CSCL: Structuring the Past, Present and Future Through Virtual Portfolios

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CSCL: Structuring the Past, Present, and Future through Virtual Portfolios

Elsebeth K. Sorensen, Eugene S. Takle, Michael R. Taber & Douglas Fils

ABSTRACT

Web-based processes of learning and collaboration produce an enlarged structural opportunity at many levels. Careful structuring of the virtual space supports and adds quality to both collaborative learning between students, and to instruction. Such enhancement in quality may take place through use of individual and collaborative spaces for learning activities, overview of process and content, increased clarity of learning expectations, and facilitation of collaborative and individual processes of reflection and self-reflection. This chapter investigates the structuring potential of a virtual version of portfolios for supporting these aspects. It discusses the conceptual and structural complexity associated with design and use of virtual portfolios from the perspective of, both learners and instructors, and on the basis of the design and use of virtual portfolios in a web-based American course on global change.

1. Introduction

Nothing influences our ability
to cope with the difficulties of existence
so much
as the context in which we view them.
(Zeldin)

Developments in education today increasingly are based on use of networked computers and distance learning (Fjuk, Sorensen and Wasson, 1998). Networked computers and distance learning generally form a flexible basis for "learning together apart" (Bates, 1995; Kaye, 1992 p. 1) and offering a way of meeting the growing need for lifelong learning. These electronic advances offer organizational flexibility for both learning and instruction to benefit from a freedom of choice, control, and
plan on an individual basis or in collaborations between student-instructor, student-student, group-group, etc..

But this freedom and flexibility in both learning and instruction come at a price. The independence of shared time and context constraints in collaborative learning settings is the most attractive feature of online education, but it also presents a weakness (Sorensen, 1997; Fjuk, 1998). There is no doubt that the hyper-textual nature of the Web offers a unique potential in online learning. But the lack of shared time and space in the hyper-textual environment in combination with the written conditions of (inter)action on the virtual scene create difficulties for both learners and instructors in terms of perceiving and over-viewing direction, expectation, and progress of the learning process (i.e. individual/collaborative learning goals, individual/collaborative (inter)actions, outcomes of learning, awareness, and (self)reflection).

Providing structure for perception, reflection and direction is essential for successful online learning processes (Sorensen, 1993). This also includes perception of context and structure in the distribution of the virtual space. Individual as well as structured spaces for collaboration, interaction and management are necessary elements in the symbolic, virtual environment in order to promote the development of a good learning experience and a feeling of shared virtual presence, despite the distributed organization of learners and tutors. Our experiences suggest that structured private spaces for both learners and instructors, which form the individual departure, perspective, and »entrance« to the collaborative learning scene, are important elements of web-based learning (Sorensen & Takle, 1999).

This chapter investigates these issues through implementation and use of a virtual portfolio in the web-based American mixed-mode (on-campus and web-delivered) course on global environmental issues. The course uses virtual portfolios as a means of meeting the needs of online structure for both learners and tutors. Our experience suggests that the virtual portfolio enhances »awareness«, at both the level of learning and instruction (Gutwin et al., 1995) by managing an overview of individual/collaborative learning expectation and progress, interactions with peers and instructors, reflection and self-awareness, and feedback and

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(1) Time and space: the parameters in relation to which we are used to understanding ourselves and our social existence (Ricoeur 1978; Lakoff & Johnson 1980)

(2) The course was developed and offered in the faculty of Sciences at Iowa State University.
evaluation throughout the learning process. We also suggest that the implementation of portfolios into virtual collaborative learning environments may promote genuine collaboration (Salomon 1995). More specifically, from the instructional perspective, the virtual portfolio also provides structure for the more specific instructional tasks such as an overview of tutoring, overview of grading, access to past comments, suggestions and recommendations given in the tutoring process, and access to past student submissions with related recommendations.

The investigation and evaluation of the virtual portfolio was a joint endeavor between instructors and course designers from Iowa State University (who developed and offered the Global Change course in the Environmental Science programme), and the Aalborg University students and instructors who were involved in a web-based distance education course (in the Faculty of Humanities) specializing in the design of web-based learning. The virtual portfolio was investigated through practical experience, which allowed a dimension of practice in distributed collaborative learning processes in virtual environments. We use this dimension of »virtual practice« and capabilities for »reflection in practice«, as part of the basis for evaluation of portfolios. It was implemented by supplying each Danish student and teacher with their own virtual portfolio in the American course for evaluating its pedagogical tools and techniques while the American course was in progress.

Section 2 provides a description of the nature of the collaboration and a presentation of the collaborating parties. Section 3 presents the concept and some of the recognized values of traditional portfolios. Section 4 outlines expectations in the use of virtual portfolios viewed from the research field of computer supported collaborative learning (CSCL). In section 5 we give a description of the design and related rational of the virtual portfolio in the »Global Change« course, and in section 6 we discuss and evaluate the virtual portfolio from the perspectives of learning, instruction, and management. Concluding remarks and potential future research perspectives are given in sections 7 and 8, respectively.

2. The collaboration

In this section we give an account of the different parties and courses involved in the collaboration.
The collaboration was built around two web-based courses separately designed for advanced students in quite different disciplines (Science and Humanities) at two distinctly different universities separated by culture, historical development, language, and seven time zones. The American course was a conventional – but mainly web-based (i.e. mixed-mode) – course for senior undergraduates and beginning graduate students at Iowa State University in the US. The course concerned global change and environmental issues. The Danish course was a web-based distance education course for high school teachers and for people from the educational system within organizations offered at Aalborg University in Denmark. This course seeks to implement ICT-technology in learning processes in pedagogically appropriate ways.

2.1. The collaborating parties

The Danish course:

The Danish course was one of three courses (and one project assignment) in a one year distance education university program (within the Humanities) for high school teachers and for people from educational organizations, on how to implement, in pedagogically reflected ways, ICT in different types of learning processes. The one-year education program was offered as continuing education on a half time basis.

Goals: To be able to integrate ICT in teaching and processes of development in appropriate ways, and – at a high level – to be able to guide and implement the use of ICT in teaching and learning as well as in other organizational contexts.

Content: The course dealt with the whole area of CSCL in the light of learning theory, and, even further, was also itself an example of what it was trying to teach.

Structure: The course – as well as the whole education program – was implemented on the Web, using the collaborative virtual learning environment »Virtual-U« (developed at the Simon Fraser University in Vancouver, Canada). Each of the two semesters contained two face-to-face weekend seminars at the university.
Pedagogical model: The pedagogical approach of the whole education programme was »Problem-Oriented Project Pedagogy« (POPP) (Dirckinck-Holmfeld, 1990; Fjuk & Dirckinck-Holmfeld, 1998). POPP has in fact been applied as the overall pedagogical approach of Aalborg University, across sciences in all teaching and learning activities. Within this pedagogical model the majority of activities take place as group activities (the exam as well) and resembles – to a certain extent – what in North-American countries is often called »problem solving« or »project-based learning« (Koschmann, 1994) in the sense that students work on projects and try to address the problem in a scientific (empirical) manner rooted in practice. There is one essential point, however, where POPP differs from problem-based learning: the group »owns« the problem, as the group itself has to identify the problem. POPP has its roots and ideology in the »critical emancipatory thinking« established in the 1970s in Denmark. A very important element in this approach to learning is the dimension of practice.

The American course:
The American course was a conventional course (within the Sciences) for senior undergraduates and beginning graduate students at Iowa State University in the USA. It has gradually been migrated to the Web over the last five years, with new features being added as ancillary software has become available. Learner-centered activities have also been introduced in place of or as supplements to conventional lectures.

Goals: (1) To help students come to an understanding of the interconnectedness of the global environment and the role of humans in charting (by design or default) its future trajectory, (2) to instill an appreciation for and recognition of authoritative literature on global-change issues, (3) to engage students within the course and across national and cultural boundaries in dialog on global-change issues, including ethical issues.

Content: The course encourages dialog on the human role of the change in our global environment by putting students in the role of policy makers having to address the scientific, societal, political and ethical issues surrounding such issues as climate change, ozone depletion, deforestation, desertification, biodiversity, water degradation, and population.
Structure: The Global Change course consists of a sequence of learning modules on different global-change topics, each having evolved from a conventional university class time period. Each unit has a set of objectives, summary information on the topic, student-submitted collaborative (2-3 students) summary of class time discussion, «problems to ponder» as discussion starters for the electronic dialog, and extensive lists of web-based and other information on the learning module topic. Each unit has its own electronic dialog for student discussion among themselves and with outside experts or representatives of selected groups.

Pedagogical model: Students manage their interaction with the course and instructor through their personal (password protected) electronic portfolios (Taber et al., 1997). Pre-class time electronic quizzes (available and automatically graded through the portfolio) require students to synthesize background material in preparation for class time discussion. Student «ownership» of the course is encouraged through posting of student class time summary discussion. Electronic dialog on individual learning unit topics is graded on the basis of both participation and quality of comments toward achieving learning unit objectives.

An authentic research-quality climate model allows students to learn by experimentation about physical processes occurring at the plant-soil-atmosphere interface. Over the Internet, students pose questions, test hypothesis, execute numerical experiments, acquire tabular and graphical experimental results, and summarize results in either personal or group portfolios.

The course is viewed by the designers as a laboratory for experimenting with a variety of pedagogical techniques and initiatives (Taber et al., 1997).

2.2. Design of the collaboration

The general aim of the collaboration was for the Danish students and instructors to investigate and evaluate the use of pedagogical techniques in the Global Change course; in particular, the design and use of virtual portfolios as a means of providing the students with a clear concept of learning expectations and directions. More concretely, the Danish students and teachers were themselves trying out the pedagogical tools and the virtual context designed for and used by the students in the Global Change course (Sorensen & Takle, 1999).
One of these tools was the virtual portfolio, which formed "the entrance" of each student and tutor to the course. Exercises were designed for the Danish students and instructors, working within the context of their course on ICT and pedagogical methods, to work also within the context of the Global Change course as a basis for evaluating its functionality and pedagogical methods. In this respect, the American course served as a "practice field" for the Danish students and provided them with the opportunity to evaluate both theory (the content of the Danish course) and practical applications. The Danish students were not asked to carry out "Global Change tasks", but they were using the same type of pedagogical tools, pedagogical techniques, and "entrance" to try out and solve special tasks and questions concerning the pedagogical design and techniques of the Global Change course.

Each student was issued a password-protected electronic portfolio as a launching point for exploring three features of the course, namely the use of quizzes and class summaries for encouraging integrative thinking, use of simulations as a means of allowing open-ended hypothesis testing, and use of the electronic portfolio as a personal space ("room" or "office") for managing interaction with the course. Danish students used their portfolios to post their evaluations through both private comments to the instructors and through public postings by which they engaged in dialog with other students and instructors.

In sum, it can be said that the Danish side approached the evaluation of the pedagogical use and benefit of the portfolio heuristically from the "outside" (but through involved practice), whereas the American side approached the evaluation "live", through involved practice with respect to both content and learning process.

The whole collaboration was bridged by using two learning technologies: the Web and video conferencing, the latter being one medium and pedagogical technique that was also integrated in the Danish course design.

3. Role and value of "traditional" portfolio

In this section we present some of the ways in which portfolios have been used in contexts of face-to-face learning and instruction.

The concept of portfolio is not new. The term "portfolio" comes from Latin and is a compound of the verb "portare" (to carry) and the
noun *foglio* (leaf), or literally *a case for keeping loose sheets of paper*. Traditionally, portfolios are being used in different contexts and for a variety of purposes. In educational contexts, use of the term *portfolio* also varies slightly, often depending on the purpose and perspective behind its use.

Both Tenhula (1996) and Seldin (1999) use the concept of *teaching portfolios* to suggest that the primary purpose of a portfolio is to improve instructional performance (methods) and practice. Tenhula (1996) reports on a study at the University of Oulu, Finland, in which portfolios were being used by more than a hundred university teachers as a means/method of enhancing individual instructional qualifications (Tenhula, 1996). Some of the most attractive features of the portfolio were found to be its usefulness for enhancing instructional self-reflection and self-assessment. Tenhula (1996) reports on the implementation of the portfolio as being the most innovative and promising teaching improvement technique, even more effective than traditional pedagogical training (Tenhula, 1996). Although the primary purpose of using portfolios was to support the development of the professional expertise of the instructor, a secondary but very useful promising effect was the simultaneous creation of a practical ground for awarding merit (Tenhula, 1996).

Kolmos (1998) reports on similar use and benefits of portfolios. Kolmos considers the portfolio as a type of instructional curriculum and documentation for instructional development. She sees the portfolio model, from a learning theoretical perspective, as building on a theory of practice of instruction. The portfolio is viewed to function both as a tool for reflection and development of a conscious approach to instruction, and as a continuous documentation of the learning processes and practices of the individual instructor (Kolmos, 1998).

The term *learning portfolios* aims at enhancing student learning. Retallick & Groundwater-Smith (1999) report on the use of portfolios in a project to educate teachers. In this project the portfolio was perceived as a container for information and interpretation about the instructor's philosophy, plans, methods, and the student learning outcomes (Retallick & Groundwater-Smith, 1999).

The concept of *course portfolios* has also been introduced and used. Cerbin (1995) reports on use of portfolios to connect assessment of learning with improvement of teaching. This use of the portfolio
seeks to enhance educational quality. Also, it is assumed that the primary aim of teaching is to improve students' understanding, thinking, and development (Cerbin, 1995). This allows educators to obtain information about their students' learning and thereby identify important problems and adapt teaching accordingly to support and enhance the educational progress of the students (Cerbin, 1995).

Cerbin (1995) uses the concept of a »course portfolio«. He argues that the entity of a course is the ideal context for investigating what, how and why students learn or do not learn. Courses are entities with their own individual goals, content, methods, results and outcomes, and they provide information on pedagogical reasoning, acts of teaching, and results describing learning and development of students (Cerbin, 1995). Course portfolios may be structured in different ways and contain different elements according to more specific purposes. According to Cerbin (1995), however, four elements appear to be central:

- teaching statement (a reflective outline of the conceptual framework of the course, linking the teaching goals with content and methods, and explaining how and why specific teaching practices and learning activities are used to meet the aims of the course)
- learning activities (assignments etc., which illustrate what and how students learn)
- student feedback (experiences of students indicating how teaching practices are facilitated or inferred with student progress in relation to course goals)
- course summary (investigating experiences of students, how well they learned and, as such, mirroring the extent to which the teacher's goals were met. It enables teachers to draw conclusions about their pedagogical techniques and to envision how potential learning dilemmas might be handled in future courses)

Applications of portfolios, as described in the approaches briefly outlined by Tenhula (1996), Seldin (1999), Kolmos (1998), Retallick & Groundwater-Smith (1999), and Cerbin (1995), all constitute experiences from traditional face-to-face contexts. In sum, we would say that despite differing perspectives, motivations, and goals behind use of portfolio in educational designs, the common denominator is a need to add structure in order to support activities that promote consciousness and reflection.
4. Virtual portfolios: An analytical perspective

In this section we attempt to assess and discuss the structuring value of virtual portfolios as a support mechanism for collaborative learning and instruction that has migrated to the Web.

The motivation behind implementation of virtual portfolios in the Global Change course was based on the assumption shared by Cerbin (1995) that the primary aim of teaching is to improve students' understanding, thinking, and development, and that assessment of learning and improvement of teaching are two sides of the same coin (section 3). Consequently, in discussing the structuring potential of the virtual edition of portfolios, we use his four central elements as part of our frame of reference (section 3). However, these four elements do not mirror a clear collaborative perspective on learning. Therefore, in addition to our acceptance of his four elements, we address some key concepts on quality of collaborative learning for incorporation in this investigation of the structuring potential of virtual portfolios from a collaborative learning perspective.

Understanding the essential aspects of the type of learning situation we are addressing, and how and in what sense the situation of distributed collaborative learning on the Web might be in search of virtual structure, requires that we look at some central qualities of learning processes that are based on collaboration.

Etymologically viewed, »to collaborate« means »to work together«, and the learning theoretical approach of »collaborative learning« implies the idea of a common goal and an explicit intention to contribute, i.e. to create something new or different through collaboration, in contrast to simply exchange of information or pass-on instructions. The basic idea of collaborative learning can be conveyed using the famous words of Harasim (1989):

»Knowledge building occurs as students explore issues, examine one another’s arguments, agree, disagree, and question positions. Collaboration contributes to higher order learning through cognitive restructuring or conflict resolution, in which new ways of understanding the material emerge as a result of contact with new or different perspectives.« (...) »Collaborative learning is predicated upon interaction«

Harasim, 1989 p. 55
Successful collaboration implies a common goal, a shared focus, and a collection of individual competencies to the advantage of the group (Dillenbourg et al., 1995). Many of the positive assumptions in relation to collaborative learning are tied to the perspectives on the learning process, that much learning and understanding at a deep level comes from conversation, argumentation, debate, and discussion (often unpredicted) between students, in group work, between colleagues, experts, and teachers (Kaye, 1992; Sorensen, 1997). In a collaborative learning situation people may learn in a number of ways, such as (Gutwin et al., 1995):

- modeling the practices and skills of more knowledgeable peers
- identifying and resolving differences between conflicting ideas and theories
- peer teaching, where one student assists or instructs another when appropriate
- constructing new shared meanings and practices.

There are certain well-established criteria which work for a successful collaborative learning activity: individual competency of the members in the group; a commonly understood goal; mutual respect and confidence; formal and informal surroundings; and clear lines in relation to the distribution of responsibility.

In the virtual environment we are facing a general, enhanced need for structure in the distributed collaborative learning environment (Sorensen, 1998). It has been previously acknowledged that the structural communicative features of computer-mediated communication (CMC) systems were suited to support essential structural aspects of interaction unfolding in a collaborative learning process (Harasim, 1990; Sorensen, 1991; Sorensen & Kaye, 1992).

The virtual environment, however, has since developed. From mainly providing support for the communicative aspects of a distributed collaborative learning situation, we are now offered a possibility through the Web for designing collaborative learning processes, which do not only manage the communicative aspects of the process, but also the aspects of the course material and the pedagogical techniques. In other words, through its multi-media nature, the Web offers a possibility for designing a more holistic virtual »world« for learners and instructors, a world in which many previously physical processes turn virtual.
and are managed through manipulation of symbols (Sorensen, 1993). But in much more holistic virtual worlds of learning with more diverse and complex functionality, we also meet a radically increased need for structural support in learning, in a much broader sense than was the case using traditional CMC software.

There are several important parameters indicating quality in collaborative learning (CSCL), some of which have also been migrated and implemented into discussions about learning quality in distributed collaborative learning. We consider the establishment of these as being strongly dependent on the type of structural support that may be offered by the implementation of the virtual portfolios:
- awareness
- genuine collaboration.

4.1. Awareness

In relation to virtual environments (synchronous and distributed), Gutwin et al. (1995) focus on "workspace awareness", defined as the up-to-the-minute knowledge of a student about other students' interactions with the shared workspace, as the most critical factor. The general concept of awareness covers 1) social awareness, 2) task awareness, 3) concept awareness, 4) workspace awareness. Gutwin et al. (1995) argues that workspace awareness is important, as it allows students to take advantage of those opportunities for interaction that make collaboration a valuable way to learn. Although not directed specifically towards a symbolic environment, Lakoff & Johnson (1980) confirm the importance of clarity in spatial orientation as being central to human perception (Lakoff & Johnson, 1980).

In terms of finding support for workspace awareness in current virtual environments for collaborative learning, Gutwin et al. (1995) points out:

Educational groupware does not yet provide the richness of face-to-face interaction. If such systems are to foster learning within a context of interaction, as has been advocated by educational theorists, they must support the existing practices and processes of group learning.

(Gutwin et al. 1995, p. 1)
In other words, it is indicated that the virtual learning scene needs to support the building and maintenance of a strong and clear overview in its actors. The reflective distance created through the representational character of the virtual environment further stresses this need (Sorensen, 1999).

4.2. Genuine collaboration

Salomon (1995) argues that although too rarely fulfilled, collaborative learning aims at fostering processes of genuine collaboration. Genuine collaboration is fundamentally predicated upon »genuine interdependence« (Salomon, 1995) between group members. Genuine interdependence is characterized by three features: 1) a need to share information, 2) a division of labor where roles complement each other, and 3) a pooling together of minds. Although less collaboratively oriented, genuine collaboration, from a learning theoretical point of view, may also touch upon what Colaizzi (1978) states as being the ultimate type of learning (Colaizzi, 1978).

Although genuine collaboration in both its face-to-face and distributed, computer-supported version needs (virtual) spaces of a collaborative nature to unfold, the concept of genuine interdependence also carries a latent premise of individuality as the other side of collaboration. It seems that as a precondition for genuine collaboration to occur, it must be based on and departing from individual perspectives, profiles and needs in the formation of the genuineness of the collaborative process.

In the context of the virtual world this means that we need virtual structures and spaces designed for collaborative activities, but we also need structured individual spaces in the virtual environment. In such individual virtual learning spaces the individual profile of the learner and/or instructor can thrive, complementary to the collaborative processes.

More concretely, support of awareness and genuine collaboration means providing structure for e.g.:
- the maintenance of overview of individual and collaborative learning expectation and progress
- the maintenance of interactions with peers and instructors
- reflection, self-awareness, and feedback
- evaluation throughout the learning process.
From the instructional perspective, this means providing structure for e.g.:
- overview of tutoring
- overview of grading
- access to a compilation of students’ past comments
- suggestions and recommendations given in the tutoring process
- access to past student submissions with related recommendations.

In sum, when moving to the virtual environment for collaborative learning and instruction, there are indications that both of the essential concepts of awareness and genuine collaboration may be in search of supportive virtual structuring elements, as for example are offered through a virtual edition of the portfolio. Additionally, besides connecting learning assessment to improvement of teaching, the structuring potential of a virtual portfolio also offers a source of support for the management side of distributed learning and instruction on the Web.

5. The virtual portfolio in Global Change

In this section we provide a description of the virtual portfolio designed and used in the Global Change course.

In the Global Change course the electronic portfolio is defined as a virtual «representative and judicious collection of your work». It is intended to a) provide documentation of student work, and b) serve as the organizational structure for evaluation of student work against standards. The intended benefits for the student are 1) to provide information on criteria to be used in judgement of student work, 2) to allow the student to give direct evidence of work, 3) to offer an opportunity for self-analysis and reflection, and 4) to provide students with the means for electronic publishing.

The individual portfolios constitute the «private entrance» of each individual student to the Global Change Course. The portfolio falls in two parts (figure 1):
Welcome to the visitor's access to the electronic portfolio. You are free to look at contents of this portfolio. Keep in mind that your personal information may not be disclosed. If you have any feedback, you can offer it, just send me an email at mander@lamar.edu.

Personal home page for: visitor
User ID number: 000
Group Number: 0

Message of the day
Read previous "Message of the Day".
30 April 1998

Great News! I have compiled past exam questions into one HTML file for you! Use these questions to help you in preparing for the final exam. Keep in mind that the exams will not have as many questions or cover all the topics represented by the sample questions. Also note: the questions are from past courses and may cover topics not presented in this year's course. Click here to access the "Sample Exam Questions for Global Change Course."

Several items to note:
1. Quizzes for units 3-10 and 3-13 are now available. They are due on Monday, May 4th. The emails for quizzes are not automatic. Please let me know if there are any problems.
2. The self-assessment essay for Block 3 is now ready. Note the new due date is Monday, May 4th.

Class did not meet on Monday April 27. The reading assignment (and basis for the quiz, which will be available soon) from the web was as follows:

1. Crisis Thematic Guide: Land Degradation and Desertification
2. Prehistoric Farming/Departing Shell Mounds
3. Archaeology: Lesson of Future Soil Use

Note: The current version does not contain the prehistoric farmings. The text contains only a general introduction. The images are not the exact:

The grading for dialog in blocks 2 and 3 is now working. I have graded your essays and ethical questions for block 2.

If you have questions, contact me at mander@lamar.edu.

Mike Tabert
20 April 1998

Use the menu bar below for navigating through the course materials.

Class Preparation
Before each class, you should visit the learning unit home pages, available from the course schedule. Read the materials provided in the "Class Preparation" section. This includes reading the quizzes (when available).

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Class Preparation
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Clicking on the assignment will link you to the assignment page.

Portfolio Assessment for Block 1

<table>
<thead>
<tr>
<th>Assignments</th>
<th>Due Date</th>
<th>Points Possible</th>
<th>Points Earned</th>
<th>View Contents and Instructor Comments</th>
<th>Public Document Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>First written examination. biological sketch</td>
<td>January 14</td>
<td>No points</td>
<td>No points</td>
<td>View my biomorph</td>
<td>View student biomorphs</td>
</tr>
<tr>
<td>First block 1 admission on self-assessment</td>
<td>January 14</td>
<td>3</td>
<td>3</td>
<td>View my self-assessment essay and instructor comments</td>
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</tr>
<tr>
<td>Learning unit outsiders Access learning unit home page (will launch a new window)</td>
<td>January 16</td>
<td>15</td>
<td>15</td>
<td>View all missing taken</td>
<td>Not available</td>
</tr>
<tr>
<td>Text assignment</td>
<td>January 16</td>
<td>3 points each</td>
<td>42 total points</td>
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<td></td>
</tr>
<tr>
<td>General discussion on unit topics</td>
<td>January 16</td>
<td>45</td>
<td>45</td>
<td>View the unit topic</td>
<td>View student presentation</td>
</tr>
<tr>
<td>Class discussions paper</td>
<td>February 2</td>
<td>10</td>
<td>10</td>
<td>View my assessment</td>
<td>View student assessment</td>
</tr>
<tr>
<td>Preprint paper on a journal article on atmospheric chemistry</td>
<td>February 9</td>
<td>40</td>
<td>40</td>
<td>View instructor comments</td>
<td>View topics submitted by other students</td>
</tr>
<tr>
<td>Submit your task</td>
<td>February 9</td>
<td></td>
<td></td>
<td>View my assignment</td>
<td>View other student position(s)</td>
</tr>
<tr>
<td>Externally developed: $20 reward for assignments</td>
<td>February 10</td>
<td>10</td>
<td>10</td>
<td>View instructor comments (if available)</td>
<td>View other student position(s)</td>
</tr>
<tr>
<td>Final Block 1 admission on self-assessment essay</td>
<td>February 10</td>
<td>30</td>
<td>30</td>
<td>View my final self-assessment essay</td>
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<td>Sub-total</td>
<td></td>
<td>187</td>
<td>187</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The first part (figure 1) is a sort of «status part» that gives an overview of past activities and forthcoming deadlines. This part of the portfolio is a kind of «home base» for the student, with navigational information (graphic or textual) to assist a feeling of presence (e.g. the names of tutors, office hours and email addresses, etc.), and links to other sites relevant to the next steps\(^3\) in the learning process.

The second part of the portfolio (figure 1) contains the actual «entrance» to all learning activities throughout the learning process, visualized and implemented as one whole structure. The structure contains six columns. The first column describes and keeps track of each activity and the continuous progress of the planned learning process. The next three columns contain the deadlines for each activity, the number of points possible to obtain in each specific activity, and the actual points earned by the learner. The last two columns contain qualitative feedback and dialog with the tutor, and the collaborative (public) dialog and involvement with other students.

The portfolio designed for the Global Change course supports the idea that the student is central to the learning process; i.e. students are encouraged to bookmark their own portfolios, not the Global Change web site, since the portfolio, not course material, is the point of departure for learning. The portfolio contains links to the module for the day (section 2.1). After reviewing materials in the module, the student completes a quiz, which is instantaneously graded, recorded in the portfolio, and the result reported back to the student. The first logon of the day for a student brings a «message of the day» from the instructor. Scrolling through their portfolio, the students find whether assignments recently submitted (electronically) have been graded and, if so, what comments the instructor has posted on that particular assignment. Space is provided for student response to the instructor’s evaluation. The portfolio also alerts the students to responses other students have posted to their comments in the electronic dialog. Future assignments and due dates are listed. Throughout the portfolio, links are given to specific relevant sites within the Global Change course materials, thereby short-cutting navigation time within the online materials.

\(^3\) Steps which at the level in the learning process may be seen as representing what Vygotsky (1978) names as the «zone of proximal development».
6. The virtual portfolio in Global Change: A principled discussion

This section provides a principled discussion, with reference to the design and experiences from the Global Change course, on the value of virtual portfolios. We do this, partly from an individual as well as a collaborative analytical perspective (as outlined in section 4), and partly by being open to new and promising features and experiences, significant to learning on the Web.

6.1. Overview, awareness and direction

From the perspective of Cerbin (1995), who sees the challenge of learning and instruction as two sides of the same coin, the Global Change portfolio seems to contain or provide access to some of the very essential features of a traditional course portfolio. The Global Change course is built in separated units. The aim of the introductory unit is to capture and frame the content of the course and at the same time, by its methods and goals, it plays the role of the methodological example in relation to the other course units. From the portfolio the learner has access to all of these units and – in quite the same way as with the introductory unit – meets with a clear «teaching statement» for the separate unit, outlining and explaining the interconnection between content, methods and goals (figure 2). Access from the portfolio to the systematic and consistently built learning units in Global Change intends to promote overview, awareness and direction in the distributed learning process as well as the virtual learning environment.
I-1: Overview of Global Change

"Today the scale of our interferences in nature is increasing and the physical effects of our decisions spill across national borders. The growth in economic interaction between nations amplifies the wider consequences of national decisions. Economics and ecology link us in ever-tightening networks. Today many regions face rates of irreversible damage in the human environment that threaten the basis for human progress."

E. K. SORENSEN, E. S. TAKLE, M. R. TABER & D. FILS

Pre-Class Preparation
There is no pre-class preparation for Overview of Global Change. Welcome to the course!!!

Objectives
- To understand the importance of global environmental change.
- To identify the general areas of our environment that are changing and explore the potential consequences of these changes.

Procedures
1. Read the summary information.
2. Take the summary information quiz. Quizzes are available from your portfolio.
3. Additional Required Reading. Although you are not ultimately responsible for content listed in this section, we encourage you to fully explore the links in order to provide a better scope on the upcoming class discussion.
   - An Introduction to the Science of Marine Climate Change (From ICES )
   - Subcategories of Global Change.
   - The United Nations Global Change Research Program (UNCGP). Note: This page is still under construction...
   - 1993 Report on the U.S. Global Change Research Program

Class Discussion
- Problem to ponder...
  - What distinguished a "global change" environmental issue from other environmental issues? We will be discussing this question, plus other questions raised by students during class.
- Class Discussion Summary by classmates B. Lemer and M. Hume.

From the lecture, it was shown that human interactions with the composition of the earth, particularly with trace gases such as carbon dioxide, methane, nitrous oxide, and CFCs, lead to global changes. There was controversy whether these global changes were warming the earth's atmosphere which would ultimately affect earth's life support system?

Trace gases like carbon dioxide, methane, CFCs and nitrous oxide are changing earth's atmosphere. The pre-industrial level of carbon dioxide was 275 ppm and has increased to a level of 359 ppm. Studies have shown that carbon dioxide is increasing one percent a year due to the tremendous amount of fossil fuel burning, deforestation, and production of cement. Individual people are responsible for 25 tons of carbon dioxide per year. As if this is not enough, the lifetime of carbon dioxide is 90 to 100 years. Meaning if we did not stop all human interactions, the consequences of our actions today would still affect us many years later. Methane had remained fairly constant until the Industrial Revolution. Since then methane levels have doubled and became important trace gas in global warming. CFCs are a man-made invention that are helping the depletion of ozone. Nitrous oxide, the CFCs is another important trace gas in adding the depletion of atmospheric ozone.

The increase in such trace gases mentioned above lead to temperature increasing over the years. It has been noted that 1998 is the warmest year on record since 1780. How did we get temperature readings back so far? By examining air bubbles in ice cores, temperatures can be read by looking at compositions like carbon dioxide, methane, and the ratio isotope of oxygen. There was controversy in the measurements of temperature that was involving a global warming. Opponents of the warming stated that no cities grew larger than because "heat waves". Then when satellites became available, temperature readings were still inconsistent with the warming. It was 1998, from August, 1998, that an satellite array they were deployed from their original position. Making the accuracy corrections showed that temperatures were increasing and proof of global warming. The only debate now is in source or sources.

Being aware that human interactions have a large impact on global change, specifically global warming, we now need to look for alternative solutions. Which will be the objective of the course.

Post-Class Materials
- Participate in the electronic dialog. Use this forum for:
  - using the electronic dialog.
  - posting new questions to students or the instructor;
  - responding to issues/questions raised by students in class/electronic dialog.

- Recommended Reading Materials
  - IPCC Climate Change 1990

- References
  - IPCC, Global Environmental Change at the Open University.
  - Global Climate Change Interventions - Links on the current state of the planet.
  - Global Climate Change (A Brief Introduction).
  - Global Climate Change: Assessment and Impacts.
  - Global Climate Change: Assessment and Impacts.
  - Global Warming and Climate Change: Briefing from the U.S. Global Change Research Information Office.
  - Glossary of Climate Change Terms.
  - The Intergovernmental Panel on Climate Change Home Page (URLs)

Figure 2

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Viewed from other fields of research, e.g. from a text analytical perspec­tive, our awareness, perception, understanding and situated confidence to act as human beings are usually established through the linking of the present to both past and future (Ricoeur, 1978; Bang, 1993; Sorensen, 1997). Such support of perception and understanding through tying together present, past and future activities is exactly what we find in the first part of the Global Change portfolio. It is likely to create a strong awareness and overview and a resulting stimulus in the learner to both act and reflect.

6.2 Learning activities and expectations

The Global Change course uses several different types of assignments, e.g. quizzes, simulations, summaries, etc. (section 2.1). The virtual portfolio gives access to these assignments and makes it possible to assess the way they were treated by the learners and to illustrate what and how the students learned. As such, the portfolio constitutes a flexible tool and source for the improvement of instruction and instructional methods and techniques.

An important aspect of the virtual portfolio in Global Change is the extensive clarity of learning expectations. Each learning activity that the learner accesses from the portfolio contains a clear statement of learning expectation as well as a complete set of marking and evaluation criteria (figure 3). Learners tend to like the electronic portfolio because of its explicit listing of course expectations. This clarity of expectation in the quality of student activity and assignments seems to be a clear advantage for the enhancement of web-based learning.
Objective

The purpose of this assignment, which spans the entire course, is to document your understanding of global change issues. It is important to understand "what you know" and "what you don't know." You are challenged to better recognize how it is that you personally improve your understanding.

Initial Submission Due: January 16
Final Submission Due: February 16

Assignment

Enter all self-assessments in this section. By the end of the course, you will be able to read all postings and self-evaluate your progress toward understanding course material.

1. Using the form below, answer the question: "What is your level of understanding on the climate and agents of global change?"

   Do you understand the climate system and what causes it to change? Are you curious about why or how some things happen or don't happen with respect to climate and other global environmental issues? Refer to your educational background and experience. In the form below, where it asks for subject, enter "Initial Submission for Block 1."

2. Keep a journal. While you are taking the course, a light bulb may go on occasionally. You may suddenly feel an "Ah Ha!" What, specifically, led you to that understanding? Did you get an answer to one of the to one of your initial questions? You may keep notes in your journal by using the form below.

Standards for Instructor Evaluation of Self-Assessment Essay

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Due Date</th>
<th>Unacceptable Response</th>
<th>Acceptable Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial Block 1 submission</td>
<td>January 16</td>
<td>No response, not aware of &quot;what you don't know,&quot; no curiosity</td>
<td>Response is clear and concise, references to past experience or education, eagerness to learn is demonstrated, learning goals are evident</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Points Possible: 5 Points Earned: Not graded</td>
<td>View Self-Assessment Essay</td>
</tr>
</tbody>
</table>

Figure 3

6.3. Collaborative learning and activity

The portfolio in Global Change is the entrance to both individual and collaborative tasks and assignments, which the portfolio structures separately. Moreover, the individual section of the portfolio, which keeps the dialog between the learner and the instructor separate, also contains and keeps track of the learner's individual input to the collaborative assignments (figure 1). From the portfolio it is possible, throughout the learning process, to access both the individual and collaborative learning spaces to retrieve and review ones past input. It is beyond any doubts that the work space awareness of the learner and its different aspects of social awareness, task awareness, concept awareness (section 4.1) find support in the design of the virtual portfolio of Global Change. This awareness is further enhanced by the carefully structured and consistently built learning units (section 6.1) each of which outlines the goal and method of activities (section 6.2).
The concept of genuine interdependence in collaborative learning (section 4.2) emphasizes not only the collaborative activities, but also the individual preconditions for this collaboration to occur. The virtual portfolio of Global Change seems likely to support such processes, as it offers structured spaces for both of these aspects of genuine collaboration to thrive and complement each other: both the individual and collaborative activities of a learner are easily accessed and overviewed from the individual portfolio. The virtual portfolio thereby promotes self-reflection and – in the case of the instructor – further development of the instructional techniques and design.

The collaborative activities and assignments of the Global Change design take the shape of a collaborative dialog/interaction, accessible from the collaborative space in the portfolio (figure 1). The instructional technique applied in this element is that both quality and quantity of the collaborative discussions are judged in the evaluation (Sorensen & Takle, 1999). This has the positive effect of stimulating collaborative discussion and interaction.

From the perspective of collaborative learning, however, there is no doubt that the collaborative potential of a virtual portfolio goes beyond the utilization and design demonstrated in the Global Change portfolio (section 7).

6.4 Continuous feedback, reflection, self-assessment, and evaluation

The virtual portfolio in Global Change provides a well functioning structure for giving and retrieving feedback (figure 1). This applies to feedback given in the individual assignments privately between the learner and the instructor, as well as to the collaborative assignments and dialogs. Both learner and instructor derive benefits from being able to access these tracks of learning, which demonstrate experiences of students and indicate how teaching practices are facilitated or inferred with their progress in relation to course goals. This provides an ideal ground for continuous processes of self-reflection in the learner as well as the instructor.

Collis (1998) reports on peer review as an important instructional technique in distributed collaborative web-based learning. Although students converse with each other and challenge each other's opinions, the Global Change course does not have a formal process for peer feed-
back and peer evaluation. However, the virtual portfolio could be expanded to allow each student to receive anonymous (or known) peer evaluation. The instructor’s portfolio would then be expanded to include a monitoring and recording of peer evaluation activity. This element could be developed under a variety of choices in instructional techniques.

The virtual portfolio of Global Change also handles continuous processes of self-assessment and self-evaluation in terms of learning progress (figure 1). It subdivides the total evaluation of student performance into small increments throughout the course rather than concentrating evaluation in one or a few isolated examinations. In this way the students are able to monitor their progress in the course and adjust their level of effort to match learning expectations.

A self-assessment that will be implemented in the next course offering asks the students about their level of confidence in discussing Global Change issues (module topics) with various groups, ranging from experts to friends:

My level of confidence in discussing this issue:
A. I feel competent to dialog with experts on this topic
B. I feel competent to lead a student discussion on this topic in a multi-disciplinary class
C. I feel competent as the average student to participate in (not lead) a discussion on this topic in a multi-disciplinary class
D. I feel competent to discuss this issue with a friend
E. I likely would have to learn a lot to participate in a discussion on this topic

The self-assessment will be given at the beginning and at the end of an academic term, and changes will be used as one measure of success in moving students up the learning curve. Some sample topics showing the design of self-assessment accessible are given in figure 4:
6.5. Promoting change and development within instruction and management

The virtual portfolio in Global Change offers the instructor a much more in-depth perspective on the student’s evolutionary thinking on global change issues. In contrast to the conventional method of returning assignments after grading, the electronic portfolio keeps all assignments permanently accessible to both instructor and student and allows reflective dialog on the student’s change in thinking. It provides structural support for overview of tutoring, overview of grading, access to past comments, suggestions and recommendations given in the tutoring process, and access to past student submissions with related recommendations, etc. It also simplifies instructional and course management tasks: quizzes are automatically graded, »housekeeping« information is more quickly and effectively disseminated, the instructor’s grade book is always accessible to the student (for viewing individual but not class grades). In other ways, however, the portfolio may complicate instructions and management: More items require instructor evaluation, students are prone to challenge many more minute points related to evaluation, students are more demanding on timeliness of instructor evaluation. It is important, therefore, to give careful attention to the integration of instructional choices and requirements implemented through the portfolio.
7. Conclusion

In this paper we have addressed the need for structure in distributed collaborative learning processes on the Web and in the virtual environments in which they unfold. We have addressed and discussed, on the basis of the design and implementation in the Global Change course, the structuring potential of virtual portfolios as one way of enhancing the quality of collaborative learning in distributed learning processes on the Web.

The chapter suggests that although the virtual portfolio in some ways seems to imply more attention and work from the tutor, it represents a strong tool for enhancing what we consider as important characteristics of collaborative learning: awareness and genuine collaboration. Through constituting a personal entrance to the learning scene, it enhances overview of learning expectations, learning content, learning goals, learning methods and individual and collaborative activities. Thus, if carefully designed, it facilitates instruction and constitutes a fruitful overview and basis for reflection on – and succeeding improvement of – instructional techniques and methods.

We can generally sum up the strength of a virtual portfolio as being concentrated in its significant ability to create a harmonious tapestry of past, present and future learning activities. The use of a virtual portfolio offers both learner and instructor a general overview and navigational orientation. By acting as a mirror during this evolution of past, through present, to future learning, virtual portfolio enhances reflective activity and adds depth to learning in virtual contexts.

8. Future research

The structuring potential of a virtual portfolio for supporting learning processes on the Web seems beyond any doubt. The Global Change course has demonstrated this unambiguously and convincingly in a variety of ways. However, there is reason to believe that a virtual portfolio may be designed to support and incorporate aspects of a virtual learning process which go further than what has been designed and demonstrated in the Global Change course – especially in terms of peer collaboration. Thus, research challenges to pursue in the future include
further development of the portfolio to handle and structure: collaboration between peers, evaluation between peers, integrated group-portfolios, and more personalized portfolios.

The next step in advancing the concept of portfolio is to design an entire course of study for a student using a curriculum portfolio. Under this concept students, and presumably their academic advisors, would build a meta-portfolio spanning, say, the four-year program leading to a university bachelor degree. Such a meta-portfolio would allow a faculty and advisor to work more systematically with each student in shaping a complete course of study to meet prescribed educational objectives. Reflection and evaluation on interconnectedness of learning achievements of individual courses would identify gaps and redundancies and allow for more seamless progression through the four-year learning process. Such a concept would require university-wide participation by staff and administration and would present a considerable departure from current practices.

References


Complex Problem Area, Dr. Scient Thesis, Department of Informatics, University of Oslo.


