A Collaborative Learning Trial between New Zealand and Sweden – Using Lotus Notes Domino™ in Teaching the Concepts of Human Computer Interaction

A.G. (Tony) Clear

Academic Leader, Computing - Systems & Technology

Faculty of Business, Auckland Institute of Technology

Private Bag 92006, Auckland 1020, New Zealand.

Tel. 64-9-307-9999 xtn 5329

E-mail: Tony.Clear@ait.ac.nz,

ABSTRACT

This paper reports the results of a collaborative learning exercise between students at Auckland Institute of Technology and Uppsala University. The exercise was conducted using both a Lotus Notes Domino™ collaborative database and electronic mail to support students working in remote groups to perform a common task. Issues concerning the logistics of such an exercise, student participation and evaluations of the process, ethical considerations and the quality of the learning process are discussed. Some conclusions are drawn concerning the value of GroupWare technology to support this form of collaborative learning, and suggestions are made for future developments.

1. BACKGROUND

This trial developed from the initial work reported in [1]. An international link to be established between classes was felt to offer the chance to develop students' capabilities in cross-cultural communication, in teamwork and in awareness of IT. GroupWare technology was thought a suitable vehicle for this exercise. It was hoped that the experience would add to students' understanding of the use of IT in global collaboration projects, and of issues related to a collaborative workspace.

This project has become loosely affiliated with the research being undertaken under the Runestone project [2]. A combination of use of GroupWare technology and Collaborativist learning theories have informed this exercise, (cf. the Leidner and Jarvenpaa [3] framework for educational uses of IT).

2. DESCRIPTION OF THE TRIAL

The trial involved a first year Computer Science class at Uppsala University studying a general paper in IT concepts, collaborating with a third/fourth year class of Bachelor of Business students taking an IT paper in Human Computer Interaction at Auckland Institute of Technology.

The Uppsala group consisted of approximately 80 students and the New Zealand group approximately 20. Both groups were to collaborate on a common task. The task involved each group acting in different roles. The Auckland group were to be business analysts consulting to a local client, while the Uppsala group were a group of software game developers, with whom the Auckland consultants had to liaise. The purpose of the exercise was to jointly develop a feasibility study for a computer game to support the client's need for a software product. The software product was to help young pharmacy assistants become more informed about the client's nailcare product range, and thus be better able to diagnose customer's problems and recommend suitable treatments and product combinations. This would lead to greater sales and reduced instances of misdiagnosis and nail damage. The project scenario thus represented an opportunity for problem based learning based upon a live business case.

The trial took place over a 3-week period between September 22nd and October 22nd 1998. After the initial week of getting started, came an intervening two week holiday period for the Auckland students, followed by a further two weeks of collaboration on the task. These parameters were dictated by the need to focus the exercise, find a common time, and fit within the syllabi and schedules for the two courses involved without "hijacking" their focus and content.

A *Generic Collaborative Database [1]*, which uses the features of Lotus Notes Domino™, was employed in combination with standard electronic mail, to facilitate the collaborative learning process. Being a secure database, students were required to register in order to participate and access its features.. The system could be accessed through a standard Internet browser client, with the database being hosted on a server at the Auckland site.

Main features of the database (cf. table 1 below) were a hierarchical structure that supported entry of generic items such as

project, task, document, section, section version, discussion threads and responses at document or section levels. In addition to these structured document control features, was a reference area. In this, files of various types such as documents, figures, pictures were able to be attached or downloaded, and web site references could be included, grouped in categories with a description of the purpose of the site.

Initial contact took place between the author and Mats Daniels his collaborating partner, at the August ITiCSE'98 conference, and it was agreed to attempt a collaboration. At this stage the Auckland course was already underway, so the collaborative exercise came as a somewhat experimental mid-course innovation for the teachers and students.

Subsequent arrangement and coordination took place between the teachers by e-mail, and the concept and the common task were outlined to each student group before the exercise began. Mail groups for the classes of students were also set up.

The next stage of the exercise was to establish and match the groups. Groups were allocated manually by their lecturers, then input into an Excel™ spreadsheet, which was attached to the database so that it could be shared. However this did not include e-mail addresses of each group member.

The first week of the collaboration resulted in very little progress. Groups were still incompletely matched, a communication "glitch" occurred between lecturers as other priorities clashed, students struggled with the foreign concept of a system with design flaws and a very user unfriendly interface, and many students had not yet mastered the registration process, which required them to remember their passwords.

During the intervening two-week break, students gradually became registered. At one stage the registration database ran out of space, which delayed registration for a couple of days. One benefit of the registration process was that, as students registered, their e-mail addresses could be notified by the lecturer to their fellow group members. In week 1 there were 17 Auckland students and 3 Uppsala students registered, by week 2 the number of Uppsala students had grown to 32 and by the end of the trial about 60 of the 80 students had become registered.

The process of assigning groups was ongoing and suffered from some confusion of naming standards and duplicated group numbers (global versus local group numbers for instance). Extensive e-mail traffic was generated in assigning the Auckland groups of typically two students, to their twelve Uppsala partners (comprising three or so groups of four members each).

Collaboration using the database was a sporadic affair. The Auckland groups had 6 in-class collaborative sessions over the three weeks, normally the first hour of a two hour 5 - 7 p.m. evening class session, held in a multimedia computer lab. A session consisted of discussion, demonstration and use of the system, review of the registration process and of collaboration entries. Usability issues, the nature of a collaborative workspace, the GroupWare paradigm, and design considerations for hypertext based systems, such as suitable menu hierarchies and navigation would be covered.

The Uppsala class augmented the exercise with a visiting lecture from a commercial game developer.

Usability problems hindered use. Help facilities for the prototype system were limited. Much advice on how to use the system was broadcast by the author via the mail group. Some students were slow in coming to grips with the exercise, some were unable to grasp the concept of the database, the "lost in hyperspace problem" defeated some, and others chose to communicate using e-mail direct.

A file giving details of recommended naming standards was provided, to help students organise their entries and related views (eg Groupnnn to sort documents related to each group in a common order). Some students made good use of these standards and saw the value of them.

By the end of the exercise many of the students had made some progress in mastering the system. The variety of different approaches and features used indicated a degree of ingenuity. Each combined group had come up with at least one design concept for a game, showing they had thought about the problem, variously using the database or e-mail alone to express it with.

3. STUDENTS AND THEIR PERCEPTIONS

The student groups were quite diverse. The Auckland group were more senior students, mostly in their twenties and thirties, not all were IT majors, they were studying towards a business degree, and the level of IT literacy varied from minimal to advanced. Many were working and studying part-time, and the class as a whole seemed to be highly focused on the assessed coursework.

The collaborative exercise appeared to have been regarded by some students as an annoyance, and a diversion from their multimedia projects, which many saw as the primary purpose of the course. They had limited access to the multimedia laboratory and tended to want to use the class time for their assignment work using products such as Macromedia Director, PhotoShop etc. A colleague, team-teaching the course with the author, observed that they were a particularly task oriented class.

The variable levels of computer literacy and the unfriendly nature of the user interface, seemed to deter many from using the database, and some reverted to using e-mail alone.

The Uppsala students struggled with features of the database, but by the end of the trial many had found ways to make effective use of it. The communication between groups appeared rather sparse. In the brief time available, the combined international groups did not appear to have become functional, although the local ones did - probably more by off-line than on-line working. In the event, each group achieved a result, in that a concept for a suitable game was developed and communicated from the developers to the consultants.

Each New Zealand group confirmed receipt of their proposal from Uppsala, by the due date when we reviewed the progress of the exercise in class. Interestingly, of the eight overall groups involved, four had used the database to communicate their proposal and four had used e-mail. This gave the opportunity to discuss issues of usability, ease of learning of a new system, and the cost of poor interface design. Issues of power and control in system development could also be tangibly demonstrated, by showing the freedom of a user to avoid using, or to bypass a computer system felt to be deficient.

A number of different sources were available for evaluation of the students' work, and their perceptions.

The *generic collaborative database* itself supported in part the visions for the use of information technology suggested in [3], of *automating, informing and transforming*. Many of these, as discussed below, support evaluation of student work:

- *Automating* - by supporting the process of developing joint documents, and conducting remote discussions

- *Informating up* - by enabling the instructor at any stage to view the work of a group as an on-line work in progress, including the relative contributions of each participant in the process. Time stamping for versions of material helped identify which groups were using the system, and had been most recently active, and their degree of contact with their group partners. This offered an interesting window into students' work-in-progress and into the tentative group formation processes.

  This dimension also gave an opportunity to clearly differentiate between the open collaborative nature of the GroupWare paradigm, and the more closed personal nature of e-mail as a technology. Groups who had communicated by e-mail alone, inhibited both the process of *informating up* to their lecturers, and as discussed below, of *informating down* to their peers.

- *Informating down* - by enabling students to have access to information from their lecturers and their peers, (the database contents were freely viewable by all participants, and not secured at group level). Also to have the support of communication facilities through the GroupWare product itself and the database application

- *Transforming* - by changing the nature of the learning and educational process, by facilitating a range of collaborative activities which traverse traditional borders. By enabling more interdisciplinary learning approaches to be adopted, emphasising learning which develops capabilities in global communication, and cultural awareness rather than the traditional curriculum navigation, content driven approaches. The nature of assessment is also called into question - how to assess, what to assess, formative vs. summative, individual vs. group etc.

Apart from on-line student observations in the course of their collaboration, and the quality of the design proposals received, there were several other means by which the exercise could be evaluated. While not a formal experiment the exercise was certainly experimental, and other sources of evaluation than the "low road" of [5] being the purely descriptive, were able to be used. The evaluation approach adopted might be termed a "middle road". Sources included for the Auckland students, information gleaned from analysis of formal lecturer appraisals, course appraisals, student reflections and answers given in the final examination, and an on-line questionnaire specifically related to the collaborative exercise, which was included as a feature of the database towards the end of the trial. A further evaluation measure will be the client's assessment of the designs proposed.

4. QUALITY OF PROCESS AND RESULTS

The fact that groups did each produce a design proposal indicates that the exercise was successful. At least some meeting of minds across the globe had occurred. However the design proposals were often less the result of joint effort, than of the Uppsala groups producing a proposal independently. The goal of the exercise was to produce a full feasibility study, which would have required much greater interaction between the groups, but, with the limited time available and level of student commitment, was too ambitious a target.

Schoenig in [4] commenting on single project software engineering courses, notes that project registration, team assignment and review of documents are three of the most time consuming processes. Certainly, in this project, assigning and establishing teams/groups was a much more time consuming activity than had been estimated. The time lost in this phase of the project, detracted from that available for producing proposals and reviewing documents.

Nonetheless the quality of many of the Uppsala students' design concepts was high, and reflected considerable variety and originality of thought.

Whitworth [6] has characterised three processes of group interaction, by which the exercise might be reviewed:

1) resolving the task,

2) relating to others

3) representing the group.

The exercise achieved a partial result in terms of *resolving the task*. Analysis of the features of the technology used to achieve this is given in table one below:

DATABASE FEATURE:	COMMENT
	(8 groups overall, 20 Uppsala groups)
Project	used by 14 of the 20 groups
Task	used by 14 of the 20 groups
Document	used by 10 of the 20 groups
Section	used by 4 of the 20 groups
Version	used by 1 of the 20 groups
Discussion thread - document level	used by 6 of the 20 groups
Discussion thread - section level	used by 4 of the 20 groups
Response	used by 10 of the 20 groups
Attached document	used by 1 of the 20 groups
Attached file	used by 1 of the 20 groups
Attached Form (embedded text)	used by 4 of the 20 groups
Web page link (from within section version text body)	used by 1 of the 20 groups
Own technology	Web page, Chat room page used by 1 of the 20 groups
Attach webpage reference link	used by 0 of the 20 groups
E-MAIL	Used by lecturer in broadcast to all groups, mail to individual group

	and from/to individuals.
	Used by all of the 20 groups during the collaboration.
	Used by 4? of the 20 groups for submission of final proposal.

Table 1

In terms of the group process of *relating to others*, the trial was only partly successful. Only a few groups established active international communication, although some of the e-mail only groups about which information could not be tracked, were known to be moderately active. Some of the reasons for this apart from those mentioned above, may have been the irregular checking of entries in the database by the Auckland groups. The system lacked a notification of new entry feature, which may have inspired more active use.

It is unclear how the third group process of *representing the group* was carried out. For instance how group members chose their on-line scribes is a process not visible from the database. If a process of on-line minute keeping and role selection were enforced, that might be a way to understand what factors affect this process. But how this third group process operates may always remain rather elusive, and use of GroupWare is unlikely to be the ideal vehicle for analysis.

Auckland student evaluation of the exercise was mixed. There was a poor response to filling in the on-line questionnaire (3 responses from 18 students), but the results of this were useful nonetheless. They confirmed that students had improved their understandings of both Human Computer Interaction and a collaborative workspace.

They also confirmed that students perceived no ethical concerns with being formally assessed based upon the results of an experimental exercise. This was an interesting finding since the author had chosen not to formally assess the students based upon this exercise, given its inherent risks and uncertainties. This decision rebounded to some extent. Some student appraisals commented on the amount of time spent on "unassessed work", and the need to "stick to the curriculum". One questionnaire response suggested that this contributed to a lack of student "buy-in" to the exercise, and even a resentment of the author taking time from their other assessed work in order to "satisfy his own research interests".

A further paradoxical finding was that the students perceived the database to offer no advantages over e-mail alone for such an exercise, but to offer effective support for international groupwork if used in conjunction with e-mail.

The nature and clarity of the exercise and the task was criticised, as being too vague, and not encouraging enough collaboration.

Finally, students made some valid and useful suggestions for improvement to the system, and its user interface.

5. CONCLUSIONS AND DIRECTIONS

Although the results of the exercise were somewhat mixed, and the exercise took concentrated effort to sustain, the author is eager to persevere with this form of pedagogy. A number of lessons have been learnt, and several things could be done differently in a future trial. The Uppsala students have produced some good and interesting work, which can be presented to the client for her feedback. A follow-up project to develop the software may come from that.

Whether this class of Auckland students were an exceptionally conservative group, or the concept had not been well sold to them, and related to the purpose of the course is a moot point. Certainly there are issues related to how such an exercise is presented and incorporated within a course and an existing assessment and examination schedule.

A trial such as this tends to develop opportunistically, and the planning window is short - aligning two student groups on different calendars, at different stages of study, in different subjects, to undertake an achievable common task within a tight collaboration window is a minor challenge.

Nonetheless the author believes that the benefits are considerable. For a Human Computer Interaction course, it offers a rich way of teaching issues associated with group support systems, collaborative workspace, navigation, use of the web, design of menu hierarchies, instructional technology issues, alpha testing, evaluation and usability concepts. Unfortunately in this case, the very flaws in usability have proven a powerful way to teach the value of designing for usability, and the costs of not doing so.

The value of the collaborative database over e-mail for such an exercise could well be questioned, but the *informating* potential far exceeds that of e-mail, although the flexibility may be less. For instance, the results of this exercise and earlier in-class trials are available for review, analysis and critique on an ongoing basis. The system provides an industrial strength, web enabled base upon which such an exercise can be conducted. Lotus Notes Domino™ offers a sound infrastructure upon which to build an application, it has the ability to link e-mail and agent functionality into the system. Given resources of time and expertise significant extra functionality could be developed. For instance with a ranking database the proposals could be ranked for value by the participants in the trial; or e-mail messages associated with each group's activity could be stored in folders and made accessible; or features for supporting workflow such as standard review processes could be incorporated. Therefore the author intends to persevere with the application and the underlying technology.

The concept of the database was built upon the idea of a structured document repository with a hierarchy of generic elements, which afforded some structure to support collaborative work, but considerable freedom to enable local input of content. While the structured elements attempt to provide a semantic layer above that provided by the standard syntactic layer of the web, the concept needs to be rethought. The hierarchies are too deep, the freedom afforded requires a tight personal discipline in terms of a house naming style and set of standards. Students failed to use consistent naming standards and produced a confusing jumble of unrelated elements. This may have been useful learning regarding the value of naming standards, but in the short time available detracted considerably form the exercise.

It appears that for future collaborations, a tighter structure to the exercise, tighter parameters to the task, and possibly a predefined set of database elements may be necessary (eg. specific projects, tasks, documents etc. if the structure is not to be radically redesigned). The database views also need to be redesigned with

less clutter and fewer levels, and more integration of mail agents into the database features would be useful, to notify group members of new entries etc.

The process of group formation needs to be addressed. It needs to be streamlined and sped up by developing functionality to support the workflows of assigning members to groups, and informing groups of their members and contact details. This would involve development using multi-database links and mail agents, so has not been undertaken so far.

Very early in the GSS literature it was observed that "Prescribing a particular structured approach for use in a generalised GDSS is very difficult"[7]. One general and related question that remains unanswered in this exercise is "how much structure is enough?" Sources of structure can be provided by such factors as the technology, by the task, by a set of cultural norms or by the facilitator of the process. Finding a suitable balance in this and determining how much structure to impose via the system, versus via the facilitator providing tight guidelines and prestructured exercise material is still an open question. As with any teaching setting, the answer to the question is one that is variable, and in the end probably to be pragmatically resolved.

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