A dialogue requires a recipient (argumentation does not) and is characterized by cooperation and toleration, as well as the expression of differing worldviews and how they lead to different priorities. Agreement is not simple.



The people of the world face a challenge that has dimensions and consequences unmatched in the history of humankind. The effects of the choices we make today have implications for the future development of Mother Earth's ability to sustain and feed her inhabitants."

The participating groups then has 20 minutes each to present what it can do by itself, but also for demands on the world community. Presentations finish with a priority list of the group's most important measures, suggested control programs, and arguments. The task is to arrive at a common list of priorities and a common control program. Each group has a representative at the negotiation table. Group members seated behind their representative may not interrupt the discussion but can communicate with their representative using written notes. The representatives are to take the floor on behalf of their respective groups during the discussion, which can continue for 5 to 10 minutes. The representatives are sent back to their groups to fine-hone their arguments for a few minutes.

Prior to the next round the groups can change negotiators. This procedure is repeated a few times,



and then everyone gathers for a follow-up in plenum. Pacts may be formed, and groups may make common cause, but at the negotiation table the negotiators represent their own countries. When the negotiations are complete, they are evaluated.

Day 4 the theme is the IPPC's best case scenario. The political situation in the world is discussed, including the Kyoto protocol and other international agreements. During the day the students reassemble to express thoughts on the workshop theme and the negotiation situation. At the end of the day, the workshop is concluded and evaluated. The students are judged mainly on their concept maps and their presentations.



Climate change affects the whole world and demands great adaptability and innovative ability, not least in the energy sector, where solar energy is an important part of the solution.

Mother Earth 2050 - Study-guide Days I and II

The inhabitants of the earth face a challenge that has dimensions and consequences incomparable with anything that has previously happened in the history of human-kind. The consequences of the choices we make today have implications for the future development of Mother Earth's ability to feed and sustain her inhabitants.

WORKSHOP Day I. Scientific facts

Your task is to define and discuss when and how key concepts are used in the scientific community. You shall also discuss how these concepts are mutually dependent on or otherwise related to each other, and the way in which they are relevant to global warming. Do the concepts contradict each other? Can measurements be interpreted differently and be used in different ways in the scientific community? What would this imply for ecosystems, economic growth and populations? are some of the questions.

Key concepts. The bio-geochemical circulation/flows/stocks of carbon, and factors that affect those flows/stocks; greenhouse gases, anthropogenic releases of greenhouse gases, their distribution in space and time; future scenarios; global energy balance; solar radiation; the OAGCM (OceanAtmosphereGlobal Climate Model); climate, historical variation and long-term trends; weather, its variation and the consequences of that variation for harvests; flooding, erosion and so on, and their relevance for sustainable development; average global temperature, measurements, historical variations and trends; natural causes of the climate system's fluctuations and uncertainties.



WORKSHOP Day II: The political perspective

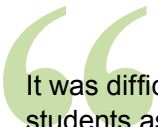
Scientific facts describe the effects of releases of anthropogenic greenhouse gases, and though the scientific community is in agreement about the seriousness of all this, it also must be communicated to decision-makers. Basically, an environmental change is not an environmental problem until sufficiently many people see it as a problem. Every community is organised around a number of rules that can be explicit (e.g. laws and rules of conduct) or implicit (e.g. general cultural values or norms). Decision-makers are part of the social context, and their decisions are influenced by different actors with varying interests (stakeholders).

Stakeholder analysis. Decisions and policies are a result of pressure from various stakeholders. The relation between them and decision-makers depends on how influential the stakeholders are. A primary stakeholder has more influence than a secondary stakeholder. Influence also changes over time depending on trends and political strategies. An analysis identifies and organises stakeholders according to their influence, and also analyses dependency relations between stakeholders and decision-makers.

Procedure. Identify at least 15 stakeholders relevant to decision-makers in the region. Describe the relation between decision-makers and stakeholders in terms of: 1) influence, and responsibility vis-à-vis each other; 2) if there are conflicts, what gives rise to them, and what reasons are there for conflict not occurring; 3) rank the stakeholders you have identified in terms of whether they are primary or secondary, and motivate your ranking.

Your assignment. Make a regional stakeholder analysis as above. What is the official political view on global warming? How does the political map look in the region? Administrative codes? Development plans? Population growth? Energy needs? How are decisions made in the political corridors? Corruption? What influence does religion have on politics? Your work should result in a regional action plan, and be based on scientific facts in the political context. You, as a decision-maker in the region, shall identify: 1) actions in the region that must be taken to prevent the effects of a full-scale global warming scenario; 2) the action plan's regional importance in relation to the country's economic growth; and 3) necessary measures to be taken on the global level. The presentation should not take longer than 20 minutes.

Picture to the left: Course participants pictured in Slottskogen in Gothenburg in June of 2005. The students are from Sweden, China, France, Greece, the Philippines, Iran, Kazakhstan, England, Pakistan, the Cameroons and Indonesia.



It was difficult for students assessing their own country's/region's development while also advocating CO₂ reduction."

What has been learned – by the students and by us

The students learned concepts related to global warming, and how they were linked. Their task was to create concept maps. Students used their understanding of their own political systems as well as articles and official statements from their country's/region's leaders, and described them. By charting influential organisations and people the students gained understanding of the political agenda in their region — how political processes affect decision-making regarding global warming, and the consequences of the decision-making system. This prompted discussion about applications and interpretations of democracy. For many students, identifying the important regional actors was an eye-opener.

The students tackled the relation between need to develop and its environmental effects by using scientific arguments in a political/social context. The discussion often reached wider needs, e.g. peace, infrastructure development, and education (all with links to global warming). Students from Europe received little sympathy for their arguments and suggestions. It was difficult for students assessing their own country's/region's development while also advocating CO₂ reduction. The students came to appreciate the need of different regions to develop, and the complexity of global decision-making. Students far from home often found it easier to distance themselves from their home countries and be objective with regard to the problem.

The teachers also contributed to understanding by taking roles as international actors such as the UN, the World Bank, WHO, the IPPC, and so on. Ideally, an introduction arouses feelings. It might include pictures that exemplify the IPPC's worst scenarios, and pictures from the countries the stu-

dents come from. To speak to feelings can create engagement, interest and relevance. The workshop concluded with realistic scenarios from the IPPC to create balance, show where the world stands today, and reconnect to reality.

Groups should have internal social and cultural communalities, since this helps the students understand the political climate in their home regions. In the workshop, the students found they could express their different perspectives, and were able to turn their different experiences and backgrounds to an advantage.



Economists, lawyers, designers, engineers, urban planners, communicators and educators – indeed all professionals can play a critical role in the necessary changes towards a more sustainable development.

AN ENVIRONMENTAL SCIENCE PROGRAMME FOR A SUSTAINABLE SOCIETY³⁹ AT MÄLARDALEN UNIVERSITY

“All problems cannot be solved with technology alone. The students need to know how communities work politically and economically.”

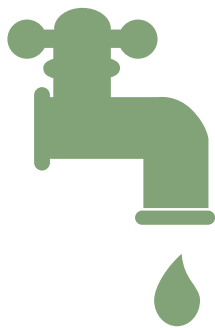
Our goal – environmental scientists for tomorrow

The aim of the environmental science program at Mälardalen University is to educate environmental scientists for tomorrow's environmental work in the public sector and industry. The education transmits knowledge of theories and research in environmental science and other relevant areas of knowledge. The students develop proficiency in practical work in the environmental area, and acquire an ability to see new creative solutions to environmental problems in the work for sustainable development.

What we do

Environmental science has to do with understanding the causes and effects of environmental problems and the repairing of old environmental errors. Chemistry and applied environmental law, how the community is built up, and the paths towards sustainable development are important parts of the program.

All of the students in the program work practically with laboratory exercises and field studies, and develop analytic abilities. In the first year they study the basics of environmental science and biology, subsequently going more deeply into environmental science. In the third year they choose individual profiles, which can be from among the following: 1) aquatic ecology, which contains sample-taking methodology, analysis methods and evaluation methods for judging environmental quality in aquatic ecosystems; 2) environmental



³⁹ Jutta Buckman-Söderlund, School of Sustainable Development of Society and Technology at Mälardalen University.



management with methods such as LCA, MKB and environmental steering; 3) environmental and health protection dealing with environmental legislation and indoor climate, land and water.

The program includes courses in environmental science, where the students acquire knowledge about natural science and the connection between the community and nature. Elements in the program address sustainable development and internationalisation.

Sustainable development is integrated into the courses as a natural part, introduced early. Students are given an introduction to sustainable development in the first course, as in other programs at the university, e.g. in the public-technology engineering program and in the teacher education program.

The program includes a block of four courses on sustainable development in the community, which can also be taken as independent courses. The courses include:

- Municipalities and Sustainable Development,
- Infrastructure and Sustainable Development,
- Sustainable Development and Community Planning, and
- the Sustainable Society pilot course.

The aim is to illuminate how the public sector – i.e. mainly municipalities – tackle the challenge of attaining a more sustainable community. The aim is also to give the students a basis for independent reflection over sustainable development.

What we have learned

Environmental science as a subject at Mälardalen University has its origin in environmental technology. Environmental problems often have technical solutions, so it is important in environmental science to maintain a connection to technology. At the same time, technology alone cannot solve all the problems. The students also need knowledge about how society functions politically and economically.

Requirements for entering the program are Biology A, Chemistry A, Physics A and Mathematics C. The program currently has a natural-scientific basis with elements of social-scientific subjects. This was prompted by signals from our branch advisory board in the environmental sector. We cooperate with the biology program in a natural-scientific platform with a common first year, as well in courses on a higher level. This gives the program a clear natural-scientific orientation and increases the number of students in program courses.

The students can choose to continue to pursue our program on an advanced level, either through a Master's in water-quality assessment in cooperation with other universities and technical colleges in Europe, or a one-year Master's with an orientation towards environment and health protection.

Most of the program courses can be taken independently, which means that we have students with varying backgrounds – including some already in jobs – participating in the courses. The environmental science courses are also taken by students from other programs, which means that we contribute to increasing consciousness about sustainability issues among other groups.





Sustainable development and learning

Sustainable Development and Learning – Inspiration for University Teachers, is part of WWF's concentration on learning for sustainable development on the university level. In this material learning and education for sustainable development is reflected upon and several universities in Sweden are sharing examples of how this is implemented in their institutions. More material is available via WWF's website wwf.se/utbildning.

INTERDISCIPLINARY

Integrating learning about sustainable development in all scientific areas and disciplines and not standing as a separate subject.

PLURALISTIC

Learning by various methods.

VALUE BASED

Choosing a base of values that, challenged, can be said to form a foundation for sustainable development.

STUDENT-DRIVEN

Where students have some participation in organising learning and in its focus.

CRITICAL AND PROBLEM SOLVING

Leading to readiness to tackle the challenges involved in work for sustainable development.

LOCAL RELEVANCE

Focused locally and globally.



Why we are here

To stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature.

wwf.se