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Recommended Citation
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Avoiding the Hermit's Way of Distance Learning: Augmenting Individual Learning With Synchronous Internet-Based Seminars[1]

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***Abstract*- Taking part in professional education is increasingly difficult for highly-skilled employees and executives because they cannot afford to be away from work for the time traditional face-to-face seminars demand. Individual, self-guided learning, on the other hand, lacks the benefits of direct interaction with people interested in the same subject. This calls for a combination of individual and collaborative learning in a virtual setting that preserves the flexibility of individual learning but augments it with virtual seminars that do not necessitate leaving work or travelling for extended periods. In this paper, we present a software environment for such virtual seminars built on widely available technology that provides tools to create a shared context of interaction among the participants and that enables a tutor to structure and facilitate virtual cooperation for learning. This environment was put into practice in an pilot course. Based on this evaluation we survey the fit of the software design for these situations of synchronous, dispersed group work. We particularly explore the role of a tutor or facilitator for successful virtual communication and cooperation. Furthermore, we present first insights into whether virtual seminars could help to improve isolated individual learning through a certain amount of scheduled events and motivating interaction with others. Finally, we describe the information systems community as an ideal test bed for such innovative ways of learning that could help to give IS research a greater bearing on the practice of the field.**

I. Introduction

"You want me to go for a training event for four days? Who do think is doing my work meanwhile? I will have to work twice as hard after the seminar to keep up". Talk to highly-qualified employees about their professional education, and this is what you will hear very often. Does it really come as a surprise that these knowledge workers are considered an indispensable resource in the information society? Those who cannot attend long seminars away from work have to resort to what one could call the hermit's way of learning: learning alone for yourself. Books or computer-based training (CBT), however, cannot offer that one element that makes traditional seminars so exciting: learning through exchanging ideas and interacting with other people trying to solve similar problems. So where to go from here?

Research on computer-supported collaborative learning suggests two routes to escape learning in isolation from others while still having the benefits of flexibility of time and location. Firstly, individual learning can be complemented with asynchronous communication and cooperation [1, 2, 3]. Secondly, one can provide students with opportunities for direct, synchronous interaction in virtual seminars.

Within the CASTLE project, the consortium has developed an internet-based learning environment that combines self-controlled, individual learning with distributed, synchronous learning sessions. This utilises the strengths of both forms of learning. CASTLE is designed to help specialists for environmental protection from authorities, research institutions and companies to acquire basic knowledge about the use of data from earth observation satellites for their job. The CASTLE learning environment offers access to course material for individual studies (accessible at http://castle.nlr.nl) and to distributed, cooperative learning sessions.

The concept of the CASTLE learning environment was put into practice and evaluated at the end of the project in the form of an evaluation course. The aim of the course was to impart basic concepts of satellite-based remote sensing. Insights from a workshop held with students of distance-learning courses and providers of telelearning courses at the beginning of the project [4] were specifically taken into account as a basis for the design of the evaluation course. In this workshop, time management and motivation had been identified as critical success factors for distance learning. The course 'Introduction to Remote Sensing' was based on five modules for individual studies and seven virtual seminars which deepened the content of the modules. The virtual seminars had the purpose of motivating the students to participate regularly and to support them to structure the timing of their private studies.

This report focuses on the experiences gained from synchronous computer-supported cooperative learning within the CASTLE project. In the following sections, we will firstly illustrate the technological basis for the implementation of the joint learning sessions. We then report results from the evaluation of the course and the software through the participants. Finally, we provide an outlook into how such a combination of individual and collaborative learning can be improved and put into practice.

[1] The CASTLE project (Computer Aided System for Tele-Interactive Learning in Environmental Monitoring) was funded under the EU Programme "Environment and Climate", DG XII, No. ENV4 CT96 0312 from August 1997 to July 1999. Members of the project consortium were: Christian-Albrecht University Kiel (D), C.I.C.E.M. Huelva (E), University of Dundee (UK), Deutsches Zentrum für Luft- und Raumfahrt (D), National Aerospace Laboratory (NL) und University of Hohenheim (D). NetMeeting is a registered trademark of The Microsoft Corporation, RealPlayer, RealEncoder and RealNetworks are are registered trademarks of the RealNetworks, Inc. Lotus, Lotus Notes and Domino are registered trademarks of the Lotus Development Corporation.

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II. Software Support for Distributed Learning Sessions

The CASTLE software offers access to the course material for private study and provides the necessary tools for the cooperation in synchronous learning sessions via an integrated interface. We based the development on existing, standard technology to allow an early evaluation of the concepts and to ensure that the software can be deployed in most standard PC environments. Thus, the system uses Microsoft NetMeeting as the communication platform between the clients. As there were no universally deployable tools of sufficient quality available for multi-point audio conferences at the time of development, we confined the system to one one-to-many audio channel. It is based on broadcasting technologies by RealNetworks. For the storage of and access to the documents edited with the group discussion tools a Lotus Notes/Domino server was used.

Three crucial points have been implemented in the software:

1. The creation of a virtual workspace for collaborative learning with appropriate communication channels.
2. The provision of tools for working with shared material that have been successfully used in computer-supported meetings for a longer time [5].
3. The facility for a tutor to remotely control the participants' workspaces and the tools within the sessions.

These focal areas complement other research projects and products which concentrate specifically on other tools for cooperation and/or put less emphasis on the means of control for tutors (e.g. CROCODILE: [6]).

The **virtual workspace** (see figure 1) provides the communication channels for synchronous and distributed collaboration. This includes a universally available chat channel to send and receive public and private messages. Additionally, the workspace includes an audio channel that is regularly used by the tutor but can be switched to other participants or audio sources as well. Furthermore, the

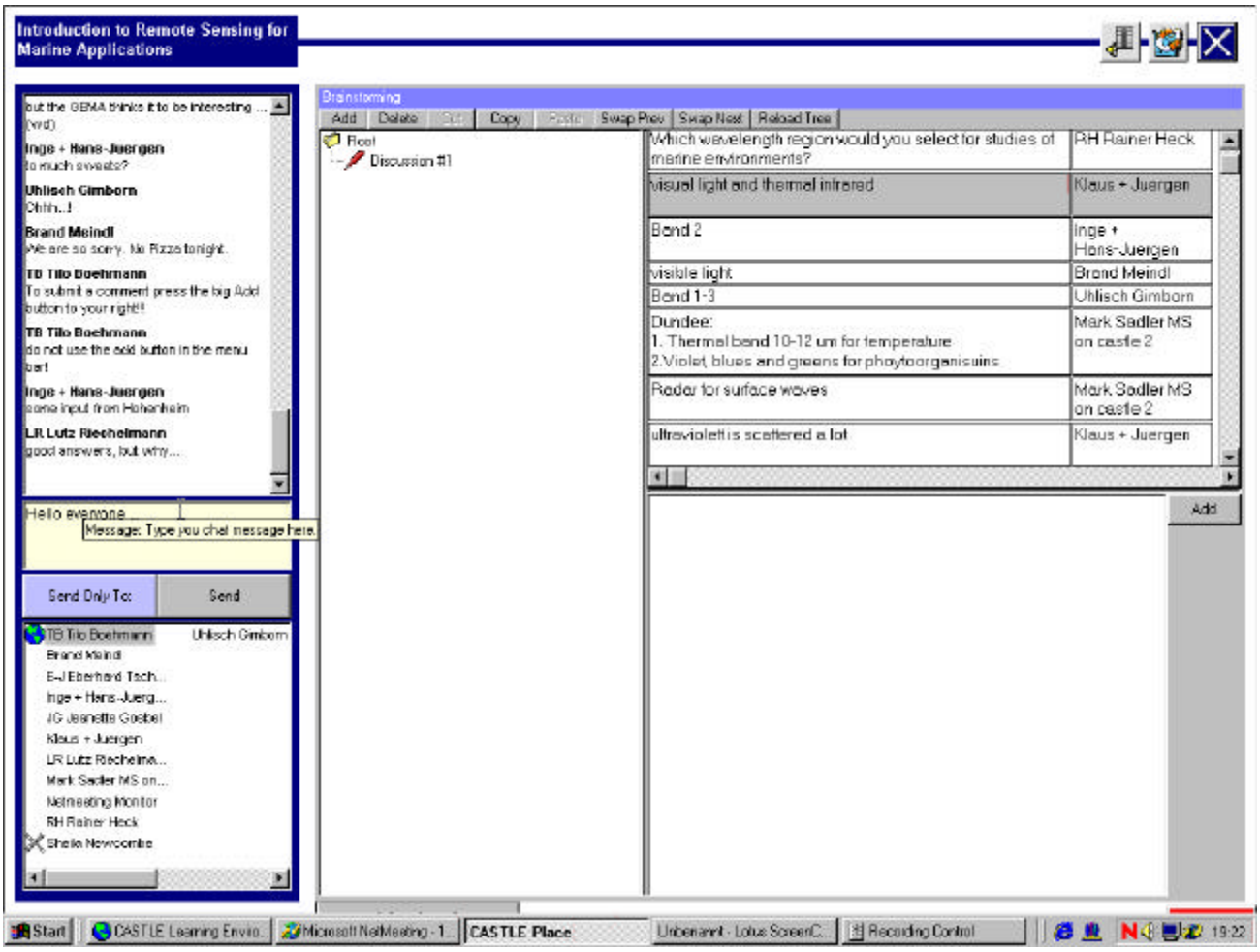

Figure 1. The Virtual Workspace

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workspace displays information about the context of the collaboration, such as the title of the current session, and an list of the session's current participants. These important information and communication elements are assigned fixed positions within the workspace to keep them always visible to and available for the participants. The larger part of the remaining screen space is reserved for placing specific tools for group work. This workspace can be horizontally divided in order to contain up to two tools. The choice and partitioning of the tools can be configured freely to meet the specific needs for interaction in each learning situation. This constant screen layout creates a shared context of work for all participants. Differing contexts could otherwise easily lead to misunderstandings and thus overload the communication channels and distract from the content.

The user interface shows a straightforward, clearly structured design with a minimum of elements for user interaction. This aids people with little computer literacy to participate in virtual learning sessions on and reduces the time to become familiar with the system. This is important for a system directed at highly-skilled professionals as they have very limited time budgets. If a system demands an extensive training phase prior to using it, the system as a whole often becomes unattractive for this group because the necessary amount of time is too high.

Tools: From the perspective of pedagogy, the main advantage of cooperative learning can be found in the collaborative construction of knowledge within a group of students [7]. Research on computer-supported collaborative work (CSCW) offers valuable indications about how to support this collaborative effort [8], e.g. through tools for generating and structuring ideas. These tools, which have been adopted from research on electronic meeting systems for this project, support creative tasks (brainstorming), processes of knowledge structuring (collaborative development of hierarchical outlines), quick knowledge quizzes and opinion polling (polling and voting). To present shared learning materials, the system further incorporates an integrated web-browser and shared drawing tool for working with graphical elements (whiteboard).

Via these tools, all participants work on the same base of shared materials for that session. The shared materials are most of the time designed to contribute to the overall objective of a seminar and thus the interaction via these materials creates a forum for task-oriented interaction. This relieves the generic communication channels. Simultaneously, some of the tools allow the participants to work in parallel. In this way, the system alternates between times of individual and collaborative work within a single session.

These tools developed during the project cover primarily the basic processes of communication and cooperation of group work. All of them use a standardised application programming interface (API) to exchange messages with remote instances of the tool. More specific tools can therefore be added later using the same interface.

Remote control for tutors: Utilising such a variety of tools to their full potential mandates a function that allows a tutor to combine and customise these tools to meet the requirements of the individual activities of a session's agenda. For this purpose, CASTLE offers an agenda tool in which the activities planned for a session can be specified. A combination of tools to be opened on the workspace can then be assigned to each activity.

During the session, the tutor can make activities available or hide them from all participants via the agenda tool and thus give the participants larger or smaller degrees of freedom in the collaborative work. The tutor thus can pursue her personal understanding of learning and teaching.

III. Evaluation Results and Discussion

From March to May 1999, a Europe-wide pilot course on the topic of "Introduction to Remote Sensing" was held with a total of 15 participants from Great Britain and Germany. The course comprised web-based modules for individual learning and seven virtual, synchronous seminars plus an evaluation workshop. The participants taking the course came from the background of biology (7), geography (5), and physics (3). They worked in academic institutions (6), for the government (3) or were self-employed (1) or students (5). One participant had to quit the course after half of the seminar sessions due to other professional commitments. The tutors for individual seminars were selected experts from the participating universities in Dundee (UK), Huelva (E), Kiel (D), Cologne (D), and Hohenheim (D). Hohenheim University provided technical support for the tutors in preparing and running the session.

A. Approach and Methodology

Technologically mediated telelearning as a field of research is very dynamic because the underlying technologies are changing and improving quickly. Furthermore, we know relatively little about its implications for learning and teaching as many approaches and ways are currently experimented with for the first time in numerous research projects and practical applications. We therefore have chosen to follow an exploratory approach for research in the CASTLE project to identify issues worth studying in more detail. So the objective of the evaluation was not to test certain hypotheses but to acquire indicators about the strengths and weaknesses of the technological system and the combination of individual and collaborative, synchronous learning chosen by the project. We intend to use these indicators to improve the design of the software and the course, to share experiences of the selected approach with others interested in the field as well as to help us and others to plot future research that focuses on more detailed questions with a more rigorous research methodology. The results, particularly the numerical results, presented in this paper should therefore be interpreted in this exploratory spirit.

Given the dispersed situation we decided to use web-based, questionnaires to collect the participants' assessment and impressions of the course and the system. The participants were asked to fill in one introductory questionnaire at the beginning, a specifically designed seminar questionnaire after each virtual seminar as well as a final questionnaire at the end of the course. Furthermore, we used the last synchronous session as a virtual evaluation workshop where the participants could discuss and comment on a number of topical areas as a group. The tutors were administered a separate questionnaire. Their impressions and assessment was also collected in a project status meeting following the pilot course.

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TABLE 1.
EVALUATION OF THE TOOLS FOR COMMUNICATION AND COOPERATION BY THE PARTICIPANTS

Tools	**Learning Support** (7 = highest support; mean)	**Focuses on Content** (% of participants)	**Deviates from Content** (% of participants)
Communication			
Chat	5,7	58%	42%
Cooperation			
Interface			
Web-Browser	6,0	83%	17%
Editing			
Outlining Tools	4,4	92%	8%
Brainstorming	4,6	86%	14%
Vote	4,3	89%	11%

B. *Evaluating the Virtual Seminars*

During the course, seven virtual seminars were conducted in total. Most tutors chose to pursue a combination of lecture style instruction and discussion-oriented group work. In the following sections, we present results of the evaluation of the virtual seminars.

Design and use of individual tools

The participants ranked the design of the user interface as suitable for learning processes with a average of 5.7 (scale from 1 to 7, with 7 as most positive value). The process of familiarisation with the CASTLE software was regarded as fairly easy (mean value=5.8). For basic interaction within a seminar, the participants only had to understand where to type and how to send chat lines, for which the tutor had to explain only a single button. This enabled the tutors to explain the software environment using the software itself in the first of the virtual seminars. The tutor then explained the use of the other tools orally or with a single slide whenever that tool was introduced the first time. We think that additional manuals, how-to-guides, etc. only distract the participants from real-time interaction. Reading and comprehending these guides comes on top of all information that is exchanged in the virtual seminar itself at the same time. That in itself is very demanding to process, therefore assigning a high priority to simplicity of use certainly helped the participants to appropriate the system quickly without intensive training and supplementing materials.

One can derive interesting insights from a direct comparison of the communication tools with the tools for cooperation with regard to the perceived support of learning. While from the participants' perspective the chat has proved to be very functional for learning in sessions, it becomes clear at the same time, that participants feel a strong distraction unfocused interaction within the chat.

On the one hand, individual participants positively noted in their comments the opportunity to spontaneously ask questions, react on what happens and to perceive the other members of the group through their interaction. On the other hand, other comments indicated that they felt distracted by the often multiple conversations that were going on within the chat (e.g. solving technical problems for other participants, social conversation).

This evaluation is inverted for the **cooperation tools**. Except for the web browser, tools' support of learning has been regarded as slightly positive, but all tools helped a majority of participants to concentrate on the content of the session (see Table 1). Two effects may be responsible for this: Firstly, the tutors used the tools for communicating and establishing a topic-oriented structure for the contributions of the participants. This visually links a certain area of the virtual workspace to a certain topic and thus clearly establishes a shared context for interaction. Secondly, such a shared context then helps the participants to decide what contributions are appropriate and how they add value to the topic discussed.

In comparison to the positive, but relatively lower values for the cooperation tools, the high positive rating for the web browser's learning support is presumably due to two factors. Firstly, these tools were designed as a prototype for a smaller number of participants. Due to limited resources, though, the sessions could not be held for more than one group. Given the larger-than-expected number of participants in each session, there were occasionally problems with the technical reliability and performance of the system. As this affected particularly the tools for cooperation, they were regularly used in all sessions, but often not as the central tools. Often the tutors alternatively chose to work with a combination of slides and the chat. The slides were then displayed with the integrated web-browser which thus became a substitute for the traditional overhead projector. Secondly, the tutors themselves had to develop a feeling for a sensible instructional design that fully utilised the potential of the tools for cooperation. The evaluation of the tools therefore presumably includes an assessment of the (technical) reliability and performance of the tools, their usefulness within the specific context of learning and also of the tasks to be performed with their help. Some of the instructional designs might thus have been too challenging or not challenging enough for some of the participants. With an improved instructional design, technical stability and

search

performance one can expect more positive results. This expectation is also warranted by the results of other studies using similar tools [9, 10].

The distinct separation of universally available communication support and task-related cooperation tools appears to be a promising approach for virtual learning sessions. The task-related tools help to communicate and establish a shared context for interaction. The granularity of separation (i.e. how many task-specific channels of interaction can participants successfully handle), though, remains an open question. Providing too many channels can easily lead to negative effects through channel overload [11]. Channel Overload describes the overload caused by the necessity to rapidly change between the different forms media to process incoming messages. Even with our limited number of channels for interaction, some of the participants had difficulties handling situations in which there were multiple conversations in the chat, the tutor was communicating via the audio channel while the participants were working with a cooperation tool.

Facilitation

The relevance of the tutor's facilitation role became clear during the course. Thus, the participants rated the facilitation by the tutor with a mean value of 6.17 (scale from 1 to 7, with 7 as most positive value) as extremely important for the success of the seminar. Throughout the series of virtual seminars, the average satisfaction with facilitation of each seminar ranged between 4.36 and 6.17, with the exception of the second seminar (3.29). The poor rating for the second seminar can be explained by the fact that this seminar had to be aborted due to technical problems and was repeated later (with a much better rating). This indicates that other factors might have influenced the participants' evaluation of facilitation and that the results should thus be interpreted with some caution. On the other hand, the participants' positive open comments support their positive evaluation of the facilitator's role.

The facilitator generally had a number of roles to play. Firstly, in most cases he or she was acting as a tutor or teacher. Taking into account the tutors' comments as well, one can assume that the tutors had to change their role from imparting knowledge to coaching for which the tutors had not been prepared. Tutoring and teaching also entails structuring a session into individual activities and progressing through them within an actual session. To aid this progression the software system enables the tutor to start and stop activities on all students' screens. Starting means placing tools labelled with the name of the activity on all workspaces, stopping means removing these tools from all workspaces. This reconfiguration of the workspaces helps to establish a shared context for interaction as the progression through the phases of a seminar becomes clearly visible for all participants.

Secondly, one has to pay attention to the fact that tele-facilitation differs substantially from a traditional seminar. For example, some of the participants indicated, that a tutors' reaction on questions took often relatively long times or occasionally the question was ignored altogether. Given the potential channel overload both for tutors and students, tutors had to pay attention to facilitating conversations, e.g. making sure that a question is met with an appropriate answer before taking up another line of conversation. Towards the end of the CASTLE course the problem with multiple lines of conversation in the chat led to the introduction of an interaction broker. This interaction broker (sometimes the tutor himself/herself, sometimes a separate person) channelled questions and feedback between the tutor and other participants, structured the ongoing conversation in the chat channel and occasionally initiated new conversations if the participants remained too quiet. Mark *et al.* [12] pointed out a similar role for successful synchronous meetings with distributed teams.

Thirdly, at some stages the tutors and participants needed support on technical issues. To solve technical problems quickly we appointed from the start a technical facilitator to operate the system and provide technical support before and within a session, similar to the role of a chauffeur that has been discussed in the context of Electronic Meeting Systems [13]. This role was in most cases taken over by a person other than the tutor because of the multitude of tasks the tutor was already facing [14].

Social Presence

In the final questionnaire the participants felt that they had almost no social relationship with participants at other locations (mean value=1.92). Additionally, they indicated that they on average knew only few people at other locations by their name (2.36). This underscores experiences from other tele-seminars [3, 15]. The low assessment may be due to the lack of social information about other participants. For example the perception of social aspects as clothes, spoken language, etc. was impossible [16]. That the participants introduced themselves to the group at the beginning of the CASTLE course did not produce the necessary basis for establishing ongoing social relationships. Even the communication in the chat was not sufficient though it had been quite lively throughout all seminars. This may also be the result of very restricted informal exchange between the students, which is very important for group dynamic processes [17].

The research community is increasingly is called to search for methods and approaches that enable the establishment of social presence in virtual environments. A first and simple step towards a solution could be for instance the integration of the learners' individual homepages in the learning environment, which could serve as a reference for background information [18]. What degree of perception of social presence, however, is necessary to support effective collaborative learning is yet unknown.

C. *Evaluating the Course Structure*

The pilot course comprised five periods for individual learning of certain modules of the web-based course materials. At the end of each period all participated in a virtual seminar in which a tutor helped them to consolidate their understanding of the respective learning modules (see Table 2).

When interviewing a number of experienced students following distance learning courses at university level we found that once and again they were stressing the very high levels of intrinsic motivation and good time management are needed to succeed in this environment [4]. They believed that

search

combining individual distance learning and virtual seminars helped them to structure their process of learning. They also see the interaction with other students as being motivating but they cannot generally give up the time flexibility in time offered by distance learning. Building only on the participants' intrinsic motivation was not solid enough a foundation in their opinion. Synchronous interaction gives people also some extrinsic motivation to work for their course. Of course, we all assume that people will be intrinsically motivated because they want to enhance their performance at work and their career prospects. Yet those people also live in a world that is littered with extrinsic incentives to do other things: milestones, deadlines, meetings, presentations, etc. So putting some benevolent pressure on these people to schedule their learning via the regular virtual seminars might help them to reserve some time to study. The benefit of virtual seminars is that they will not loose time travelling to another location so that this time can be used for learning or other purposes.

It is thus not surprising that the participants of the pilot course made a generally positive assessment of chosen course structure (mean=4.9). They also held a positive view about taking part in another course with the same structure (mean = 5.5). The participants described especially the virtual seminars as helping them to structure their own learning process and as an incentive for regular and concentrated individual learning. One participant expressed his opinion that it helps to know that one is not the only person learning. Another stressed the positive effects of the chance to actively apply the knowledge they had acquired before in the seminars. Especially the direct feedback from the other participants and the tutor was regarded as helpful by two other participants. Similar experiences were made within the virtual university project of the FernUniversität Hagen, a German university that offers only distance learning courses [18]. On the other hand, participants criticised the level of integration of the units for self-study with the virtual seminars within the pilot course. So some improvement here would be necessary to exploit the full potential of the combination of both forms of learning.

For research on CSCL and telelearning, respectively, the question remains, which degree of structuring a learning arrangement needs. A quick sequence of virtual seminars bears an intensive effect on structuring, but simultaneously reduces the flexibility in time for the participants. Flexibility in time, however, is one of the strongest arguments for distance learning, especially for employed participants [18]. A clear majority of the participants spoke therefore in favour of a biweekly interval between two seminars (weekly: 4 participants, biweekly: 8 participants, three week interval: 1 participant).

On a more practical note: What changes would we make to the course structure if we did the course again? In principle we would also use a biweekly interval for the seminars. At the beginning of the course, however, we would change to a series of more densely scheduled seminars to strengthen the participants' appropriation of the software environment and the perception of learning in a virtual community. The following idealistic structure for kick-off phase of a virtual course will sound a bit like a cookbook but one should perhaps read it as a grounded hypothesis that should be subjected to further evaluation in research and practice.

A course should start with a quick sequence of seminars. The first seminar then focuses on establishing a virtual community among the participants. For this, the participants will introduce themselves through an individual homepage which the tutor can make visible to all participants in this seminar. This situation of getting to know others can also be used to work with some of the tools of the software system to learn how to conduct virtual discussions and presentations.

After the introductory session, the work on the subject can be started. Having only a short interval between the first two session helps the students not to forget how to operate the software for virtual seminars. The agenda for this second session should not be organised too tightly so that the participants can improve on using the system and that they

TABLE 2
SEQUENCE OF VIRTUAL SEMINARS

Week	Topic	Type of Session
1	Learning how to learn in the CASTLE environment	Seminar
4	Modules 1 & 2 of the web course	Seminar (The seminar was suspended due to technical problems and repeated successfully in week 8)
6	Modules 3 & 4 of the web course	Seminar
8	Software tools for analysing satellite data (Repetition of 4th week's session)	Presentation via application sharing
9	Module 5 of the web course	Seminar
10	Specific applications of satellite data	Seminar
11	Guide to further studies in topic area	Seminar
	Evaluation Session	Workshop

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can intensify patterns of virtual interaction.

After about two sessions, the virtual learning community should be established well enough to allow a longer distance between the sessions in order to give the participants a greater flexibility in time. For each session one could provide a detailed guide as to what interaction will be required in the session. People can then prepare in advance, which is even more helpful if people come from different languages.

The interaction between participants can be further intensified by asynchronous communication and cooperation, either through simple e-mail or more advanced collaboration support systems, such as Lotus LearningSpace or similar. At this point, however, one should not overestimate the participants' time budget and bare in mind that the objective of these sessions is not to establish a virtual community in itself but learning progress in a certain topic. The minimum quality of the community required for successful collaborative learning in a virtual environment still remains an open question.

IV. Summary and Outlook

We have presented a software environment built on widely available technology for virtual seminars that provides tools to build a shared context of interaction among the participants and that enables a tutor to structure and facilitate virtual cooperation for learning. This environment was put into practice in an pilot course that surveyed the fit of the software design for these situations of synchronous, dispersed group work. We explored the role of a tutor or facilitator for successful virtual communication and cooperation. Furthermore, we presented first insights into whether such an interaction could help to improve isolated individual learning through a certain amount of scheduled events and motivating interaction with others without necessitating the participants to travel and spent time away from work or home.

Participants did not fundamentally resist or object to the this new way of learning. There was only one drop-out and they were on average satisfied with the learning environment. Looking at their comments on the questionnaires they give suggestions for improving the technological system used. Much more than that, however, they were addressing in their remarks how the instructional design could be improved and how different elements of the course could be integrated in a better way. Certainly, there are ample opportunities for developing better, simple to use and reliable technology for telelearning. Yet much more emphasis should be directed towards developing successful and enjoyable instructional designs.

Perhaps the information systems community is an ideal test bed for these new ways of learning. It is equipped with networked technology, with people ready to make use of it, with a great degree of specialisation and the seemingly eternal need to adapt to new developments. This is the environment where telelearning can deliver its potential of catering for very specialised and dispersed groups of learners. It also can deliver education without mandating people to leave their work for many days, as traditional seminars do. So information systems departments could make use of these technologies to extend their reach into professional or executive education in their field, thereby transforming their research to have a greater impact on the practice of information systems.

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