Chapter 7

Ron Cörvers, Joseph Leinders and Rietje van Dam-Mieras

Virtual seminars – or how to foster an international, multidisciplinary dialogue on sustainable development

Abstract

Problems of sustainable development are typically complex, and perspectives on the nature and solution of these problems are likely to vary with national, cultural and disciplinary backgrounds. Transboundary competence, the ability to communicate and collaborate across the boundaries of nation, culture and discipline, is therefore an essential competence for sustainable development. In a virtual seminar on sustainable development, students with different national and disciplinary backgrounds work together on case studies in sustainable development, using modern ICT tools to overcome the constraints of place and time. The heterogeneous student groups represent an excellent learning environment to develop transboundary abilities, as the students experience differences in perspective in a very direct way and have to develop a joint solution to the problem. This chapter describes three examples of virtual seminars on sustainable development, spanning a decade of experience, and focuses on the current European Virtual Seminar. A comparison of the examples reveals major trends in the design of virtual seminars, the ingredients of a successful virtual seminar, the strengths and weaknesses of virtual seminars, as well as ideas for further improvement.

What is a virtual seminar?

This chapter discusses the role of a 'virtual seminar' as a new method of learning for sustainable development. The key issue is how to foster an international, multidisciplinary dialogue on sustainable development among students. We will describe three examples of a virtual seminar in

which the School of Science of the Open University of the Netherlands played an active role:

1)   the European Environmental Science: Towards Sustainability (EES) course,
2)   the Global Seminar on Environment and Sustainable Systems (GS), and
3)   the European Virtual Seminar on Sustainable Development (EVS).

Our analyses of these examples will focus on topics such as the aim and learning objectives, the educational format, the learning process, organisational aspects and evaluation.

A period of ten years lies between the first occasion on which the EES was run back in 1995 and the most recent EVS in 2005. This has been a period of learning by doing, or more specifically, of learning by trial and error. So what can we learn from a decade of virtual seminars on sustainable development? What are the strengths and weaknesses of the didactic concept, and what improvements can we recommend? Before discussing the EES, GS and EVS in detail, however, we should first like to define what it is that we mean by a 'virtual seminar'.

As far as the virtual dimension is concerned, the volume and diversity of computer-supported and web-based learning materials is expanding at an extremely rapid pace. Electronic learning is likely to becoming increasingly important in the future, and also more closely integrated into the educational system. At the moment, however, most applications of e-learning – such as electronic workbooks, multimedia components, electronic assessments, etc. – cannot be regarded as seminars, as they focus primarily on learning by individual students. The term 'seminar' traditionally refers to a study group working under the guidance of a teacher. Some form of communication and interaction between the students and their teacher is required in order for the members of the group to learn. An advantage of a seminar presented as an e-learning opportunity using modern information and communication technology (ICT) and the internet is that it enables communication between the students and their teacher, and – even more importantly – between the students themselves, to be time- and place-independent.

This brief description of the terms 'virtual' and 'seminar' leads us to the following four categories of e-learning:

a) The most conservative form involves the publication of written course materials on the internet. The students download and print the materials, study them on their own, and receive feedback from their teacher, mainly at the end of the course. This is an individual and asynchronous learning process. ICT is used primarily as a means of delivery.

b) A more advanced form is when the written course materials are web-based and – ideally – designed to be used interactively. This means that students study on a computer, and receive most feedback from the computer during the course. This is an individual and asynchronous learning process. ICT is used primarily as a learning tool.

c) A further dimension is added if – in addition to the written course materials published on the internet – the course also includes audio- or video-supported lectures, enabling 'live' meetings with the students during the course. The students attend lectures on-line (and can often watch them again afterwards). This is a social and synchronous learning process. ICT is used primarily as a means of delivery, and to some extent as a communication tool between the teacher and the students.

d) A more sophisticated variant is when – in addition to the written course materials on the internet – the course is designed in such a way as to promote communication, interaction and collaboration among students and (to a lesser degree) between the students and the teacher. This is a social, synchronous and/or asynchronous learning process. ICT is used primarily as a tool for supporting communication and interaction between the students.

The final form (i.e. variant d) is equivalent to a virtual seminar, which may be defined as 'a didactic concept that promotes an international, multi-disciplinary dialogue between students on authentic and current issues, using modern ICT and the internet to overcome the constraints of place and time'. In terms of the learning process, it is important to be aware of the differences between a discussion (where a student wants to make clear what he or she thinks), a debate (in which a student makes a point, but is also willing to listen to points made by other students) and a dialogue (in which students question each other to understand the ideas underpinning their statements). The ultimate goal of a virtual seminar is to create a dia-

logue between a learning community of geographically distributed students. A virtual seminar consists of the following components (figure 1):

a)   a learning *process* that supports collaboration between students of different nationalities and from different cultural and disciplinary backgrounds;

b)   a learning *content* that consists of authentic, current scientific or societal problems;

c)   a learning *technology* based on modern ICT and the internet that facilitates collaboration, communication and interaction between students.

Figure 1: **Key components of a virtual seminar**
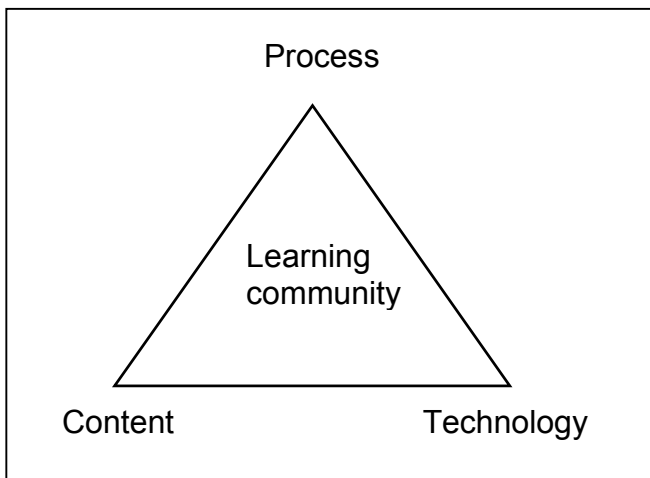
Bearing in mind this description of a virtual seminar, we would now like to start our tour of three examples of such a seminar. We shall begin with the oldest, a course entitled 'European Environmental Science: Towards Sustainability' (EES), and then move on to its successors, the Global Seminar on Environment and Sustainable Systems (GS) and, finally, the European Virtual Seminar on Sustainable Development (EVS). We shall describe the EVS in more detail so as to give a full impression of how a virtual seminar works in real life. After presenting these sample cases, we shall then

compare them with each other, and discuss their main characteristics. Finally, we will explain what lessons have been learned about the strengths and weaknesses of the didactic concept, and recommend various improvements.

Earlier experiences

Design and development of the European Virtual Seminar on Sustainable Development (EVS) were based on earlier experiences with the course European Environmental Science: Towards Sustainability (EES), developed in 1995, and the Global Seminar on Environment and Sustainable Systems (GS), in which the Open University participated from 1997 until 2002. The experiences with EES and GS will be described in brief below.

The European Environmental Science: Towards Sustainability (EES) course

In the mid-nineties of the last century the Internet started booming and members of the European Open University Network (EOUN) were exploring the potentials of the new communication technologies. Stimulated by the Program Committee Science and Technology of the European Association of Distance Teaching Universities (EADTU) and funded by the European Commission, they decided to develop jointly an experimental course on environmental sciences that would make use of novel electronic communication technologies in a first attempt to create an international collaborative learning environment. The participating institutions, De Montfort University (Leicester, UK), Norwegian University of Science and Technology (Trondheim), Open University of the Netherlands (Heerlen) and Swedish University of Agricultural Sciences (Uppsala), contributed written course materials already on the shelf, which could be used with only limited adaptations. Hence, the core of the course was a printed textbook in the traditional self-study/distance-learning layout, divided in eight blocks with a study-load of about ten hours (box 1).

Box 1: **Table of contents of EES textbook**

1. Introduction to and structure of the course
2. The earth, the a-biotic point of view
3. A biological perspective on the environment
4. Monitoring the earth: environmental applications of remote sensing technology
5. Agriculture and sustainability
6. Industrial production and sustainability
7. Prospects for sustainable development

Addendum: The European Community's fifth action programme of policy action in relation to the environment and sustainable development

The course was offered jointly by the four participating institutions and the staff members that wrote the materials acted as tutors for 'their part' of the course. Project co-ordination and examination was in the hands of the Open University of the Netherlands. The course was first run in 1995 and a second time in 1996. In the first run 125 students from seven European countries participated. Students from the participating institutions in The Netherlands, Sweden, Norway and the United Kingdom were supported by their home university. Students from Belgium, Germany and Finland were supported by so-called 'EADTU Euro Study centers' in those countries. Of the 125 students that enrolled, 66 participated in the examination.

The innovative elements of the course were the use of a computer conferencing system and a series of three interactive television broadcasts, facilitated for free by the European Space Agency (box 2). The first one, at the start of the course, introduced the objectives, contents, and tutors of the course. The second broadcast was organised in collaboration with the European Space Agency and dealt with environmental applications of remote sensing technology. The third one, near the end of the course, was organised together with the Environment Directorate General of the European Commission. It had the form of a panel discussion on the European 5th Action Programme 'Towards Sustainability'.

Box 2: **Interactive television broadcasts in the EES course**

A series of three interactive television broadcasts of 90 minutes each, accompanied the course. Each broadcast featured a panel of experts from the participating universities that gave presentations on certain course-related topics and answered questions from students. The panel assembled in a TV recording studio near Brussels. From the studio the TV signals were transmitted across Europe by satellite. The students of each university got together in 'Euro study centres', that were equipped with satellite dishes, e-mail, telephone, fax or ISDN digital telephone lines. In this way, the students at the various Euro study centres received real-time, though one-way, TV from the panel in Brussels. The students could give feedback to the panel and ask questions by e-mail, telephone, fax, or, in one case (low quality) videoconferencing via ISDN.

The experiment made clear that the major barrier to incorporation of the course in the regular curricula was not in the different legal and administrative systems of the universities. The stumbling block were the chosen means of communication in the course, which were technically complex, difficult to coordinate and most of all, far too expensive due to the satellite broadcasts. A great advantage of the satellite broadcasts was that the students could see the tutors, which certainly stimulated communication via the computer conferencing system later on. However, in addition to the costs, the satellite broadcasts had quite a few disadvantages. From an educational point of view they were not very effective, partly because the sessions were dominated too much by the presentations of the expert panel and partly because of the relatively poor feedback technology. This resulted in a rather top-down and one-way transfer of knowledge with in fact little added value from the expensive real-time interactivity. Another flaw in this respect was the lack of communication channels between the Euro study centres, preventing an international exchange of points of view and ideas among the students.

The other innovative part of the course however, made up for this last shortcoming: a-synchronous communication via Internet through a computer conferencing system, at the time a new phenomenon for most of the

participants. The conferencing system (FirstClass) was hosted and operated by the Swedish University of Agricultural Sciences, and offered bulletin discussion boards and e-mail facilities. FirstClass was used by the students to ask questions (passive tutoring) and by the tutors to initiate discussions (active tutoring). In addition, the system functioned as a communication system among the tutors (hidden from the students) and among the students on whatever topic they liked (virtual café). Although the students enthusiastically used the system as a discussion and communication platform, it was not well integrated in the educational design of the course because the teaching staff lacked the experience in the didactic use of this new medium. Although the course developers argued that 'mutual, cross-country understanding and co-operation is essential to environmental problem solving' (Sloep, 1997), no efforts were made to exploit the diversity in participating institutions and disciplinary background of the students in structured collaborative learning activities. No group products were required and the students could finish the course by passing an individual multiple-choice exam.

To summarise, the main characteristics of the course were: (1) a strong orientation on content in learning materials (box 1) and learning objectives (box 3); (2) a technology-driven experimental use of novel ICT-tools; and (3) absence of collaborative learning as a guiding educational principle.

Box 3: **Learning objectives of the EES course**

After having studied the course, the student should be able to:

- explain the inherently international character of many environmental issues
- explain the principles on which food webs in natural ecosystems operate
- explain in a qualitative way the concept of mass and energy balances in a global context
- describe in a qualitative way the flow of solar energy and fossil fuels through the biosphere
- describe the use of remote sensing as a monitoring method

- explain the relevance of biophysical factors (energy flow, nutrient cycling) for agricultural production
- explain the main differences between 'natural products' and 'human designed products' as regards raw materials and production processes
- explain in a qualitative way the concepts of integral life cycle management, environmental auditing, and industrial ecology
- describe the use of 'governmental tools' (political agendas, planning, instruments, legislation and implementation) in environmental policy and management
- give examples of international disputes on environmental issues (including the role of government and industry)
- explain the principle of subsidiarity in relation to European environmental issues

The Global Seminar on Environment and Sustainable Systems (GS)

The Global Seminar on Environment and Sustainable Systems (GS) was a next step in joint international course development. That course was coordinated by the College of Agriculture & Life Sciences of Cornell University, Ithaca, New York and was supported by a grant from the US Department of Agriculture's Higher Education Challenge Grants program. Cornell University was responsible for project management, for organising video- and audioconferences and for the project website. Other partners at the start of the project were Escuela de Agricultura de la Región Tropical Humeda (EARTH College, San José, Costa Rica), Escuela Agricola Panamericana El Zamorano (Zamorano College, Honduras), Uppsala University (Sweden), Agricultural University (Sweden), University of Melbourne (Australia), Wageningen Agricultural University (The Netherlands) and the Open University of the Netherlands. The last two universities jointly participated in the GS from the start in 1997 till 2003. The filosophy behind the GS was that sustainable development is not confined to national borders and involves (almost) all sectors of the economy. This creates a need for discussions on sustainable development in a broad international and multidisciplinary network. The GS offered students from different parts of the

world opportunities for such a dialogue. The core of the GS was a series of five interactive live videoconferences of 1.5 hour each, organised each year during spring semester at a two-week interval. Each videoconference a different case study was prepared and presented by one of the participating institutions. The case studies covered a wide variety of topics, such as population growth, biodiversity, novel proteins, waste management, water quality, forest fire management, and eco-tourism.

The learning objectives for the students were not only content-oriented, such as gaining an understanding of sustainable development and a global perspective on global issues, but also aimed at enhanced skills in the area of interdisciplinary and intercultural communication, collaborative learning and team work, and the use of modern electronic technology for communication and learning purposes (box 4). In the context of its focus on innovation, a number of practical educational research questions were formulated and studied by the staff involved in the GS (box 4). As such, the GS was also explicitly a learning environment for the staff members.

Box 4: **Objectives of the Gobal Seminar**

General objectives of the GS
- To design, develop and improve educational models that enable collaboration between students from different disciplinary and cultural backgrounds
- To offer students and staff the opportunity to learn how to use modern synchronous and asynchronous communication techniques in collaborative learning settngs
- To create and maintain an international network of co-operating institutes/experts in the field of distance education, problem-oriented learning, collaborative learning and virtual learning environments
- To develop interdisciplinary and international case studies in the field of sustainable development

Learning objectives for students
After having participated in the GS, students should be able to:
- Use the computer conference for collaborative learning purposes
- Participate effectively in a video conference
- Describe the concept of sustainable development
- Give an overview of policy-related issues concerning sustainable development
- Make a link between regional, national and global issues concerning sustainable development

Research objectives for staff
In the GS, the following educational research questions were studied by the staff:
- How can an international team best develop and operate an educational project using mainly telematic means?
- How should a video conference be organised?
- How can students be tutored via computer conferencing?
- How must the learning processes before and after the video conference be organised?
- What value does interactive video conferencing add to the learning process?
- What value does computer conferencing add to the learning process?
- How can the effectiveness of collaborative learning be measured?

During the first run of the GS, each videoconference started with a rather lengthy introduction of the case at hand by the authors, who were also chairing the conference. Next, the electronic floor was successively given to the other participants for a first comment or statement. After completion of this first round, the floor was open for discussion. The videoconferences ended with a few concluding remarks by the chair. In between the videoconferences, the case was discussed more in depth by means of an internet-based computer conferencing system. (Black Board) hosted by Cornell University. These discussions were encouraged and moderated by staff members from all participating institutions.

In successive runs of the GS a number of improvements were implemented. Soon after the start it became clear that the staff members were too dominant during the video discussions, thus preventing a lively discussion between the students. Therefore, the first modification was to 'silence' the staff members. Furthermore, the introduction to the case by the authors was minimized. This made it necessary to distribute sufficient study material on the case well in advance through the computer conferencing system, so that the students could prepare for the upcoming videoconference. However, the need for a more intensive preparation for each videoconference created another problem: the intervals of two weeks in between the conferences were now too short. In these two weeks the students had to conclude an in-depth discussion about the past case study and also had to prepare themselves for the next case study. As a result, the discussions about the various case studies on the computer conferencing system began to mix up. In an attempt to avoid this chaos, a new approach was introduced. The students were divided into small groups and each student participated in two different groups, in a so-called national group and in an international group. The national groups were composed of the students of each participating university and they met face to face at their campus. The international student groups were made-up of representatives (two or three) from each of the participating institutions and their members communicated via a discussion-board on the computer conferencing system.

The task of the national groups was to prepare themselves jointly for the upcoming videoconference and to discuss the case study in face-to-face meetings. For each case study, two students were assigned to chair the national group with the specific task to abstract a series of statements from the discussions in the group and to present these at the upcoming videoconference. So, at the start of a videoconference, two students of each university presented their statements as a starting point for the plenary discussions. In the new set-up of the videoconferences, these presentations of statements replaced the introduction of the case study by the authors, whose role was now restricted to moderation and conclusion of the discussions. The international groups elaborated each on only one of the five case studies included in a run of the GS. The groups discussed the various aspects of the assigned case during the whole run-time (2,5 months) and collaborated in making a final product, a PowerPoint presentation of their

findings and conclusions. These were presented and discussed in the last videoconference of the run.

Box 5: **An example of intercultural (mis)communication**

One of the cases presented by EARTH College (Costa Rica) featured the problem of the frequent fires that devastate parts of the tropical rain forests in Central America. Most of these fires are deliberately started by peasants, in the hope to gain or to expand arable land. In their opening statement, the students from Costa Rica concluded that poverty of the rural population and ineffective, or sometimes even counter-productive, legislation were the main causes of the problem.

The Dutch students apparently had not been able to grasp the reality in Central America: vast areas of rugged volcanic terrain covered with tropical forests, poor infrastructure and limited means to enforce legislation in rural areas. So, in their statement about the case, they brought forward the methods used in The Netherlands (a country with a highly developed infrastructure, more than enough arable land and no primeval forests left) to protect the scanty wooded areas against arsonists, like: cutting fire lanes, aerial surveillance with high-tech sensors, fire fighters with specialised equipment and intensified police patrolling on the ground.

Bringing together students from very different cultures and parts of the world to discuss global environmental issues, is fascinating and often an eye opener, not only for the students, but certainly also for the staff members involved (see box 5). The use of live video in a virtual seminar conveys a sense of 'global presence'. Synchronous 'global presence' of people from different countries creates an excitement that is very motivating for the students. Furthermore, the regular visual contact between students stimulated the more in-depth discussions on the computer conferencing system, because this contact made the interactions more personal. Another important added value that live video conferences may provide, is the opportunity to involve renowned guests like business tycoons and politicians who normally cannot be approached by students (see box 6).

Box 6: **Videoconferences with renowned guests**

Twice a GS live videoconference featured a prominent guest who could be questioned directly by the students. One guest was an investor who initiated an eco-tourism resort on a Caribbean island in a beautiful area with forests and coral reefs, but with virtual no infrastructure. A rather heated debate unfolded whether tourists flown in by 747's on a newly constructed airport, could be labeled as eco-tourists or not. A comparable confrontation occurred between the students and the Minister of Agriculture of Costa Rica, discussing the 'Biodiversity' case study from EARTH College. In both events the live video connections were of course essential for such discussions coming to life (as were the courage and calmness of the prominent guests).

A serious drawback of synchronous communication at a global scale, like the videoconferences in the GS, are the time differences. In case of the GS, the European partners were the lucky ones because for them the conferences started at a comfortable 2.00 PM. The Americans had to start early at 8.00 in the morning, but worst off were the Australians who had to assemble at their campus at midnight. Also, videoconferences must be rather condensed in time because of the high costs, and, taking also the differences in fluency between native and non-native speakers into account, are thus not suited for transfer of in-depth knowledge and lengthy discussions. In case of the GS, the technology, which made use of dedicated ISDN telephone lines, also caused troubles regularly.

In conclusion, the vital core of a virtual seminar is the a-synchronous computer conferencing system. Such a relatively low-cost and reliable system may be supplemented with exciting yet expensive videoconferences, but there are probably cheaper alternatives. An example of a useful and much cheaper alternative for a live video presentation was born out of need in the GS. Due to the absence of ISDN telephone lines at the campus of one of the partners, their case study was presented by way of an audio (telephone) conference in combination with a PowerPoint slideshow. The PowerPoint presentation was distributed among the partners earlier

through the computer conferencing system. The presenter indicated each time which slide should be projected. Through a conference telephone, students could ask questions and talk to each other.

The European Virtual Seminar on Sustainable Development

From idea to reality

The encouraging experiences gained during the Global Seminar on Environment and Sustainable Systems (GS) inspired us to develop a European version of the seminar. However, it was clear right from the start that a European Virtual Seminar should not be a carbon copy of the GS. The backbone of the GS consists of video conferences, enabling students from all over the world to engage in 'live' meetings. However, the idea of meeting in a video conference room to communicate with students abroad is not a perceived feature of the educational system of distance learning, in which students are used to the learning paradigm of 'freedom of place and time'. Whilst video conferencing is a powerful technology, it is also a very expensive educational tool. The GS is heavily dependent on private funding from a number of US individuals, alongside investments made by the participating institutions. In Europe, however, it is almost impossible to attract external funding (whether private or public) for regular implementation of an educational project. It was against this background that two vital decisions were made:

1. First, the EVS would use computer conferencing rather than video conferencing (a much cheaper approach).
2. Second, there would not be any external funding or joint budget for the development and implementation of the EVS. The 'business model' would be based on cooperation between the participating institutions, who would share expertise and invest staff time and resources. The project would not depend on external support.

The idea for a European Virtual Seminar on Sustainable Development (EVS) was presented in 2000 by the Open University of the Netherlands and COPERNICUS-Association (a network of universities to share knowledge

and expertise in the field of sustainable development) at the COPERNICUS Conference on 'Sustainable Universities and Environment in an Integrating Europe' in Krakow, Poland. Several institutions of higher education in different European countries joined the project, and the idea evolved into an educational format and project organisation. Since the pilot project in 2001, the EVS has been organised once a year, and the cooperation between the partner institutions can be described as a joint process of ongoing development of the EVS in educational and organisational respects. The number of participating institutions has gradually risen (see table 1) and has given the EVS network a real European dimension. At present (2006), the network consists of 20 partner institutions in 13 European countries. The number of institutions actively participating in any given EVS may be lower, however, depending on what individual institutions are able to do at any one time.

Table 1: **Institutions and students participating in EVS**

Year	No. of institutions	No. of countries	No. of student groups	No. of case studies	No. of students enrolled	No. of students passing
2001	9	4	6	3	59	43
2002	11	5	6	4	45	30
2003	15	9	11	5	61	37
2004	18	11	13	5	78	41
2005	12	9	10	5	68	41
2006	9	8	8	6	36	20

Let's now take a closer look at the EVS, i.e. its aim and learning objectives, educational format, learning process, organisational model, and finally, mode of evaluation.

Aim and learning objectives

The aim of the EVS is to foster an international, multidisciplinary dialogue on sustainable development among students from all over Europe. The EVS confronts students directly with divergent peer views on sustainable development, and their implications for a societal shift towards a more sustainable Europe. These differences in student views depend on differences in the social, economic, political, cultural or environmental contexts in which the students live.

On the basis of this aim, the learning objectives for students are as follows. After participating in the EVS, the student should be able to:

a) describe and operationalise the concept of sustainable development;
b) analyse sustainable development issues from a European perspective;
c) link local, national and European policy-related issues to a societal shift towards sustainable development;
d) cooperate with students of different nationalities and from different cultural and disciplinary backgrounds;
e) use the computer-conferencing system effectively for collaborative learning.

These learning objectives are regularly referred to in the following description of the educational format and the learning process.

Educational format

In order to foster a dialogue between geographically distributed students, the educational format should support collaborative learning via the internet, known as computer-supported collaborative learning (CSCL). The educational format of EVS may be described in terms of its underlying educational principle (collaborative learning), the operationalisation of this principle (formalised rules and protocols that support the learning process), the content of the seminar (case studies of sustainability problems), and the learning technology applied (modern ICT tools). In the following sections, we shall discuss the most important elements.

Collaborative learning

Collaborative learning between geographically distributed students is a new type of learning practice (for both students and teachers), and differs considerably from face-to-face meetings, where all participants are present in the same place at the same time. The term 'collaborative learning' refers to an educational approach in which students work in small groups to achieve a common goal. The educational literature lists several prerequisites for successful collaborative learning: social interaction, individual accountability, positive inter-dependence, interpersonal and small-group skills, and group processing (Johnson and Johnson, 1991; Slavin, 1995). Most of these prerequisites have been incorporated in the educational format for the EVS (see box 7).

Box 7: **Prerequisites for successful collaborative learning in the EVS**

(1) Communication and social interaction are desirable in groups holding different views on reality. This is clearly true of the EVS, as students have to describe and operationalise the con-cept of sustainable development (one of the learning objectives). In order to agree on a group definition of sustainable develop-ment which they can use in their research work, the students have to communicate intensively with each other so that they can understand each other's statements and viewpoints.

(2) In order for a student group to be successful, the group members need to understand that they are individually accountable for at least one aspect of their group work. The student groups in an EVS are international and multidisciplinary, and each group member has to contribute to his or her group's activities from the perspective of his or her cultural and disciplinary background.

(3) Positive interdependence means that group members are linked such that one member can succeed only if all members succeed. The assessment procedure in an EVS is based on the quality of the group products (i.e. a group report and a policy summary) and the group process (i.e. the group's performance). The final mark awarded is awarded to the group as a whole, and not to individuals.

(4)   Interpersonal and small-group skills, such as social and communication skills, are indispensable for all kinds of group work, both virtual and face-to-face. Some of these skills, such as an ability to make effective use of computer conferencing for collaborative learning (one of the learning objectives) or the way in which students communicate and interact, are supported by specific assignments.

(5)   The term 'group processing' refers basically to the group's performance. In an EVS, the tutor of each student group monitors teamwork within the group, the division of responsibilities among group members, communication between group members and the tutor, etc. His or her role is to coach the group and perform an in-depth analysis of the group's performance at the end of the EVS.

Rules of conduct to support communication between students

The EVS is designed to support virtual collaborative learning by using modern ICT tools to enhance social interaction and community-building. Computer-supported collaborative learning, however, generally excludes facial expressions (unless video-conferencing or webcams are used). Tools for synchronous communication (i.e. chat lines, webcams, video conferencing and internet-based telephony) require participants to be on-line at the same time, and this can be difficult for geographically distributed students, especially if they are based in different time zones (as was the case in the Global Seminar). However, tools for asynchronous communication (such as e-mail and electronic discussion boards) can result in considerable delays in communication between students. Asynchronous communication does have the advantage that it gives students time to think about the meaning of a message or to reflect on the collaborative process.

As the idea is for the EVS not to use video conferencing, the educational format was geared towards the use of asynchronous communication tools, especially group discussion boards. The risk of long delays in communication between students was minimised by the adoption of a clear set of rules. The following rules of conduct were drawn up for students taking part in the EVS (see box 8).

Box 8: **Rules of conduct for EVS students**

- Log-in frequently to check for announcements and other information from staff (such as timetables, assessment criteria, case study materials, etc.).
- Check your student group at least twice a week to see whether there any new entries on the group discussion board or updates of documents in the file exchange circuit. Ideally, you should check every day.
- Reply as soon as possible to questions or messages from other group members. Never leave them unanswered for a week or more.
- Post all messages on the group discussion board. If you use the e-mail facility, be sure to copy-in all group members (and the tutor).
- Inform your tutor immediately if any problems arise within the group that the members are unable to resolve themselves.
- Reply as soon as possible to any message you receive from your tutor.

Although the rules of conduct may conflict with individual students' study habits, they are critical to the success of virtual collaborative learning. In the case of the EVS, we decided not just to stress the importance of these rules, but also to monitor compliance. Our ambition is to create an effective and efficient learning process, and we believe that explicit rules of conduct are among the vital ingredients of such a computer-supported learning environment.

Collaborative work on 'wicked problems'

The topics students are required to address in the EVS are both current and authentic. Typical for sustainability problems, they are 'wicked' (i.e. complex and difficult) rather than 'tame'. This type of problem requires the selection and assimilation of information from a multitude of sources, domains, discussions and argumentation, thus maximising the potential benefit

of collaboration. The students taking part in an EVS are challenged to address these real-life problems by using all the expertise and perspectives possessed by their group members. The assumption is that a student group can perform an in-depth analysis of a wicked problem, and hopefully come up with an enriched problem definition, as well as a proposal for solving the problem. This is why the student groups in an EVS are extremely heterogeneous, in terms of nationality, discipline, institution and gender. The basic idea is that each group member cooperates with the others (one of the learning objectives) and contributes to the group activities from the perspective of his or her own cultural and disciplinary background. However, working in a multidisciplinary group is a complicated skill, and becomes even more complex where different nationalities are involved (see box 9). The only way of learning this type of skill is probably by giving students an opportunity to test and improve their skills at regular intervals during their education.

Box 9: **Working in a international, multidisciplinary team – students' perspectives**

„Basically, working in an international, multidisciplinary student group is a fascinating experience with tremendous potential for the future. The opportunity of discussing topics with students from other nationalities and disciplines forms a unique way of learning about differing perceptions of the same issue. The wide variety of socio-cultural and disciplinary backgrounds allows for a far more comprehensive discussion of a topic than conventional seminars usually do. It is this aspect that enables EVS students to adopt a more differentiated view and consequently broaden their individual perceptions of a problem."

„However, there are also certain difficulties inherent to an international, multidisciplinary approach. Firstly, there is a language barrier, as the discussion of a scientific subject and the composition of a research paper in a foreign language both require a very good command of language as well as knowledge of subject-specific terminology. Secondly, there is the complexity of the research question, which needs to be formulated relatively openly to allow for a

multidisciplinary approach. This demands a sound and multi-faceted knowledge of the topic, which is difficult for the students to attain as their regular studies do not always cover the required fields of research. For these reasons, the group process, especially during group discussions, is somewhat limited as individual group members primarily need to acquire basic information on the topic and then try to complete their parts of the group work or term paper."

„A further difficulty resulting from the international composition of the groups is the fact that the countries involved often have different university systems and therefore different terms. This can result in timetabling problems."

Source: *Group Reflection Report by student group 13 (2004 EVS)*

Case studies

The wicked problems are presented to the students in the form of case studies. The overall theme of the case studies is sustainable development in Europe (this is one of the learning objectives). In the EVS, a case study is an open problem description that invites students to seek the best possible solution. The case studies are delivered by experts from partner institutions (see box 10) and reviewed by EVS staff. A case study consists of background information, a general assignment, sources and web links. A set of writing guidelines (including criteria) has been developed to make sure that the case studies are well written and more or less similar to each other.

Box 10: **Case studies, EVS 2001-2005**

- Climate Change and Energy Technology in Industrial Production. Supplied by Vrije Universiteit, Amsterdam.
- European Spatial Planning Policy. The Mediterranean Forest in the Dehesa Region. Supplied by University of Extremadura.
- Geoconservation: Hateg Country Dinosaur Geopark. Supplied by University of Bucharest.
- Integrated Water Management in the Danube basin: Implementation of the European Water Framework Directive from

> an international perspective. Supplied by University of Antwerp.
> - Nature and Biodiversity Conservation in Romanian forests. Supplied by University of Bucharest.
> - Sustainability Communication: Strategies for Communicating the Concept of Sustainable Development. Supplied by University of Lüneburg.
> - Corporate Sustainability in Small and Medium-sized Enterprises in Europe. Supplied by Vrije Universiteit, Amsterdam.
> - The Future of Sustainable Agriculture in Poland. Supplied by University of Amsterdam.

When registering for EVS, students are asked to state their case study preferences, and these preferences are taken into account when the student groups are formed. Each student group works on one case study. They have to formulate a problem description, write a research proposal, select information from a range of sources (e.g. the internet, reports, journals, newspapers, interviews, etc.) and integrate these with current theory to devise the 'best possible' solution to the problem. Their work culminates in a group report, in which they operationalise the main terms in the case study, produce a group definition of sustainable development, integrate the views of the group members (from a range of cultural and disciplinary backgrounds) on the problem, and produce a policy summary for the target group (i.e. the stakeholders). Two or more student groups generally work on the same case study, thus giving staff an opportunity to compare the groups and their products during the evaluation stage.

Staff support of student groups

After a number of individual activities at the start of an EVS, the students spend most of the time working in their groups. Experiments with relatively large groups (i.e. consisting of 10 students or more) were not successful due to the presence of free riders, coaching and monitoring difficulties, delays in communication, etc., and it was decided that a student group should ideally consist of 4–6 students. Small, heterogeneous groups were found to work very well for collaborative learning.

The student groups are responsible for their own learning process in the EVS. They are responsible for keeping the process going and delivering high-quality products by the deadlines set. Our experience is, however, that students also need coaching (from a tutor), as well as in-depth knowledge (from an expert), which is what they normally receive from their teachers. For this reason, staff play a vital role in an EVS. The success of an EVS depends not only on the presence of active students, but also on staff members who are committed to their roles. The role of the tutor is particularly important, and not always easy to perform. There are two main difficulties in tutoring in an EVS:

(1) students are not used to working in an electronic learning environment;
(2) they are not used to self-guided group work (i.e. doing group research).

Good tutoring is, however, essential for the success both of the group and of individual students. The tutor should make frequent visits to both criticise and encourage the students, and should provide regular updates on the progress of individual students and the group as a whole. Each student group in EVS is coached and monitored by a tutor, whose job it is to solve any problems in the group as quickly as possible (see box 11).

Box 11: **Strategy for collective action in the event of problems in a group**

---

(1) The members of the group first try to solve the problem by themselves.
(2) If they do not succeed, they inform the tutor, who then tries to solve the problem.
(3) If the tutor does not succeed, he or she informs the institutional coordinator. If the coordinator and the tutor conclude that the problem is due to a disruptive student, they may decide to exclude the student in question from taking part in the EVS.
(4) The tutor informs the central coordinator, and the student is excluded from the electronic learning environment. This means that he or she no longer has access to the EVS.
(5) The student receives a message from the central coordinator explaining why he or she is no longer permitted to take part in the EVS.

Every tutor faces the challenge of striking the right balance between managing a student group and allowing the group to manage itself (under the tutor's guidance). Alongside the tutor, each student group has access to an expert, i.e. the author of the case study on which the group is working. Compared with the tutor, the expert plays an essentially passive role. Although the students are free to contact the expert for information or advice about the case study, they are also required to find external experts or stakeholders who are relevant to the case on which they are working. The expert also comments on the group research proposal. The expert assesses group products (i.e. the group report and policy summary), whilst the tutor is responsible for assessing the group process (i.e. the group's performance). The two assessments are combined to give a final mark for each student group (with the mark for the product representing 60% of the final mark and the mark for the process counting for 40%).

Modern ICT tools

The backbone of the EVS is the use of modern ICT tools and the internet. Whilst modern ICT enables collaborative learning, successful learning depends not so much on ICT as on the educational format and the participants. However, ICT problems can easily hinder a collaborative learning process (see box 12).

Box 12: **How to respond to technical problems**

In December 2004, just before the Christmas holiday, hackers launched a major attack on the servers of the Open University of the Netherlands and other Dutch universities. The severity of this assault, combined with the closure of the university for the Christmas holiday, meant that the EVS server was out of action for over 20 days. It was remarkable to hear from students that they were able to continue their work on the EVS during this period by switching from an electronic learning environment to pragmatic solutions like e-mail and MSN. In fact, the staff were more concerned about the breakdown than the students, because they did not know how to contact the students or to monitor their work. The lesson learned was the need to 'bypass' the electronic learning environment by distributing the

most important documents (such as a list of e-mail addresses, case studies, guidelines and the timetable) to all participants at the start of EVS, and asking them to save them on their computers (in case of emergencies).

The computer conferencing system used for the purpose of the EVS is the Blackboard Learning System. When the EVS was launched in 2001, no in-depth analysis was performed of the best systems or tools available to support virtual collaborative learning. Blackboard was selected on account of its user-friendliness and the experiences of a number of partner institutions with the system (during the Global Seminar). All EVS course materials (case studies, guidelines for students and staff, lists of individual and group acti-vities, assessment criteria, timetables, etc.) are accessible via Blackboard. What is more important for the EVS, however, are the tools for commu-nication and interaction (see box 13).

Box 13: **Blackboard tools for communication and interaction in an EVS**

In an EVS, the students use different tools for communication and interaction, at two different levels: general and group. At a general level, the tools may be used by all students and staff who have en-rolled in the EVS. At a group level, the tools are accessible only to the group members, the tutor and the expert. The students can use electronic discussion boards, e-mail facilities, virtual classrooms and chatrooms, as well as a tool for file exchange between group mem-bers. In the educational format, the emphasis is on asynchronous communication using pre-structured group discussion boards be-tween group members (and their tutor). The students (and their tutors) also use chatrooms and virtual classrooms for real-time com-munication.

One of the great advantages of modern ICT tools and the internet is that a student's learning environment is no longer restricted to traditional class-rooms. Other students from all over Europe, plus the 'real world' outside

(in the form of authentic problems, external experts, other sources, stake-holders, etc.) all become part of the learning process (see box 14).

Box 14: **The extended classroom – students' perspective**

„We also learned a great deal from working with students from diffe-rent countries. The best example of this was the presence of one group member from Ukraine. She was not able to participate much during the research proposal writing process, partly because she was taking part in the 'Orange Revolution' on the streets and partly the university was closed and she did not have much internet access due to the re-volution. This brought the news of the Orange Revolution in Ukraine very close to home."

Source: *Group Reflection Report by student group 8 (2004 EVS)*

The learning process

The learning process in an EVS differs greatly from that in mainstream education. There are no lectures in an EVS, the students have to work in international, multidisciplinary groups, the group members cannot organise face-to-face meetings, and all collaboration and social processes depend on communication using modern ICT. Moreover, the learning process is spread over a relatively long period (i.e. 14 weeks) so as to create the best possible conditions for virtual collaborative learning and to allow the stu-dents to participate in the EVS alongside their regular study programmes. The study load of an EVS is approximately 120 hours, and students are required to spend 8–10 hours a week working on it. To support such an 'exceptional' learning process, the EVS is divided into three stages:

1) orientation, student selection and community-building;
2) writing the group research proposal;
3) research of case study and writing the group report.

Each stage consists of activities the students need to perform before they can pass on to the next stage. Students who are unable to perform the activities are excluded from further participation in the EVS. In order to

give an impression of the learning process, we will describe the main activities in each stage. Special attention will be given to activities that are designed to overcome two pitfalls frequently cited in the educational literature on computer-supported collaborative learning:

(1)   a failure to account for social interaction,
(2)   a failure to account for group formation and group dynamics (Kreijns, 2004).

Stage 1: Orientation, student selection and community-building

The first stage (lasting four weeks) consists of a number of individual activities and two group activities. The individual activities are intended to help students explore the EVS, acquire basic skills in working in an electronic learning environment (Blackboard), and present themselves, their expertise and ambitions to other students in the form of a 'personal expertise page' (see box 15).

Box 15: **Introducing yourself to the EVS community**

> Students use a personal expertise page (pexpi) to present themselves to their fellow-students and staff. A pexpi should contain personal information (name, age, etc.), a picture (to improve socialisation), a description of the student's expectations in relation to the EVS, their availability during the EVS, their specialist fields, their educational and working experience, and their outside interests and hobbies. The pexpi also provides an opportunity for students to reflect on less formal aspects: What do they want to share with their group members? What can they tell each other about their personal situations? In other words, the pexpis are a valuable platform for providing a bit more personal information. The pexpis are published on the EVS Blackboard, and later on also on each group's page on the EVS Blackboard.

Individual activities are intended not just to acquaint students with the EVS, but also as a selection mechanism for EVS staff. Students who success-

fully complete the individual activities are allowed to enter a student group and embark on group work. Students who do not successfully complete the individual activities are excluded from further participation. There is a fairly high dropout rate, of approximately 50%. However, the majority of exclusions take place in this first stage, and most of these may not really be regarded as dropouts, as they relate to students who do not actually become active in the first place. The dropout rates in the second and third stages of the EVS are much lower. The procedure for separating active from inactive students now works very well (see box 16).

Box 16: **Most dropouts during the first stage**

The EVSs held in 2001 and 2002 did not include any procedure for separating active from inactive students during the first stage of the seminar. The students groups were formed right at the outset, and the active students were frustrated by the passive attitude adopted by some of their fellow-group members. In some cases, it actually proved necessary to disband a student group, and to transfer the active students to another group working on the same case study. To overcome this undesirable situation, a selection procedure was introduced in 2003, consisting of compulsory individual activities to be performed during the first stage of the EVS. Students who successfully complete these individual activities are entitled to join a student group, and students who fail to perform these activities are excluded from further participation in the EVS. In practice, this means of discriminating between active and inactive students works very well, as is illustrated by the following example.

In 2005, the EVS started with 68 students from 12 institutions in nine different countries. Five students pulled out at the start, and another 23 students failed to complete the first stage, i.e. the individual activities. Interestingly, the dropouts were not equally divided among the partner institutions. Some institutions performed very well (with all students passing), while other institutions did much worse (with almost all students failing). The result was that 45 students were allowed to take part in group work. Ten groups were formed, consisting of 4–5 members each.

After the student groups are formed, the group members use their pexpis to introduce themselves to each other and to their tutors. Next, they start working on two group activities. The intention of these activities is to support group forming and community-building, and to facilitate communication and interaction between the group members. The first group activity focuses on sustainable development as a concept. Each student group has to define sustainable development, specifically from a European perspective, and make sure that the definition applies to the topic of their case study (one of the learning objectives). To formulate a definition on which all (or, if this is not possible, most) group members agree, the students are required to discuss the concept of sustainable development on their group discussion board. Here, they can comment on the views of other group members and formulate an 'enriched' definition of sustainable development. However, using an electronic discussion board both effectively and efficiently (one of the learning objectives) is fairly demanding, especially for students who are not familiar with e-learning (see box 17).

Box 17: **E-learning as a challenge – students' perspective**

> „Studying in a virtual learning environment is a completely diffe-rent learning situation than 'real-life' face-to-face interaction. There is a huge difference between understanding the spoken and, more importantly, unspoken message conveyed in a 'real-life' conversation on the one hand, and interpreting a few lines written by someone who is virtually anonymous on the other. Not only is it hard to get used to the nature of asynchronous communication, it is also very difficult for a group to reach a clear decision. Despite these difficulties, virtual collaboration is a very interesting way of communicating and studying. It may not be easy to learn, but it certainly offers a wide range of opportunities."
>
> Source: *Group Reflection Report by student group 8 (2004 EVS)*

In the second group activity, the group members discuss the subject and objectives of the case study, and their own knowledge of the subject. By the end of this activity, the group should be ready for the next stage, i.e.

writing a research proposal. The communication between the students in this activity runs via the group discussion board. Recently, we investigated whether a pre-structured discussion (board) could facilitate the dialogue between the students (see box 18). A first analysis of the data suggests that pre-structuring makes the discussion process more orderly and efficient, but whether it also becomes more effective is not yet clear.

Box 18: **Effects of pre-structured discussion boards**

In the 2005 EVS, a research study was conducted on how to facilitate an orderly and effective dialogue on the group discussion board. Students from different groups had to assess their collective knowledge of a given problem, and the objectives and expectations of the group members in relation to the case study. To structure the discussion on these topics, a set of rules were introduced in three stages:

1) The input stage. There is no discussion (in a strict sense) yet during this stage. Each participant makes individual suggestions, which may form the basis for subsequent discussion.
2) The discussion stage. The group has to identify and discuss all issues and differences of opinion as clearly as possible.
3) The consensus stage. The group draws conclusions by resolving differences, eliminating inconsistencies and making summaries of what they have learned.

Ten student groups worked under three different conditions:

(1) three groups were instructed only to discuss the case study;
(2) four other groups were given the same instructions, plus information on how to divide a discussion into stages (i.e. input, discussion and consensus);
(3) three other groups were also given a detailed pre-structured discussion board, in addition to the same instructions and information on how to divide a discussion into stages.

The hypothesis was that the best results would be achieved by the groups working under condition (3), then condition (2) and, finally, condition (1) in terms of: the quantity and quality of the input, the ability of the group to stick to their instructions as closely as possible, the identification of differences between group members, the conclusion of the discussion, and the equivalence of the contributions from group members.

The preliminary finding was that a pre-structured discussion (or discussion board) helps students 'do the right things'. Without a pre-structured discussion, students find it much harder to stick to the instructions for the group activity, and spend more time discussing what they should do. However, a further analysis of the data is required to answer the question whether a pre-structured discussion also results in a qualitatively better outcome.

Stage 2: Writing the group research proposal

The second stage of the EVS (lasting four weeks) involves writing a group research proposal on the case study selected by the group. The basic input for the proposal derives from the previous stage, i.e. the group definition of sustainable development, and the results of group discussions on the subject and objectives of the case study. In the second stage, however, the groups have to translate their tentative research plans and learning objectives into a coherent group research proposal. An outline research proposal is provided (see box 19) so as to give the students a clear picture of what is expected at the end of this stage.

Box 19: **Outline research proposal**

1.	Title of the research project
2.	Objective of the research project
3.	Relevance
3.1	Scientific relevance

3.2	Relevance to society
3.3	Relevance to group members
4.	Target group
5.	Problem definition
6.	Research questions
6.1	Derived research questions (no more than five)
7.	Methods of research
7.1	Type of sources
7.2	Disciplinary knowledge in group
7.3	Tasks and activities to be performed
8.	Timetable
8.1	Who's going to do what?
8.2	Overview of time needed (e.g. in days) to perform tasks and activities
8.3	Timetable and deadlines for tasks and activities
9.	Expected outcome

Each student group is required to produce a first draft of their research proposal within a period of two weeks. The tutor checks the draft on the group discussion board, and asks the expert (i.e. the author of the case study) to send the group any comments within three days. The expert publishes his or her comments on the group discussion board, and asks the students to redraft their research proposal accordingly. Two weeks later, the final research proposal is published on the group discussion board, and the group enters the third stage of the EVS.

Some student groups find it difficult to draft a research proposal within the given time frame, and need more time to write both their first draft and the final version (see box 20). This is generally either because not all group members are active straight from the start, or because some students need to wait for input from others. The tutor plays a particularly important role during this stage, in monitoring the progress made by the group and, if necessary, urging individual group members to publish their ideas and start discussing and writing. At the same time, it is worth bearing in mind that even professionals find it difficult to compose a group research proposal.

Box 20: **Performing research in an EVS – students' perspective**

> „Regarding the expected outcome of the group work as stated in
> the assessment criteria, the standard of this seminar is definitely
> high, perhaps too high considering the difficulties a virtual seminar
> might pose. Nonetheless, it is interesting and challenging to work
> on a case study instead of dealing with theory. Splitting the tasks into
> preparing a research proposal, a group report and a policy summary
> is definitely a good idea and helps students to familiarise themselves
> with the organisational aspects of academic work. However, the tight
> deadline for the research proposal made it difficult to prepare properly,
> as the first and second stages of the seminar required the students to
> do a lot of reading about the topic itself. In addition, it is not realistic
> to expect a heterogeneous group of students from very different
> degree courses and varying stages of their studies to produce a
> detailed scientific paper within four months, when it would take an
> international team of experts far longer to do the same."

Stage 3: Research of case study and writing the group report

In the third stage of the EVS (lasting eight weeks), the student groups
research their selected case study, and publish their results in the form of a
group report and policy summary. The research starts from the group re-
search proposal published in the previous stage. In order to perform the
research project, the students divide tasks and often roles between group
members (e.g. project leader, English editor, etc.). The students are required
to make full use of the members' different cultural and disciplinary back-
grounds in analysing the problem presented by the case study and finding
a sustainable solution.

The experience with the EVS is that some groups produce comprehensive
reports based on detailed discussions and reviewed contributions from all
members, while other groups publish reports consisting of no more than a
series of individual contributions. The groups should publish not only a
report, but also a policy summary in which they address the problem and
present their solution for a specific target group (i.e. the stakeholder). Our

impression is that most student groups find it difficult to contact a stakeholder for their case study. One possible solution would be for the expert concerned to ask a stakeholder to become actively involved in the EVS before the seminar actually starts. It helps to raise the students' awareness of the relevance of their research work if someone in the 'real world' is waiting for their analysis, findings and suggestions. Finally, all group reports and policy summaries are published at a general level on the EVS Blackboard, and made available to the entire EVS community.

Organisational model

The organisational model for the EVS is based on a network of higher education institutions sharing expertise and investing staff time and resources. It is a bottom-up approach without formal, top-down institutional arrangements. Institutions can become partners in an EVS run at three different levels:

1) students and an institutional coordinator participate;
2) also a tutor participates;
3) a case study is provided as well and the expert participates.

The idea is for a new partner institution to start at level one before – hopefully after positive experiences – moving on to level two, and finally, to level three. It is up to each institution to decide at which level it wishes to start, and when it wants to switch to another level of participation, offering either more or less involvement in the EVS. In principle, all partner institutions are required to invest in the management and development of the EVS. A core of active and experienced partner institutions is needed in order to sustain the EVS. The success of the EVS proves that a bottom-up approach without any external funding can work. The network has undergone substantial enlargement since 2001 (see box 21).

Box 21: **EVS network from 2001 to 2005**

Open University of the Netherlands, University of Amsterdam, Vrije Universiteit Amsterdam, University of Antwerp, University of Lüneburg, Karlstad University, University of Latvia, Open International University of Human Development in the Ukraine, Karkonosze College, Wroclaw University of Agriculture, Wroclaw University of Economics, Wroclaw University of Technology, Charles University of Prague, Czech University of Agriculture in Prague, Czech Technical University of Prague, University of South Bohemia, Eszterházy Károly College, University of Bucharest, Karl-Franzens University Graz, University of Basel, University of Bologna, University of Extremadura, University of Santiago de Compostela.

Responsibilities are divided between the central coordinator (i.e. the Open University of the Netherlands) and the other EVS partners. The central coordinator is primarily responsible for the overall management of the EVS, controlling the development of the EVS, and maintaining the electronic learning environment. The other partners are primarily responsible for tutoring and assessing the student groups, developing the case studies, implementing the EVS at their institutions, and recruiting and selecting student participants. The institutional coordinator at each partner institution is responsible for selecting students who meet the requirements for participation (see box 22).

Box 22: **Requirements for student participation in the EVS**

Participants must:

- be interested in sustainable development issues;
- be keen to perform group work;
- be able to read and write English;
- be able to spend 8-10 hours a week on the course;
- have access to a computer with an internet connection;
- be open to e-learning.

Students who pass the EVS are awarded a 'certification of completion' by the central coordinator. The institutional coordinators are responsible for organising the EVS in such a way that their students also receive credit points. At present, the EVS is a compulsory component of the curriculum at some institutions, but optional at the majority of institutions. At three points of the seminar, i.e. at the start, halfway, and at the end, the institutional coordinator organises a face-to-face meeting with the students from his or her institution to discuss the educational format and learning process, and to give the students (who are members of different groups) an opportunity to share ideas and experiences. Student feedback is also important for the evaluation of the EVS.

Reflection and evaluation

The students reflect on their learning process, both individually and group-wise, at various points during the course of the seminar. At the end of each stage of the seminar, the students are required to complete an individual learning record, in which they reflect on their own learning process in terms of content (i.e. what did I learn?) and strategies (i.e. how did I learn it?). The assumption is that this helps the students to understand what they already know and what they still need to learn. All learning records are anonymous, and can be used as a feedback tool by the tutors, experts and coordinators. A template for an individual learning record is given in box 23.

Box 23: **Individual learning record – an example**

What did you learn; what was 'new'?
„This is the first time I have taken part in a group research project, so the fact that I had to consider how the other students interpreted the case material, the objective, the questions that needed to be asked and the planning of group work was a new learning experience for me. In addition, I had to think about how to logically structure the work and divide it up so that everyone had their own task to perform. I had to learn to let go and not have complete control. Moreover, we are a virtual group, have never met each other and

communicate primarily by means of chat sessions and e-mail. Although chat sessions have the advantage of instant feedback, they tend to be rather long and are not always productive."

How does that new knowledge fit in with your previous experiences (e.g. normal study)?
„I study at the Open University of the Netherlands, which is a deliberate choice as it allows me to study on my own and in my own time. At the beginning of the year, I attended a classroom-type course at a 'normal' university. Although I enjoyed the lectures and discussions, and appreciated the input from other students, I again chose to work on the projects on my own (as did most students, by the way)."

What skills or competences did you acquire by taking part in the EVS? Was it a completely new experience?
„I guess I had to learn to bite my tongue (which, fortunately, is the advantage of typing: you are forced to think before you speak) when things didn't go as I would have liked them to (in terms of getting results)."

Which ways of learning (e.g. group discussion, searching the Internet, individual learning) did you find most useful?
„I (still) find self-learning most useful. Group discussion is most useful if it is properly prepared and if the discussion has a clear focus. We had one very productive (three-hour!) session putting our draft research proposal together."

What is still unclear, and what questions have arisen in the meantime?
„I am not convinced of the value of chat as method of communication and learning. Blackboard is most useful for information storage; the e-mail and chat functions are so limited that we use normal e-mail and MSN for communication."

Source: *individual learning record, after the second stage of the EVS (2005 EVS)*

In addition to completing their individual learning records, students also have to publish a group reflection report at the end of the EVS. In this report, the group reflects on the value of the EVS as a form of international and multidisciplinary collaborative learning, its format (i.e. the breakdown into stages, individual and group activities), the products they are required to deliver (i.e. the group definition of sustainable development, a research proposal, a group report, a policy summary, etc.), the learning process (i.e. individual and collaborative learning), the role of the participants (i.e. students, tutors, experts, institutional coordinators and the central coordinator), their role in their group, their experiences with group work, their experiences with e-learning, the use of ICT tools in Blackboard, and any general comments. The reflection reports consist of comments from individual group members, which the group then combines to form a single report.

Whilst the individual learning records and group reflection reports are important for the students, they are also very useful for the EVS staff. The records and reports are rich sources of information and suggestions that can be used to improve the EVS's educational format. These data are supported by formal evaluations and research. At the end of the EVS, the students are invited to complete a web-based questionnaire on the concept, format, process, products, use of ICT, etc. In addition, an annual meeting for staff is organised after each EVS. This meeting provides an opportunity to evaluate the seminar, and gives the tutors and experts an opportunity to share experiences with each other and other EVS staff, discuss group products and processes, award formal marks to the student groups, discuss potential improvements to the EVS before the next run, and, last but not least, to socialise. Finally, researchers from the partner institutions in the EVS regularly undertake research on specific topics (such as pre-structured discussion boards and peer assessment). The findings of their research may prompt the organisers to alter the educational format of the EVS.

In conclusion, whilst the EVS is making good progress, it is a very complex educational format (consisting of a virtual, international, multidisciplinary learning environment using group work on 'wicked problems', and using modern ICT tools). We therefore need to improve it step by step, using our experiences and input from students (see box 24).

Box 24: **On its way, but still a long way to go – students' perspective**

> „Although the EVS is a very good idea in theory, making it work in practice really takes a lot of effort. Although it will take some time before the project is fully successful, we still believe it will be successful in the future. It really is a step forward in the direction of sustainable development. It increases openness and understanding by providing different perspectives on the same issues."
>
> Source: *Group Reflection Report by student group 11 (2004 EVS)*

Seminar characteristics

We now wish to compare EES, GS and EVS with each other, to identify major trends in the design of our virtual seminars over the past decade. The findings are presented in terms of the learning process, the learning content, the learning technology and, finally, organisation and costs. The seminar features are summarised in table 2 (following page).

In terms of the *learning process* we notice a shift from an individual learning process (EES) towards a collaborative learning process in small, extremely heterogenous groups (GS and EVS). As a consequence the assessment is not longer focusing on individual exams (EES), but on group products and group processes (GS and EVS). Another feature is that the role of the teacher has changed significantly, from steering on the content side of the seminar (EES), towards controlling the contribution of student groups to the seminar (GS), and, finally, coaching the learning process in small student groups (EVS).

The *learning content* shows a shift from theory driven courses (EES) towards case study based courses (GS and EVS). The topics of the case studies are authentic and 'wicked' prolbems to challenge all students in a group to collaborate and to share their expertise and perspectives. In the distribution of the course materials to the students we see a transition from traditionaly printed courses (EES) towards completely web-based courses (GS and EVS).

Table 2: **Characteristics of EES, GS and EVS** [a]

Characteristics	Criteria	EES	GS	EVS
Learning process				
Educational principle	individual learning / self-study	***	*	*
	collaborative learning / group work	–	***	***
Composition groups of collaborating students	international	–	***	***
	multidisciplinary	–	***	***
	cross-cultural	–	***	*
Meetings of groups of collaborating students	face-to-face	–	–	–
	virtual	–	***	***
Assessment	individual exam	***	–	–
	group product	–	***	***
	group process	–	*	***
Role of teacher	central, controlling	***	**	*
	marginal, coaching	*	**	***
Learning content				
Content of the learning materials	theory	***	*	*
	case studies	–	***	***
Format of the learning materials	traditional printed materials	***	–	–
	web-based materials	–	***	***
Learning technology				
Conferencing system	audio/video	**	***	–
	computer	*	**	***
Communication	synchronous	**	***	*
	asynchronous	*	**	***
Use of technology	at a central location	***	***	–
	at home	*	**	***
Organisation and costs				
Organisation of seminar	top-down	***	**	*
	bottom-up	–	**	***
Assessment procedure	by student's institution	–	***	–
	jointly by partner institutions	***	–	***
Overall cost of seminar	staff time	***	**	**
	out-of-pocket expenses	***	***	*

_____

a) The symbols indicate the relative importance of a given criterion for the seminar:
   * = applicable, ** = important, *** = crucial, - = not relevant.

The *learning technology* is not only used as a means to deliver web-based materials, but primarily as a tool for communication (satellite TV in EES), interaction (video conferencing in GS) and collaboration (computer conferencing in EVS). Computer conferencing (cheap and accessible at home) helps to overcome some of the disadvantages of video conferencing (expensive and necessary to meet at a central location), and enables a shift from synchronous (real time) towards asynchronous communication, which gives more flexibility to the learning process. In general, we notice a shift towards more easily accessible technology, supporting more intensive interaction between both staff and students.

The *organisation and costs* of a seminar are depending on the educational format and learning technology to be used. A seminar designed for central steering by the teacher and the use of video conferencing for communication and interaction with and between the students is very expensive in terms of staff time and out-of-pocket costs. In an educational setting this type of seminar is only feasible when external funding (public or private) is provided (EES and GS). A seminar focusing on the responsibility of the student group to take care of their own learning process and supported by a computer conferencing system for collaboration is much cheaper (EVS).

In retrospect, we conclude that the observed trends in the learning process, in the learning content and in organisation are to a large extent determined by the developments in the learning technology: from expensive showcase telecom technology to widespread, easily accessible information- and communication technology. The educational format of the virtual seminar was at first technology-driven and is now technology-supported. The use of inexpensive ICT-tools (pc's connected through internet) that allow flexible, time- and place independent communication and retrieval of information, makes the virtual seminar accessible to students from universities in different cities, countries or even time-zones, with different schedules and financial resources. The technology enables a 'bottom-up' organisational model, which can be easily expanded to include more partners without the need for external funding. It also enables an educational format (collaborative problem-based learning) that matches better the aim and objectives of a virtual seminar.

Lessons learned

What are the lessons we have learned from the good practices described in this chapter? We have formulated our experiences in terms of ingredients of a successful virtual seminar, strengths and weaknesses of the current European Virtual Seminar, and ideas for further improvement.

Ingredients of a successful virtual seminar

In the previous section we have pointed out the important enabling role of modern ICT-tools in a virtual seminar. This technology makes a virtual seminar possible, but certainly does not guarantee its success. On the basis of our experiences we have compiled a list of ingredients for a successful (i.e. effective, efficient and sustainable) virtual seminar (see box 25). The list provides a summary of the more extensive discussions of these issues we presented earlier in this chapter.

Box 25: **Ingredients of a successful virtual seminar**

1. Inspiring aim and clear learning objectives
2. Selection mechanism (entry requirements at several stages)
3. Guidelines for students and staff about their roles and tasks
4. Realistic case studies
5. Structured learning process: separate stages, and individual and group activities linked to a detailed timetable
6. Assessment protocol, available to all participants, with explicit requirements for group functioning and group products
7. User-friendly electronic learning environment
8. Specific tools and instruments to support group building, social and work processes (e.g. pexpi)
9. Bottom-up organisational model, without reliance on external funding
10. Step-wise improvement and enlargement of the seminar, no blueprint design

Strenghts

A virtual seminar enables collaborative learning by geographically distributed students and students with different study schedules. This makes it relatively easy and inexpensive to bring students with different national and disciplinary backgrounds together to work on case studies in sustainable development. Problems of sustainable development are typically complex and 'wicked', and perspectives on the nature and solution of these problems are likely to vary with national, cultural and disciplinary background. The ability to communicate and collaborate accross these boundaries of nation, culture and discipline, is an essential competence for sustainable development (see chapter 5). The heterogeneous student groups of the European Virtual Seminar are an excellent learning environment to develop this competence, as the students experience differences in perspective in a very direct way, and they will also have to come to a joint solution of the problem. Our evaluations show that most students are enthusiastic about this experience of international and multidisciplinary learning and appreciate its value in learning for sustainable development.

Another strength of the EVS for competence-based learning for sustainable development, is the authenticity and openness of the learning environment. It is quite unlike making closed exercises in a traditional classroom. The students deal with open, real-life case studies, and in their research of the problem, they interact with 'real world outside', in the form of external sources, experts, stakeholders, etc. Such a realistic learning environment is generally acknowledged as a major requirement for effective competence development.

The two features of EVS discussed above, international, multi-disciplinary student groups working in a realistic learning environment, can only be realised through intensive interuniversity cooperation in development and implementation. Thus, the organisational model of EVS, which makes this type of cooperation possible, is almost by definition a strength. The bottom-up approach based on network principles guarantees flexibility, and makes it easy for new partners to join. Distributed responsibility and absence of reliance on external funding were critical factors in sustaining the EVS since its start back in 2001. In the opinion of the staff, the innovative learning experience that the students can be offered by sharing expertise, staff time and resources, certainly outweighs the relative large amount of time this cooperation consumes due to differences in educational paradigm, institutional policies, et cetera.

Weaknesses and suggestions for improvement

A virtual seminar requires specific skills from the educational staff involved, such as teaching in an intercultural context, dealing with other educational paradigms, using modern ICT-tools, communicating without face-to-face meetings, et cetera. In particular, the role of tutor is difficult but yet crucial under these conditions. Most staff is not trained to operate in such a learning environment. In the EVS, we deal with this problem by approaching the repeated implementation of the EVS as a joint learning process. In particular the annual staff meetings after each EVS are a major mechanism to exchange experiences and initiate improvements. Frequently, parts of the collective tacit knowledge and experience are formalised and documented in guidelines, to assist present and new staff in their educational roles in the virtual seminar.

Not only for the staff, but even more for the students the EVS is a type of learning environment they are not used to. The heterogeneity of the student groups is a strength from an educational perspective, but also creates difficulties in communication: the foreign language (English) is an obvious stumbling block, and also cultural differences may frequently result in misunderstandings. As effective communication between students is crucial in collaborative learning, this is a major issue for further improvement. In the next run of the EVS, the requirement regarding students' command of English will be applied stricter. Tools are under development that may improve the communication in the research and report writing stage, to ensure that all groups deliver genuine group products rather than a compilation of individual products.

Communicating and collaborative learning in the heterogeneous student groups in the EVS takes place via the internet. This makes it even more complicated than in face-to-face meetings, because facial expressions, body language and social awareness are missing, and all social processes are depending on computer technology. Thus, the socialisation process cannot be taken for granted, and needs specific attention in the educational format of a virtual seminar. In the current format of the EVS, the 'personal expertise pages' (see box 15) are an important tool to facilitate socialisation. Yet, the lack of live dialogues and visual communication is a major drawback of computer conferencing as compared to video conferencing. We hope, therefore, that in the not-too-distant future we can integrate the use of webcams as a standard option in the EVS.

Compared to regular education, the dropout rate in a virtual seminar can be high (see table 1). In the beginning, we thought that this was due to

its complexity (international, multidisciplinary, virtual, collaborative learning), but after structuring the seminar into three stages we found out that the majority of the dropouts never passed the first stage. In fact, many of them never started at all. The impact of a high dropout rate on the successful implementation of the seminar is now strongly reduced by including a selection phase before the formation of the student groups. In the future, we hope to minimize the dropout rate even further by emphasising the importance of a strict intake procedure to the institutional coordinators.

Concluding remark

Education is on the move, worldwide. New technologies will bring us new opportunities we cannot even imagine at the moment. However, the constraining factor will be the development of effective and efficient educational formats and organisational models rather than technology. To develop useful and significant new concepts we should follow an experimental approach. In this chapter we have described how a series of experimental educational projects has resulted in the virtual seminar as an innovative educational and organisational model for joint, international courses in study programmes on sustainable development. The current technological conditions of widely available, inexpensive and yet powerful ICT-tools create a conducive climate for innovative experiments, as they allow for a bottom-up approach by staff directly involved in education.

References

EVS website: http://www.ou.nl/evs

Johnson, D.W. and R.T. Johnson (1991), *Learning together and alone: Cooperative, Competitive, and individualistic learning,* Prentice Hall.

Kreijns, C.J. (2004), *Sociable CSCL Environments, Social Affordances, Sociability and Social Presence*, Ph.D. dissertation, Open University of the Netherlands, Heerlen.

Slavin, R.E. (1995), *Cooperative learning: Theory, research, and practice*, Allyn & Bacon.

Sloep, P. (ed.) (1997), *European environmental science; Towards sustainability*, Open universiteit, Heerlen, The Netherlands.